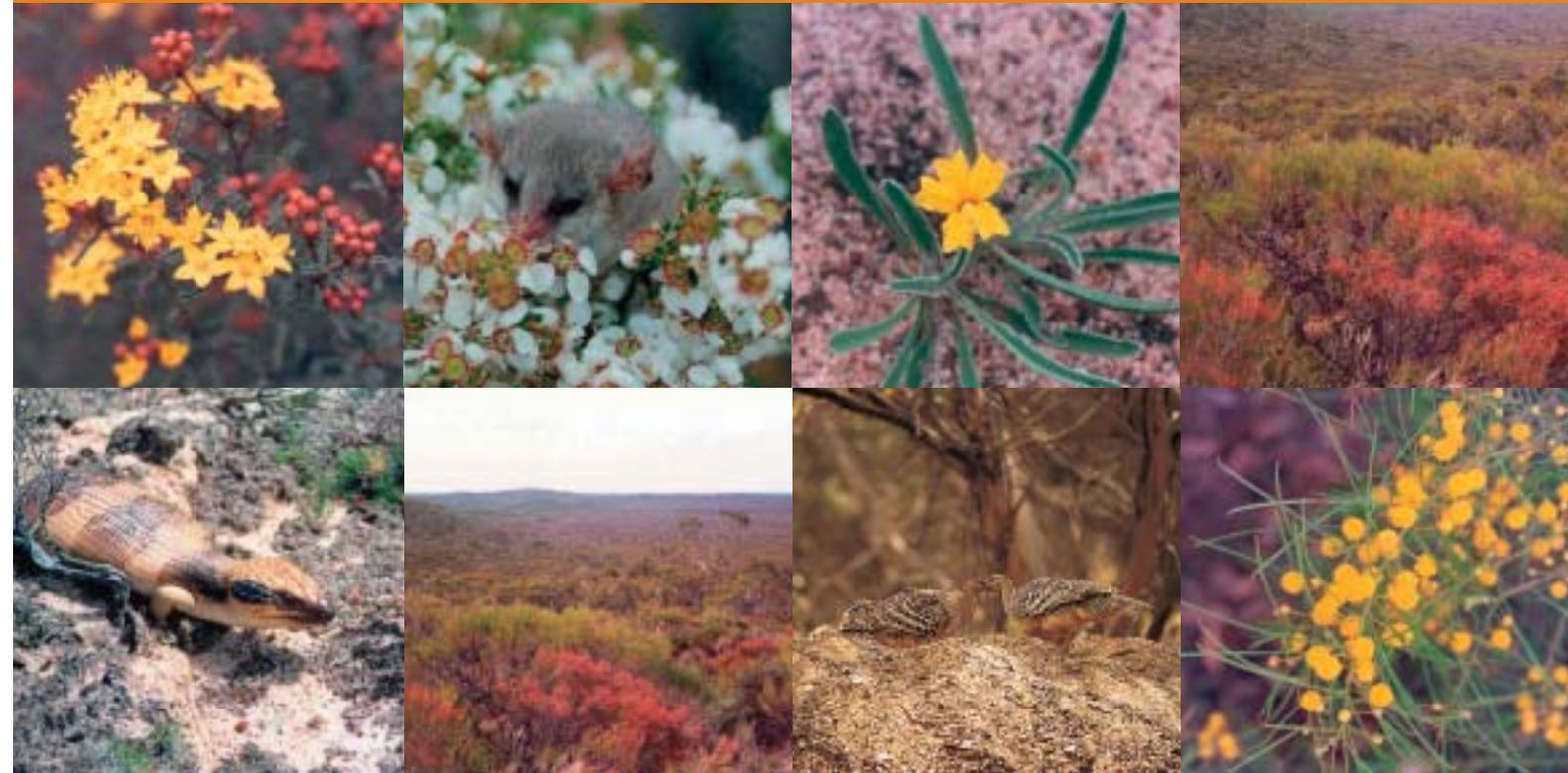


Department for Environment and Heritage

Ngarkat Complex of Conservation Parks



Management Plan



Government
of South Australia

This plan of management has been prepared and adopted in pursuance of Section 38 of the National Parks and Wildlife Act 1972.

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Cover photo clockwise from top left: Silvery phebalium *Phabalium bullatum*, Little Pygmy Possum *Cercartetus lepidus* on *Leptospermum* spp, Silver Goodenia *Goodenia willisiana*, Mallee Heath, Wallowa *Acacia calamifolia*, Malleefowl *Leipoa ocellata*, Mallee Heath and Western Blotongue *Tiliqua occipitalis*.

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Department for Environment and Heritage

Ngarkat Complex of Conservation Parks

Incorporating Ngarkat, Mt Rescue, Mt Shaugh and Scorpion Springs Conservation Parks

Management Plan

March 2004



Government
of South Australia

Our Parks, Our Heritage, Our Legacy

Cultural richness and diversity are the marks of a great society. It is these qualities that are basic to our humanity. They are the foundation of our value systems and drive our quest for purpose and contentment.

Cultural richness embodies morality, spiritual well-being, the rule of law, reverence for life, human achievement, creativity and talent, options for choice, a sense of belonging, personal worth and an acceptance of responsibility for the future.

Biological richness and diversity are, in turn, important to cultural richness and communities of people. When a community ceases to value and protect its natural landscapes, it erodes the richness and wholeness of its cultural foundation.

In South Australia, we are privileged to have a network of parks, reserves and protected areas that continue to serve as benchmarks against which we can measure progress and change brought about by our society. They are storehouses of nature's rich diversity, standing as precious biological and cultural treasures. It is important to realise that survival of species in 'island' reserves surrounded by agriculture or urban areas is uncertain, and that habitat links between reserves are essential for their long-term value as storehouses.

As a result of more than a century of conserving nature and cultural items, we possess a "legacy" which is worth passing on to future generations.

There are twelve essentials for the protection of our park environments:

- Recognition that a primary purpose of our national parks system is to conserve the wide diversity of South Australia's native plants and animals and to improve their chances of survival through active wildlife management.
- Recognition that all our parks also protect cultural legacy of relevance to both Indigenous and Non-Indigenous people, and that Indigenous people have had cultural association with this land over many thousands of years.
- Freedom to improve our legacy by making additions to the park system -- enhancing existing protected areas and including landscapes and environments containing native plant and animal communities not already protected.
- Realisation that the continuance of our native species cannot be dependent upon island reserves alone but should be provided for in a regional landscape with linkages between natural areas to enhance the prospect of long-term survival.
- Recognition that there is potential for new and useful substances or genetic material to be found in native plant and animals.
- Recognition of economic and social benefits for local communities, which arise from the presence of national parks in their region and the consequent opportunities to offer service for visitors.
- Development of close relationships with the community, so that there is an understanding of the role of parks in conserving native wildlife, cultural items and in providing recreational opportunities.
- Promotion of community participation in making decisions on the management of parks, so that a sense of community ownership of the reserve system may be fostered, and so that parks and surrounding landscapes are managed in harmony.
- Appreciation that those qualities presented to visitors for their use and enjoyment in parks, should be the diversity of plants, animals and landscapes for which the parks were set aside.
- Understanding that development in a park should proceed where it :
 - contributes to the conservation of the environment;
 - provides for better appreciation of the need to conserve the diversity of plants and animals;
 - protects wildlife habitats and landscape (especially vulnerable and threatened species or communities); and
 - is necessary for management of the park.
- Reassurance, in support of our cultural character, that natural areas can survive even though those who care deeply for their survival may never visit them.
- Provision of valued natural areas for people to be at one with nature and for personal and spiritual refreshment.

FOREWORD

This management plan sets out objectives and actions for the Ngarkat Complex of Conservation Parks. It has been produced in accordance with the *National Parks and Wildlife Act 1972*. The park is of considerable conservation value and is managed by the Department for Environment and Heritage.

Known simply as ‘Ngarkat’, this complex is located in the Upper South East and Murray Mallee regions of South Australia, and consists of four contiguous parks; Ngarkat Conservation Park, Mount Rescue Conservation Park, Mount Shaugh Conservation Park and Scorpion Springs Conservation Park. This vast area of relatively undisturbed native vegetation has a total area of 270 098 ha, and is recognised as the largest single remnant of native vegetation in the settled agricultural regions of South Australia. Together with the adjacent Big Desert Wilderness Park, Wyperfeld National Park and other Victorian protected areas, it forms one of the largest remnant areas of native vegetation in south-eastern Australia (approximately 885,000 hectares).

Due to its size and undisturbed nature, Ngarkat is capable of maintaining ecosystems and supporting populations of significant species including the Malleefowl (*Leipoa ocellata*), Western Whipbird (*Psophodes nigrogularis*), Little Pygmy-possum (*Cercartetus lepidus*) and over 30 rare or endangered native plant species.

Ngarkat offers recreational opportunities that are unique in the southern part of South Australia. The wilderness of this heath and mallee country can be explored either on foot or from a vehicle in selected areas and tracks. The visitor is offered outstanding opportunities to enjoy and understand the fauna, flora, and the ecological and geological processes of this fascinating and unique landscape.

Management objectives for Ngarkat aim to protect the natural and cultural resources of the area whilst providing for appropriate recreational activities. Wherever possible, management actions will be consistent with any agreed management requirements for the larger national asset shared with the State of Victoria. The management objectives for Ngarkat have not been prepared in isolation, but rather in consultation with other agencies and community groups. The location of other DEH reserves and areas of remnant vegetation have also been considered to ensure that Ngarkat is managed in a regional context.

The plan of management for The Ngarkat Complex of Conservation Parks is now formally adopted under the provisions of section 38 of the *National Parks and Wildlife Act 1972*.



JOHN HILL

MINISTER FOR ENVIRONMENT AND CONSERVATION



SYNOPSIS

The Ngarkat Complex of Conservation Parks has a significant profile in the local and broader South Australian community. Although regarded as a single park, commonly known as “Ngarkat”, the area actually comprises four contiguous parks with a total area of 270,098 ha:

Ngarkat Conservation Park	207,941 hectares
Mount Rescue Conservation Park	28,340 hectares
Mount Shaugh Conservation Park	3,474 hectares
Scorpion Springs Conservation Park	30,343 hectares

All references in the text of this plan to the words “Ngarkat”, “the planning area” and “the park” should be read as a reference to the four contiguous conservation parks.

Ngarkat is the largest single remnant of native vegetation in the settled agricultural regions of South Australia. The purpose of dedicating these reserves was to “conserve mallee heath habitat of the Ninety Mile Desert”, which once occupied 1.5 million hectares of the upper South-East.

The four conservation parks, which are now commonly called Ngarkat, together with the Big Desert Wilderness Park, Wyperfeld National Park and other Victorian protected areas, form one of the largest remnant areas of native vegetation in south-eastern Australia (approximately 885,000 hectares). The majority of the park falls within the Big Desert Environmental Association, with about 10% in the south-west being within the Carcuma Environmental Association (Laut *et al* 1977).

The park has a significant role in the conservation of biological diversity. Given the large area and relatively low levels of disturbance, the park is capable of maintaining ecosystems that protect populations of significant flora and fauna. Species of note include the Malleefowl (*Leipoa ocellata*), Western Whipbird (*Psophodes nigrogularis*), Little Pygmy-possum (*Cercartetus lepidus*) and over 30 rare or endangered native plant species.

The park also provides for a range of low-key recreational opportunities; protects an area of wilderness unique in the settled agricultural regions of South Australia and provides an important over-wintering area for the apiary industry.

To conserve these values, the management direction for the park will be to:

- protect and maintain biological diversity, by implementing threat abatement programs including introduced flora and fauna control, and developing strategic actions to protect species of significance;
- provide sustainable recreational opportunities that do not impact on the parks nature conservation and heritage values;
- undertake fire prevention, suppression and management actions whilst developing appropriate long term fire management initiatives, to maintain biological diversity whilst protecting human life and adjacent park property;
- develop and maintain ongoing liaison with local community, volunteer and stakeholder groups in relation to the management of the park; and
- maintain ongoing liaison with the apiary industry to manage bee sites and develop and review policy and practices that are commensurate with the sustainability of the park’s biological resources.

This management plan for the Ngarkat Complex of Conservation Parks identifies the significant physical, biological, recreational and heritage values represented within the park. Management proposals emphasise the protection of natural and cultural resources whilst providing opportunities for appropriate recreational use. Fire prevention, suppression and management, community involvement and apiary activities are recognised as key management issues.

The plan concludes with a summary of management actions, which details the priority and duration prescribed to each of the proposed activities.

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ABBREVIATIONS AND GLOSSARY OF TERMS

The following abbreviations are used in this document:

ALRM:	Aboriginal Legal Rights Movement
BFDCC:	Box Flat Dingo Control Committee
CFS:	Country Fire Service (South Australia)
CP:	Conservation Park (gazetted under <i>National Parks and Wildlife Act 1972</i>)
DEH:	The Department for Environment and Heritage
DAARE:	Department for Aboriginal Affairs and Reconciliation
GIS:	Geographic Information System
IBRA:	Interim Biogeographic Regionalisation of Australia
MMP:	Murray Mallee Partnership, an alliance of conservation agencies in the Murray Mallee regions of New South Wales, Victoria and South Australia
PIRSA:	Department of Primary Industries and Resources SA
4WD:	Four wheel drive vehicle

ACKNOWLEDGEMENTS

This Management Plan for the Ngarkat Complex of Conservation Parks was prepared by Reserve Planning, in conjunction with staff of the Mallee District, in the Murraylands Region of the Department for Environment and Heritage.

Design in Print and Natcon Land Management Services contributed to the preparation of the draft management plan.

This management plan updates the 1994 plan, addresses a range of additional park management issues and incorporates a series of new maps.

1 INTRODUCTION

This management plan has been prepared in accordance with the *National Parks and Wildlife Act 1972*. It combines the management plans for the Ngarkat Complex of Conservation Parks:

- Ngarkat Conservation Park
- Mount Shaugh Conservation Park
- Mount Rescue Conservation Park
- Scorpion Springs Conservation Park

The reserves have been considered together as they are contiguous and are considered, for management purposes, to be a single park. The Ngarkat Complex of Conservation Parks is located in the southern Murray Mallee/upper South-East, which falls within the Murraylands Region of the Department for Environment and Heritage. Ngarkat is contiguous with the adjacent Big Desert Wilderness Park, Wyperfeld National Park and other Victorian protected areas. The plan outlines proposals to effectively conserve the natural and cultural values of the parks, while providing for public use and enjoyment.

Section 38 of the Act states that a management plan is required for each reserve. A management plan should set forth proposals in relation to the management and improvement of the reserve and the methods by which it is intended to accomplish the objectives of the Act in relation to that reserve.

Upon completion of a draft plan an announcement is made in the Government *Gazette* and the plan is placed on public exhibition for three months. During this period, any interested person may make submissions which are then referred, with the plan, to the South Australian National Parks and Wildlife Council for their comments and suggestions.

Having formal community input into public land management is a requirement of the legislation and is supported by park managers. The draft plan for the Ngarkat Complex of Conservation Parks was released for public exhibition in October 2001. At the close of the comment period, seven submissions had been received. Issues raised in submissions included the reopening of public access tracks, fire management and the conservation of cultural heritage sites. All these comments and concerns were considered by the Mallee Consultative Committee before seeking the views of the SA National Parks and Wildlife Council.

The Minister, after considering all representations, may then adopt the management plan with or without alterations. In the case of the plan for Ngarkat, a number of alterations have been incorporated as a result of the community consultation process. Notice of official adoption is published in the Government Gazette and copies of the final plan are made available for sale to the public. They may also be viewed on the departmental website:
http://www.environment.sa.gov.au/parks/management_plans.html.

Once a plan of management is adopted, its provisions must be carried out in relation to the reserve in question and no actions undertaken unless they are in accordance with the plan. However, the Act makes provision for amending adopted plans, similar to the process described above.

Delegate plans are referred to in the text of this management plan. These are detailed, non-statutory action plans through which the objectives of this management plan, once adopted, will be achieved. The principles endorsed in this management plan will provide a mandate and adequate guidance to develop delegate planning documentation.

2 MANAGEMENT FRAMEWORK

Management planning is a statutory requirement for all reserves prescribed in S38 of the *National Parks and Wildlife Act 1972* and S31 of the *Wilderness Protection Act 1992*. The management planning process is but a small part of a much larger, state-wide hierarchy of management. This is directed at the highest level by state government policies and departmental priorities and implemented, on a day to day basis, at a regional and district level.

Management plans are significant, in that they provide a ministerially endorsed and legally binding framework for the use and management of *National Parks and Wildlife Act* reserves. They are intended to accommodate anticipated trends and community aspirations over a five to ten year time frame. The legislation anticipates that management plans will be formally reviewed from time to time, but there are no prescribed time limits for this to occur.

DEH regional staff have been assigned primary responsibility for preparing management plans and undertaking the associated community consultation process. A standard management planning process is mandated, to ensure that all statutory obligations are met.

Management plans define what is considered acceptable activity in a reserve while still allowing park managers some flexibility in day to day decision-making. They should be proscriptive enough to prevent deleterious activities, or inappropriate developments, taking place. They are not intended to be comprehensive compendiums of resource information, nor are they heavily prescriptive action statements; other documentation covers those aspects. They do however, identify the key values of reserves, the appropriate utilisation and the major issues of concern requiring action, thereby providing the community (and park managers) with a blue-print of how public land is going to be used and managed.

It will be noted that management plans often foreshadow the preparation of 'delegate' plans to achieve the proposed objectives. For example, a fire management statement and a visitor facilities plan might both be needed to provide additional details on how the actions, listed in this management plan, are to be progressed. Although such in-house action plans are not subject to the same statutory processes as are formal management plans, DEH will continue to involve relevant stakeholders, other agencies and community groups in their preparation and implementation as part of the on-going management of the park.

2.1 Park Classification

Parks have been established over the past century for a variety of reasons, ranging from the conservation of biodiversity and cultural heritage to multiple use areas which include the environmentally responsible use of our natural resources. The classification of parks provides a general statement of purpose for which the area was acquired.

Classifications under the *National Parks and Wildlife Act 1972*, the *Crown Lands Act 1929* or the *Wilderness Protection Act 1992* are as follows:

Recreation Parks (RP) - areas of significance under the *National Parks and Wildlife Act*, managed for public recreation and enjoyment in a natural setting;

National Parks (NP) - areas proclaimed under the *National Parks and Wildlife Act* considered to be of national significance due to wildlife, natural features of the land or cultural heritage;

Conservation Parks (CP) - areas under the *National Parks and Wildlife Act* that are protected for the purpose of conserving wildlife or the natural or historic features of the land, where the development of visitor facilities tends to be kept to a minimum;

Game Reserves (GR) - areas set aside under the *National Parks and Wildlife Act* for the conservation of wildlife and the management of game at prescribed times for controlled seasonal hunting;

Regional Reserves (RR) - areas proclaimed under the *National Parks and Wildlife Act* for the purpose of conserving wildlife or natural or historical features while allowing responsible use of the area's natural resources (ie. mining);

Conservation Reserves (CR) - land currently set aside for conservation of natural and cultural features under the *Crown Lands Act 1929* and held under the care, control and management of the Minister for Environment, that for various reasons were not proclaimed under the *National Parks and Wildlife Act 1972*;

Wilderness Protection Areas (WPA) - land set aside under the *Wilderness Protection Act 1992* to protect natural and remote areas.

2.1 Government Policy and Legislation

The Ngarkat group of parks are dedicated under the *National Parks and Wildlife Act 1972*. This Act forms the principal legislative base for the management of the reserved land. When the reserves were proclaimed in the *Government Gazette* they were not subject to a "joint" proclamation under Section 43 of the Act to permit mining access. Therefore exploration and mining activity is prohibited within all the Ngarkat reserves.

When managing reserves, DEH is required under section 37 of the *National Parks and Wildlife Act 1972* to have regard to, and provide actions that are consistent with the following objectives stated in the Act:

- preservation and management of wildlife;
- preservation of historic sites, objects and structures of historic or scientific interest within reserves;
- preservation of features of geological, natural or scenic interest;
- destruction of dangerous weeds and the eradication or control of noxious weeds and exotic plants;
- control of vermin and exotic animals;
- control and eradication of disease of animals and vegetation;
- prevention and suppression of bush fires and other hazards;
- encouragement of public use and enjoyment of reserves and education in, and a proper understanding and recognition of, their purpose and significance; and
- generally, the promotion of the public interest.

Additional legislation, conventions and agreements that DEH is obliged to comply with are listed in Appendix D.

2.2 Native Title

Native Title is used to describe the interests Aboriginal and Torres Strait Islander People have in land and waters according to their traditional laws and customs. Federal legislation, in the form of the *Native Title Act 1993*, was enacted to:

- provide for the recognition and protection of native title;
- establish ways in which future dealings affecting native title may proceed and to set standards for those dealings;
- establish a mechanism for determining claims to native title; and
- provide for, or permit, the validation of past acts, and intermediate period acts, invalidated because of the existence of native title.

Any development proposed for a reserve must be valid in terms of the *Native Title Act 1993*.

There is currently no native title claim registered over the park. However, native title claims by the Ngarrindjeri and Others (SC98/004), and the First Peoples of the River Murray and Mallee (SC98/003), which were registered on 11/01/2000, extend to within 15 and 10 kilometres to the west of the park respectively. Additionally, there is a native title claim (VC95/002 registered 11/06/1999) by the Wotjobaluk People and Others adjacent to the eastern boundary of the parks within Victoria. Native title can exist, regardless of whether it has been claimed or whether there are registered holders of title.

This management plan is released and has been adopted subject to any native title rights and interests that may continue in relation to the land and/or waters. Nothing in the management plan is intended to affect native title. Before undertaking any future acts that might affect native title, DEH will follow the relevant provisions of the *Native Title Act 1993*.

However, in addition to the requirements of native title legislation, DEH is committed to developing partnerships with Aboriginal people. This may include a number of native title and Aboriginal heritage groups.

Consistent with South Australian Government policy, DEH is also keen to pursue Indigenous Land Use Agreements (ILUAs) where appropriate. ILUAs are voluntary agreements between a native title group and other people about the use and management of land and/or waters.

2.3 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) represents a fundamental reform of former Commonwealth environment laws. The Act establishes a new Commonwealth approval process for assessment of proposed actions that are likely to have a significant impact on matters of national environmental significance and provides an integrated system for biodiversity conservation and management of important protected areas.

