Yanchep National Park

Management Plan 1989-1999

MANAGEMENT PLAN No. 14

Department of Conservation and Land Management

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

YANCHEP NATIONAL PARK

MANAGEMENT PLAN

1989-1999

PLANNING TEAM

Vanessa Smith (Co-ordinator)
Alan Briggs
Terry Hales
Ian Herford
with assistance from
Kate Orr

PREFACE

All National Parks and Nature Reserves in Western Australia are vested in the National Parks and Nature Conservation Authority (NPNCA). The management of these parks and reserves is carried out by the Department of Conservation and Land Management (CALM).

The NPNCA is responsible for the preparation of management plans for all lands which are vested in it. A draft management plan for Yanchep National Park was prepared by officers of CALM and issued by the Authority for public comment. After consideration of public comment, the NPNCA submitted the revised draft plan to the Minister for Conservation and Land Management for approval. The Minister approved this document as the final management plan for Yanchep National Park on 2 July 1989.

On 23 June 1989, the Bush Fires Board endorsed this plan under Section 34(1)of the Bush Fires Act (1954).

YANCHEP NATIONAL PARK MANAGEMENT PLAN
CONTENTS

LIST OF FIGURES

* Map is based on original prepared by consultant landscape architects Micheal Stoner and Jordan Pregelj.

LIST OF TABLES

ACKNOWLEDGEMENTS

The Planning Team consists of Vanessa Smith (Coordinator), Alan Briggs, Terry Hales and Ian Herford, with assistance from Kate 0rr (who wrote Sections 5.0, 6.0, 7.0, 8.0), Paul Albone and Gary Davies.

Many people (from within and outside CALM) and organisations (both government and community-based) have contributed to this plan, and their assistance is gratefully acknowledged. In particular the rangers and office staff of Yanchep National Park have provided valuable support and assistance throughout the preparation of the plan; and officers of the State Planning Commission, Environmental Protection Authority, Water Authority of W.A., W.A. Museum and the City of Wanneroo have provided valuable information and advice. Much of the master plan for the recreation area was developed by two consultant landscape architects, Michael Stoner and Jordan Pregelj, in conjunction with the planning team. Their efforts, enthusiasm and dedication were a great contribution to this plan. The many people and organisations who prepared submissions on the draft management plan are especially acknowledged. Cover photo is by Vanessa Smith.

The efforts of Bob Symons, Rob Doria, Chris Simms, Loretta Nutini and Cheryl Watters of Mapping Branch in preparing the maps in this plan, and Debbie Bowra for the typing of this plan, are much appreciated.

A GUIDE TO THIS PLAN

Overall the plan is divided into five main sections (refer to contents page), the Introduction, Overall Management of the Park, Management of Natural Resources, Management for Visitors and Implementation. Within this overall structure the plan follows a basic format which varies when particular issues require it.

Each section begins with background information, followed by Implications for Management (derived from the background information), Management Objectives and Prescriptions. Some sections also have strategies, where the overall direction of the management is discussed. Priorities have been allocated for all prescriptions.

The key sections to read in this plan, to gain an overview of what is proposed are: Part A Introduction, Sections 2.0 Management Objectives for the Park, 14.1 Background information and recreation opportunities, 14.1.2 Summary of current conflicts and management issues, 14.2 Recreation Area Management Objectives and 14.3 Overall Strategies. More detailed information can be found in specific sections (refer to the contents).

SUMMARY

Yanchep National Park, 2799 ha, is situated 48 km north of Perth, on the Wanneroo-Lancelin Road. Its gazetted purpose is the 'Protection and Preservation of Caves and Flora and for Health and Pleasure Resorts'.

Values

The conservation values of the Park relate to what has occurred to the Swan Coastal Plain. Much of it has been cleared for human activities, such as urbanisation and farming. Many wetlands on the Swan Coastal Plain have been filled in, and those left have been modified and subjected to pressures such as pollutants and clearing. All of these activities have severely diminished the range and availability of habitats for fauna, so that many are either no longer present on the Plain, or are very reduced in numbers. The Park contains seven vegetation communities, four wetlands that have had little modification, and over 1 000 caves (some of which are scientifically important and need protection), all of which provide a wide range of habitats for a variety of fauna. It is an important conservation area, and as urbanisation spreads, its value will increase.

It is also a popular and unique recreation destination. Over 250 000 visitors per year go to the recreation area, the highest number of visitors to any single area of a national park in the State. Also high is the number of tourists from interstate and overseas (34% of the total). Within this beautiful and tranquil Park, visitors can participate in many activities including rowing on Loch McNess, picnicking and walking along the two nature trails and having a game of golf.

Management Issues

There are many natural values of the Park which need protection from many influences, including wildfire, dieback disease, feral animals and the effects of an expanding population.

This Park is very different from other national parks because of the developed nature of the recreation area. It requires high levels of maintenance, so it has the largest ranger force for any national park in the State; therefore, management and maintenance costs are high. The high numbers of visitors, the number of staff required and the high costs of management, produce a number of management issues, both problems and opportunities.

Management of Natural Resources

Some aspects will be:

* *The addition of Ridges State forest, a part of State Forest No. 65, and, if possible, Pipidinny Swamp to the Park, increasing its size by 3 100 ha (See Figure 1).*

* *The rehabilitation of eroded and degraded areas.*

* *The encouragement of a study of the inter-relationships between the ground water and the Park's caves and wetlands (in view of proposed extraction of ground water from the Gnangara Mound by the Water Authority).*

* *The continued monitoring and surveying of rare and restricted flora and fauna in the Park, and where possible other flora and fauna.*

* *Development of opportunities for learning about and appreciation of the fauna of the Park, for example, establishment of viewing hides and guided interpretive walks.*

* *Instigation or encouragement of the research and monitoring of the wetlands, including the ecological role of Typha orientalis and the breeding habits of birds on Loch McNess.*

* *The drawing up of guidelines for the use and management of Loch McNess including:*
  - *a restriction on further clearing of the lake's catchment*
  - *dieback hygiene practices to be carried out in the lake's catchment*
  - *South Loch McNess - no dredging the lake and any future activities must be demonstrated not to have a detrimental effect on the lake. North Loch McNess - will be a recreation-free zone. East Loch McNess - there will be no further filling of Loch McNess.*

* *The use of dieback hygiene practices for all operations involving the movement of soil.*

* *The continued control of a variety of feral animals and weeds.*

* *The protection and enhancement of cultivated and natural landscape values of the Park.*

* *The changing of the purpose of the Park from 'Protection and Preservation of Caves and Flora and for Health and Pleasure Resorts' to 'National Park' to more accurately reflect*

its conservation values.

* *The formation of a Caves Management Committee, including representatives from speleological groups, to assist with the management of caves.*

Management for Visitors

Recreation Area

The overall goal is to rationalise existing services and facilities and enhance those which are compatible with national parks.