Matters that require assessment and approval of proposed actions under the EPBC Act 1999 are:

- any action that has, will have or is likely to have a significant impact on the following identified matters of national environmental significance:
 - World heritage properties
 - Ramsar wetlands of international significance
 - Nationally listed threatened species and ecological communities
 - Listed migratory species
 - Commonwealth marine areas
 - Nuclear actions (including uranium mining)
- any activity involving Commonwealth land that has, will have, or is likely to have a significant impact on the environment.

With regard to Ngarkat, the Lowan Phebalium (*Phebalium lowanense*), Malleefowl (*Leipoa ocellata*), Red-lored Whistler (*Pachycephala rufogularis*), Western Whipbird (*Psophodes nigrogularis leucogaster*), and the Mallee Emu-wren (*Stipiturus mallee*) are nationally threatened species known to occur within the park. Commonwealth approval is required for any action that has, will have or is likely to have a significant impact on these nationally threatened species in addition to any State approval that may be required.

Furthermore, in consultation with relevant State authorities, the Commonwealth Minister for the Environment and Heritage may develop and implement recovery plans and threat abatement plans for threatened species and ecological communities listed under the EPBC Act. Where applicable, DEH should contribute to and incorporate these plans into park management regimes and operational procedures.

2.4 Land Tenure History

The land tenure history identifies the prior tenure for each land parcel now reserved, as well as detailing reserve proclamations. The following list and Figure 4 indicate the sections comprising the park and dates of proclamation, while specifics of the land tenure history are provided in Appendix A:

Ngarkat Conservation Park (207,941 ha) dedicated in 1979

Sections 22, 29-31, 33, 36, 37, 40-44, 49, 51, 68, 69, 72, 106, Out of Hundreds (Pinnaroo)

Sections 1-5, 8-14, 18, Hundred of Fisk

Sections 29, 30, Hundred of Day

Sections 24, 25, Hundred of McCallum

Sections 23, 26, 27, Hundred of Makin

Additions dedicated in 1983

Sections 48, 64, 102, Out of Hundreds (Pinnaroo)

Section 15, Hundred of Fisk

Mt Rescue Conservation Park (28,340 ha) originally a Flora and Fauna Reserve in 1953, re-dedicated as a Conservation Park in 1972

Sections 7-10, Hundred of Archibald

Sections 3, 4, Hundred of Makin

Mt Shaugh Conservation Park (3,474 ha) dedicated in 1971, re-dedicated as a Conservation Park in 1972

Section 5, Hundred of Shaugh

Scorpion Springs Conservation Park (30,343 ha) originally dedicated in 1970, re-dedicated as a Conservation Park in 1972

Section 65, Out of Hundreds (Pinnaroo)

Section 16, Hundred of Fisk

Sections 9, 10, Hundred of Quirke

3 MANAGEMENT CONTEXT

A management philosophy and prescriptions for Ngarkat are derived from an understanding of the management context within which the plan is prepared.

The management context is derived from a consideration and balancing of the following:

- legislation
- the regional setting
- the reasons for dedication
- public use and community expectations.

3.1 Purpose of Reserve

Mount Rescue Conservation Park was proclaimed in 1953, “to conserve the mallee heath habitat of the Ninety Mile Desert”. Originally established as a Flora and Fauna Reserve, the park was considered to be “predominantly land unsuitable for development on account of its hilly or sandy nature” (Whitelock, 1985).

Scorpion Springs Conservation Park was proclaimed in 1970, followed closely by Mount Shaugh Conservation Park in 1971. Both were also established “to conserve the mallee heath habitat of the 90 Mile Desert”. Planning for both parks occurred concurrently with the development of adjacent areas for farming, in the late 1960’s (Whitelock, 1985).

Ngarkat Conservation Park was proclaimed in 1979, from previously unallotted Crown Land. The purpose of the reserve was also “to conserve the mallee heath habitat of the 90 Mile Desert”. Ngarkat effectively linked the three pre-existing reserves, to form the contiguous area that this plan now encompasses (Whitelock, 1985).

The maintenance of a large area of natural vegetation such as the planning area is a very important component of the wider task of wildlife conservation throughout the State. The reserve, being principally dedicated for nature conservation, may be categorised in the International Union for Conservation of Nature (IUCN) system as a "Scientific reserve/Strict nature reserve", or Category Ia type of reserve (Commission on National Parks and Protected Areas, 1978). However, because of the continuing use of large parts of the area for bee-keeping, such areas are better categorised as "Multiple use management area/Managed resource area", or Category VI type reserve.

3.1.1 Legal Adoption of the Name Ngarkat

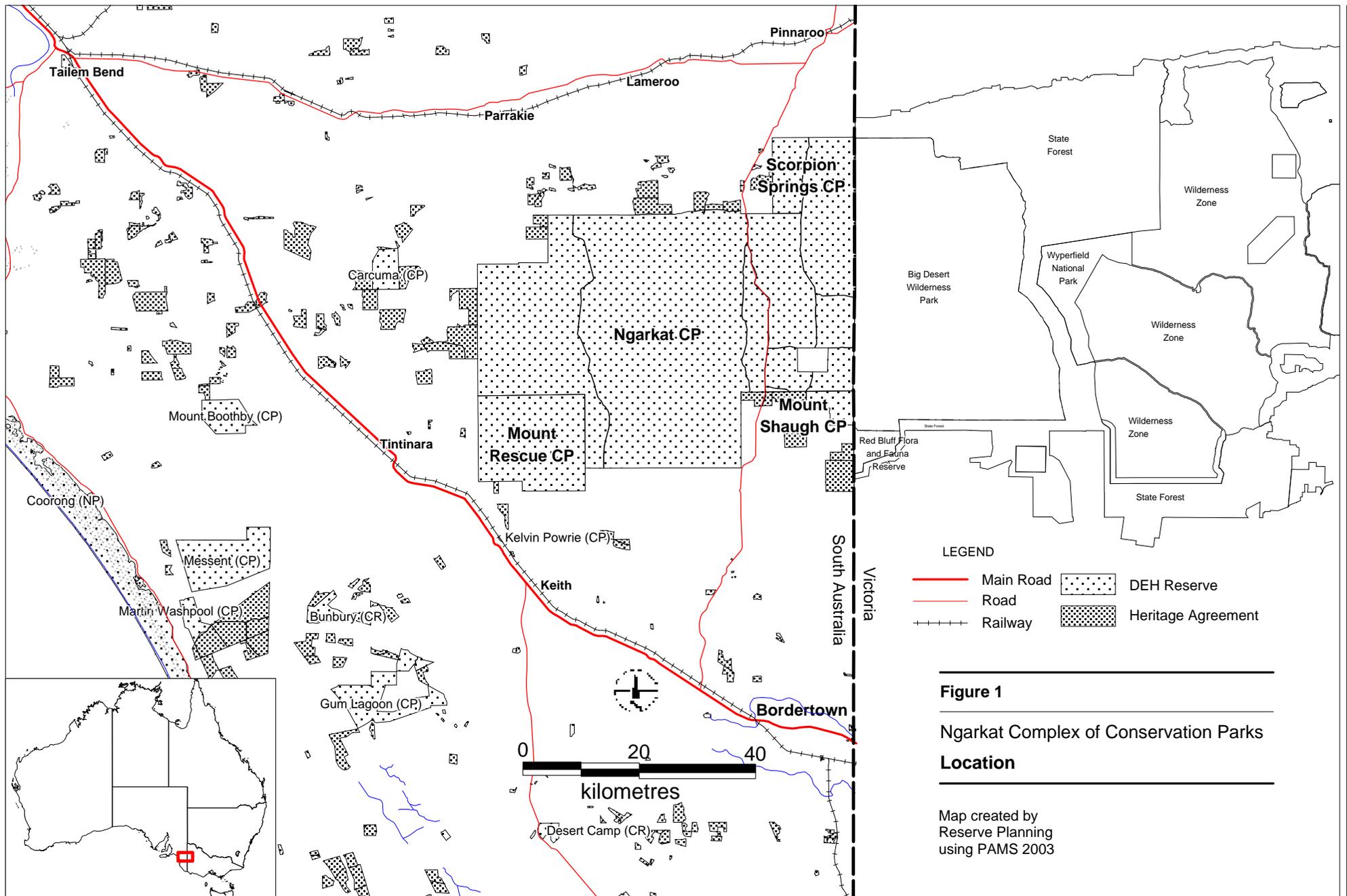
For a number of years the community, DEH and other government agencies have referred to the area covered by this plan as Ngarkat. The name recognises the region’s original inhabitants and is commonly used to refer to the combined area of the reserves.

DEH proposes that the entire area of Ngarkat Conservation Park, Scorpion Springs Conservation Park, Mount Rescue Conservation Park and Mount Shaugh Conservation Parks be consolidated into one reserve named Ngarkat Conservation Park.

The names Mount Shaugh, Mount Rescue and Scorpion Springs will remain in common usage as they refer to geographical features.

3.2 Location and Park Features

Ngarkat is located 200 kilometres south-east of Adelaide (Figure 1), to the south of the Mallee Highway through Lameroo and Pinnaroo and to the north-east of the Dukes Highway and railway through Tintinara, Keith and Bordertown, and comprises a nearly rectangular block of land. The eastern park boundary lies on the Victorian border. The coast, at the Coorong, is 70 kilometres to the south.



The four conservation parks that comprise the Ngarkat complex make up the largest single conservation area (270,098 hectares) and the largest remnant of native vegetation in the settled agricultural regions of South Australia. Together with Big Desert Wilderness Park, Wyperfeld National Park and other Victorian protected areas, it forms one of the largest remnant areas of native vegetation in south-eastern Australia (approximately 885,000 hectares). The region is listed in the Register of the National Estate and has recently been recognised by the Australian Heritage Commission as one of Australia's outstanding natural heritage areas.

3.2.1 Climate

The climate of the southern Murray Mallee and upper South-East is of the Mediterranean type, with changes of weather associated with frontal systems, which approach from the south-west. These frontal systems are most active in winter and spring, bringing fairly reliable and frequent light to moderate rainfall in these seasons. Ngarkat lies within the winter pattern rainfall zone, with the highest gaugings usually recorded from June to August. The annual average rainfall is 389.6mm at Lameroo and 470.6mm at Keith (Bureau of Meteorology, 1999a and 1999b). The annual evaporation rate is approximately 2000mm in the north-east of the park and 1900mm in the south-west of the park (Laut *et al.*, 1977).

Temperatures are typically warm to hot in summer and cool to cold in winter. Mean daily maximum temperature ranges from 30.7°C (Lameroo) and 29.7°C (Keith) in January to 14.9°C (both Lameroo and Keith) in July (Bureau of Meteorology, 1999a and 1999b). Mean daily minimum temperature ranges from 13.1°C (Lameroo) and 12.9°C (Keith) in January to 4.3°C (Lameroo) and 5.5°C (Keith) in July (Bureau of Meteorology, 1999a and 1999b).

Summer thunderstorms may occur when moist tropical air moves in from the north west of the continent. When these thunderstorms are not accompanied by rain, lightning strikes may result in the ignition of fires within the park. Most fires within the park have started in this manner. There are occasional frosts and sometimes (for example during the relatively cold winter of 1982) there is widespread frost damage to the vegetation.

3.3 Regional Setting

DEH

Ngarkat is located in the Murraylands Region of DEH and includes four of the 19 reserves in the Mallee District, with staff based at the district headquarters in Lameroo. Other DEH reserves in the vicinity include Carcuma Conservation Park, Kelvin Powrie Conservation Park, Billiatt Conservation Park and Karte Conservation Park.

Ngarkat comprises four contiguous reserves totalling 270,098 hectares, which is almost all of the remaining native vegetation of the original 1.5 million hectare Ninety Mile Desert. Billiatt Conservation Park (59,148 ha) lies about 50 kilometres to the north. Additionally, Ngarkat adjoins the SA/Victorian border, and is biogeographically an extension of the Big Desert Wilderness Park in Victoria. Hattah-Kulkyne (48,000 ha), Wyperfeld (323,000 ha) and Yanga-nyawi (633,000 ha) National Parks are relatively close to the Big Desert Wilderness Park.

National Reserve System

Ngarkat forms part of the National Reserve System (NRS), which encompasses all existing protected areas managed and/or administered by State or Commonwealth nature conservation agencies. The aim of the National Reserve System is to establish a Comprehensive, Adequate and Representative Reserve System (CARRS) for the protection of Australia's biodiversity according to the following principles:

- Comprehensiveness; inclusion of the full range of ecosystems recognised at an appropriate scale within and across each bioregion.
- Adequacy; ability to maintain the ecological viability and integrity of populations, species and communities.
- Representativeness; those areas that are selected for inclusion in reserves reasonably reflect the biotic diversity of the ecosystems from which they derive.

Biogeographic Regionalisation and Environmental Associations

The Interim Biogeographic Regionalisation of Australia (IBRA) (Environment Australia, 2000) provides a bioregional planning framework within which to identify the gaps and to set priorities for developing the National Reserve System. IBRA regions represent a landscape based approach to classifying the land surface from a range of continental data on environmental attributes. In 1999, IBRA version 5.1 was developed with 85 bioregions delineated, each reflecting a unifying set of major environmental influences which shape the occurrence of flora and fauna and their interaction with the physical environment.

Based on IBRA, the majority of the park is located within the Murray-Darling Depression Bioregion which is described as an extensive gently undulating sand and clay plain of Tertiary and Quaternary age frequently overlain by aeolian dunes. Vegetation consists of semi-arid woodlands of Black Oak / Belah, Bullock Bush / Rosewood and *Acacia* spp, mallee shrublands and heathlands and savanna woodlands. A small portion (the south-western half of Mt Rescue Conservation Park) is located within the Naracoorte Coastal Plain Bioregion.

The park may be further classified on the basis of environmental association (Laut *et al.*, 1977b). The majority of the park forms part of the Big Desert Environmental Association, which is described as undulating plain on calcrete overlain with sand sheets and dunes with mallee woodland and heathland. About 10 per cent in the south-west is within the Carcuma Environmental Association which is described as calcarenite dune ridges overlain with irregular sand dunes and mainly mallee woodland and heathland.

The only other South Australian reserve with environments closely comparable to the planning area is Carcuma Conservation Park (Big Desert Environmental Association) which comprises 2,880 hectares, located 15 kilometres west of the north-west corner of the planning area. Despite the confusion in nomenclature, Carcuma Environmental Association is not represented in the South Australian reserves system other than within Ngarkat.

The contribution of Ngarkat to the National Reserve System is important due to the fragmented distribution of protected areas generally and the poor representation of many environmental associations within Government reserves.

Wilderness

This total extensive combined area of wilderness is a major national asset. The management of Ngarkat must take into account the fact that, geographically, Ngarkat is only one component of a much larger conservation and wilderness resource. Many areas within the Victorian National Parks listed previously either have, or will have, wilderness zones established within them.

South Australia established legislation to protect wilderness in 1992. *The Wilderness Protection Act 1992* allows for the assessment of land and its potential for proclamation as wilderness protection areas against a set of criteria, which measure the extent to which the land has been influenced by modern technological society. A wilderness code of management (Department of Environment and Natural Resources, 1994) establishes principles to protect wilderness values, ecosystems, flora and fauna, Aboriginal and non Aboriginal cultural heritage; and to manage visitors, scientific research and fire.

An initial assessment of the wilderness values of Ngarkat was made in 1983 (Lesslie, 1983) which found that a significant area of the core of the parks contained high quality wilderness values. An assessment of Ngarkat for inclusion under the *Wilderness Protection Act* is being undertaken by the Wilderness Advisory Committee at the present time. Therefore, given the State responsibility to assess all potential wilderness and to manage the area as part of a much larger national conservation and wilderness asset, this plan must ensure that no management actions are proposed that might compromise wilderness designation at some time in the future. Should the Minister for Environment and Conservation eventually decide to propose reservation of parts of Ngarkat under the *Wilderness Protection Act*, a further consultation program would be required.

Regional Biodiversity Conservation

The parks of the Ngarkat complex were dedicated progressively to conserve the largest remaining block of native vegetation in south-eastern South Australia and to facilitate the effective conservation of complete ecosystems and all wildlife, including rare and endangered species. The size of the area is important in permitting natural processes to continue with minimal interference by modern society and technology and because the gene pools in such a large area should be of sufficient magnitude to be self sustaining.

There are numerous blocks of land with remnant native vegetation surrounding Ngarkat, some that have been voluntarily placed on Heritage Agreements under the *Native Vegetation Act 1991*, which complement the conservation value of the park. The *Biodiversity Plan for the South Australian Murray-Darling Basin* (DEH 2001) advocates the removal of stock grazing, vegetation restoration and feral animal, pest plant and wildfire control on these vegetated blocks in coordination with park management, as a means of increasing the conservation value of the area.

The *Biological Survey of the Murray Mallee South Australia* (Foulkes and Gillen, 2000) provides recommendations for the conservation of the flora and fauna of the Murray Mallee. These recommendations are the result of a systematic survey of flora and fauna, which was undertaken in 1990. The survey took place at 678 vegetation quadrats and 173 vertebrate sites throughout the Murray mallee, including Ngarkat.

Overall recommendations include:

- prevent further clearance of habitats;
- reduce degradation and encourage rehabilitation of remaining populations, habitats and communities, and
- reconnect isolated populations, habitats and communities.

As part of this process, the following steps need to be undertaken:

- Identify priorities for endangered and vulnerable species and communities;
- Identify groups of endangered or vulnerable species that could best be tackled jointly through the preparation of multi-species Recovery Plans;
- Identify threats to endangered or vulnerable species that could most appropriately be controlled through a common Threat Abatement Plan;
- Identify key areas critical to the conservation of endangered and vulnerable species or communities.

This management plan will complement the aims and objectives of the *Biological Survey of the Murray Mallee South Australia* and the *Biodiversity Plan for the South Australian Murray Darling Basin*.

3.4 History of Reserve Management

Some of this area has been reserved for almost fifty years. Following dedication of the reserves, over the years, some specific management actions have been undertaken, including:

- rationalisation of tracks and access within the reserve,
- restoring heritage items such as Pertendi Hut,
- development of fire suppression techniques suitable for the local environment,
- development of visitor facilities, including signage, campgrounds and visitor information,
- development of community-based Friends of Parks groups,
- predator control activities, and
- preparation and release of a draft plan of management in 1984 (not adopted).

3.5 Existing Management Arrangements

Murray Mallee Partnership

The Murray Mallee Partnership is a forum of land managers from New South Wales, Victoria and South Australia with a major role in conservation. The Partnership was formally launched on 12 March 1999 with the signing of a Memorandum of Understanding between the State and Federal Environment Ministers.

The Partnership will also welcome other interested parties to participate in specific cooperative programs where mutual benefits are anticipated.

The objectives of the Partnership include:

- protection of the landscape;
- protection of flora and fauna habitats and ecosystems;
- amelioration of threatening processes;
- protection of cultural values;
- provision of outdoor recreation and tourism opportunities;
- promotion of the appreciation and understanding of the Murray Mallee; and
- efficiency and effectiveness in delivering programs.

The Department for Environment and Heritage has regional representatives on both the MMP Steering Committee and Operations Committee. Mallee District staff participate in field meetings and may be co-opted to assist with specific projects.

3.6 Management Philosophy & Strategic Directions

The role of reserves is prescribed by the twin aims of the *National Parks and Wildlife Act 1972*; to conserve wildlife in a natural environment and to provide for public benefit and enjoyment. Increasingly, the importance of biodiversity conservation is being recognised and the future use and management of reserves must address this issue. Proposed actions will need to be assessed with the ability to meet the parks primary objective of biodiversity conservation, which may result in public use becoming regulated to serve that aim.

DEH must optimise the use of the limited resources available for the conservation and maintenance of reserves, with priorities set on a statewide and then regional perspective. Within the Murraylands Region, most resources are allocated to the maintenance of areas of relatively intact, biologically-diverse habitat containing species or communities of state or national significance, and to locations receiving heavy, concentrated public use.

When resources are allocated for annual work programs, Ngarkat has to compete with other parks and regional projects that may be deemed to be of higher priority.

With that proviso, DEH remains committed to its responsibilities as a public land manager and Ngarkat will receive an annual allocation of resources. However, DEH believes that in partnership with the community and other agencies, considerable advances can be made towards increasing overall protection of biological and cultural values, while ensuring sustainable and high-quality recreational opportunities for the community.

The vision for Ngarkat is a complex of parks, valued by the community and managed by an agency for its unique biodiversity assets, geological and cultural history, visual amenity, and recreational opportunities. To achieve this vision, DEH is keen to explore the possibility of partnership arrangements with agencies and organisations that have a legitimate interest in the management the park. DEH recognises the importance of community and volunteer organisations management inputs into nature conservation and will continue to provide support and assistance to promote community stewardship of the states natural resource assets.

Based upon a consideration of the issues previously discussed within the background and management context section of this plan, government policy and the available natural resource information, DEH will:

- manage Ngarkat in a sustainable manner to ensure the conservation of natural ecosystems, natural processes and biodiversity. Emphasis will be given to the maintenance of ecological processes and wilderness values. Specific habitat manipulation will only be considered for vulnerable, rare or endangered species where research has indicated such manipulation is warranted or where it is deemed necessary to protect some feature or age class of some particular plant community.
- provide sustainable recreation opportunities for visitors, maintain access systems and in association with the community, manage fire, pest plants and animals in a manner consistent with the above primary principles. DEH will conserve indigenous and non-indigenous cultural sites and provide educational material based upon park values, with the concurrence of traditional custodians of such information.
- facilitate the use of bee sites by commercial apiarists, based upon an agreed management framework and subject to any changes to State Government policy and practices that may result from any government review, research findings and or best nature conservation practices.

The Ngarkat complex contributes to the conservation of the largest remnant of native vegetation in the south east of Australia. Management wherever possible will be consistent with any agreed management requirements for the larger national asset shared with the State of Victoria.

4 MANAGEMENT PRESCRIPTION

4.1 Natural Resources

The main purpose of reserving these areas is for nature conservation. To some observers, the land may not appear to be used at all, but its continued maintenance as a functioning natural ecosystem with as little outside disturbance as possible meets important community objectives. The concept of maintaining a system of nature conservation reserves has been recognised for many years now, and there is substantial evidence of continuing support within the Australian and international community for a strong commitment to such programs (Australian Heritage Commission, 1982; Fenner, 1975). This applies to representative samples of natural ecosystems as much as to protection of rare and endangered species, although many people give the latter special emphasis (Gunn, 1980).

The overall maintenance of self sustaining ecosystems forms the basis for management of this large area of reserved land. The mallee/heathland vegetation associations of which Ngarkat is now the major remaining remnant in South Australia are of considerable ecological interest. Ngarkat is used for scientific research to shed light on environmental problems in other areas, but our understanding of the full ecological requirements of this area is still in its infancy. The area is known to contain a number of rare and endangered flora and fauna species. While the size of the area conserved would indicate the long term survival of most species is likely, a better understanding of the role of fire (both natural and manipulated) is still required.

The flora includes many species that are at their northern and southern limits of distribution (ecotone) and are therefore of ecological and biogeographical interest. The specific habitat manipulations that might be required to maintain viable populations of rare species of flora and fauna are largely unknown.

Conservation strategies should be based on current knowledge and worlds best ecological management practices. Ecological research is especially required on the interactions of species to fire, drought and severe frost events in the park. To this end, the ongoing involvement of research individuals and institutions will be encouraged.

Objectives

Protect Ngarkat's ecological systems so that they are self-sustaining. In particular, maintain the diversity of indigenous flora and fauna species, communities and age classes.

Actions

- Encourage research to expand knowledge and information about the ecological processes found within the park.
- Encourage research into the requirements of the areas endangered, rare and vulnerable species.
- Ensure research findings are made available to all interested parties.
- Encourage surveys to determine the distribution, abundance and population dynamics of fauna and flora populations, especially rare and endangered species.
- Explore the values of habitat manipulation to ensure the preservation of selected species within Ngarkat.
- Monitor the effects of high frequency large-scale fires, visitor impacts, commercial apiary industry and introduced threatening processes (weeds and vermin) have on the parks natural assets and ecological processes. Develop policies, programs and procedures to amend any detrimental effects found.
- Maintain liaison and information exchange and sharing with other relevant state and interstate authorities, agencies and community groups.
- Undertake, encourage and contribute to research into the populations of pest plants and animals and their effects on the biodiversity of Ngarkat.
- Undertake, encourage and contribute to research to determine the extent of climate change and its effects on the biodiversity of Ngarkat.

4.1.1 Geology and Landform

Background

Ngarkat is generally of low relief, consisting of a broad sweep of irregular, undulating sand dunes. There is a gentle increase in elevation of the inter-dunal flats from 50 metres above sea-level in the south-west to 130 metres in the south-east. Topographic relief of the dunes is typically 5 to 20 metres and is generally greater in the south than in the north. There are a few high peaks to 60 metres above the flats. The highest point is Mount Shaugh, near the south-eastern corner of the planning area, at 182 metres.

There is no surface drainage. The only surface water is in a few small unreliable soaks and ephemeral pools. Groundwater of good quality is available in substantial quantities from Miocene limestones at a little over 50 metres depth (Rogers, 1980).

The area is underlain by a series of Tertiary fluvial sands, marine sands and limestones totalling some 250 metres in thickness. These sediments overlies Cambrian metamorphic rocks of the widespread Kanmantoo Group (Rogers, 1980). Uppermost in the Tertiary sequence are the Early Pliocene Loxton Sands (Ludbrook, 1961) and the Late Pliocene Parilla Sand (Firman, 1966). The Loxton Sand (fluvial facies) consists of yellow to brown micaceous-quartz sand and gravel, with surface calcrete. It outcrops in a limited band extending south-east from Box Flat. The Parilla Sand is more extensive to the east, especially near Mount Shaugh. It is red-brown and pale-grey quartz sand, and is probably derived partly from fluvial deposits and partly from stranded coastal deposits. In the south-west of the park there is an extensive area of stranded Pleistocene beach with coastal dune calcarenites of the Bridgewater Formation (Rogers, 1980).

4.1.2 Soils

Background

The whole area is covered to a varying degree by a jumble of parabolic aeolian sand dunes of Holocene age. This Molineaux Sand (Firman, 1966) is comprised of pale yellow and red-brown quartz sands. These sand dunes were derived from the Parilla Sand and Bridgewater Formation calcarenite under arid conditions within the last 15,000 years or so. The dunes are now vegetated and mainly stable under present conditions.

The Molineaux Sand is up to 20 metres thick and is the dominant element in the landscape of Ngarkat. Other sediments are generally only exposed in areas left bare of the Molineaux Sand during its aeolian spread. The main part of Ngarkat on the Pliocene Sands (which are extensively mantled by the Molineaux Sand) corresponds with the Big Desert Environmental Association (Laut *et al.*, 1977b); the dune limestones of the Bridgewater Formation (which are mantled by rather less extensive Molineaux Sand) correspond with the Carcuma Environmental Association.

The few surface soaks in the area occur at places where clays associated with the less permeable Pliocene sediments are exposed in some of the flats. The water is essentially percolation water at the base of the Molineaux Sand.

The most widespread soils are sandy, mottled-yellow duplex soils, with bleached sands on the dunes (Laut *et al.*, 1977b). Local variations in depth of the Molineaux Sand, or occurrence of the other parent materials, give rise to a quite complex mosaic of soil types. The soils are predominantly infertile, particularly the siliceous sands. Sandy soils are subject to wind erosion when vegetation cover is removed. This occurs on vehicle tracks that traverse dunes, especially the Border Track. Vehicle drivers are occasionally forced to skirt around sections of loose sand, further damaging vegetation and spreading the eroded areas wider and wider with each diversion. Visitor permitted access areas damaged by side excursions will have barriers erected to prevent further use and to protect rehabilitation work. Dune crests will be modified to prevent the need for side excursions.

In addition, some tracks traverse swales that contain clay soils, which retain moisture following rains. Driving on these surfaces frequently leads to vehicles becoming bogged, causing deep rutting and rendering the tracks virtually impassable. These areas are also subject to widening diversions, which

spread the damage and destroy vegetation. Tracks will be closed to public use if unfavourable weather conditions make them impassable.

Information for 4WD drivers that discusses and details the damage that can be caused by incorrect driving techniques, acceptable driving methods that will help alleviate this damage and focuses on the conservation values of the park will be made available.

There is a need for further research into the distribution of soil types throughout the complex, the threats to individual soil types and the relationship between soils and other components of the ecosystems within the complex.

Objectives

Protect tracks and trails within the park from adverse soil impacts.

Actions

- Provide educational material to visitors on the correct methods of operating 4WD vehicles on sandy tracks by maintaining signs at appropriate places on the tracks and by means of an informative brochure.
- Erect barriers and signage to prevent side excursions from tracks and rehabilitate damaged areas.
- Close tracks during unfavourable weather conditions including times of severe fire danger and during wet periods (both summer and winter).
- Undertake research to determine soil types and their distribution throughout Ngarkat.
- Undertake research to increase knowledge of the role of soils within ecological processes.
- Undertake research to determine threats to soils and implement management strategies if required.

4.1.3 Native Vegetation

Background

At the broad level, the vegetation of Ngarkat consists primarily of mallee and heath. Using the vegetation classification system of Specht (1970), as modified by Laut *et al.*, (1977a), the vegetation is dominantly open scrub (S3Z) of eucalypts, with sub-dominant open heath (Z3) of sclerophyllous shrubs.

Open heath of the kind found in the planning area has been the subject of quite detailed scientific investigation and is of considerable ecological interest (Specht, 1966 and 1979b). There has been similar scientific interest in the characteristically Australian open scrub (mallee) vegetation (Parsons, 1981). The flora of the planning area includes a substantial number of rare or endangered species. Some of these are quite important components of the plant communities within the planning area and most have an extremely limited distribution elsewhere.

Plant communities in Ngarkat have been studied and mapped in some detail by Barker (1982), with further description by Symon (1982a and 1982b) and Alcock (1982). Comprehensive lists of plant species recorded within the planning area are also available (Harris, Reeves and Symon, 1982). The following vegetation descriptions summarise those of Barker (1982).

Heath

The most distinctive and widespread vegetation community in Ngarkat is the heath. Because of varied topography and soil conditions it is far from uniform in either floristic composition or structure.

Desert Banksia (*Banksia ornata*) generally dominates, but there are a number of areas, particularly in the south-west, where Dwarf Sheoak (*Allocasuarina pusilla*) is more characteristic. Associated species in both mallee and open heath typically include Common Fringe-myrtle (*Calytrix tetragona*), Flame Heath (*Astroloma conostephioides*), Guinea-flowers (*Hibbertia* spp), Prickly Geebung (*Persoonia juniperina*) and Sword-sedges (*Lepidosperma* spp).

The heath is generally confined to the undulating plain country between the jumbled scatter of high sand dunes. The dunes themselves are usually timbered with Brown Stringybark (*Eucalyptus aranacea*) accompanied by Desert Banksia (*Banksia ornata*), Heart-leaved Bearded-heath (*Leucopogon cordifolius*), Slaty Sheoak (*Allocasuarina muelleriana*) and Myrtle-leaved Wattle (*Acacia myrtifolia*), with Ridge-fruited Mallee (*Eucalyptus incrassata*), Green Tea-tree (*Leptospermum coriaceum*) and Heath Tea-tree (*Leptospermum myrsinoides*) on the lower slopes.

The landscape of the heath association is not very uniform; it is a complex mosaic of heath with taller trees and shrubs on the dunes. Many of the species of this heath association, although not necessarily rare, are at the most northerly and/or inland point of their distribution here (Symon, 1982a), which makes this community of particular biogeographical interest.

Mallee Heath

Another widespread plant community is mallee heath. The overstorey mallee eucalypts are typically Ridge-fruited Mallee (*Eucalyptus incrassata*) and Narrow-leaved Mallee (*Eucalyptus leptophylla*), with an understorey of either Desert Banksia (*Banksia ornata*) or Dwarf Sheoak (*Allocasuarina pusilla*), Common Fringe-myrtle (*Calytrix tetragona*), Sword-sedges (*Lepidosperma* spp), Flame Heath (*Astroloma conostephioides*), Guinea-flowers (*Hibbertia* spp) and Prickly Geebung (*Persoonia juniperina*). In the north-east there is a substantial overstorey component of Mallee Cypress-pine (*Callitris verrucosa*), with little understorey beneath it when mature.

In areas where clay is relatively close to the surface (mainly in the north), the mallee heath becomes dense Broombush (*Melaleuca uncinata*). Ridge-fruited Mallee (*Eucalyptus incrassata*) and Narrow-leaved Mallee (*Eucalyptus leptophylla*) are again the dominant eucalypts but are accompanied by high densities of Broombush (*Melaleuca uncinata*) together with Silver Broom (*Baeckea behrii*), Sword-sedges (*Lepidosperma* spp), Common Fringe-myrtle (*Calytrix tetragona*) and Twiggy Bearded-heath (*Leucopogon costatus*).

Mallee

Similarly scattered in many of the inter-dunal clay flats, particularly in the north, are generally small patches of whipstick mallee dominated by Square-fruited Mallee (*Eucalyptus calycogona*), Kangaroo Island White Mallee (*Eucalyptus anceps*) and Narrow-leaved Mallee (*Eucalyptus leptophylla*), with Mallee Honey-myrtle (*Melaleuca acuminata*), Pink Velvet-bush (*Lasiopetalum behrii*) and Small Hop-bush (*Dodonaea bursariifolia*).

The stranded coastal dune limestones carry quite distinctive mallee vegetation. The pattern is typically of Coastal White Mallee Gum (*Eucalyptus diversifolia*) on the slopes, with Yorrell (*Eucalyptus gracilis*) and/or Red Mallee (*Eucalyptus socialis*) on the ridgetops. Understorey species include Small Hop-bush (*Dodonaea bursariifolia*), Lavender Grevillea (*Grevillea lavandulacea*), Spiny Wattle (*Acacia spinescens*), Slender Velvet-bush (*Lasiopetalum baueri*) and Pink Velvet-bush (*Lasiopetalum behrii*).

Soakage Areas

Those areas where underlying sediments (particularly clays) are relatively close to the surface, and where the few surface soaks are developed, support vegetation which is dramatically different from that of the sandy country. The trees are usually much larger and include Brown Stringybark (*Eucalyptus aranacea*), Drooping Sheoak (*Allocasuarina verticillata*), Bull Oak (*Allocasuarina leuhmannii*), Rough-barked Manna Gum (*Eucalyptus viminalis* ssp *cygnetensis*) and Golden Wattle (*Acacia pycnantha*), together with South Australian Blue Gum (*Eucalyptus leucoxylon*) mainly in the north and Pink Gum (*Eucalyptus fasciculosa*) in the south.

The understorey is often comprised of Silver Banksia (*Banksia marginata*), Desert Banksia (*Banksia ornata*), Sticky Hop-bush (*Dodonaea viscosa*), Dryland Tea-tree (*Melaleuca lanceolata*) and Muntries (*Kunzea pomifera*).

The pattern of vegetation communities is the result of a complex interplay of environmental factors; soil fertility, moisture status and fire being most important. The incidence of fire is rather more unpredictable than these other factors, and its spatial distribution is very variable.

The current vegetation of Ngarkat consists of an extremely complex mosaic of variables such as class of stand, age of stand and fire history of the site (Noble and Mulham, 1980; Groves and Specht, 1981). The sequence of fire events over preceding decades may be a more important determinant of the structure and composition of the present vegetation than any other factor. The role of fire with its ecological and management implications is discussed in a separate section.

Rare And Endangered Plants

119 species of native plants recorded from Ngarkat are listed as being of conservation significance at national, state or regional levels. A list of species of conservation significance appears in Appendix B. Populations of plants of conservation significance will be recorded on a database with GIS capability and populations monitored. If necessary, threat abatement programs will be implemented.

Objectives

Conserve natural flora populations, especially those of conservation significance.

Actions

- Record information on populations of plants of conservation significance on a database with GIS capability, monitor populations, identify threatening processes, and undertake threat abatement programs if necessary for their conservation.
- Research impacts of frequent, large area fire regimes on all flora populations.

4.1.4 Native Fauna

Background

Ngarkat is rich in native mammals, birds, reptiles and insects, although surveys are incomplete (Robinson, 1982).

Insects and other invertebrates have received only limited study. Preiss (1982) lists 120 species collected during a brief survey of a small area in 1973 and comments that there is very little overlap of species (10 per cent) compared with the species collected in a similar survey from another mallee area on Eyre Peninsula. Greenslade (1982) found an unexpectedly low number of species of springtails (*Collembola* spp) in the area, but of the thirty-five species identified, three were new to science. These results suggest that the invertebrate fauna of these mallee areas warrant further investigation. The conservation status of rare or endangered insects in the communities of the planning area is unknown.

Reptiles are well represented, with twenty-two species having been recorded (White, 1982). The most common are dragons, geckos, legless lizards, skinks and snakes. None of the species identified so far is considered rare, but several species appear to be at the inland and/or northern limit of their distribution.

Birds are probably the best studied of the planning area's fauna (Attwood, 1977; Close, 1982; Hatch, 1977; Hunt, 1976; Paton, 1982). This is partly due to the richness of the bird fauna in comparison with other animal groups and partly because they are often more readily observed. Over 120 species have been recorded. A full list is appended to Close (1982).

There is a regional gradation of species characteristic of higher rainfall and coastal areas in the south-west, to arid species in the north-east. Thornbills, wrens, honeyeaters (fourteen species in the family Meliphagidae) and whistlers are very well represented. There is a relative scarcity of raptors, parrots, treecreepers, flycatchers and other species generally dependent on trees larger than mallee (Close, 1982).

Records from the planning area include the state and nationally vulnerable Malleefowl (*Leipoa ocellata*), Mallee Emu-wren (*Stipiturus mallee*), Western Whipbird (*Psophodes nigrogularis*), and the Red-lored Whistler (*Pachycephala rufogularis*) (Close, 1982; Margules, 1978; Paton, 1982). There are unpublished reports of the Australian Bustard (*Ardeotis australis*), which is now extremely rare in this part of Australia and at risk elsewhere. Appendix B provides a list of birds of conservation significance in Ngarkat.

Mammals of the planning area have so far received very limited study, but include the Short-beaked Echidna (*Tachyglossus aculeatus*), Common Dunnart (*Sminthopsis murina*), Western Pygmy-possum (*Cercartetus concinnus*), Western Grey Kangaroo (*Macropus fuliginosus*), Silky Mouse (*Pseudomys apodemoides*), Mitchell's Hopping-mouse (*Notomys mitchellii*), Lesser Long-eared Bat (*Nyctophilus geoffroyi*) and the White-striped Mastiff-bat (*Tadarida australis*) (James, 1982; Robinson, 1982). Of particular note is the Little Pygmy-possum (*Cercartetus lepidus*) which was discovered here in 1976 (Aitken, 1977). It is now known to inhabit two other South Australian conservation parks and the Big Desert in Victoria, as well as Kangaroo Island and Tasmania (Robinson, 1982). Numbers, at least in the mainland areas, appear to be low, and the species is considered to be rare.

Robinson (1982) argues that it is very likely that further species of mammals will be discovered in the planning area, some of them possibly rare. Information about the distribution of species already recorded is incomplete.

There are likely to be substantial changes in animal populations from season to season in response to fluctuations in growth and flowering of the vegetation (Edmonds and Specht, 1981; Specht, Rogers and Hopkins, 1981). The fauna of heathlands such as those of the planning area is of considerable scientific interest (Kikkawa, Ingram and Dwyer, 1979).

The conservation status, distribution and population health of native fauna need to be better understood. An inventory of populations of native animals will be recorded and populations of animals of known conservation significance will be monitored. Species management plans necessary for their conservation will be designed and implemented if necessary, based on the latest scientific information available. Habitat requirements, especially in relation to the distribution of the impacts of drought, introduced flora and fauna and wildfires, need to be better understood. If necessary for the conservation of significant fauna, management intervention may be required in relation to fire.

Objectives

Conserve populations of native fauna, especially those of conservation significance.

Actions

- Record information on populations and distribution of native fauna on a database with GIS capability, monitor populations, identify threats and undertake abatement programs if necessary for their conservation.
- Encourage and undertake research into the dynamic nature of animal populations.
- Research the impact of frequent and large fire regimes on the parks fauna population.

4.1.5 Introduced Plants

Background

Weed infestations are not widespread within Ngarkat. Parts of the planning area which have been substantially disturbed by past land uses and/or by recreation (mainly the soakage areas, along tracks, and at the sites of old settlements, bores and yards) contain a number of introduced species (Alcock, 1982; Harris, Reeves and Symon, 1982). These species are primarily agricultural weeds that are not invasive of native vegetation.

Although over 70 species of introduced plants are recorded for the reserves, only a few proclaimed and potentially invasive species warrant attention. Horehound (*Marrubium vulgare*), Salvation Jane (*Echium plantagineum*), Yellow Burrweed (*Amsinckia* sp) and Bridal Creeper (*Asparagus asparagoides*) are the species of greatest concern. Populations of invasive weed species will be monitored to assess their impact on biodiversity values and the effectiveness of any control measures put in place.

Objectives

Control pest plant populations within Ngarkat that have been identified as being of significant concern.

Actions

- Monitor and maintain weed control programs with emphasis on control of potentially invasive species.

4.1.6 Introduced Animals

Background

The area contains a number of Dingoes (*Canis familiaris dingo*). The extent to which these are purebred dingoes (rather than interbred with the more recently introduced wild dogs) remains unclear. These animals have been and remain a significant problem for graziers adjoining the planning area and are the subject of a continuing eradication program pursuant to the *Animal and Plant Control (Agricultural Protection and Other Purposes) Act 1986*.

In consultation with the Animal and Plant Control Commission and the Box Flat Dingo Control Committee, DEH undertakes a planned, extensive predator-baiting program across the park. Some sections of the community see the dingo as being a naturalised animal to the Australian landscape due to the amount of time it has been present on the continent and would like to retain the animal as a top-order predator in Ngarkat. The *Animal and Plant Control Act*, however, requires eradication of all dingos south of the dingo proof fence.

Other introduced animals to Ngarkat include Red Deer (*Cervus elaphus*), European Rabbits (*Oryctolagus cuniculus*), European Hares (*Lepus capensis*), Red Fox (*Vulpes vulpes*), Feral Cats (*Felis catus*) and Feral Bees (*Apis mellifera*). Feral Goats (*Capra hircus*) also occur within the area and require monitoring and the development of a suitable control program.

Rabbits usually occur in small colonies, mainly in the vicinity of soaks and clearings. Their impact on natural regeneration in these areas is significant and therefore warrants continued control programs.

Foxes and cats are found throughout the park area and have an impact on small to medium sized native fauna. Control occurs as an integrated program with dingo control.

Feral bees occur in areas of the reserve where suitable hollows allow for hive development. These bee populations are distinct from managed honeybees that are only placed within the planning area during the non-swarming winter period. DEH will encourage research, in cooperation with the Apiary Industry Consultative Committee and South Australian Apiarists Association, towards developing eradication techniques for feral hives.

Objectives

Control introduced animals and eradicate dingoes within Ngarkat in line with APC Act.

Actions

- Control rabbits by poisoning, warren destruction and fumigation, and encourage rabbit haemorrhagic disease (RHD) when possible. Monitor results.
- Establish goat, fox and cat monitoring and control programs.
- Maintain dingo management program. Monitor the effectiveness of the program.
- Ensure that all control programs are undertaken with adequate training, procedural understandings and precautions to reduce the likelihood of off target species impacts.
- Develop and undertake feral beehive eradication programs in conjunction with commercial apiarists.
- Maintain close liaison and co-operation with research and field officers of the Animal and Plant Control Commission, regional Animal and Plant Control Boards and their officers and the Box Flat Dingo Control Committee.
- Develop integrated pest control programs in cooperation with the local community.

4.2 Cultural Heritage

Background

4.2.1 Aboriginal Heritage

Dreaming

For Aboriginal people, land and waters have many interconnected complex meanings and values. The significance of land and waters is central to Aboriginal people's lives: at birth, death, ceremonies, and socially, whilst hunting, gathering camping, and travelling. The term 'Dreaming' is the term used to describe the combination of these aspects of life, religion, mythology, law and history, which includes the past, the present and the future.

The land or waters that an Aboriginal person has a traditional or contemporary association with is commonly referred to as 'Country.' Both 'Country' and 'Dreaming' are complex concepts that are difficult for non-indigenous people to understand. For example 'Dreaming' can be a site located in song, in physical space or embodied in an object. Its physical, social or psychological importance can vary according to the speaker's traditional country, gender, age and personal experience. For these reasons the 'Dreaming' is rarely mapped in the western sense, but the significance of a site is integral for Aboriginal people.