Overall Strategies

The main strategy to resolve the conflicts and issues of the recreation area has been development of a master plan for the recreation area. This takes into account past, present and future use, the views of the Park visitors, and management requirements. It is a guide for the development of the Park for the next twenty years.

The master plan involves:

* *Allocation of a specific name for the recreation area (McNess Recreation Area) to distinguish it from the remainder of the Park;*

* *The redesign of the vehicle circulation system, including re-location of some stretches of road and upgrading of others, producing a two-way road loop;*

* *Re-location, upgrading, formalisation and screening of carparks;*

* *Provision of a scenic drive;*

* *Improvement of the entrance to the recreation area;*

* *Provision of pedestrian corridors to separate pedestrians from vehicles;*
* *Provision of more nature trails;*

* *A change in the function of some buildings, eg. McNess House to become a part of a visitor information facility;*

* *The removal of some buildings, eg. the hall, ranger houses, the Park Staff's office building.*

* *A rationalisation of recreation facilities, eg. upgrading of most gardens into wildflower displays; upgrading of picnic facilities; a continuation of the koala colony (providing animals are available from the Eastern States, so the colony can again be viable); relocation of the koala enclosure (to make room for more suitably located carparks, and to provide an experience un-interrupted by vehicles); removal of the kangaroo/emu enclosure and provision of opportunities to view the animals in more natural conditions; the provision of one sports oval and the development of parkland areas from the other two existing ovals; the development of an adventure playground for children; the provision of a small-scale, backpack camping area.*

* *The leasing out of a number of facilities in the Park, eg. rowboats, swimming pool, golf course, cave tours, souvenirs (providing lessees can be found);*

* *Rationalisation of the management and maintenance services eg. - replacement of the water supply system, installation of an automatic ticket machine at the entrance, development of an effective sign system; the setting of a limit beyond which vehicle entry will be restricted;*

* *The retention of Cabaret Cave for use by CALM as part of special interpretive cave tours of the Park, once it is declared safe; the re-opening of Yonderup cave for special tours;*

* *The enhancement of the Park's role as an important tourist destination;*

* *The development of the Park as a major gateway to the natural environment through the provision of a visitor information facility and interpretive programs.*

Natural Areas

There is growing demand for use of the natural areas of the Park for a variety of activities, such as bushwalking, and, as the population of Perth increases, this demand will increase. Most visitors have not experienced the Park outside the recreation area, and so in future visitors will

be encouraged to discover other delights of the Park (consistent with protecting the environment).

The following activities will be encouraged: bushwalking, responsible caving, photography, bird watching and other activities which have a minimal impact on the environment.

The following activities will not be allowed in the natural areas: horse-riding, private vehicle use (including motorcycles) and camping.

PART A. INTRODUCTION

National Parks are special areas which have high conservation value and contain natural landscapes of great beauty, all of which are managed to protect and allow the appreciation of these values by present and future generations.

Yanchep National Park has high conservation and recreation values. Its conservation values relate to the fact that much of the Swan Coastal Plain has been cleared for human activities, such as urbanisation and farming. There are few substantial areas of undisturbed vegetation remaining, let alone reserved for conservation. Many wetlands on the Swan Coastal Plain have been filled in, and those remaining have been modified and subjected to pressures such as the input of pollutants and clearing. All of these activities have severely diminished the range and availability of habitats for fauna, so that many are either no longer present on the Plain, or are severely diminished in numbers. The Park also contains many caves, some of which are scientifically important and which require protection. So the Park, which contains seven vegetation communities of the Swan Coastal Plain, four wetlands which have had little modification, and over 1 000 caves, all of which provide a wide range of habitats for a variety of fauna, is an important conservation area. As urbanisation spreads further in the future, its value will increase.

Overall, management of the Park needs to aim to buffer it from the effects of increasing recreational demand and greater urbanisation so that its conservation values are maintained.

Yanchep National Park, and in particular the recreation area, is very different from other national parks in the State, and indeed in Australia. The highly modified and developed area is the result of past use and values; and is unlikely to be repeated in any other national park.

The diverse combination of recreational opportunities provided in the Park, including barbecues, golf course, swimming pool, caves and wildlife enclosures, are unique to a Western Australian national park, and combine to make Yanchep National Park a very popular and special recreation area.

One side effect of the concentration of activity on the central recreation area has been the relatively low level of disturbance to the environment of the rest of the Park, which is remarkable in view of its proximity to the Metropolitan Area. It is proposed to continue this concentration of activity in the recreation area, and to encourage activities which have a minimal effect on the environment in the remainder of the Park; this will help to ensure the long term viability of the natural environment.

The developed nature of the recreation area means that it requires high levels of maintenance, so that it has the largest ranger force for any national park in the State; therefore management and maintenance costs are high. Visitor numbers are also high. With over 250 000 visitors per year the recreation area has the highest visitation of any single area of a national park in the State. The Park is an important tourist destination, with 34 percent of visitors from interstate and overseas (as revealed in the 1987 visitor survey).

Although satisfaction and positive feelings about the Park have been expressed by many visitors there has also been an expression by the local community that the Park warrants upgrading and improving.

The recreation area was developed in the 1930s, and the cultural significance of the buildings in the Park has been recognised by the National Trust of W.A., which has classified a number of the buildings. Because there have been many changes in the structure, functions and habits of society since the 1930s the design and layout of the recreation area needs to be improved to cater for the demands of the 1990s.

As part of the planning process two consultant landscape architects were engaged to prepare a master plan for the recreation area in conjunction with the planning team, to try to resolve these conflicts and to plan for future demands.

In preparing this plan the planning team has a long term vision for the Park; to initiate changes now to resolve present conflicts, and also to plan for future demands, opportunities and conflicts. As the population of the Perth Metropolitan Area increases over the next 20 to 30 years (it is estimated by about 663,300 by the year 2021, SPC 1987) including an increase in the City of Wanneroo by about 145,000 people (SPC 1987) (combined, 65% of visitors to the Park are from these two areas) there will be increasing demand on the recreation facilities of the Park and pressures on the natural environment. This plan is the first stage of a 20 year plan, which will require ongoing review.

1.0 BACKGROUND

1.1 LOCATION

1.1.1 LOCATION AND TENURE

Yanchep National Park is situated 48 km north of Perth, on the Wanneroo-Lancelin Road (see Figure 1). It is 2799 ha in size. Its gazetted purpose is the `Protection and Preservation of Caves and Flora and for Health and Pleasure Resort'

It is vested in the National Parks and Nature Conservation Authority. The Park is located within the City of Wanneroo, with the coastal towns of Yanchep and Two Rocks within close proximity.

1.1.2 SURROUNDING LAND USE

The uses of areas surrounding the Park are shown in Figure 2. Areas to the north, east and south-east of the Park are State forest and are part of the Gnangara Water Reserve. Much of this area consists of pine plantations. Land to the south-east, south, south-west and north-west of the Park is zoned rural. Activities on this land include market gardening and farming. Land to the west of the Park is zoned urban. It is expected in the long term that the areas currently zoned rural will be zoned urban to accommodate the demands of a growing population (0. Drescher pers. comm.).