Furthermore, mythological sites associated with these stories are known only to the Aboriginal people with cultural knowledge of the area. These sites are often landscape features which can be one or many trees, rocky outcrops, riverbeds or water holes. These sites physically represent the ancestors and their activities in the story with the knowledge and 'Dreamings' associated with these sites passed down through stories of travellers, ancestors and mythological beings. Many "Dreaming Stories" 'travel' throughout an area and may be known as a 'Dreaming trail' or 'track.' Some stories focus on specific 'sacred sites.' These stories and traditions exclusively belong to Aboriginal people. Who tells them, where they are told, to whom they are told and when, are all a part of their culture and must be respected.

Ngarkat Culture and Heritage

The name Ngarkat is taken from the Ngarkat people who were the original inhabitants of the area (Tindale 1974). Harris (1982) provides an excellent and detailed account of the history of the planning area, of which a brief summary is given here.

It is believed that Aboriginal occupation of the area by the Ngarkat people was constrained by the lack of surface water, and the indigenous population appears always to have been small. The soaks were of crucial importance to the Ngarkat people and most of the known Aboriginal sites are near them. Harris suggests that the open vegetation around many of the soaks may be due, in part, to long Aboriginal use and disturbance of vegetation focussed at those sites.

Other impacts of Aboriginal occupation on the environment are not obvious. It seems very likely that the Ngarkat people used fire, although how often and how much of the area they burnt at any one time is not clear. It seems very unlikely, however, that the people in this particular area would have used fire to as great an extent as may have been the case in more fertile and better watered parts of south-eastern Australia.

Following colonial settlement in 1836, the populations of the Ngarkat people were substantially reduced as the result of disease, dispersal, occupation of land and water supplies and through violent conflict.

The *Aboriginal Heritage Act 1988* defines a site as 'An area of land that is of significance to Aboriginal tradition, Aboriginal archaeology, anthropology or history.' Site types include:

- **Archaeological sites, campsites, middens and artefact manufacturing sites.** These may occur in isolation or in conjunction with other sites. These may contain scattered pieces of stone leftover from the manufacture of tools, stone or clay hearths, and food remains such as shellfish or animal bone. Middens are characterised by large deposits of shells. They may also contain animal bone, charcoal, stone tools and possibly skeletal remains.

- **Burial sites.** Can be historic or pre Contact. In some areas burials are marked with stones, logs or brushwood at the head or sides of the grave, however most burial sites are only recognisable when they become exposed by erosion or by disturbance. Many are found in sandy areas where they are readily exposed through erosion.
- **Quarry sites - stone tool, grindstone and ochre quarries.** Quarries can be identified from signs of chipping or hammering on suitable rock outcrops and from associated surface scatters of flaked stone.
- **Stone arrangements- ceremonial, hunting hides, and fish traps.** Arrangements can be made out of stone timber or earth. They are distinguished by large or small arrangements of stones laid out in patterns on relatively clear ground, but can also be found across watercourses as fish traps.
- **Mythological sites.** Mythological sites are dreaming sites. These may include natural features in the landscape, such as single trees, rock formations and waterholes to mountain ranges.
- **Historic sites.** Historic sites can include missions; ration depots, birthplaces and fringe camps.
- **Paintings and engravings.** Painting and engraving sites are widely distributed and are found in a range of environments where suitable rock surfaces, shelters and overhangs are found.
- **Scar trees.** Scar trees exhibit scars on the trunk or limbs where bark has been removed for various purposes to make canoes, shields, dishes or shelters. These are also termed Culturally Modified Trees.

Any land, developed or undeveloped can contain sites. Sites relate to living patterns and exploitation of environmental resources such as water, animal and vegetable foods and stone by Aboriginal people. They also relate to spiritual beliefs, and ceremonial activities.

Certain landforms at Ngarkat likely to contain evidence of Aboriginal pre-historic occupation include:

- *Claypans* (stone artefact scatters, middens, rock art, stone arrangements, campsites or ovens)
- *Rocky outcrops* (quarries, rock art, rock holes, stone arrangements, ceremonial religious sites, stone artefact scatters)
- *Dunes* (stone artefact scatters, burials, campsites or ovens)
- *Bush or forested areas* (stone artefact scatters, campsites or ovens)

The South Australian Government is responsible for the protection and preservation of sites objects and remains of significance to Aboriginal people. The Department for Aboriginal Affairs and Reconciliation maintains a Central Archive of some 6000 site recordings of Aboriginal sites.

Currently 10 sites are listed on the Central Archive for the Ngarkat Complex of Conservation Parks. These are mostly located near soaks or clearings. They include hearths, scattered flakes and burial sites. Some are in need of conservation and all are vulnerable to disturbance. Ongoing conservation of these sites is important. Most will revegetate naturally if disturbance is minimised.

Eight of the sites were identified during the Ngarkat site-recording project, a National Estate Grant funded survey in 1997. Due to problems with visibility the survey targeted areas around existing vehicle tracks, accessible water sources, and areas that had previously been collected. The SA Museum holds a number of artifacts collected from the area between 1933 and 1983.

These 1997 recordings do not reflect a comprehensive survey of the park. To promote better cultural heritage management at the Ngarkat Complex of Conservation Parks further research needs to be undertaken to identify and record sites of significance on the park.

To avoid inadvertent damage to sites DEH shall consult with DAARE and the relevant Aboriginal authorities before commencement of any development works.

Management of Aboriginal sites is largely at the direction of authorised Aboriginal Heritage Committees, constituted under the *Aboriginal Heritage Act 1988*. DEH has, and will continue to, liaise with Aboriginal people with an interest in the area. The intention is to preserve sites as an integral part of the surrounding natural environment, although once stabilised (and following consultation with Aboriginal representatives) it is generally accepted that the public need not be excluded from the sites, provided access is only on foot and in low numbers.

4.2.2 Colonial Heritage

Colonial use of the area began with occupation for extensive sheep grazing in the 1870s. The former station settlements at Box Flat and Bucks Camp date from this time. There were wells at these locations, and at some of the other natural soaks, shallow wells were dug and lined with timber. Wire fences bound the main holdings. The area had very limited grazing potential and was systematically burnt every five to six years to encourage better feed.

The combined effects of rapidly expanding rabbit and dingo populations (the latter probably more in response to the abundance of rabbits than to the availability of sheep) and the general unsuitability and low productivity of the country meant that none of the early pastoral leases were renewed and by the mid 1890s, the area had been effectively abandoned.

Following the First World War, much smaller pastoral leases were taken up over the whole area, this time mainly for occasional drought grazing. Blocks of land were fenced and a few stockyards, huts and bores were established. Despite attempts at control, dingoes continued to be a problem, and in the few areas that were used regularly, systematic burning was again employed to promote palatable feed. Most of these leases lapsed in the 1930s and 1940s.

After the Second World War there was occasional grazing under annual licence. Despite various proposals for development, most of them unrealistic, the area remained vacant Crown land (with the exception of the apiary industry that took up and utilised 299 bee sites within the area) until its progressive consolidation into the series of conservation parks that now make up the planning area. The first was Mount Rescue in 1953, followed by Scorpion Springs in 1970 and Mount Shaugh in 1971. Most of the remaining land became Ngarkat Conservation Park in 1979. The slow and sometimes frustrating progress in establishing reserves over this outstanding natural area has been documented by Harris (1982).

The general impression throughout most of Ngarkat today is one of relatively undisturbed natural landscape. It is difficult to assess the extent to which this landscape has changed as a result of past land-use. The very frequent burning during the two main pastoral phases may have had quite substantial effects on the vegetation, but we are as yet unable to assess to what extent the present vegetation has recovered from, or changed, since such disturbance. The ecological changes caused by rabbits and introduced weeds, combined with erosion caused by a combination of very frequent fires and overgrazing by rabbits and trampling by sheep may well have had lasting effects.

Nevertheless, it appears that the natural ecosystems of the planning area are reasonably intact in comparison with most other areas in south-eastern Australia.

Identified Colonial historic sites within Ngarkat reflect the successive phases of past attempts to establish agriculture and pastoral activity within the Ninety Mile Desert.

The ruins at Bucks Camp and Box Flat, various wells, windmills and bores represent relics of early pastoral activity. Some locations have no known relics but the historical associations are still a valid part of the sites' value.

Some of the Colonial heritage locations are also Aboriginal cultural sites and in addition are also used as day visit locations. A balance must be found between competing conservation and public use requirements. Pertendi Hut has been restored as a visitor facility, thus achieving both historic site and recreational objectives.

However, it must be acknowledged that DEH is not in a position to commit significant resources to conserving the Colonial historic fabric contained within Ngarkat. The encouragement of volunteer assistance and/or a business sponsorship to achieve effective conservation needs to be explored more fully.

Objectives

Conserve and protect significant archaeological, cultural or historical sites and provide suitable interpretive material.

Actions

- Consult Aboriginal people who have a traditional association with the land, Native Title Claimants and relevant State and Federal Aboriginal heritage authorities, in decisions regarding the management of Aboriginal cultural heritage.
- Before proceeding with any development works within the reserve, obtain an assessment and clearance from the appropriate authority, under the provisions of the *Aboriginal Heritage Act 1988*.
- Identify, record, protect, restore and monitor known or relocated sites and items of archaeological, anthropological, cultural and historical significance located in the park, in cooperation with the Department for Aboriginal Affairs and Reconciliation, the Heritage Branch of DEH and other relevant authorities and organisations. Aboriginal and historic cultural heritage sites require conservation plans to facilitate appropriate management.
- Research and inventory historic sites and stories that relate to the history of the park and where appropriate, make this information available to visitors through interpretive material.
- Encourage and support archaeological, anthropological and historic studies within the park. All sites located during these surveys should be recorded to the standards set by The Heritage Branch of DEH and/or DAARE and submitted for inclusion on the DAARE Central Archive and/or State Heritage Register.
- Build and maintain liaison with local communities to further the collection of historic information and to gain an understanding of local attitudes and concerns.
- Encourage local volunteer assistance with site recording, conservation and research.
- Seek technical assistance to assess heritage conservation values and conservation requirements.
- Conserve the following sites within resource constraints:
 - Box Flat ruins, dam, and open landscape,
 - Bucks Camp stone ruins, well and environs,
 - Scorpion Soak, the soakage well and environs,
 - Nanam Well.
 - Comet Bore
 - Pertendi Hut
- Increase the safety of visitors and reduce public risk.
- Explore a commercial approach (eco-tourism, sponsorship or retail booklets etc) to improving the resource base for conservation and interpretation of historic sites in the context of other park values.
- Liaise with local council and local community to link historical interpretation with applicable sites off park.

4.3 Fire Management

Background

Fire is now recognised as one of the most important natural environmental variables in determining the structure and composition of Australian vegetation (Gill, Groves and Noble, 1981; Hopkins and Robinson, 1981; Noble, I.R., 1982; Specht, 1981b). The response of heath and mallee vegetation to fire has received considerable attention and it is now possible to base the fire management of Ngarkat on considerable relevant research (Cheal, 1982; Cheal, Day and Meredith, 1979; Gill, 1976; Gill and Groves, 1981; Groves and Specht, 1981; Noble, J.C., 1982; Noble, Smith and Leslie, 1980).

Such research is important in developing a general understanding of the fire ecology of Ngarkat. However, the actual extent, frequency and behaviour of past fires in the area and precisely how those fires have influenced the present vegetation pattern, has yet to be fully determined.

Fires within the park have been comprehensively mapped since the mid-1950's. Figure 2 shows the fire history of Ngarkat.

Preliminary analysis of aerial photographs flown at intervals of between one and five years over the last thirty years or so demonstrates that fires have been a major and recurrent feature within Ngarkat throughout that period. Currently a few small areas have remained unburnt throughout that time, but other areas have been subject to as many as four fires within the thirty years. This contrasts with the view of Day (1982) that such areas may not carry fire again for up to twenty years after the first fire.

There have been about thirty-five fires of greater than 20 hectares extent during the last thirty years. Ten of them have exceeded 100 square kilometres (10,000 hectares). Four have exceeded 500 square kilometres (50,000 hectares), one of which exceeded 900 sq km (90,000 hectares). Fires of large magnitude that burn one third or more of the park are considered undesirable, especially from the point of view of fauna population recovery.

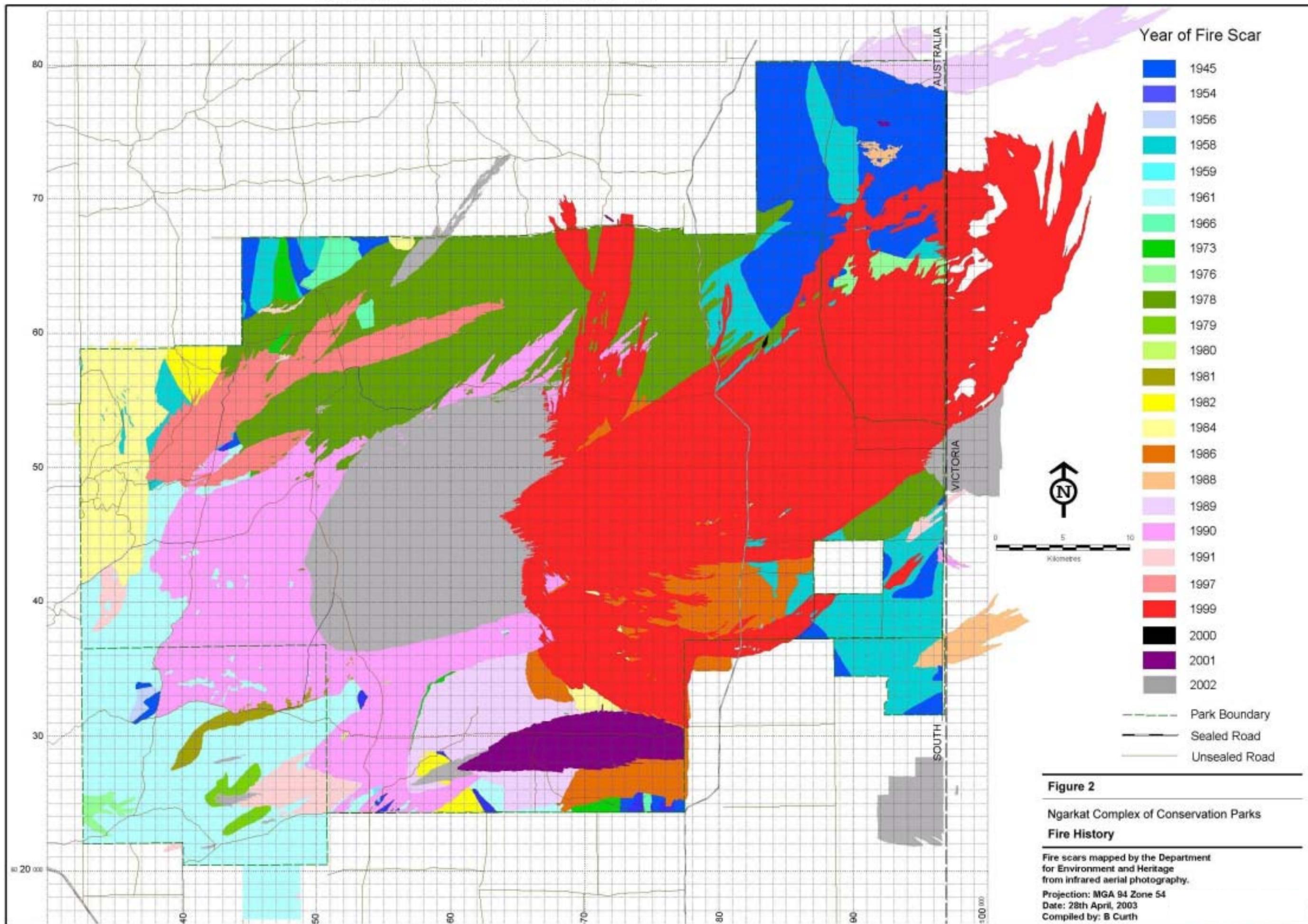
Lightning has been and continues to be the major source of ignition of fire within Ngarkat. Escapes from fires originating outside the reserve and entering the park, however, are not significant. Evidence suggests that naturally occurring fires can be expected to burn through any particular area on an average of once every ten to fifteen years.

It is not possible to assess whether lightning has always been the main source of fires or whether there have been other factors in the past. Equally, it is not possible to know the impact that Aboriginal induced fires have had on the area since their first occupation as well as other issues such as the influence of climate change over this period. (Singh, 1982; Walker and Singh, 1981). We can only speculate that long-term changes, if they have occurred, may have had substantial effects on the vegetation of the planning area. Harris (1982) speculates that the absence of vegetation around the soakage areas is partly the result of Aboriginal burning.

On a shorter time scale, it is clear from the work of Gill (1976), Specht, Rayson and Jackman (1958); Specht (1981b) and others, that not only the vegetation of the planning area is adapted to fire as a recurrent feature of the environment, but periodic fire is necessary for the maintenance of some of the plant communities as we know them.

Studies of the response of fauna to fires suggest that a mosaic of different habitat structures and age classes is important to ensure survival of a natural diversity of species (Campbell and Tanton, 1981; Catling and Newsome, 1981; Fox and McKay, 1981; Main, 1981; Whelan and Main, 1979). As yet, there is very little evidence to suggest that the present diversity of vegetation structures and age classes (and hence fauna opportunities) are substantially different from that which occupied in the area prior to colonial influences. Fire remains one of the few broad acre techniques that can be used to manipulate natural habitats.

A Fire Management Statement has been prepared for the park in consultation with adjoining Country Fire Service Groups and Brigades, but will be subject to future evaluation, review and updating.



Objectives

Minimise the incidence of large high intensity fires within the reserve

Manage fire to ensure the protection of life and property, the maintenance of biodiversity and the protection of natural, cultural and built values.

Minimise the negative environmental impacts of large fires and fire suppression activities within the reserve.

Strategies

Develop a fire management plan to address:

- protection of life particularly fire fighter safety
- fire-related visitor management, protection and evacuation
- protection of built assets and property in and surrounding the reserve/s
- protection of cultural and natural values particularly identified habitats, important vegetation communities and threatened species
- maximise biodiversity conservation and ecological management including the evaluation of tools such as prescribed burning
- fuel hazard assessment
- risk assessment including the environmental risks to vulnerable species, communities and habitats
- balancing the risk of a large fire and resultant environmental impact with the environmental impact of fire suppression
- response and suppression, particularly appropriate fire suppression methods and environmentally sensitive practices
- works and activities to mitigate risk
- fire access, suppression guidelines, warnings, fire infrastructure particularly water supply.

Ensure stakeholders and the wider community are consulted and understand the fire risks and mitigating actions being proposed or undertaken in the reserve.

Actions

- Develop a fire management plan for the reserve.
- Formally consult with CFS, the relevant District Bushfire Prevention Committee/s and other key stakeholders, conservation and park interest groups, neighbours and the wider community during the preparation of the fire management plan.
- Review and update fire management planning to ensure the planning is current, accurate and adequately addresses all issues.
- Maintain a strategic network of fire access and fuel reduced areas.

4.4 Recreation and Tourism

4.4.1 Visitor Use

Background

The pattern of recreation within Ngarkat is primarily vehicle-based, with increasing numbers of visitors regularly using a series of dispersed sites for camping and picnics. Use is greatest in the cooler months but there is an increase in summer visitor numbers as indicated by traffic counters installed in the park.

Much of Ngarkat presents outstanding opportunities for wilderness experiences. The experience of driving along some of the remote tracks is of a kind now unavailable elsewhere in the southern part of South Australia. Exploring the wilderness of this heath and mallee country, either on foot in the core of the park, or from a vehicle on one of the many designated vehicle tracks, is one of the unique recreation experiences the planning area has to offer. Management of these wilderness recreation opportunities is an important challenge in this area and comes with a price to ensure they remain quality wilderness. This will mean the need to impose constraints on some visitor expectations (Davey, 1980; Robertson, Helman and Davey, 1980).

Ngarkat presents recreation opportunities that are unique in the southern part of South Australia. The development of facilities should not detract from the wilderness character that attracts the majority of visitors. The pattern of recreation is primarily vehicle-based with ever increasing numbers of 4WD vehicles using the park. Access for conventional drive vehicles is limited.

Ngarkat offers many, as yet untapped, opportunities for the development of eco-tourism ventures. Eco-tourism is nature-based tourism that involves education and interpretation of the natural environment and is managed to be ecologically sustainable (Commonwealth Department of Tourism, 1994). Private tour operators will need to be licensed and accredited and comply with standards and a code of practice, all currently being developed by DEH and the Tourism Commission (State Eco-tourism Steering Committee).

Ngarkat offers visitors outstanding opportunities to enjoy and understand the fauna, flora, biological and biophysical processes of the area. In addition, quite rich Aboriginal and Colonial cultural and historic themes are (potentially) available for interpretation.

In keeping with the primary nature conservation objective, recreational activities will be directed to sites where impacts can be contained and managed. Indiscriminate use of the park for inappropriate recreation purposes and incompatible uses will not be permitted. Camping will only be allowed at designated sites, although approval may be given at other locations for specific purposes. Day visit sites will be managed in locations with historic, cultural or scenic values, which provide opportunities for interpretation and short nature walks. Horse and camel trekking will not be permitted.

Interpretive and educational techniques will be used to promote the natural and cultural values, to assist community and visitor understanding of park management actions and to emphasise visitor safety requirements.

Objectives

Develop and maintain simple bush camping, day visit and walking opportunities within Ngarkat consistent with the reserves' primary nature conservation role.

Monitor the impact of vehicles within the park and develop management strategies to ensure sustainability and the preservation of biodiversity values.

Facilitate the establishment of ecologically sustainable eco-tourism ventures.

Promote the natural and cultural values of Ngarkat to the local community and the visiting public and improve understanding of park management actions and an awareness of visitor safety requirements.

Actions

- Establish interpretive information and direction signs and markers as required to assist with navigation and safety.
- Identify and promote eco-tourism opportunities.
- Assess applications for eco-tourism ventures and approve if appropriate and compatible with other park objectives.
- Liaise with local council to erect appropriate signs indicating entry points to Ngarkat on all designated entry routes.
- Erect informative signs at appropriate locations to interpret the natural history, Aboriginal cultural history (with appropriate liaison and approval) and post-colonisation history of the area to park visitors.
- Maintain liaison with schools, Aboriginal groups, and other relevant local community groups and authorities to ensure local understanding of management actions and park values by utilising a range of extension techniques.
- Monitor vehicle activities and develop appropriate management programs to maintain the integrity of the parks' values.

4.4.2 Camping and Day Visit Areas

Background

Camping is permitted at ten sites within the park and fees apply. Bucks Camp, Rabbit Island Soak, Box Flat, Comet Bore, Pertendi Bore, Pine Hut Soak, Coxs Windmill and, on the Border Track; Doggers Hut, The Pines and The Gums are designated camping areas.

The main picnic sites are at Pine Hut Soak, Scorpion Springs, Comet Bore, Pertendi Hut, Box Flat, Jimmys Well, Rabbit Island and Bucks Camp. There are picnic facilities at Pertendi Hut and Pine Hut Soak (wooden tables, designated campfire sites and toilets). Other places which are a focus of interest include the vantage points of Mount Rescue, Gosse Hill, Hensleys Trig Point photographic platform (constructed and erected by the S.A. Association of Four Wheel Drive Clubs) and some of the smaller soaks.

Activities undertaken from these locations include bushwalking, photography, bird watching and other forms of nature study and vehicle touring. Most visitors, particularly those equipped with four-wheel-drive vehicles come to this area primarily to explore the remote tracks.

Camping and day visit areas located within the park are shown in Figure 3.

Objectives

Provide appropriate camping and day visit areas within Ngarkat.

Actions

- Establish and maintain bush camping areas by means of low profile fencing and signs at the following locations: Bucks Camp, Rabbit Island Soak, Box Flat, Comet Bore, Pertendi Bore, Pine Hut Soak, Coxs Windmill and, on the Border Track; Doggers Hut, The Pines and The Gums.
- When visitor levels indicate the need, develop appropriately designed toilets and facilities at selected campsites.
- Formalise the management of day visit sites at Scorpion Springs and Jimmys Well utilising low profile fencing to protect vulnerable features.
- Undertake rehabilitation of camping and day visit areas where necessary.
- Prohibit the collection of local firewood and provide interpretive material to explain its importance to wildlife.
- Encourage visitors to supply their own fuel and continue to make alternative fuel available for sale.
- Monitor the impact of campfires and in the event that damage to biodiversity, habitat or visual amenity becomes significant, consider implementing a more restrictive regime.

4.4.3 Vehicle Access

Background

The sealed road from Pinnaroo to Bordertown runs north-south through the eastern part of the planning area. In addition to comprising a major through-road, it is the main access into most of the eastern park area. The road easement is not part of the Conservation Park. Unsealed secondary roads from near Coombe, Tintinara, Keith and Lameroo access the western section.

Within Ngarkat there is a substantial network of vehicle tracks, most of which are not suitable for conventional vehicles. Some of these are former fence-lines, while others have resulted from fire-fighting. Many are used for fire management, public access to specific recreational sites, general touring within the park and for commercial apiarists to access their bee sites. Unused tracks are now overgrown and not negotiable.

Navigation on the internal tracks can be difficult (with attendant serious consequences for an error, particularly during an emergency such as a bushfire). Persons diverting around poor sections of track

cause considerable vegetation damage. The problem is worst where the trend of sand ridges in a particular area is generally across the line of a track. The result has often been a series of parallel vehicular deviations around ever deteriorating and impassable sandy sections. Track damage and visitor strandings are most prevalent during hot, dry summer weather.

The existing severe degradation to dune crossings caused by 4WD vehicles in the past is being rehabilitated in part, by a volunteer project conducted by the South Australian Association of Four Wheel Drive Clubs.

The principal access requirements are for recreation, fire management, apiary industry use, research and park management. The management of access in the park must be achieved in a manner that promotes and protects conservation values, links points of interest, recognises public safety issues and avoids conflict of use. The current access strategy is based upon recommendations of the Ngarkat Access Working Group. The group was established in 1991 with representation from the Country Fire Service, South Australian Association of Four Wheel Drive Clubs, the apiary industry, the Mallee and Apiary Consultative Committees and DEH. The development of the access strategy included consultation with District Councils and the Department of Natural Resources and Environment (Victoria).

Fire Access:

A network of strategically located tracks (including apiary management tracks) and fuel reduced zones are detailed in the Fire Management Statement. These tracks will be maintained for fire management purposes. They are established in consultation with local Country Fire Service Brigades through District and Regional Fire Prevention Committees and may vary as circumstances change. Following any fire suppression operations, rehabilitation of access tracks may be necessary. This may include temporary closure of some public access tracks.

Apiary Access:

In keeping with the current State Government policy on bee keeping, access will be provided to licensed apiarists. On tracks where use is exclusive to beekeepers the responsibility for maintenance of the tracks will lie with the apiarist. Where tracks are shared with other park functions the maintenance costs will be shared with DEH. Access will be rationalised and any unnecessary tracks will be closed and rehabilitated following consultation. All material used in track maintenance must be sourced from a DEH approved pit or supplier.

Public Access:

In line with the recommendations of the Ngarkat Access Working Group the network of public access shown in Figure 3 will be adopted and progressively implemented as resources permit. The strategy has the following features:

- It links sites of cultural, historic and natural significance and compliments day visit and camping areas.
- It avoids multiple use conflict, largely by separating public and apiary use and is manageable in terms of financial and staff resources.
- It maintains a core wilderness area without public tracks.
- It adopts a strategy to maintain safe public access along the Border Track by the creation of a one way route along the northern half of the Border Track to the Pertendi Hut track that permits vehicles to only travel from north to south. This is necessary to overcome the significant damage that has occurred in this area. Vehicle traverse is easier north to south because of the shape of the dunes. Travel in that direction should increase public safety and lessen incidences of 4WD vehicles creating track damage. The tendency for vehicle owners to create deviation tracks to crest the dunes should also be reduced. From the Pertendi Hut track to the southern border of the Park the Border Track provides for two-way 4WD vehicle access.

The high frequency of fire within Ngarkat must be taken into account when designing and implementing a network of public access tracks. Fires can develop rapidly in Ngarkat, with many crossing the Border Track and moving into Victoria (see Fig 2). Once visitors are on the Border Track

there is little opportunity for DEH to provide advanced warning of fire danger. At present visitors are not required to inform DEH of their intention to use the track, and consequently DEH staff are not able to monitor the numbers of visitors on the track at any one time and ascertain their approximate location.

As access along the northern portion of the track is one way (north to south), and there are few opportunities to leave the track, during a fire visitors may be forced to drive directly into a fire front. Those attempting to avoid this by traversing the track from south to north may become bogged and/or sustain damage to their vehicle. This combination of factors also increases the difficulty of search and rescue operations.

To ensure public safety, DEH will not permit public access along the Border Track from 1 November to 31 March and during other periods of high fire danger (as determined by the District Ranger). Additionally, a fee will be charged for entry to the Border Track as a means of encouraging responsible usage, and to provide DEH with information on the numbers of visitors on the track at any one time.

One previously closed track will be opened for public access. The track runs from the northern border, through Box Flat and links with the Jimmys Well Track. The opening of this track will remove pressure from other tracks and reduce public track degradation. Other non-public access tracks within Ngarkat have the potential to provide high quality wilderness experiences if opened to the public. These may be opened on an exclusive basis, subject to ongoing assessments of their feasibility, with a limited number of fee paying visitors permitted to use the track at any one time.

Objectives

Rationalise the existing total access system within Ngarkat to provide appropriate access to a range of sites and environments for park visitors, fire management and the apiary industry, while achieving the following:

- improved track surface stability,
- closing and rehabilitating track deviations,
- limiting user group conflict,
- reduced navigational confusion and improved public safety,
- reduced maintenance costs in the medium term, and
- no new tracks into the wilderness core area of the park.

Actions

- Adopt and implement the public access network of tracks shown in Figure 3.
- Undertake repair and stabilisation work where public access tracks have been damaged.
- Establish one way access along the Border Track from the northern border to the Pertendi Hut Track entrance, and two way access from the Pertendi Hut Track to the southern border. Establish a fee for access to the track.
- Close the Border Track from November 1 to March 31 and during other periods of high fire danger. Also close during weather conditions that render the track impassable and susceptible to damage (eg summer dryness or flooding of swales). Review this strategy periodically.
- Open the track running from the northern border to the Jimmy's Well track for public access.
- Provide Information by way of signage and/or brochures that includes advice on access routes, speed limits, travel times, recommended tyre pressures, driving techniques and other safety issues.
- Investigate the feasibility of periodically opening suitable non-public access tracks, for use by a limited number of fee-paying visitors. Implement if feasible and if conservation values are not compromised.
- Review all public access tracks periodically for public safety and biodiversity outcomes and develop alternative opportunities where conflicts arise.

4.4.4 Walking Trails

Background

Several walking trails are located within Ngarkat, as shown in Figure 3. These trails are currently short to intermediate in duration with an easy to intermediate level of difficulty.

Self guided walks, such as those at Tyms Lookout, Pertendi Hut and the trail from Pine Hut Soak to Scorpion Springs and Nanam Well are a great way to experience the mallee. Short walks to the tops of Mount Rescue, Gosse Hill, Hensleys Trig Point photographic platform and Mount Shaugh offer great views.

Objectives

Provide appropriate walking trails within Ngarkat.

Link current walking trails with trails in reserves within Victoria.

Actions

- Maintain walking trails to Gosse Hill, Hensleys Trig Point, Mount Rescue and self guided walks at Pertendi Hut, Pine Hut Soak and Tyms Lookout.
- Investigate the feasibility and requirements for long duration unsupported walking trails within the park.
- If appropriate, develop and maintain other walking trails where there is a demonstrated demand.

4.4.5 Mountain Bikes

Background

Mountain biking is a very popular around Australia with many reserves managed by DEH being used by clubs and individuals. Whilst the wilderness qualities of the park may be attractive to many mountain bike users, the sandy terrain makes the area generally unsuitable for use by cyclists.

While the major role of the Ngarkat complex of parks is nature conservation and some compatible resource utilisation, low key recreational use, with an emphasis on appreciation of the natural environment and cultural features, is also acceptable. Current recreational uses of the park include bushwalking, birdwatching etc. Mountain bike riding, despite the sandy terrain being not particularly well suited to this activity, is a potential use although riding mountain bikes in the park, except on designated roads or tracks, is at present contrary to the National Park Regulations.

Use of mountain bikes can contribute to vegetation damage, cause erosion of tracks, and spread weeds. It is vital that park users are made aware of the high conservation status of the park and the potential impact of recreational activities. Under the Regulations, mountain bikes are only permitted on designated access routes such as public roads and the permission of the Director (or delegate) is required to ride elsewhere.

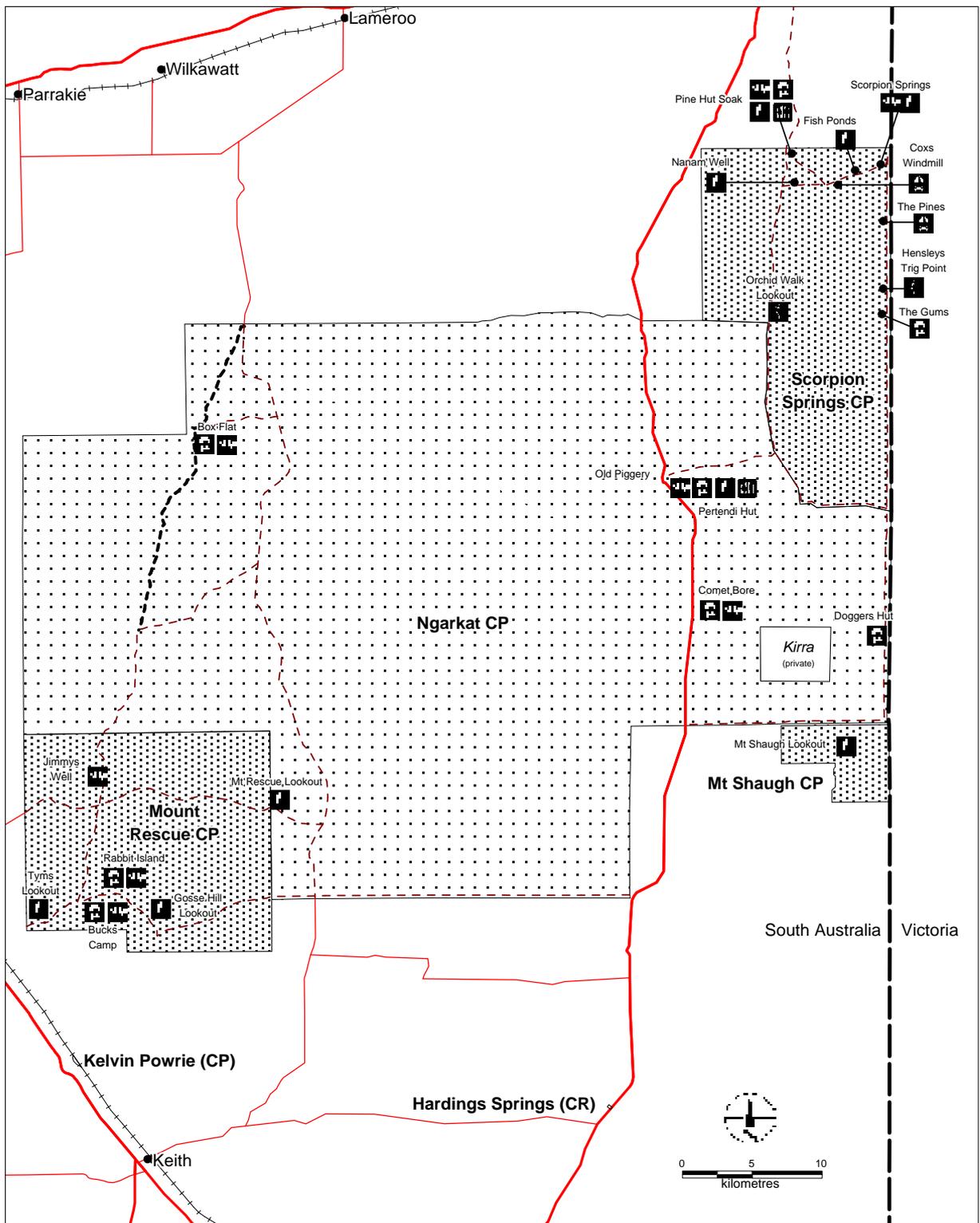
Subject to Departmental policy, consideration may be given to granting permission, at the discretion of the District Ranger, for persons to ride mountain bikes on other roads or tracks (or to use specific areas of the reserves set aside for that purpose), when and where such use is deemed to be appropriate. The impact of such recreational activities on the natural systems in the park should, however, be monitored and appropriate action taken to mitigate any adverse effects.

Objectives

Regulate the use of mountain bikes within Ngarkat to ensure environmental degradation and user conflicts do not occur.

Actions

- Restrict the use of mountain bikes within Ngarkat to designated roads and tracks.



LEGEND

- | | | | |
|--|------------------------|--|-----------------|
| | Sealed Access | | Walking Track |
| | Unsealed Access | | Day Visit Areas |
| | Railway | | Camping |
| | 4WD Track | | |
| | 4WD Track to be Opened | | |

Figure 3

Ngarkat Complex of Conservation Parks
Features and Public Access

Map created by
Reserve Planning
using PAMS, 2003

4.4.6 Education and Research

Background

The Botany Department of the University of Adelaide maintains a hut just inside the park at a site south of Gosse Hill as a base for research and undergraduate field studies, primarily related to heathland vegetation. This arrangement is one of long-standing that has generated considerable scientific information on the park's environment. Many students had their first exposure to field ecology at this site. The University will continue, under lease, to have the use of the hut. The Botany Department will be encouraged to make the facility available to researchers from other institutions that are working in the area. The lease will include provisions for the maintenance of the hut environs in an undisturbed condition.

Dr David Paton, (professor of zoology at Adelaide University), maintains a small research station in the northern section of the reserve. This facility will remain until it is no longer required by Dr Paton. All research activities undertaken within Ngarkat must be covered by a current scientific permit obtained from DEH. A fee will not be charged to researchers using facilities, but any research findings or scientific documents produced must be forwarded to the Mallee District Office.

In addition to the specific research recommendations contained elsewhere in this plan, DEH will promote, and undertake, investigations into resource management issues within Ngarkat. A schedule of management based research needs will be prepared to ensure compatibility of data and a systematic approach to meet management objectives.

Objectives

Promote continued research into resource management issues or other ecological and biodiversity issues within Ngarkat.

Ensure research information is reported to DEH.

Actions

- Encourage research into ecological processes and resource management issues within Ngarkat.
- Maintain the lease on the botany hut with Adelaide University and consider lease agreements for other research facilities on a short-term basis in other appropriate locations within the park.
- Ensure that research information is reported to DEH by making this a condition of all scientific permits.

4.4.7 Entry and Camping Fees

Background

Camping fees were implemented when the National Parks and Wildlife Service was established in 1972 and apply within Ngarkat. These fees are paid into the General Reserves Trust Fund, which is then used to improve the services and facilities of parks in the region, including Ngarkat.

Objectives

Continue effective mechanisms for the collection of entry and camping fees within Ngarkat.

Actions

- Establish self-registration facilities at key locations for collection of fees.
- Utilise revenue generated from entry and camping fees to improve visitor services and facilities within the parks.

4.5 Commercial Activities

4.5.1 Apiary Industry

Background

Ngarkat is a major over-wintering area in South Australia for commercially managed honeybees. The apiary industry has a history of use of Crown lands prior to the dedication of the Ngarkat complex of reserves, with about 299 sites in existence at the time of park dedication. The reduction in available winter-flowering vegetation and its long-term importance to the industry seems to have received little recognition until relatively recently. The majority of the existing 265 bee-sites licensed by DEH occur within the boundaries of the planning area. Licence fees are paid into a General Reserves Trust Fund, which assists with the administration and management of apiary activities within the park.

Concern over the presence of honeybees within Ngarkat and their impact upon natural systems generally and the parks in this area in particular, led to considerable community debate when the 1984 Ngarkat draft management plan was released. The future of apiary use within the planning area is guaranteed through departmental policy until research into the effects of honeybees demonstrates a need to amend the policy.

Paton (1996) concludes that “Introductions of commercial loads of honeybees to sites in Ngarkat Conservation Park did not affect the numbers of honey eaters, small mammals or invertebrates living in the reserve during winter but did result in a substantial increase in seed production for *Banksia ornata*”.

DEH, the Mallee and Apiary Industry Consultative Committees and the South Australian Apiarists Association are working co-operatively to address concerns through the bee policy and research aspects relating to the apiculture industry. As a result DEH has developed a bee site policy for *National Parks and Wildlife Act* and *Crown Lands Act* conservation reserves which addresses issues including number of sites, site management and site fees.

The South Australian Government has recognised the importance of the apiary industry for the production of honey and other bee products as well as for the pollination services it provides to agriculture. Current State Government policy is that apiarists will continue to have controlled access to existing sites within Ngarkat. DEH will undertake a collaborative approach to the ongoing management of commercial honey production in Ngarkat that includes apiary industry involvement and ongoing research into the activity’s ecological influence.

Objectives

Provide bee sites within Ngarkat to the apiary industry within the current agreed policy and management framework.

Review the management framework and/or the policy on the basis of research findings.

Actions

- Maintain liaison with the South Australian Apiarists Association and the National Parks and Wildlife Apiary Industry Consultative Committee and other Consultative Committees.
- Implement and monitor the current agreed State Government policy and Ngarkat bee keeping management framework. Continue to maintain records of distribution, seasonality of use, activity and compliance.
- Review the current research program and its initial findings to determine what additional research is required to address a range of environmental and user group issues and concerns.
- Encourage additional research into the impact of commercial apiaries on biodiversity values.
- Utilise bee site lease fees to assist with management of reserves where the sites are located and to facilitate research.

4.5.2 Tour Operators

Background

All tour operators are obliged to obtain a Commercial Licence, which is issued pursuant to the *National Parks and Wildlife Act 1972*. Licence fees are paid into a General Reserves Trust fund, which is used to improve visitor services and facilities within the parks in the region. Revenue generated from Commercial Licences is low.

Objectives

Provide Commercial Licences to tour operators using Ngarkat.

Ensure that commercial tourism ventures comply with the provisions of the *National Parks and Wildlife Act 1972* and this plan.

Actions

- Issue Commercial Licences to tour operators, subject to compliance with the provisions of the *National Parks and Wildlife Act 1972* and the objectives of this plan.

4.5.3 Other Commercial Activities

Background

Commercial filming in parks requires a Commercial Filming Agreement to be obtained, pursuant to the *National Parks and Wildlife Act 1972*. Filming fees are paid into a General Reserves Trust fund, which is used to improve visitor facilities within the parks of the region, including Ngarkat. Revenue generated from other commercial activities is low.

Illegal harvesting of Broombush (*Melaleuca uncinata*) has occurred from time to time in Ngarkat. The harvesting of Broombush is considered to be land clearance under the *Native Vegetation Management Act 1985* and will not be permitted in Ngarkat. Those wishing to harvest Broombush on private land may apply for a permit, which may be granted subject to certain conditions.

Objectives

Provide Commercial Licences to proponents wishing to film in Ngarkat.

Ensure that filming activity complies with the provisions of the *National Parks and Wildlife Act 1972* and this plan.

Ensure that Broombush harvesting is not undertaken within Ngarkat.

Actions

- Implement the Commercial Licence fee structure, as determined by DEH.
- Utilise revenue generated from Commercial Licence fees to improve visitor services and facilities within the parks.
- Monitor Ngarkat for signs of illegal Broombush harvesting and investigate incidents.
- Increase awareness amongst surrounding landowners and the general community with regard to the legal requirements for Broombush harvesting.
- Assist in the prosecution of those caught illegally harvesting Broombush.

4.6 Alien Tenures and Other Land Uses

4.6.1 Agriculture

Background

The private agricultural property, 'Kirra' (Sections 6 and 7, Hundred of Fisk) is entirely enclosed within Ngarkat. The property is developed to a high standard on a limited area of Parilla Sands. The owners currently use an access road, which is part of Ngarkat, rather than the surveyed road route, which is impractical. DEH guarantees the owners of 'Kirra' access along the currently used road subject to the owners of 'Kirra' being responsible for reasonable maintenance of the access road (the Department does not require the road for public access to recreation sites).