In summary, the northern and eastern boundaries of the Park are State forest managed by CALM, and the west and south boundaries consist of privately-owned land.

1.1.3 ADDITIONS TO THE PARK

There are three areas that are to be added to the Park. The areas are: Ridges State forest; an area of State Forest No. 65 to the south of Ridges; and Pipidinny Swamp (see Figure 2). These are more fully discussed in Section 11.2.

The recommendation to include Ridges State forest in the Park was in the System 6 Report (1983) and together with the area of State Forest No. 65 it was in CALM's Northern Forest Region Management Plan (1987) while the addition of Pipidinny Swamp and the area to the south of Haddrill Road extending from Ridges State forest are new to this plan. All of the additions are included within all the management objectives and prescriptions in this

plan ie. they are treated as part of the Park for the purposes of management. All references to Ridges State forest in this plan refer to both areas (except in Section 11.2).

Implications for Management

1. Yanchep National Park is situated within one hour's drive of the centre of Perth; it is therefore popular for day visits.

2. The gazetted purpose of the Park is outdated and not relevant to current recreation demands or management; it requires changing to reflect its conservation values.

3. Adjacent areas zoned rural may be in conflict with the Park at times, for example straying animals, fire risk, spread of weeds and fertiliser drift.

4. Neighbouring lands (including pine plantations) have values which require special protection, particularly from fire.

5. If and when urban areas surrounding the Park increase, so the pressures on the Park environment will increase.

Management Objectives

1. To have the gazetted purpose of the Park reflect its values.

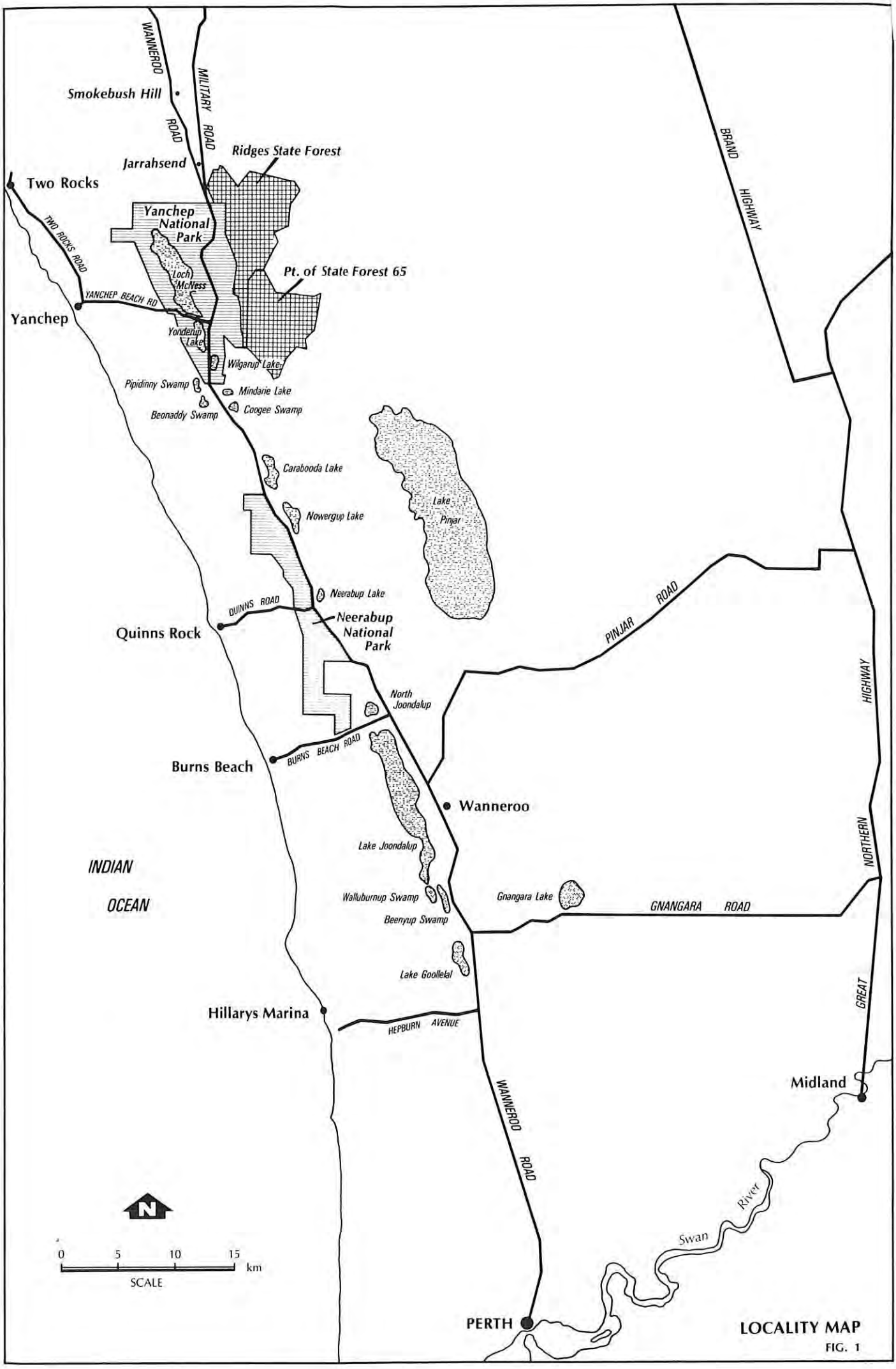
2. To protect the Park from adverse effects of neighbouring land use, and to protect neighbouring lands from adverse effects of the Park.

Prescriptions

1. Instigate the necessary administrative procedures to change the gazetted purpose of the Park from `Protection and Preservation of Caves and Flora and for Health and Pleasure Resort' to `National Park'.