Objectives

Permit and safeguard private access to 'Kirra'.

Actions

- Maintain liaison with the managers of 'Kirra' concerning access.
- Maintain a 20 metre wide fuel reduced zone around 'Kirra'.
- Prohibit public access on the 'Kirra' entrance road and monitor road condition.

4.6.2 Mineral Exploration and Mining

Background

The *National Parks and Wildlife Act 1972* established reserves with two major purposes; conservation of natural and historic features, and public benefit and enjoyment. Although the Act includes provisions that could have been used to permit mineral exploration and mining in the Ngarkat reserves, these provisions were not implemented. Consequently, no mineral exploration or mining is permitted within the parks except by a resolution passed by both Houses of Parliament.

4.7 Management Arrangements

4.7.1 Partnerships and Cooperative Management

Background

The Department for Environment and Heritage supports and promotes partnerships and cooperative management arrangements to establish integrated natural resource management. This requires the development of substantial working relationships with government agencies, local authorities and local communities.

With regard to Ngarkat, this involves developing working relationships with neighbours, local land managers, Heritage Agreement owners, Native Title Claimants and the representative Aboriginal Heritage Committee. DEH also recognises the importance of developing ongoing partnership arrangements, participating in regional management programs and contributing to community organisations and boards including, Natural Resource Management groups (NRM's) Landcare groups, Soil Conservation Boards, Animal and Plant Control Boards and Local Government.

DEH is committed to reconciliation and to the development of partnerships with indigenous communities to effectively manage parks and wildlife in a way that respects both contemporary and traditional culture, knowledge and skills. Partnerships involve the delivery of programs that promote reconciliation, cultural awareness, indigenous employment and training, joint management and indigenous cultural heritage management on parks.

Furthermore, the South Australian Government is keen to pursue Indigenous Land Use Agreements (ILUAs) which are voluntary agreements between native title groups and other people about the use and management of country. For Ngarkat such an agreement would be between native title group/s, and the South Australian Government. Partnership arrangements should be initiated with relevant aboriginal communities and individuals to develop appropriate management requirements of indigenous heritage sites found within the park and help fulfil the objectives of this plan.

Objectives

Develop and maintain partnerships and/or working relationships with organisations, statutory bodies and others to assist with the management of the park and help fulfil the reserve's potential without compromising its natural and cultural values.

Actions

- Consult with local government councils, relevant management boards, the local community, and other relevant bodies and individuals to explore the benefits of partnership arrangements that will support future management decisions on issues of common interest.
- Encourage and contribute to the development of partnership arrangements to integrate biodiversity and recreation management in the region, with organisations and individuals that have an interest in contributing to the sustainable management of the park.
- Involve Aboriginal people with a traditional association with the land in future management of indigenous cultural heritage within the park, and in the management of other resources.
- Promote discussion with Aboriginal people who have a traditional association with the land comprising the park to better understand and appreciate their culture, lifestyle and knowledge of the reserve.

4.7.2 Community and Volunteer Involvement

Background

Volunteer and community-based groups active within the Ngarkat area include the Friends of Southern Mallee, Friends of the Upper South East, Mallee Consultative Committee, Apiary Industry Consultative Committee, SA Association of 4WD Clubs and the Adventurer 4WD Club.

The purpose of Consultative Committees is to provide an avenue for communication between local communities (or in two cases, an industry that relies on natural resources), the Minister and the department. It enables local communities and stakeholders to contribute advice on biodiversity, management of reserves, wildlife, heritage, planning, works programs and financial budgets and it enables the Minister and the department to consult with local people and stakeholders and to inform them of activities both current and proposed. It also involves local people and park users in the preparation of draft management plans, policies and their periodical revision. The Minister appoints members of consultative committees based on their particular expertise or experience.

The purpose of a "Friends Group" is to provide assistance with the care and maintenance of parks and to serve as an information source for park visitors. Such community assistance is a great benefit to DEH in helping to manage parks. Volunteers have contributed to numerous projects in Ngarkat. These have included walking trail and heritage site development and maintenance, track repair and vegetation rehabilitation. The interest and voluntary contribution of Friends Groups and community organisations will be fostered and incorporated into park management programs.

There are numerous blocks of land with remnant native vegetation surrounding Ngarkat, some that have been voluntarily placed under Heritage Agreements under the *Native Vegetation Act 1991*, which complement the conservation value of the park. The *Biodiversity Plan for the South Australian Murray-Darling Basin* (DEH 2001) advocates the removal of stock grazing, vegetation restoration and feral animal, pest plant and wildfire control on these vegetated blocks in coordination with park management as a means of increasing the conservation value of the area. Liaison will be maintained with neighbours whose properties have been placed under Heritage Agreements or retain native vegetation and their involvement in regional biodiversity conservation programs encouraged.

Objectives

Encourage and maintain community volunteer involvement in park management and biodiversity conservation.

Actions

- Maintain liaison with community groups that have an interest in Ngarkat and regional based conservation programs.
- Plan, develop and supervise projects involving volunteer community organisations.
- Liaise with neighbouring landholders to encourage their involvement in coordinated, regional biodiversity conservation programs.

4.8 Future Directions

4.8.1 Additional Land

Background

The addition of land to the park will be considered where it provides significant management, nature conservation or recreation benefits. Areas contiguous with the existing park boundaries may provide the opportunity to increase the park area without significantly increasing management overheads. Investigations will be undertaken to assess the conservation and recreation values of appropriate parcels of land that are offered for sale, either directly to the Department or on the open market. Some additional land has already been acquired and is currently awaiting formal addition to the park. This is shown in Figure 4.

There are several road reserves within the park. Some have management tracks on them, while others have never been used. In order to consistently apply conservation management to these strips of land, it is proposed to formally close unnecessary road reserves under the *Roads (Opening and Closing) Act 1991* and incorporate the land within the park. These road reserves are also shown on Figure 4.

Objectives

Acquire suitable additional land that will increase the natural values of Ngarkat.

Actions

- Close unnecessary road reserves within the park under the *Roads (Opening and Closing) Act 1991* and proclaim the land as part of Ngarkat Conservation Park.
- Assess any neighbouring land if offered for acquisition and recommend that it be added to the park if it improves the parks' natural values or strategic management.
- Investigate any unallotted Crown Land that may be on or in near vicinity to Ngarkat for potential addition.

5 SUMMARY OF MANAGEMENT ACTIONS

ACTION	PRIORITY	DURATION
Natural Resources		
Encourage research to expand knowledge and information about the ecological processes found within the park,	Medium	Ongoing
Encourage research into the requirements of the areas endangered, rare and vulnerable species.	High	Ongoing
Ensure research findings are made available to all interested parties.	High	Ongoing
Encourage surveys to determine the distribution, abundance and population dynamics of fauna and flora populations, especially rare and endangered species.	High	Ongoing
Explore the values of habitat manipulation to ensure the preservation of selected species within Ngarkat.	Medium	Ongoing
Monitor the effects of high frequency large-scale fires, visitor impacts, commercial apiary industry and introduced threatening processes (weeds and vermin) have on the parks natural assets and ecological processes. Develop policies, programs and procedures to amend any detrimental effects found.	Medium	Ongoing
Maintain liaison and information exchange and sharing with other relevant state and interstate authorities, agencies and community groups.	Low	Ongoing
Undertake, encourage and contribute to research into the populations of pest plants and animals and their effects on the biodiversity of Ngarkat.	Medium	Ongoing
Undertake, encourage and contribute to research to determine the extent of climate change and its effects on the biodiversity of Ngarkat.	Medium	Ongoing
Soils		
Provide educational material to visitors on the correct methods of operating 4WD vehicles on sandy tracks by maintaining signs at appropriate places on the tracks and by means of an informative brochure.	High	Short
Erect barriers and signage to prevent side excursions from tracks and rehabilitate damaged areas.	High	Ongoing
Close tracks during unfavourable weather conditions including times of severe fire danger and during wet periods (both summer and winter).	High	Ongoing
Undertake research to determine soil types and their distribution throughout Ngarkat.	Medium	Ongoing
Undertake research to increase knowledge of the role of soils within ecological processes.	Medium	Ongoing
Undertake research to determine threats to soils and implement management strategies if required.	Medium	Ongoing
Native Vegetation		
Record information on populations of plants of conservation significance on a database with GIS capability, monitor populations, identify threatening processes, and undertake threat abatement programs if necessary for their conservation.	High	Ongoing
Research impacts of frequent, large area fire regimes on all flora populations.	High	Ongoing

ACTION	PRIORITY	DURATION
Native Fauna		
Record information on populations and distribution of native fauna on a database with GIS capability, monitor populations, identify threats and undertake abatement programs if necessary for their conservation.	High	Ongoing
Encourage and undertake research into the dynamic nature of animal populations.	High	Ongoing
Research the impact of frequent and large fire regimes on the parks fauna population.	High	Ongoing
Introduced Plants		
Monitor and maintain weed control programs with emphasis on control of potentially invasive species.	High	Ongoing
Introduced Animals		
Control rabbits by poisoning, warren destruction and fumigation, and encourage rabbit haemorrhagic disease (RHD) when possible. Monitor results.	High	Ongoing
Establish goat, fox and cat monitoring and control programs.	High	Ongoing
Maintain dingo management program. Monitor the effectiveness of the program.	High	Ongoing
Ensure that all control programs are undertaken with adequate training, procedural understandings and precautions to reduce the likelihood of off target species impacts.	High	Ongoing
Develop and undertake feral beehives eradication programs in conjunction with commercial apiarists.	High	Ongoing
Maintain close liaison and co-operation with research and field officers of the Animal and Plant Control Commission, regional Animal and Plant Control Boards and their officers and the Box Flat Dingo Control Committee.	High	Ongoing
Develop integrated pest control programs in cooperation with the local community.	High	Ongoing
Cultural Heritage		
Consult Aboriginal people who have a traditional association with the land, Native Title Claimants and relevant State and Federal Aboriginal heritage authorities, in decisions regarding the management of Aboriginal cultural heritage.	High	Ongoing
Before proceeding with any development works within the reserve, obtain an assessment and clearance from the appropriate authority, under the provisions of the <i>Aboriginal Heritage Act 1988</i> .	High	Ongoing
Identify, record, protect, restore and monitor known or relocated sites and items of archaeological, anthropological, cultural and historical significance located in the park, in cooperation with the Department for Aboriginal Affairs and Reconciliation, the Heritage Branch of DEH and other relevant authorities and organisations. Aboriginal and historic cultural heritage sites require conservation plans to facilitate appropriate management.	High	Ongoing
Research and inventory, historic sites and stories that relate to the history of the park and where appropriate, make this information available to visitors through interpretive material.	High	Ongoing

ACTION	PRIORITY	DURATION
Encourage and support archaeological, anthropological and historic studies within the park. All sites located during these surveys should be recorded to the standards set by the Heritage Branch of DEH and/or DAARE and submitted for inclusion on the DAARE Central Archive and/or State Heritage Register.	Medium	Ongoing
Build and maintain liaison with local communities to further the collection of historic information and to gain an understanding of local attitudes and concerns.	Medium	Ongoing
Encourage local volunteer assistance with site recording, conservation and research.	Medium	Ongoing
Seek technical assistance to assess heritage conservation values and conservation requirements.	Low	Short
Conserve the following sites within resource constraints: <ul style="list-style-type: none"> - Box Flat ruins, dam, and open landscape - Bucks Camp stone ruins, well and environs - Scorpion Soak, the soakage well and environs - Nanam Well - Comet Bore - Pertendi Hut 	Medium	Short
Increase the safety of visitors and reduce public risk.	High	Ongoing
Explore a commercial approach (eco-tourism, sponsorship or retail booklets etc) to improving the resource base for conservation and interpretation of historic sites in the context of other park values.	Low	Short
Liaise with local councils to link historical interpretation with applicable sites off park.	Low	Short
Fire Management		
Develop a fire management plan for the reserve	High	Short term
Formally consult with CFS, the relevant District Bushfire Prevention Committee/s and other key stakeholders, conservation and park interest groups, neighbours and the wider community during the preparation of the fire management plan.	High	Short term
Review and update fire management planning to ensure the planning is current, accurate and adequately addresses all issues.	Medium	Ongoing
Maintain a strategic network of fire access and fuel reduced areas	High	Ongoing
Visitor Use		
Establish interpretive information and direction signs and markers as required to assist with navigation and safety.	High	Medium
Identify and promote eco-tourism opportunities.	Medium	Ongoing
Assess applications for eco-tourism ventures and approve if appropriate and compatible with other park objectives.	Medium	Ongoing
Liaise with local council to erect appropriate signs indicating entry points to Ngarkat on all designated entry routes.	Medium	Short
Erect informative signs at appropriate locations to interpret the natural history, Aboriginal cultural history (with appropriate liaison and approval) and post-colonisation history of the area to park visitors.	Medium	Medium
Maintain liaison with schools, Aboriginal groups, and other relevant local community groups and authorities to ensure local understanding of management actions and park values by utilising a range of extension techniques.	Medium	Ongoing

ACTION	PRIORITY	DURATION
Monitor vehicle activities and develop appropriate management programs to maintain the integrity of the parks' values.	Medium	Ongoing
Camping and Day Visit Areas		
Establish and maintain bush camping areas by means of low profile fencing and signs at the following locations: Bucks Camp, Rabbit Island Soak, Box Flat, Comet Bore, Pertendi Bore, Pine Hut Soak, Coxs Windmill and, on the Border Track; Doggers Hut, The Pines and The Gums.	High	Ongoing
When visitor levels indicate the need, develop appropriately designed toilets and facilities at selected campsites.	High	Ongoing
Formalise the management of day visit sites at Scorpion Springs and Jimmys Well utilising low profile fencing to protect vulnerable features.	High	Ongoing
Undertake rehabilitation of camping and day visit areas where necessary.		
Prohibit the collection of local firewood and provide interpretive material to explain its importance to wildlife.	High	Ongoing
Encourage visitors to supply their own fuel and continue to make alternative fuel available for sale.		
Monitor the impact of campfires and in the event that damage to biodiversity, habitat or visual amenity becomes significant, consider implementing a more restrictive regime.	High	Ongoing
Vehicle Access		
Adopt and implement the public access network of tracks shown in Figure 3.	High	Medium
Undertake repair and stabilisation work where public access tracks have been damaged.	High	Ongoing
Establish one way access along the Border Track from the northern border to the Pertendi Hut Track entrance, and two way access from the Pertendi Hut Track to the southern border. Establish a fee for access to the track.	Medium	Short
Close the Border Track from November 1 to March 31 and during other periods of high fire danger. Also close during weather conditions that render the track impassable and susceptible to damage (eg summer dryness or flooding of swales). Review this strategy periodically.	High	Ongoing
Open the track running from the northern border to the Jimmy's Well track for public access.	Medium	Short
Provide information by way of signage and/or brochures that includes advice on access routes, speed limits, travel times, recommended tyre pressures, driving techniques and other safety issues.	High	Short
Investigate the feasibility of periodically opening suitable non-public access tracks, for use by a limited number of fee-paying visitors. Implement if feasible and if conservation values are not compromised.	Medium	Ongoing
Review all public access tracks periodically for public safety and biodiversity outcomes and develop alternative opportunities where conflicts arise.	High	Ongoing

ACTION	PRIORITY	DURATION
Walking Trails		
Maintain walking trails to Gosse Hill, Hensleys Trig Point, Mount Rescue and self guided walks at Pertendi Hut, Pine Hut Soak and Tyms Lookout.	High	Ongoing
Investigate the feasibility and requirement for long duration unsupported walking trails within the park.	Medium	Long
If appropriate, develop and maintain other walking trails where there is a demonstrated demand.	Medium	long
Mountain Bikes		
Restrict the use of mountain bikes within Ngarkat to designated roads and tracks.	Low	Ongoing
Education and Research		
Encourage research into ecological processes and resource management issues within Ngarkat.	High	Ongoing
Maintain the lease on the botany hut with Adelaide University and consider lease agreements for other research facilities on a short term basis in other appropriate locations within the park.	Medium	Short
Ensure that research information is reported to DEH by making this a condition of all scientific permits.	High	Ongoing
Entry and Camping Fees		
Establish self registration facilities at key locations for collection of fees.	High	Short
Utilise revenue generated from entry and camping fees to improve visitor services and facilities within the parks.	High	Ongoing
Commercial Activities – Apiary Industry		
Maintain liaison with the South Australian Apiarists Association and the National Parks and Wildlife Apiary Industry Consultative Committee and other Consultative Committees.	High	Ongoing
Implement and monitor the current agreed State Government policy and Ngarkat bee keeping management framework. Continue to maintain records of distribution, seasonality of use, activity and compliance.	High	Ongoing
Review the current research program and its initial findings to determine what additional research is required to address a range of environmental and user group issues and concerns.	Medium	Short
Encourage additional research into the impact of commercial apiaries on biodiversity values.	Medium	Ongoing
Utilise bee site lease fees to assist with management of reserves where the sites are located and to facilitate research.	High	Ongoing
Tour Operators		
Issue Commercial Licences to tour operators, subject to compliance with the provisions of the <i>National Parks and Wildlife Act 1972</i> and the objectives of this plan.	High	Ongoing
Other Commercial Activities		
Implement the Commercial Licence fee structure, as determined by DEH.	High	Ongoing

ACTION	PRIORITY	DURATION
Utilise revenue generated from Commercial Licence fees to improve visitor services and facilities within the parks.	High	Ongoing
Monitor Ngarkat for signs of illegal Broombush harvesting and investigate incidents.	High	Ongoing
Increase awareness amongst surrounding landowners and the general community with regards to the legal requirements for Broombush harvesting.	High	Ongoing
Assist in the prosecution of those caught illegally harvesting Broombush.	High	Ongoing
Alien Tenures and Other Landuses – Agriculture		
Maintain liaison with the managers of ‘Kirra’ concerning access.	High	Ongoing
Maintain a 20 metre wide fuel reduced zone around ‘Kirra’.	High	Ongoing
Prohibit public access on the ‘Kirra’ entrance road and monitor road condition.	High	Ongoing
Partnerships and Cooperative Management		
Consult with local government councils, relevant management boards, the local community and other relevant bodies and individuals, to explore the benefits of partnership arrangements that will support future management decisions on issues of common interest.	High	Ongoing
Encourage and contribute to the development of partnership arrangements to integrate biodiversity and recreation management in the region, with organisations and individuals that have an interest in contributing to the sustainable management of the park.	High	Ongoing
Involve Aboriginal people with a traditional association with the land in future management of indigenous cultural heritage within the park, and in the management of other resources.	High	Ongoing
Promote discussion with Aboriginal people who have a traditional association with the land comprising the park to better understand and appreciate their culture, lifestyle and knowledge of the reserve.	High	Ongoing
Community and Volunteer Involvement		
Maintain liaison with community groups that have an interest in Ngarkat and regional based conservation programs.	High	Ongoing
Plan, develop and supervise projects involving volunteer community organisations.	High	Long
Liaise with neighbours to encourage their involvement in coordinated, regional biodiversity conservation programs.	High	Ongoing
Additional Land		
Close unnecessary road reserves within the park under the <i>Roads (Opening and Closing) Act 1991</i> and proclaim the land as part of Ngarkat Conservation Park.	Medium	Short
Assess any neighbouring property if offered for sale and recommend that it be added to the park if it improves the parks’ natural values or strategic management.	Low	Ongoing
Investigate any unallotted Crown Land that may be on or in near vicinity to Ngarkat for potential addition.	Medium	Short

6 REFERENCES AND BIBLIOGRAPHY

- Aitken, PF (1977) 'The little pygmy possum (*Cercartetus lepidus*) found living on the Australian mainland', *S. Aust. Nat.* 51(4): 63-66.
- Alcock, CR (1982) 'Introduced plants', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Attwood, R (1977) 'Birds recorded at Mt Rescue Conservation Park', *S. Aust. Orn.* 27 173-175.
- Australian Heritage Commission (1982) *The National Estate in 1981*, AGPS, Canberra.
- Australian Heritage Commission (1986) *National Wilderness Inventory*, Environment Australia, Canberra.
- Barker, S (1982) 'Plant ecology of the Ninety Mile Desert' in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Bureau of Meteorology (1999a) Climate averages, Keith [Online, accessed 28 March 1999]. URL: http://www.bom.gov.au/climate/averages/tables/cw_025507.shtml
- Bureau of Meteorology (1999b) Climate averages, Lameroo [Online, accessed 28 March 1999]. URL: http://www.bom.gov.au/climate/averages/tables/cw_025509.shtml
- Campbell, AJ and Tanton, MT (1981) 'Effects of fire on the invertebrate fauna of soil and litter of a eucalypt forest', in *Fire and the Australian Biota*, eds AM Gill, RH Groves and IR Noble, Australian Academy of Science, Canberra.
- Catling, PC and Newsome, AE (1981) 'Responses of the Australian vertebrate fauna to fire', in *Fire and the Australian Biota*, eds AM Gill, RH Groves and IR Noble, Australian Academy of Science, Canberra.
- Cheal, PDC (1982) 'Ecological effects of fire: north-west Victoria', in *Fire Ecology in Semi-arid Lands*, Proceedings of a workshop held in Mildura, Victoria, May 1981, eds A Heislars, P Lynch and B Walters, CSIRO Division of Land Resources Management, Canberra.
- Cheal, PD, Day, JC, and Meredith, CW (1979) *Fire in the National Parks of North-west Victoria*, National Parks Service, Victoria.
- Close, DH (1982) 'Birds of the Ninety Mile Desert', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Commission on National Parks and Protected Areas (1978) *Categories, Objectives and Criteria for Protected Areas*, International Union for the Conservation of Nature and Natural Resources, Morges, Switzerland.
- Commonwealth Department of Tourism (1994) *National ecotourism strategy*, AGPS, Canberra.
- Davey, AG (1980) 'Management of wilderness areas', in: *The Value of National Parks to the Community*, Proceedings of the 2nd National Wilderness Conference at Sydney University, 1979, eds J Messer and G Mosley, Australian Conservation Foundation, Melbourne.
- Day, J (1982) 'Fire history and fire records', in *Fire Ecology in Semi-arid Lands*, Proceedings of a workshop held in Mildura, Victoria, May 1981, eds A Heislars, P Lynch and B Walters, CSIRO Division of Land Resources Management, Canberra.
- Department for Environment and Heritage (2001) *Biodiversity Plan for the South Australian Murray-Darling Basin*, Adelaide.
- Department of Environment and Natural Resources (1994) *Wilderness Protection Areas and Zones South Australian Code of Management*, Adelaide.