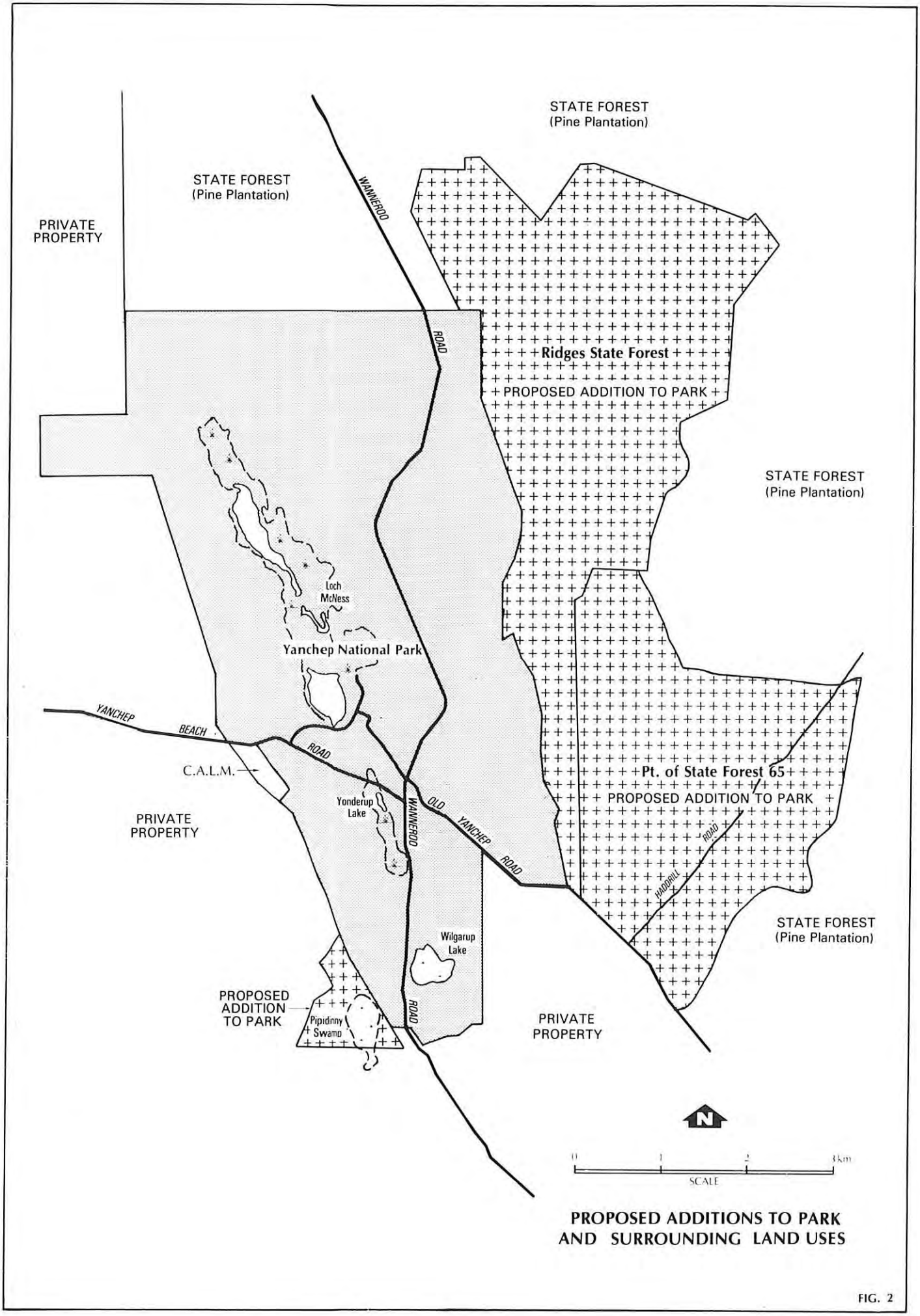
2. Implement proposed prescriptions as outlined in Sections 6.0 (Hydrology) 10.0 (Protection) and 11.2 (Additions to the Park) to minimise impacts from and on surrounding land uses.

3. Liaise with authorities regarding changes to adjacent land use or conditions which may adversely affect Park values and impact on Park management.



LOCALITY MAP

FIG. 1



PROPOSED ADDITIONS TO PARK AND SURROUNDING LAND USES

FIG. 2

1.2 REGIONAL CONTEXT

National parks do not exist as isolated entities. Their natural features and visitor use patterns relate to and can be affected by the features and use of the region in which they are located, and often in a broader context ie. Statewide.

The Park's regional context is discussed in relevant sections throughout this plan, and can be summarised as follows:

The Park's natural values and their regional context relate mainly to its representative vegetation associations, its wetlands and caves, and the fauna these habitats support.

The Park is part of the proposed Gnangara Metropolitan Park which is a `green corridor' of remnant bushland which extends from Lake Joondalup, encompassing Neerabup National Park north to the Park and east encompassing State Forest No. 65 (SPC 1987). This provides an important extended habitat and ecosystem, which has higher chances of being viable in the future than if the Park and other areas were isolated pockets of bushland. The wetlands are part of a chain of linear lakes (Wanneroo linear wetlands) which support many resident and vagrant birds between them, and in turn form part of an important network of wetlands in the Swan Coastal Plain. The Yanchep area is an important region for caves in the State, with many caves occurring within the Park. Much of the landscape of the Park is relatively unmodified which is uncommon on the Swan Coastal Plain.

The Park lies towards the edge of the Gnangara Mound, an extensive unconfined ground water aquifer which is one of Perth's major water resources. Future abstraction from this aquifer, and related activities, could affect some of the Park's vegetation, wetlands and caves.

Human values: The Park's cultural heritage relates to the history of human use of the region and the Swan Coastal Plain. The Park was part of a migration route for Aborigines, which extended from the Swan River to Moore River and east to Gingin. There are sites of significance to Aborigines in the Park.

European exploration, settlement and development extended from the Swan River colony to the Wanneroo/Yanchep area and was initially focussed on the wetlands, which were fertile grounds for farming, and as part of a stock route north and south of the area.

With its wetlands (principally Loch McNess) and caves, the area that is now Yanchep National Park was recognised in the early 1900s as significant for conservation and

recreation. It was developed in the 193Os and became a prime recreation and tourist area in the region. Hence Yanchep National Park is part of the traditional recreational experiences of Western Australians and many have a feeling of proprietary interest over the Park, similar to that felt for Kings Park and Rottnest Island.

Today, Yanchep National Park remains an important recreation area in the region and a major tourist destination in the State. It is popular with residents of the Metropolitan Area, country areas and tourists alike. It is within one of the two most visited regions in the metropolitan area (the other being the Hills area) (W.A. Tourism Commission 1987a). Its value is enhanced by the provision of a variety of facilities in the region since the late 197Os, including Atlantis Marine Park, Dizzy Lamb Park and Two Rocks Marina. The proposed Gnangara Metropolitan Park will provide extensive recreational opportunities in the region.

PART B OVERALL MANAGEMENT OF THE PARK

2.0 MANAGEMENT OBJECTIVES FOR THE PARK

The overall objective for management of national parks, according to the CALM Act is

`...to fulfill so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest'.

Within this overall objective, the general management objectives for National Parks are to:

1. Conserve, protect and restore areas of scenic beauty, natural landforms, ecosystems and all areas of scientific or cultural importance.

2. Provide opportunities and facilities for appropriate public recreation, consistent with the protection of the natural environment and to minimise conflict between uses.

3. Promote awareness and appreciation of natural processes and the natural and cultural attributes of the Park.

4. Protect the lives and property of neighbours and visitors to the Park.

5. Develop and maintain knowledge regarding the biological, physical and social environments of the park to aid future management.

There are also objectives for the management of specific aspects of the Park, throughout the plan.