- Edmonds, SJ and Specht, MM (1981) 'Dark Island heathland, South Australia: faunal rhythms', in *Heathlands and Related Shrublands: Analytical Studies, Ecosystems of the World* series, volume 9B, ed. RL Specht, Elsevier, Amsterdam.
- Environment Australia (2002) *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and Development of Version 5.1. Summary Report.*
<http://www.ea.gov.au/parks/nrs/ibra/index.html>
- Fenner, F (ed) (1975) *A National System of Ecological Reserves in Australia*, Australian Academy of Science, Canberra.
- Firman, JB (1966) 'Stratigraphy of the Chowilla area in the Murray Basin', *Quart. Geol. Notes*, Geol. Surv. S.Aust. 20: 3-7.
- Foulkes, J. N. and Gillen, J. S. (Eds.) (2000). *A Biological Survey of the Murray Mallee, South Australia*. (Biological Survey and Research, Department for Environment and Heritage and Geographic Analysis and Research Unit, Department for Transport, Urban Planning and the Arts).
- Fox, BJ and McKay, GM (1981) 'Small mammal responses to pyric successional changes in eucalypt forest', *Aust.J.Ecol.* 6: 29-41.
- Gill, AM (1976) 'Fire and the opening of *Banksia ornata* (F Muell.) follicles', *Aust.J.Bot.* 24: 329-335.
- Gill, AM (1982) 'Priorities for research and monitoring in mallee and heathlands of conservation reserves in north-western Victoria', in *Fire Ecology in Semi-arid Lands*, Proceedings of a workshop held in Mildura, Victoria, May 1981, eds A Heislers, P Lynch and B Walters, CSIRO Division of Land Resources Management, Canberra.
- Gill, AM, and Groves, RH (1981) 'Fire regimes in heathlands and their plant-ecological effects', in *Heathlands and Related Shrublands: Analytical Studies, Ecosystems of the World* series, volume 9B, ed RL Specht, Elsevier, Amsterdam.
- Gill, AM, Groves, RH, and Noble, IR (eds.) (1981) *Fire and the Australian Biota*, Australian Academy of Science, Canberra.
- Good, R (1981) 'The role of fire in conservation reserves', in *Fire and the Australian Biota*, eds AM Gill, RH Groves and IR Noble, Australian Academy of Science, Canberra.
- Greenslade, P (1982) 'Collembola of the Ninety Mile Desert', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Groves, RH and Specht, RL (1981) 'Seral considerations in heathland', in *Vegetation Classification in Australia*, Proceedings of a workshop held in Canberra, October 1978, eds AN Gillison and DJ Anderson, CSIRO Division of Land Use Research, Canberra.
- Gunn, AS (1980) 'Why should we care about rare species?', *Environmental Ethics*, 2(1): 17-37.
- Harris, CR, Reeves, AE and Symon, DE (eds) (1982) *The Ninety Mile Desert of South Australia*, a report of surveys carried out by the Nature Conservation Society of South Australia in 1973 and 1977, Nature Conservation Society of South Australia, Adelaide.
- Harris, CR (1982) 'A brief history of the Ninety Mile Desert', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Hatch, J.H. (1977) 'The birds of Comet Bore (Ninety Mile Plain)', *S.Aust Orn.*, 27: 163-172.
- Hopkins, A.J.M. and Robinson, C.J. (1981) 'Fire induced structural change in a Western Australian woodland', *Aust.J.Ecol.*, 6: 177-188.

- Hunt, T (1976) 'Birds in the Big Desert region of Victoria and South Australia', *Vict. Orn. Resear. Gp. Notes*, 12(2): 3-13.
- James, CT (1982) 'Mammals of Scorpion Springs Conservation Park', in *The Ninety Mile Desert of South Australia*, eds. CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Kikkawa, J, Ingram, GJ and Dwyer, PD (1979) 'The vertebrate fauna of Australian heathlands - an evolutionary perspective', in *Heathlands and Related Shrublands: Descriptive Studies, Ecosystems of the World* series, volume 9A, ed RL Specht, Elsevier, Amsterdam.
- Laut, P., Heyligers, P.C., Keig, G., Löffler, E., Margules, C., Scott, R.M. and Sullivan, M.E. (1977a) *Environments of South Australia: Handbook*, CSIRO, Canberra.
- Laut, P, Heyligers, PC, Keig, G, Löffler, E, Margules, C, Scott, RM and Sullivan, ME (1977b) *Environments of South Australia - Province 2: Murray Mallee*, CSIRO, Canberra.
- Lesslie R (1983) 'Wilderness in South Australia', Occasional Paper no. 1, Centre for Environmental Studies, University of Adelaide.
- Ludbrook, NH (1961) 'Stratigraphy of the Murray Basin in South Australia', *Bull. Geol. Surv. S.Aust.*, 36.
- Main, AR (1981) 'Fire tolerance of heathland animals', in *Heathlands and Related Shrublands: Analytical Studies, Ecosystems of the World* series, volume 9B, ed RL Specht, Elsevier, Amsterdam.
- Margules, C (1978) 'The status of rare plant alliances, birds and mammals in South Australia', Technical Memo 78/23, CSIRO Division of Land Use Research, Canberra.
- Noble, I.R. (1982) 'Ecological effects of fire - an overview', in *Fire Ecology in Semi-arid Lands*, Proceedings of a workshop held in Mildura, Victoria, May 1981, eds A Heislars, P Lynch and B Walters, CSIRO Division of Land Resources Management, Canberra.
- Noble, JC (1982) 'Use of fire for ecological purposes - vegetation management', in *Fire Ecology in Semi-arid Lands*, Proceedings of a workshop held in Mildura, Victoria, May 1981, eds A Heislars, P Lynch and B Walters, CSIRO Division of Land Resources Management, Canberra.
- Noble, JC and Mulham, WE (1980) 'The natural vegetation of aeolian landscapes in semi-arid south-eastern Australia', in *Aeolian Landscapes in the Semi-arid Zone of South-eastern Australia*, eds Storrier and Stannard.
- Noble, JC, Smith, AW and Leslie, HW (1980) 'Fire in the mallee shrublands of western New South Wales', *Aust. Rangel. J.*, 2(1): 104-114.
- Parsons, RF (1981) 'Eucalyptus scrubs and shrublands', in *Australian Vegetation*, ed. RH Groves, Cambridge University Press, London.
- Paton, DC (1996) 'Impact of commercially managed honeybees *Apis mellifera* on the flora and fauna of Banksia heathlands in Ngarkat Conservation Park (final report for the Wildlife Conservation fund #1326 and #1511).
- Paton, J (1982) 'Birds of Scorpion Springs Conservation Park', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Preiss, KA (1982) 'Insects of Scorpion Springs Conservation Park', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and D.E Symon, Nature Conservation Society of South Australia, Adelaide.
- Robertson, RW, Helman, PM and Davey, AG (eds) (1980) 'Wilderness Management in Australia', Occasional Papers in Recreation Planning, Natural Resources Division, School of Applied Science, Canberra College of Advanced Education, Canberra.

- Robinson, AC (1982) 'Mammals of the Ninety Mile Desert', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Rogers, PA (1980) Pinnaroo, South Australia, Explanatory Notes 1: 250,000 Geological Series Sheet SI/54-14, Geological Survey of South Australia, Department of Mines and Energy, Adelaide.
- Singh, G (1982) 'Environmental upheaval: vegetation of Australasia during the Quaternary', in *A History of Australasian Vegetation*, ed. JM Smith, McGraw Hill, New York.
- Specht, RL, Rayson, P and Jackman, ME (1958) 'Dark Island Heath (Ninety Mile Plain, South Australia). VI. Pyric succession: changes in composition, coverage, dry weight and mineral nutrient status', *Aust.J.Bot.*, 6: 59-88.
- Specht, RL (1966) 'The growth and distribution of mallee-broombush (*Eucalyptus incrassata-Melaleuca uncinata* association) and heath vegetation near Dark Island Soak, Ninety Mile Plain, South Australia', *Aust.J.Bot.*, 14: 361-371.
- Specht, RL (1970) 'Vegetation', in *The Australian Environment*, ed GW Leeper, CSIRO, Melbourne.
- Specht, RL, Roe, EM and Boughton, VH (1974) 'Conservation of major plant communities in Australia and Papua New Guinea', *Aust J. Bot. Supplement*, 7.
- Specht, RL (ed) (1979a) *Heathlands and Related Shrublands: Descriptive Studies, Ecosystems of the World* series, volume 9A, Elsevier, Amsterdam.
- Specht, RL (1979b) 'The sclerophyllous (heath) vegetation of Australia: the eastern and central States', in *Heathlands and Related Shrublands: Descriptive Studies, Ecosystems of the World* series, volume 9A, Elsevier, Amsterdam.
- Specht, RL (1981a) *Heathlands and Related Shrublands: Analytical Studies, Ecosystems of the World* series, volume 9B, Elsevier, Amsterdam.
- Specht, RL (1981b) 'Responses to fires of heathlands and related shrublands', in *Fire and the Australian Biota*, eds AM Gill, RH Groves, and IR Noble, Australian Academy of Science, Canberra.
- Specht, RL, Rogers, R.W., and Hopkins, AJM (1981) 'Seasonal growth and flowering rhythms: Australian heathlands', in *Heathlands and Related Shrublands: Analytical Studies, Ecosystems of the World* series, volume 9B, Elsevier, Amsterdam.
- Symon, DE (1982a) 'Notes on the flora of Scorpion Springs Conservation Park', in *The Ninety Mile Desert of South Australia*, eds. C.R. Harris, A.E. Reeves and D.E Symon, Nature Conservation Society of South Australia, Adelaide.
- Symon, DE (1982b) 'Notes on the species list from the 1977 survey', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Walker, D and Singh, G. (1981) 'Vegetation history', in *Australian Vegetation*, ed RH Groves, Cambridge University Press, London.
- Whelan, RJ and Main, AR (1979) 'Insect grazing and post-fire plant succession in south-west Australian woodland', *Aust.J.Ecol.*, 4: 387-398.
- White, J (1982) 'Reptiles of the Ninety Mile Desert', in *The Ninety Mile Desert of South Australia*, eds CR Harris, AE Reeves and DE Symon, Nature Conservation Society of South Australia, Adelaide.
- Whitelock, D (1985) *Conquest to conservation*, Wakefield Press, Adelaide.

APPENDIX A: LAND TENURE HISTORY

Ngarkat Conservation Park

Hundred of Day
Sections: 29 and 30.

Hundred of Fisk
Sections: 1-5, 8-15 and 18.

Hundred of Makin
Sections: 23, 26 and 27.

Hundred of McCallum
Sections: 24 and 25.

OH Pinnaroo
Sections: 22, 29, 30, 31, 33, 36, 37, 40-44, 48, 49, 51, 64, 68, 69 and 72.

Total Area 204589 ha.

Ngarkat Conservation Park was constituted under the *National Parks and Wildlife Act 1972*, Gazetted 13/09/1979.

HISTORICAL TENURE

Hundred of Day, proclaimed 24/10/1929.

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2396	31/12/1874	05/07/1894
Blk 603	Cr. Land	PE 1438, ICL 640/64	17/01/1920	12/10/1933
Secs 29 & 30		Cr Land	12/10/1933	

Hundred of Fisk, proclaimed 09/06/1969.

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2686	31/12/1876	11/01/1894
		PE 2368	30/06/1874	30/06/1895
		PE 848	09/04/1901	25/07/1901
		PE 2619	30/06/1876	27/02/1890
		PE 357, CL 323/59	01/04/1895	23/02/1899
Pt. Blk 610	Cr. Land	PE 1552, CL 679/13	09/02/1924	03/12/1938
Pt Sec 37	Pt Blk. 610	OM 10009, CL N/A	07/11/1940	26/09/1946
Sec 10 & Pt Secs 8,9,11,15 & 18	Pt Sec. 37	Cr Land	26/09/1946	

Pt. Blk 610	Pt. Blk O	PE 1552, CL 679/13	09/02/1924	03/12/1938
Sec. 38	Pt. Blk 610	OM 10009, CL N/A	07/11/1940	26/09/1946
Secs 12,13 & Pt Secs 11, 14 & 18	Sec38	Cr Land	26/09/1946	

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Pt. Blk 610	Cr. Land	PE 1552, CL 679/13	09/02/1924	03/12/1938
Pt. Sec. 39	Pt. Blk 610	OM 10051, CL 939/44	04/12/1938	26/07/1946
Secs 3, 4 & Pt Secs 2 & 5	Pt. Sec 39	OM 13134, CL 1266/9	12/12/1961	15/08/1966
		Cr. Land	15/08/1966	

Pt. Blk. 610	Cr. Land	PE 1552, CL 679/13	09/02/1924	03/12/1938
Sec. 40	Pt. Blk. 610	OM 10047, CL 940/35	04/12/1938	26/07/1946

Ngarkat Complex of Conservation Parks Management Plan

Secs 1 & Pt Secs 2, 8 & 9	Sec. 40	Cr. Land	26/07/1946	
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Pt. Blk 607	Cr. Land	PE 1513, CL 673/26	01/10/1923	06/07/1935
Pt. Sec. 48	Pt Blk 607	OM 11016, CL 1207/37	23/09/1958	14/04/1966
Sec 103	Pt Sec 48	OM 11016 ^c , CL 1207/39	23/09/1958	04/07/1966
		OM 13575, CL 1323/31	05/05/1966	30/04/1971
Sec 15	Sec 103	OM 13883, CL 1391/21	01/05/1971	22/05/1981

Pt. Blk 607	Cr. Land	PE 1513, CL 673/26	01/10/1923	06/07/1935
Pt Sec 51	Pt Blk 607	Cr Land	06/07/1935	
Pt Secs 14, 15 & 18	Pt Sec 51	Cr Land		

Hundred of Makin, proclaimed 19/10/1939

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2623	30/06/1876	31/03/1895
Cr Land		PE 357, CL 323/59	01/04/1895	23/02/1899
Pt Blks 611 & 612	Cr Land	PE 1464, CL 649/51	16/10/1920	23/10/1941
Secs 23, 26 & 27	Pt Blks 611 & 612	Cr Land	23/10/1941	

Hundred of McCallum, proclaimed 19/10/1939.

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2623	30/06/1876	31/03/1895
Cr Land		PE 357, CL 323/59	01/04/1895	23/02/1899
Pt Blks 612 & 613	Cr Land	PE 1464, CL 649/51	16/10/1920	23/10/1941
Secs 24 & 25	Pt Blks 612 & 613	Cr Land	23/10/1941	

Out of Hundred - Pinnaroo.

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr. Land		PE 2686	31/12/1876	11/01/1894
Blk 606	Cr. Land	PE 1483, CL 668/20	02/02/1923	27/11/1931
Sec 22	PE 1483	OM 9078, CL 834/38	01/07/1935	17/07/1938
		Cr Land	18/07/1938	

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr.Land		PE 2212	31/12/1872	11/01/1873
Blk. 605	Cr. Land	PE 1446	10/05/1920	N/A
		PE 1446	PE 1478, CL 658/64	16/03/1922
Secs 29 & 31	PE 1478	OM 10008, CL 936/34	07/11/1940	05/07/1943
		Cr Land	06/07/1943	

Cr Land		PE 2212	31/12/1872	11/01/1873	
Cr Land		PE 2430	31/12/1874	14/09/1893	
Pt. Blk. 605	Cr Land	PE 1446	10/05/1920	N/A	
		PE 1446	PE 1478, CL 658/64	16/03/1922	08/04/1933
		PE 1478	OM 10008, CL 936/34	07/11/1940	05/07/1943

Ngarkat Complex of Conservation Parks Management Plan

Sec 30	Pt. Blk 605	OM 1 1001, N/A	01/10/1951	16/06/1952
		Cr Land	17/06/1952	

Cr Land		PE 2686	31/12/1876	11/01/1894
Pt. Blk 609	Cr Land	PE 1549, CL 679/11	24/12/1923	15/03/1937
Sec 33		Cr Land	16/03/1937	

Cr Land Pts Blks 609 & 610		PE 2686	31/12/1876	11/01/1894
Sec 36 & Pt. Sec 37	Pts Blks 609 & 610	PE 1549, CL 679/11	24/12/1923	15/03/1937
		OM 10022, CL 937/6	29/11/1940	28/07/1942
		OM 10846, CL 1004/38	10/05/1944	09/05/1965
Sec 36		Cr Land	10/05/1965	

Pt. Blk. 610	Cr Land	PE 1552, CL 679/13	09/02/1924	03/12/1938
Pt. Sec 37	Pt. Blk 610	OM 10009, CL N/A	07/11/1940	26/09/1946
Cr Land	Pt. Sec 37		27/09/1946	
Cr Land		PE 1893	31/12/1870	31/12/1891
Pt Blk 607	Cr Land	PE 1513, CL 673/26	05/07/1923	02/08/1935
Pt. Sec 48	Pt Blk 607	OM 10016, CL 1030/21	01/05/1945	21/09/1956
		OM 100165 CL 1177/40	31/08/1956	30/09/1958
		OM 100165 CL 1207/37	23/09/1958	14/07/1966
Sec 37	Pt. Sec 48	Cr Land	15/07/1966	

Pt. Blk. 610	Cr Land	PE 1552, CL 679/13	09/02/1924	03/12/1938
Pt. Sec. 40	Pt. Blk. 610	OM 10047, CL 940/35	04/12/1938	26/07/1946
Sec 40	Pt Sec 40	Cr Land	27/07/1946	

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2686	01/04/1895	23/02/1899
		PE 357, CL 323/59	01/04/1895	18/02/1899
Pt. Blk 609	Cr Land	PE 1549, CL 679/11	24/12/1923	15/03/1937
Pt. Blk 610	Cr Land	PE 1552, CL 679/13	09/02/1924	03/12/1938
Sec 41 & Pt. Sec 40	Pts Blks 609 & 610	OM 10022, CL 937/6	29/11/1940	28/07/1942
		OM 10846, CL 1004/3	10/05/1944	09/05/1965
Sec 41		Cr Land	10/05/1965	

Cr Land		PE 2623	01/04/1895	23/02/1899
		PE 357, CL 323/59	01/04/1895	23/02/1899
Pt. Blk 609	Cr Land	PE 1549, CL 679/11	24/12/1923	15/03/1937
Sec 42		Cr Land	16/04/1937	

Cr Land		PE 1899	30/06/1870	30/06/1891
		PE 2576	03/03/1876	23/04/1880
		PE 5032	29/03/1880	28/01/1886
Pt. Blk 608	Cr Land	PE 1536, CL 673/41	01/10/1923	30/09/1944
Sec 43		Cr Land	01/10/1944	

Cr Land		PE 2576	03/03/1876	23/04/1880
		PE 5032	29/03/1880	28/01/1886
Pt. Blk 608	Cr Land	PE 1536, CL 673/41	01/10/1923	30/09/1944
Secs 44 & 72		Cr Land	01/10/1944	

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 1893	31/12/1870	31/12/1891
Pt. Sec 48	Pt. Blk 607	PE 1513, CL 673/26	05/07/1923	02/08/1935
Pt. Sec 48	OM 10016, CL 1030/21	01/05/1945	21/09/1956	
		OM 100165, CL 1177/40	31/08/1956	30/09/1958
		OM 10016, CL 1207/37	23/09/1958	14/07/1966
Sec 48		OM 13883, CL 1391/21	01/05/1971	22/05/1981
Secs 48 & 69		Cr Land	15/07/1966	

Cr Land		PE 2686	31/12/1876	11/01/1894
		PE 1893	31/12/1870	31/12/1891
Pt. Sec 49	Pt. Blk 607	PE 1513, CL 673/26	05/07/1923	02/08/1935
Cr Land	Pt. Sec 49		03/08/1935	05/09/1945
Sec 49	Cr Land	OM 11069, N/A	06/09/1945	05/06/1946
Sec 49		Cr Land	06/06/1946	

Cr Land		PE 2686	31/12/1876	11/01/1894
Pt. Blk 607	Cr Land	PE 1513, CL 673/26	05/07/1923	02/08/1935
Sec 51		Cr Land	03/08/1935	

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2686	31/12/1876	11/01/1894
Pt. Blk 607	Cr Land	PE 1513, CL 673/26	05/07/1923	02/08/1935
Pt. Sec 48	Pt. Blk 607	OM 10016, CL 1030/21	01/05/1945	21/09/1956
		OM 10016, CL 1177/40	31/08/1956	30/09/1958
		OM 11016, CL 1207/37	23/09/1958	14/07/1966
Sec 102	Pt. Sec 48	OM 11016 ^B , CL 1207/38	23/09/1958	14/07/1966
		OM 13588, CL 1323/18	01/05/1966	20/08/1971
Sec 64		OM 13575, CL 1323/31	01/05/1966	20/08/1971
Secs 64 & 102		OM 13883, CL 1391/21	01/05/1971	22/05/1981

Cr Land		PE 1893	31/12/1870	31/12/1891
Pt. Sec 49	Pt. Blk 607	PE 1513, CL 673/26	05/07/1923	02/08/1935
Sec 68		Cr Land	03/08/1935	

S106 was created from part Sections 30 and 31 after all tenure had expired.

TENURE HISTORY REPORT

Mount Rescue Conservation Park

Hundred of Archibald
Sections: 7-10.

Hundred of Makin
Sections: 3, 4.

Total area: 28327 ha.

Sections 9 and 10, hundred of Archibald, and sections 3 and 4, hundred of Makin,' were dedicated under the *Crown Lands Act 1929-1944*, for flora and fauna purposes. Gazetted 20/08/1953, page 541.

Sections 9 and 10, hundred of Archibald, and sections 3 and 4, hundred of Makin, were resumed and dedicated as a Wild Life Reserve under the *Crown Lands Act 1929-1960*. Gazetted 8/03/1962, pages 486 and 487.

Sections 9 and 10, hundred of Archibald, and sections 3 and 4, hundred of Makin, were declared Wild Life Reserve under the *National Park and Wild Life Reserves Act 1891-1960*. Gazetted 19/07/1962, page 109.

Sections 7 and 8, hundred of Archibald, were dedicated Wild-Life Reserve under the *Crown Lands Act 1929-1960*. Gazetted 17/06/1965, page 1533.