3.0 ALLOCATION OF AREAS FOR APPROPRIATE MANAGEMENT AND USE

Dividing the Park into management units provides a basis on which management objectives can be achieved. It ensures maximum protection of the environment and also allows for a variety of recreational activities to occur, in areas which are able to sustain those activities.

Overall, intensive activities (both recreational and management) which can have a high environmental impact will be confined to the recreation area. Activities which have a low or minimal effect on the environment will be confined to `managed natural areas' and all but essential management activities will be restricted in `natural areas'.

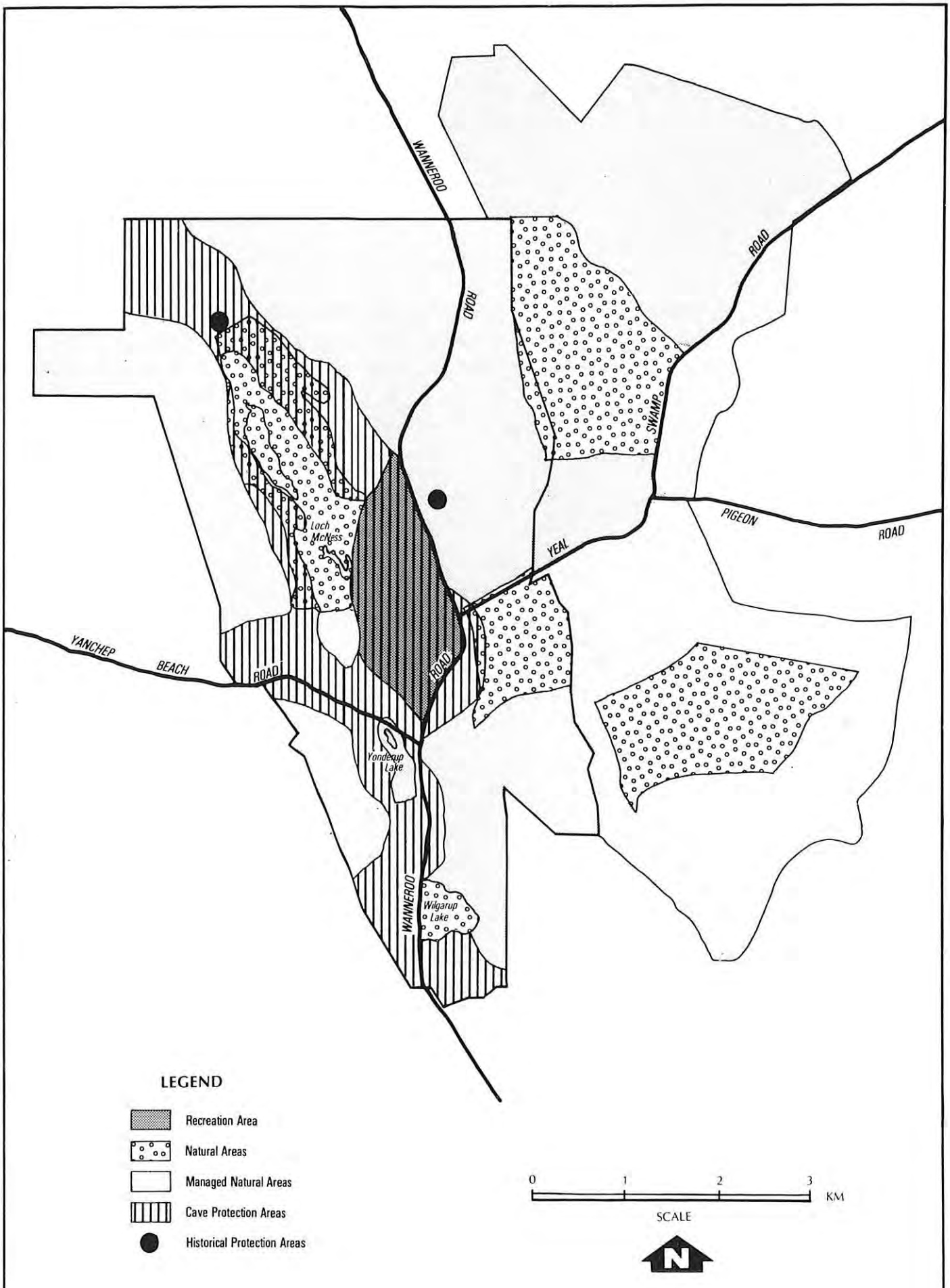
The units are as follows (summarised in Table 1 and represented in Figure 3):

1. **Natural Areas:** These core areas will have minimal disturbance or modification. There will be a low level of management activities and recreational activity will not be encouraged or facilitated. There will be no noticeable modifications to the environment as a result of management activities. Appropriate management activities will include feral animal control, weed control and research. The areas will not be burnt for fuel reduction purposes, and vehicle access will be restricted to the boundaries of the areas. Where the natural areas are bordered by major tracks, some additional management activities may be required to buffer the areas.

2. **Managed Natural Areas:** These areas will have some management activities occurring, such as for fuel reduction burning where necessary, feral animal and weed control and recreational activities which have minimal impacts, such as bushwalking. Access will be on designated tracks. Some activities may result in a temporary change in the environment.

3. **Special Areas**: These include areas of special scientific or cultural significance.

    a) **Cave Protection Areas** - These areas have a high concentration of caves and other karst features. Activities which may damage caves such as use of heavy machinery will be restricted in these areas and access will be limited (by rehabilitation of existing tracks and the requirement for permission to enter the caves (see Section 15.0 on Caves). There are parts of the Caves Protection Area within the recreation area and the conditions for the Caves Protection Area will take precedence over those for the recreation area.



MANAGEMENT UNITS

FIG. 3

b) **Special Habitat Protection Areas** - These contain areas that are used for scientific research or contain special habitats of species of significance; recreational activity will not be encouraged or facilitated.

c) **Historical Conservation Areas** - These contain significant historical features which need protection, and are located outside the recreation area (which also contains a number of historical features which will be protected within the management of the recreation area).

4. **Recreation Area**: Within which all intensive recreation occurs (eg. golfing, boating, camping etc) with associated facilities. This area, being highly modified, has a high capacity to support intensive recreation. Associated with this high level of use are intensive management activities and fuel reduced areas to facilitate fire control.

The recreation area has been further divided into sub-units so that activities and management within the recreation area are compatible (see Section 14.3.2) including separation of day-use areas from a backpack camping area.

TABLE 1 MANAGEMENT UNITS

UNIT	ACCESS	LEVEL OF RECREATION EXPERIENCE	MANAGEMENT
1. **Natural Area**	No vehicle or formal pedestrian access.	Low	Unmodified - isolated Recreation not encouraged
2. **Managed Natural Area**	- Pedestrian access on roads and tracks. - Vehicle access for management.	Moderate	Modified intermittently some isolated areas
3. **Special Areas**			
a) **Historical Conservation**	As for 2	Moderate	Semi developed/ developed
b) **Cave Protection**	As for 2, with no heavy machinery allowed in the area.	Moderate	Unmodified - isolated (wild caves) Semi developed - adventure caves Developed - tourist caves
c) **Special Habitat Protection**	Vehicle access for management; no public access.	Variable	Recreation not encouraged
4. **Recreation Area**	Vehicle and pedestrian access on approved roads and tracks.	Very high	Developed - intensive recreational activities - some areas semi-developed.