Sections 7 and 8, hundred of Archibald, were declared Hundred of Archibald-Reserve under the *National Park and Wild Life Reserves Act 1891-1960*. Gazetted 29/07/1965, page 229.

Sections 7, 8, 9 and 10, hundred of Archibald and Sections 3 and 4 hundred of Makin, were declared Mount Rescue National Park under the *National Parks Act 1966*. Gazetted 9/11/1967, page 2043.

Mount Rescue Conservation Park was constituted under the *National Parks and Wildlife Act No 56 of 1972* - page 41.

HISTORICAL TENURE

Hundred of Archibald, proclaimed 22/03/1906.

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2331 N/A	01/01/1874	31/12/1894
Sec 37	Cr Land	OM 8258, CL 693/118	01/04/1926	18/05/1936

Cr Land		PE 1899	30/06/1870	30/06/1891
		PE 2331 N/A	01/01/1874	31/12/1894
		PE 2623	30/06/1876	31/03/1895
Cr Land	Cr Land	PE 2331A N/A	21/07/1881	31/12/1894
Sec 8	Cr Land	PE 357, CL 323/59	01/04/1895	23/02/1899

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2623	30/06/1876	31/03/1895
Sec 9	Cr Land	PE 357, CL 323/59	01/04/1895	23/02/1899

Cr Land		PE 2253 N/A	31/12/1872	31/03/1887
Cr Land		PE 2623	30/06/1876	31/03/1895
Cr Land	Cr Land	PE 357, CL 323/59	01/04/1895	23/02/1899
Pt. J	Cr Land	OM 6753, CL 468/48	01/01/1903	31/12/1923
Sec 10	Pt. J & Cr Land	OM 8259, CL 694/33	01/04/1926	06/08/1936

Hundred of Makin, proclaimed 19/10/1939.

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2253 N/A	31/12/1872	31/03/1887
Cr Land		PE 2623	30/06/1876	31/03/1895
Cr Land	Cr Land	PE 357, ICL 323/59	01/04/1895	23/02/1899
Pt. Blk 611	Cr Land	PE 1464, CL 649/51	16/10/1920	23/10/1941
Secs 3 & 4		Cr Land	24/10/1941	

TENURE HISTORY REPORT

Scorpion Spring Conservation Park

Hundred of Fisk
Section 16.

Area: 1049.3 ha.

Hundred of Quirke
Sections: 9 & 10.

Area: 18106.9 ha.

OOH Pinnaroo
Section 65.

Area: 11195.7 ha.

Total area: 30351.9 ha.

Sec 16 Hd of Fisk, Sections 9 and 10 Hd of Quirke and Section 65 South Out of Hundreds was declared a National Park and named Scorpion Well National Park under the *National Parks Act 1966*, Gazetted 09/07/1970, page 80.

Scorpion Springs Conservation Park was constituted under the *National Parks and Wildlife Act No 56 of 1972* - page 42.

HISTORICAL TENURE

Hundred of Fisk, proclaimed 09/06/1969.

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2619	30/06/1876	27/02/1890
Pt. Blk 607	Crown Land	PE 1513, CL 673/26	01/10/1923	06/07/1935
Sec 16		Cr Land	07/07/1935	

Hundred of Quirke, proclaimed 09/06/1969.

Cr Land		PE 1893	01/01/1871	31/12/1891
		PE 2178	01/07/1872	03/06/1893
		PE 2619	30/06/1876	27/02/1890
Blk 604	Cr Land	PE 1434, CL 640/48	10/11/1912	09/11/1940
		PE 1434	01/01/1946	23/06/1959
Blk 1096	Pt. Blk 604	PE 2098, CL 1219/34	14/05/1959	25/10/1966
Blk 1097	Pt. Blk 604	PE 2098 ^A , CL 1219/35	14/05/1959	25/10/1966
Blk 1098	Pt. Blk 604	PE 2098 ^B , CL 1219/36	14/05/1959	25/10/1966
Secs 9 & 10		Cr Land	25/10/1966	

Out of Hundreds - Pinnaroo

Cr Land		PE 2619	30/06/1876	27/02/1890
Pt. Blk 607	Cr Land	PE 1513, CL 673/26	01/10/1923	06/07/1935
Sec 65	Cr Land	OM 11061, N/A	06/09/1945	05/06/1946

TENURE HISTORY REPORT

Mount Shaugh Conservation Park

Hundred of Shaugh
Section 5.

Area: 3473 ha.

Sec 5 hundred of Shaugh was declared a National Park and named Mount Shaugh National Park under the *National Parks Act 1966*, Gazetted 25/11/1971, page 2164.

Mount Shaugh Conservation Park was constituted under the *National Parks and Wildlife Act No 56 of 1972* - page 43.

HISTORICAL TENURE

Hundred of Shaugh, proclaimed 19/10/1939.

Sec/Lot	Previously	Title/Crown Lease	Date Issued	Terminated
Cr Land		PE 2368	30/06/1874	30/06/1895
Pt. Blk 169		PE 848, N/A	09/04/1901	25/07/1901
Pt. Blk 615	Cr Land	PE 1550, CL 679/12	24/12/1923	08/02/1934
Sec 26	Pt Blk 615	OM 9031, CL 831/5	01/01/1935	21/06/1950
Pt Sec 5	Sec 26	OM 9031 ^A , CL 1080/31	29/05/1950	23/03/1955
		OM 12340, CL 1166/35	22/02/1955	30/03/1965
	OM 12340	OM 13500, CL 1309/48	22/02/1965	16/06/1970
Sec 5		Cr Land	17/06/1970	

APPENDIX B: SPECIES OF CONSERVATION SIGNIFICANCE

Plants of conservation significance

Species	Common Name	Conservation Status			
		EPBC Act	NPW Act	Regional	
				SE	MU
<i>Acacia acinacea</i>	Wreath Wattle			U	U
<i>Acacia argyrophylla</i>	Silver Mulga				U
<i>Acacia brachybotrya</i>	Grey Mulga			U	
<i>Acacia cupularis</i>	Cup Wattle				R
<i>Acacia hakeoides</i>	Hakea Wattle			U	
<i>Acacia rupicola</i>	Rock Wattle			R	R
<i>Acacia sclerophylla</i>	Hard-leaf Wattle			R	
<i>Acrotriche affinis</i>	Ridged Ground-berry				K
<i>Actinobole uliginosum</i>	Flannel Cudweed			U	
<i>Allocasuarina luehmannii</i>	Bull Oak		U	U	V
<i>Allocasuarina pusilla</i>	Dwarf Oak-bush				Q
<i>Amphibromus nervosus</i>	Veined Swamp Wallaby-grass		U	U	
<i>Amphipogon caricinus</i> var <i>caricinus</i>	Long Grey-beard Grass			R	
<i>Amyema pendulum</i> ssp. <i>pendulum</i>	Drooping Mistletoe				K
<i>Anogramma leptophylla</i>	Annual Fern		R	V	
<i>Aphanes australiana</i>	Australian Piert				R
<i>Argentipallium blandowskianum</i>	Woolly Everlasting				R
<i>Banksia marginata</i>	Silver Banksia				U
<i>Baumea juncea</i>	Bare Twig-rush				R
<i>Billardiera versicolor</i>	Yellow-flower Apple-berry				R
<i>Brachycome lineariloba</i>	Hard-head Daisy			U	
<i>Brachyloma daphnoides</i>	Daphne Heath				R
<i>Bulbine semibarbata</i>	Small Leek-lily			U	
<i>Caladenia filamentosa</i> var <i>tentaculata</i>	Wispy Spider-orchid			U	
<i>Caladenia stricta</i>	Upright Caladenia		U	V	U
<i>Calandrinia corrigioloides</i>	Strap Purslane			K	U
<i>Calandrinia eremaea</i>	Dryland Purslane			R	
<i>Calandrinia granulifera</i>	Pigmy Purslane			Q	
<i>Calochilus robertsonii</i>	Purplish Beard-orchid			R	
<i>Calytrix alpestris</i>	Snow Heath-myrtle				R
<i>Cassytha glabella</i> forma <i>dispar</i>	Slender Dodder-laurel				R
<i>Chenopodium desertorum</i> ssp <i>microphyllum</i>	Small-leaf Goosefoot			U	
<i>Comesperma calymega</i>	Blue-spike Milkwort				R
<i>Comesperma polygaloides</i>	Mauve Milkwort		U	U	E
<i>Comesperma scoparium</i>	Broom Milkwort			K	R
<i>Conospermum patens</i>	Slender Smoke-bush				U
<i>Danthonia carphoides</i> var <i>carphoides</i>	Short Wallaby-grass		R	K	
<i>Daviesia arenaria</i>	Sand Bitter-pea		U	E	R
<i>Dodonaea hexandra</i>	Horned Hop-bush			U	
<i>Dodonaea viscosa</i> ssp <i>angustissima</i>	Narrow-leaf Hop-bush			K	
<i>Drosera glanduligera</i>	Scarlet Sundew				U

Ngarkat Complex of Conservation Parks Management Plan

Species	Common Name	Conservation Status			
		EPBC Act	NPW Act	Regional	
				SE	MU
<i>Epilobium hirtigerum</i>	Hairy Willow-herb			R	
<i>Eriostemon pungens</i>	Prickly Wax-flower				U
<i>Eucalyptus aranacea</i>	Brown Stringybark				R
<i>Eucalyptus globata</i>	Port Lincoln Mallee			R	
<i>Eucalyptus leucoxylon ssp stephaniae</i>	Scrubby Blue Gum				R
<i>Eucalyptus rugosa</i>	Coastal White Mallee			U	
<i>Eucalyptus viminalis ssp cygnetensis</i>	Rough-bark Manna Gum				V
<i>Gahnia trifida</i>	Cutting Grass				V
<i>Goodenia blackiana</i>	Native Primrose				R
<i>Goodenia ovata</i>	Hop Goodenia			Q	
<i>Goodenia pinnatifida</i>	Cut-leaf Goodenia		Q	V	U
<i>Grevillea lavandulacea var sericea</i>	Spider-flower		U	U	R
<i>Hakea repullulans</i>	Furze Hakea		U	U	
<i>Hakea rugosa</i>	Dwarf Hakea				V
<i>Haloragis aspera</i>	Rough Raspwort			U	U
<i>Hypolaena fastigiata</i>	Tassel Rope-rush				R
<i>Ixodia achillaeoides ssp alata</i>	Hills Daisy			U	
<i>Kennedia prostrata</i>	Scarlet Runner				U
<i>Laxmannia orientalis</i>	Dwarf Wire-lily				R
<i>Lepidosperma laterale s.str.</i>	Tall Sword-sedge				R
<i>Leptocarpus brownii</i>	Coarse Twine-rush				R
<i>Leptomeria aphylla</i>	Leafless Currant-bush		U	U	
<i>Leucopogon clelandii</i>	Cleland's Beard-heath		R	R	E
<i>Leucopogon costatus</i>	Twiggy Beard-heath				E
<i>Leucopogon rufus</i>	Ruddy Beard-heath		U	U	U
<i>Leucopogon woodsii</i>	Nodding Beard-heath		U	U	V
<i>Logania nuda</i>	Leafless Logania			K	
<i>Lomandra effusa</i>	Scented Mat-rush			Q	
<i>Luzula meridionalis</i>	Common Wood-rush				R
<i>Maireana enchylaenoides</i>	Wingless Fissure-plant			U	
<i>Marsilea drummondii</i>	Nardoo			V	
<i>Melaleuca wilsonii</i>	Wilson's Honey-myrtle		R	R	
<i>Micromyrtus ciliata</i>	Fringed Heath-myrtle		R	R	R
<i>Millotia tenuifolia var</i>	Soft Millotia				R
<i>Myriocephalus rhizocephalus var rhizocephalus</i>	Woolly-heads		U	U	R
<i>Olearia lanuginosa</i>	Woolly Daisy-bush		U	U	R
<i>Ophioglossum lusitanicum</i>	Austral Adder's-tongue			U	
<i>Orthoceras strictum</i>	Horned Orchid		U	R	V
<i>Ozothamnus retusus</i>	Notched Bush-everlasting		Q		
<i>Persicaria prostrata</i>	Creeping Knotweed		U	U	
<i>Phebalium brachyphyllum</i>	Limestone Phebalium		R	R	
<i>Phebalium lowanense</i>	Lowan Phebalium	V	V	T	

Ngarkat Complex of Conservation Parks Management Plan

Species	Common Name	Conservation Status			
		EPBC Act	NPW Act	Regional	
				SE	MU
<i>Philothea angustifolius</i> ssp <i>angustifolius</i>	Narrow-leaf Wax-flower		R	R	
<i>Phyllota remota</i>	Slender Phyllota		U	U	
<i>Pimelea phyllicoides</i>	Heath Riceflower				R
<i>Pittosporum phylliraeoides</i> var <i>microcarpa</i>	Native Apricot			E	
<i>Podolepis rugata</i> var <i>rugata</i>	Pleated Copper-wire Daisy			R	
<i>Prostanthera aspalathoides</i>	Scarlet Mintbush			R	
<i>Prostanthera serpyllifolia</i> ssp <i>microphylla</i>	Small-leaf Mintbush			V	R
<i>Ptilotus spathulatus</i> forma <i>spathulatus</i>	Pussy-tails			K	
<i>Pultenaea acerosa</i>	Bristly Bush-pea			U	
<i>Pultenaea densifolia</i>	Dense Bush-pea		U	U	
<i>Pultenaea prostrata</i>	Silky Bush-pea				R
<i>Pultenaea vestita</i>	Feather Bush-pea		U	R	
<i>Santalum acuminatum</i>	Quandong			R	
<i>Santalum murrayanum</i>	Bitter Quandong		U	U	U
<i>Schoenus breviculmis</i>	Matted Bog-rush				R
<i>Schoenus racemosus</i>	Sandhill Bog-rush			R	R
<i>Scleranthus minusculus</i>	Cushion Knawel		U	R	U
<i>Senecio biserratus</i>	Jagged Groundsel		U	U	
<i>Senecio picridioides</i>	Purple-leaf Groundsel				R
<i>Sida corrugata</i> var <i>angustifolia</i>	Grassland Sida		Q	V	
<i>Stipa acrociliata</i>	Graceful Spear-grass			R	
<i>Stipa elegantissima</i>	Feather Spear-grass			R	
<i>Stipa eremophila</i>	Rusty Spear-grass			R	
<i>Stipa hemipogon</i>	Half-beard Spear-grass				R
<i>Stipa nodosa</i>	Tall Spear-grass			R	
<i>Stipa semibarbata</i>	Fibrous Spear-grass				R
<i>Styphelia exarrhena</i>	Desert Heath				V
<i>Thelymitra canaliculata</i>	Azure Sun-orchid		U	U	V
<i>Thelymitra juncifolia</i>	Spotted Sun-orchid			U	
<i>Thysanotus baueri</i>	Mallee Fringe-lily			K	
<i>Trachymene pilosa</i>	Dwarf Trachymene			R	
<i>Tricoryne elatior</i>	Yellow Rush-lily				Q
<i>Triglochin calcitrapum</i>	Spurred Arrow-grass			R	
<i>Wahlenbergia luteola</i>	Yellow-wash Bluebell			K	
<i>Westringia eremicola</i>	Slender Westringia			U	U
<i>Zieria veronicea</i>	Pink Zieria		R	R	E

Extracted from the Reserves Database on 11 December, 1998 (Murray Mallee) and 25 November 1999 (South East), and the DEH Reserve Species Lists Database, 2002.

Birds of conservation significance

Species	Common Name	Aus Status	SA Status
<i>Acanthiza iredalei hedleyi</i>	Slender-billed Thornbill		V
<i>Amytornis striatus</i>	Striated Grasswren		R
<i>Aphelocephala leucopsis</i>	Southern Whiteface		U
<i>Calamanthus fuliginosus</i>	Striated Fieldwren		U
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-cockatoo		V
<i>Chrysococcyx lucidus</i>	Shining Bronze Cuckoo		R
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo		U
<i>Cinclosoma castanotus</i>	Chestnut Quailthrush		R
<i>Corcorax melanorhamphos</i>	White-winged Chough		U
<i>Eurostopodus argus</i>	Spotted Nightjar		U
<i>Hirundapus caudacutus</i>	Spine-tailed Swift (White-throated Needletail)		U
<i>Leipoa ocellata</i>	Malleefowl	V	V
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater		U
<i>Neophema chrysostoma</i>	Blue-winged Parrot		V
<i>Pachycephala rufogularis</i>	Red-lored Whistler	V	V
<i>Plectorhyncha lanceolata</i>	Striped Honeyeater		R
<i>Psephotus varius</i>	Mulga Parrot		U
<i>Psophodes nigrogularis leucogaster</i>	Western Whipbird	V	V
<i>Stipiturus mallee</i>	Mallee Emu-wren	V	V
<i>Turnix varia</i>	Painted Button-quail		V

APPENDIX C: CONSERVATION STATUS CODES

Australian Conservation Status Codes

The following codes are based on the current listing of species under Section 179 of the *Environmental Protection and Biodiversity Conservation Act 1999*.

- EX Extinct:** there is no reasonable doubt that the last member of the species has died.
- EW Extinct in the Wild:** known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
- CE Critically Endangered:** facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
- E Endangered:** facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
- V Vulnerable:** facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
- CD Conservation Dependent:** the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Note: Prescribed criteria as defined under the IUCN Red List of Threatened Species.

South Australian Conservation Status Codes

The following codes are based on the current listing of species under Schedules of the *National Parks and Wildlife Act 1972*, as amended in 2000.

- E Endangered:** (Schedule 7) in danger of becoming extinct in the wild.
- V Vulnerable:** (Schedule 8) at risk from potential or long term threats which could cause the species to become endangered in the future.
- R Rare:** (Schedule 9) low overall frequency of occurrence (may be locally common with a very restricted distribution or may be scattered sparsely over a wider area). Not currently exposed to significant threats, but warrants monitoring and protective measures to prevent reduction of population sizes.

Regional Status Codes

The categories below apply to the species distribution at a regional level.

Mammals, Reptiles & Amphibians

There are no regional conservation status categories developed for mammals, reptiles or amphibians to date (2003).

Birds

Regional conservation status for birds follow Carpenter and Reid (1998) *The Status of Native Birds in the Agricultural Areas of South Australia*;

The regions are defined as follows;

ML Mount Lofty	MN Mid-North	SE South-Eastern	KI Kangaroo Island
MM Murray Mallee	EP Eyre Peninsula	YP Yorke Peninsula	

Plants

Regional conservation ratings for plants follow:

Lang, P.J. & Kraehenbuehl, D.N. (2001). *Plants of Particular Conservation Significance in South Australia's Agricultural Regions*.

January (2001) update of unpublished database: Florlist. Department for Environment and Heritage.

The regions are as defined by the State Herbarium (Plant Biodiversity Centre), illustrated in the back cover of 'A List of the Vascular Plants of South Australia (Edition IV)' (Ed. Jessop, 1993).

NW North-Western	FR Flinders Ranges	NL Northern Lofty	SL Southern Lofty
LE Lake Eyre	EA Eastern	MU Murray	KI Kangaroo Island
NU Nullarbor	EP Eyre Peninsula	YP Yorke Peninsula	SE South-Eastern
GT Gairdner-Torrens			

In order of decreasing conservation significance:

- X** **Extinct/Presumed extinct:** not located despite thorough searching of all known and likely habitats; known to have been eliminated by the loss of localised population(s); or not recorded for more than 50 years from an area where substantial habitat modification has occurred.
- E** **Endangered:** rare and in danger of becoming extinct in the wild.
- T** **Threatened:** (*Plants only*) likely to be either Endangered or Vulnerable but insufficient data available for more precise assessment.
- V** **Vulnerable:** rare and at risk from potential threats or long term threats that could cause the species to become endangered in the future.
- K** **Uncertain:** likely to be either Threatened or Rare but insufficient data available for a more precise assessment.
- R** **Rare:** has a low overall frequency of occurrence (may be locally common with a very restricted distribution or may be scattered sparsely over a wider area). Not currently exposed to significant or widespread threats, but warrants monitoring and protective measures to prevent reduction of population sizes.
- U** **Uncommon:** less common species of interest but not rare enough to warrant special protective measures.
- Q** **Not yet assessed:** but flagged as being of possible significance.
- N** **Not of particular significance** (*Plants only*) Also indicated by a blank entry.
- C** **Common** (*Birds only*) Also indicated by a blank entry.
- O** **Occasional Visitor Only** (*Birds only*) Not considered of conservational status.

APPENDIX D: LEGISLATION, CONVENTIONS AND AGREEMENTS

In addition to the *National Parks and Wildlife Act 1972*, DEH is obliged to comply with the provisions of the following legislation, conventions and agreements:

South Australia
<i>Aboriginal Heritage Act 1988</i>
<i>Animal and Plant Control Act (Agricultural Protection and Other Purposes) 1986</i>
<i>Biological Control Act 1986</i>
<i>Catchment Water Management Act 1995</i>
<i>Coast Protection Act 1972</i>
<i>Country Fires Act 1989</i>
<i>Equal Opportunity Act 1984</i>
<i>Environment Protection Act 1993</i>
<i>Development Act 1993</i>
<i>Harbors and Navigation Act 1993</i>
<i>Heritage Act 1993</i>
<i>Historic Shipwrecks Act 1981</i>
<i>Mining Act 1971</i>
<i>National Trust of South Australia Act 1955</i>
<i>Native Title (South Australia) Act 1994</i>
<i>Native Vegetation Act 1991</i>
<i>Occupational Health, Safety and Welfare Act 1986</i>
<i>Petroleum Act 1940</i>
<i>Prevention of Cruelty to Animals Act 1985</i>
<i>Roads (Opening and Closing) Act 1991</i>
<i>Recreational Greenways Act 2000</i>
<i>Soil Conservation and Land Care Act 1989</i>
<i>Water Resources Act 1997</i>
<i>Wilderness Protection Act 1992</i>

Commonwealth
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>
<i>Disability Discrimination Act 1992</i>
<i>Environment Protection and Biodiversity Conservation Act 1999</i>
<i>Native Title Act 1993</i>
<i>Natural Heritage Trust Act 1996</i>

International
Japan / China Australia Migratory Bird Agreements (JAMBA, CAMBA)
Ramsar Convention
World Heritage Convention

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