PART C MANAGEMENT OF NATURAL RESOURCES

4.0 HISTORY

Yanchep National Park has a rich history from Aboriginal and European cultures. It was important to Aboriginal people because it provided plentiful food and water, and to the European settlers because of its proximity to the main settlement in Perth.

4.1 ABORIGINAL HISTORY

Aboriginal occupation of south-Western Australia dates back to more than 40 000 years ago (Merrilees et al. 1973; Hallam 1975 and 1985; Pearce and Barbetti 1981; Dortch 1984). In the Wanneroo/Yanchep area artefacts have been found dating between 6 500 and 1 700 years ago (Hallam 1971; Merrilees et al. 1973). Population sizes appear to have fluctuated, however, the coastal plain supported comparatively higher densities because of the abundance of food and water (Hallam 1971). The coastal plain was occupied by different groups of the Nyungar people. One group centred on the Swan estuary and its northern limit extended to between Lake Joondalup and Lake Neerabup, while another group occupied an area from this point up to Moore River and extended across to the scarp around Gingin. These groups were closely linked, and these were also linked with groups in the south west and along the south coast (Hallam 1974).

The chain of linear lakes extending from the Swan River estuary north to Yanchep were well used because of good water supplies throughout the year and availability of food.

Use of group areas varied with the seasons. During winter the preferred hunting grounds were further east, whereas during the summer months the coastal plain was preferred, as water sources dried up inland (Hallam 1974).

The area of Yanchep National Park, particularly around Loch McNess, was occupied and hunted, and associated with this are areas of mythological, ritual and ceremonial significance.

The lake was a source of fish, tortoises and birds (Hallam 1974). The reeds of the lakes (*Typha orientalis*) were a food source; they were regularly burnt to improve growth, and the roots were pounded into a paste and used as a type of flour (Hallam 1975). Other animals hunted in the area included small and large mammals, such as the Western Grey kangaroo, Quokka and Western Brush Wallaby, as well as snakes and frogs (Hallam 1974).

Fire was a key tool in hunting and gathering. It was used to `cultivate' and manage the resources of the land to ensure good, ongoing food supplies. It was used to flush out animals, to stimulate new growth of plants for eating (as with *Typha*), to encourage the feeding of animals that could then be hunted and to clear undergrowth to make passage easier (Hallam 1975 and 1985).

The Park area, particularly around Loch McNess, was an important ritual and corroboree area. Aboriginal people from the two groups, from the Moore River area and the Swan River area, gathered at Yanchep to hold tribal meetings, conduct rituals and corroborees (O'Connor *et al.* unpubl; Ken Colbung pers. comm.).

Loch McNess is a mythological site. According to Aboriginal tradition a Waugal inhabits the lake, and the spring (or stream) feeding into the lake (from East Loch McNess), known as Wagardu Spring, is central to the mythology (O'Connor *et al.*, unpubl; Hallam 1974).

Yonderup Cave is also an area of significance. Aboriginal skeletal material has been found in the cave (Davidson 1948). The W.A. Museum is researching the origins and nature of the skeletal material.

The tribal name for the Yanchep National Park area is Nyanyi-Yandjip which alludes to the reeds of the lake and Waugal's hairy mane (O'Connor *et al.* unpubl). The west coastal areas have a rich mythology involving the elements of serpent, water, earth, cave and fire (Hallam 1974). Caves appear to have been important for rituals, although no evidence (so far) indicates that caves in the Park were used for such purposes (Hallam 1974).

Aboriginal oral history states that a violent encounter occurred between an Aboriginal tribal meeting and a group of early European explorers in the Park and it resulted in some Nyungars being shot (0'Connor *et al.* unpubl).

4.2 EUROPEAN HISTORY

The first recorded visit by a European to the Park area was in 1834, when a farmer John Butler searched for his lost cattle, and recorded the presence of lakes and abundant game.

Lieutenant George Grey explored the area in 1838 and recorded the existence of some `remarkable' caves. Surveyor General Roe and Governor Hutt explored caves in Boomerang Gorge in 1841 (Daniels and Cockman 1979).

A road survey was carried out in 1862 past the western edge of Loch McNess, extending

from Perth to Champion Bay. In 1865 a stock route was pioneered through the area, which was subsequently used by drovers.

Henry White was the first settler in the area, in 1901; he built his house adjacent to the north-west of Yonderup Lake. In 1903 he was appointed honorary caretaker and guide of the caves (Downey 1958). By 1904 most of the major caves in the Park area had been discovered and explored.

The importance of the caves in the area was recognised, and in 1905 most of what is now Yanchep National Park was reserved for the `Protection and preservation of caves and flora and for a health and pleasure resort'. Control was by the Caves Board.

Control of the Park changed between various bodies over the years, reflecting the changing emphasises in the administration of the State.

Major development of the recreation area into a `Health and Pleasure Resort' occurred in the 1930s. It was the brainchild of Mr L. E. Shapcott, Under Secretary of the Premiers Department and Chairman of the State Gardens Board. Works were funded by grants made by Sir Charles McNess to provide jobs during the Depression. During this time the following were constructed: roads and internal pathways, McNess Hostel (around the original caves house), crystal pool, Gloucester Lodge, Yanchep Inn, the administration building and a `weekend house' for Mr Shapcott at the northern end of Loch McNess. Other works included the dredging of Loch McNess, and the subsequent establishment of a launch service, siting of eight trams for bungalows near Boomerang Gorge, the fitting out of several caves (Crystal, Bedomoro, Mambibby, Yonderup) for tours, construction of a pathway through Boomerang Gorge, the establishment of a koala colony and an aviary, and the sealing of Wanneroo Road to the Park. Loch McNess was originally known as Lake Yanchep (after the Aboriginal word `Yandjid' relating to the reeds of the lake) but was later changed to honour Sir Charles McNess.

With this major development the Park became a major tourist and recreational attraction in the 193Os (Daniels and Cockman 1979). During the 1930s, areas of Yonderup Lake were leased for market gardens (Downey 1958).

During the Second World War (from 1942 to 1946) the Park was occupied by the armed services. Yanchep Inn was used for the rest and recuperation of returned servicemen, and Gloucester Lodge was used as an office and barracks for a radar squadron.

After the war, during the 1950s and 60s, developments (such as the golf course, staff

housing, redredging of Loch McNess, construction of a new swimming pool within the existing pool) occurred. The reserve was declared a National Park in 1969.

The major buildings of the Park have been classified by the National Trust. These are the Administration building, McNess House, Yanchep Inn, Gloucester Lodge, tram bungalows and army bunkers. Shapcott's house and the chauffeur's cottage have been classified as ruins.

Implications for Management

1. There are Aboriginal sites in the Park which are protected under the Aboriginal Heritage Act (1972-80).

2. The Park has a rich history of Aboriginal and European cultures; there is potential to develop interpretive and educational programs on these themes.

3. The buildings classified by the National Trust are important to our cultural heritage and restoration and maintenance need to be sensitive to their heritage values.

4. The buildings are of a complementary architecture; combined they present homogenous setting of some rarity. This association needs to be maintained with all buildings in the recreation area.

Management Objectives

1. To protect the Aboriginal and European cultural heritage of the Park.

2. To encourage greater understanding and appreciation of the cultural heritage of the Park.

Prescriptions

1. Prior to any development works (including roads, carparks and walk trails) ensure no Aboriginal site is affected. (Priority: Ongoing).

2. As funds permit ensure that all the classified buildings in the Park are maintained to a high standard. (Priority: Ongoing).

3. **Ensure that all works and extensions carried out on classified buildings in the Park enhance their heritage value. (Priority: Ongoing).**

4. **Ensure all buildings (new and existing) are compatible as far as possible in form, colour, construction materials and texture. (See also Section 12.0 on Landscape.). (Priority: Ongoing).**

5. **Develop interpretive programs highlighting the cultural heritage of the Park, for example:**
   - an historical walk through the recreation area
   - activities involving traditional Aboriginal use of the area (see Section 18.0 on Information and Interpretation). (Priority: Ongoing).

6. **Liaise with the National Trust of W.A. regarding improvements to buildings, and the Nyungar community and National Trust regarding development of interpretive programs. (Priority: Ongoing).**

7. **Investigate alternative names for Loch McNess, relating to its Aboriginal heritage. (Priority: 2).**

5.0 GEOLOGY, SOILS AND LANDFORMS

The Park has a representative array of geological features associated with the continued solution and re-deposition of limestone (karst features). These include caves, capstone (hardcapping of limestone), solution pipes and dolines (collapsed caves). (Caves are discussed in Section 15.0).

The Park is situated in a landform known as the Dandaragan Trough, which is the deepest subdivision of the Perth Basin. Quaternary deposits cover much of the surface of the Basin in deposits of up to 75 m in depth (Playford et al. 1975).

Geomorphologically, the Park forms part of the low-lying, gently undulating Swan Coastal Plain. This is built of accumulations of aeolian (wind-deposited) and alluvial (water-deposited) sediment (Seddon 1972). The Park consists of the geologically recent Spearwood dunes with small areas of more recent Quindalup dunes and wetlands (see Figure 4). The vegetation associations in the Park are directly related to the dune associations.

Spearwood Dune System

The Spearwood Dunes formed in the Pleistocene period (1.7 million to 10 000 Before Present). They are composed of aeolianite limestone (Tamala limestone) overlain by variable depths of leached soils yellow to brown in colour (Churchward and McArthur, 1980). In some areas the limestone is exposed.

Quindalup Dune System

The Quindalup Dunes formed during the Holocene Period (less than 10 000 years Before Present) and consist of recently deposited calcareous sands. There is some cementing (lithification) in the lower layers of the older phases of the system, towards formation of aeolianite limestone (Churchward and McArthur 1980).

Wetlands

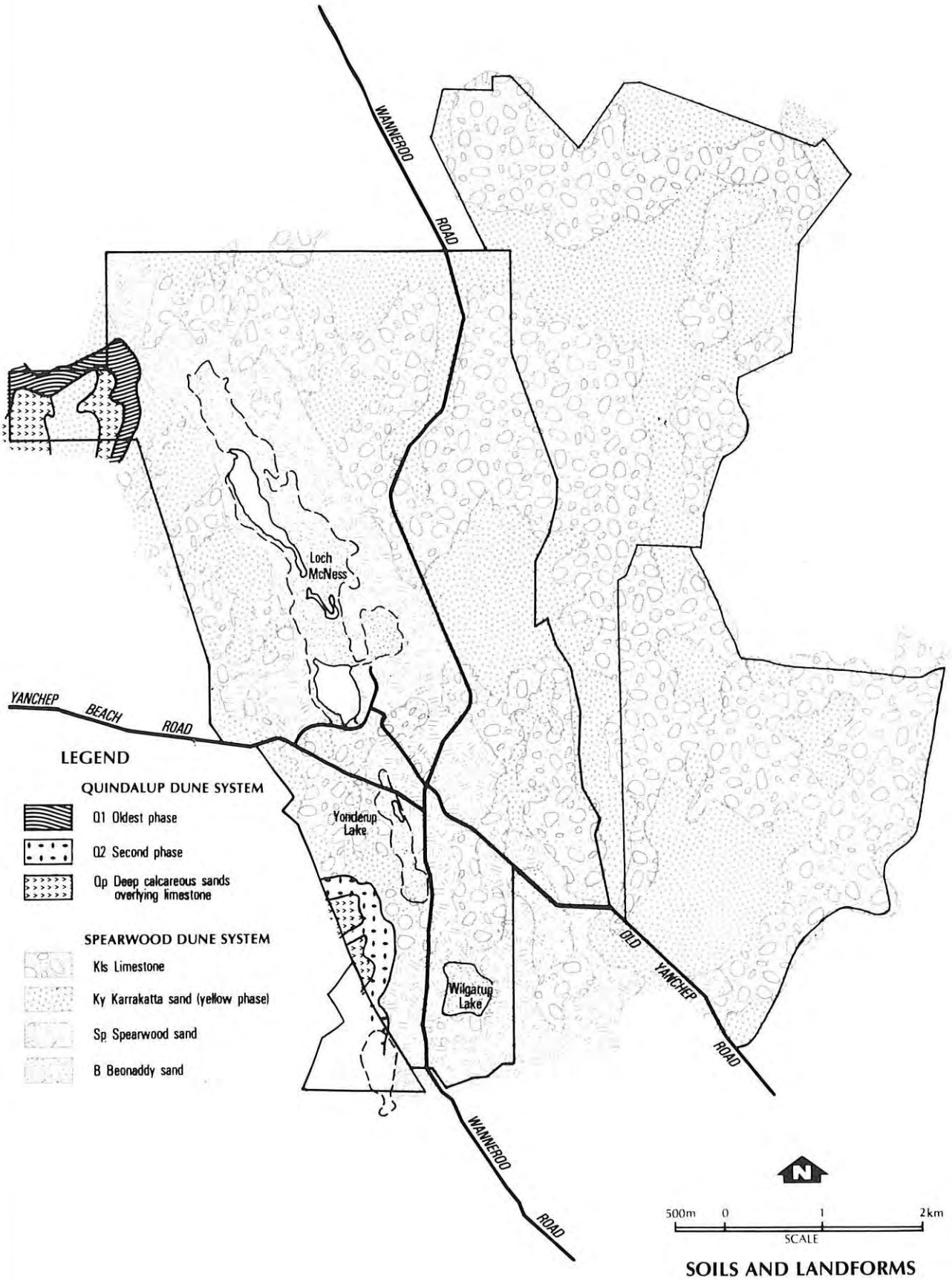
The wetlands of the Park have peaty soils characteristic of the Herdsman soil association.

Mineral Potential

There are deposits of limestone, limesands, diatomite and ore in the Park. Limestone has been commercially quarried in Ridges State Forest at four sites. Currently, there are two mining leases in the area not presently in use (refer to Section 11.2.1). Areas of State Forest No 65 and Ridges State Forest have been classified as "priority resource areas" for the substantial high grade limestone they contain (SPC, 1987). There are no mining leases in Yanchep National Park. Limesands in the area have no great commercial value (MRPA 1977). Diatomite underlies many of the wetlands of the Swan Coastal Plain (MRPA 1977). This has been mined from the swamp in Ridges State Forest. There are demonstrated ore deposits in the east of the Park and Ridges State Forest (Biggs et al. 1980).

Mining activity (including marking out and exploration) is controlled by the Mining Act (1978-1982). Any activities on lands controlled by CALM require concurrence of the Minister for CALM and is subject to conditions according to Sections 24 and 26 of the Mining Act. Furthermore, the consent of both Houses of Parliament is a prerequisite before mining occurs in national parks.

CALM (or authorised agents) may extract raw materials (such as limestone) for some purposes, such as road building, on CALM land but due to the proximity of limestone and sand close to the Park there is no requirement for extraction within the Park.



SOILS AND LANDFORMS

FIG. 4

Implications for Management

1. Erosion potential of an area must be considered in management (eg. location of roads, walk trails). This can be determined by such factors as the nature of the soil, slope and vegetation cover. Illegal and off-road vehicle activity initiates and exacerbates soil erosion.

2. There is educational and interpretive value in the range of karst features.

3. All mining activities are controlled by the Mining Act (1978-1982), therefore, liaison with the Mines Department and the licensee is important.

4. The geological features contribute to the landscape quality of the Park and need to be protected.

Management Objectives

1. To protect the geological and geomorphological features and soils.

2. To develop the interpretive potential of the geological features of the Park.

Prescriptions

1. Map the erosion potential of the Park. Consider the erosion potential of a site prior to the commencement of management activities such as the construction of firebreaks, roads and trails. (Priority 2).

2. Identify eroded areas requiring rehabilitation. (Priority 2).

3. Rehabilitate old quarries and eroded areas (refer to Section 7.4). (Priority 3).

4. Control access to outstanding geological features (such as caves and limestone ridges). (Priority 1).

5. Obtain limestone and sand for the Park's requirements outside the Park where possible. (Priority: Ongoing).

6. Incorporate geological features within nature trails where appropriate (refer to Section 16.0). (Priority: Ongoing).

7. **Restrict illegal off-road vehicle activity by erection of barriers and regular patrols (refer to Section 16.0). (Priority 1).**

6.0 HYDROLOGY

The hydrology of the Park involves a complex interconnecting system between a groundwater aquifer and the wetlands and caves. (For further information also refer to Sections 9.0 and 15.0.)

Hydrological information was obtained predominantly from the Water Authority Gnangara Mound Ground Water Resource Environmental Review and Management Programme (ERMP) (1986) and the EPA's response to the ERMP in Bulletin 295 (August 1987), except where cited.

The Park lies towards the western edge of the Gnangara Mound, an extensive, unconfined ground water aquifer that provides approximately 20 percent of the public water supply for Perth (Hopkins, pers. comm.). The Mound is recharged by the direct infiltration of rainfall, mostly between April and October. The water table generally reflects the topography, and wetlands occur where the water table is at or near the surface. Beneath the coastal strip the water table has a low gradient for three to four kms inland then rises very steeply immediately west of the lakes. This occurs close to the contact between limestone and sand and is believed to mark a ground water cascade where ground water locally moves through limestone caves.

To cater for public water supplies the Water Authority has proposed a number of schemes, including the Pinjar and Yeal schemes near Yanchep. Their potential environmental impact is reviewed in the ERMP. The major constraint in managing ground water resources is the retention of wetlands and natural water depths in the caves.

The Water Authority (1986) consider that the potential environmental impact on the Park's wetlands is low because:

> `the water table contours rise steeply to the east of the lakes such that lake levels are less susceptible to reductions in ground water levels to the east" (where the proposed scheme is situated), "the high transmissivities of the limestone will tend to mitigate drawdowns as water will rapidly flow into the area, the lake's steep sides and depth means that falls in level affect a narrower fringe than would be the case of a shallower lake'.

However, the ground water in the caves, which is essential to the maintenance of their environment, averages only 10 to 20 cms in depth. For the reasons above, abstraction of the ground water some distance away does not directly reflect a decrease of water depth in the caves. Nevertheless if there is any `unnatural' change in depth it can be critical. It is crucial that the normal depth and variation in the caves is maintained.

The EPA (1987) considered that the environmental impacts of the drawdown predicted in the ERMP are unacceptable for some wetlands, including Loch McNess and Yonderup Lake. The EPA recommended that for the Category 1 (Loch McNess) and Category 2 (Yonderup Lake) wetlands there should be no change in the existing regime of water quality and quantity, and normal climatic variations. (Categories of wetlands are discussed in Section 9.0). For Loch McNess the environmentally acceptable level is 6.9 Above Height Datum (AHD) and Yonderup Lake 5.15 AHD.

The Water Authority currently monitors water levels in Loch McNess and Yonderup Lake at monthly intervals, and monitoring will soon begin of water levels in Crystal Cave. Water quality of Loch McNess is being studied by Davis (in prep) funded by the Water Authority and EPA, and initial studies have been conducted for Yonderup, Wilgarup Lakes and Pipidinny Swamp. The Water Authority is also sponsoring monitoring of terrestrial wetland vegetation in the Park to study the inter-relationships between native flora, fauna and ground water.

The reservation of the Park and the nature of the surrounding land use has protected the wetlands and caves, which are dependent on the ground water, however further study and monitoring is essential given future proposals of large scale ground water abstraction in the Park's vicinity.

Implications for Management

1. The Water Authority considers that the environmental impact on the Park of ground water abstraction is low. Conversely, the EPA considers the drawdown predicted is unacceptable for Loch McNess and Yonderup Lake. This conflict stresses the necessity for further studies, including research into the inter-relationships between the ground water and the Park's caves and wetlands.

2. At present management practices in the Park appear to be effective in protecting the integrity of the wetlands. However, with any of the proposed management practices that may affect the ground water resources careful study is a prerequisite.

3. Factors external to the Park can affect its wetlands and caves, for example, abstraction may decrease water levels, whereas thinning of nearby pine plantations may result in an increase in water levels. Thus liaison between various authorities, particularly the Water Authority, and CALM is essential.

Management Objective

To maintain the existing regime of water quality and quantity in the wetlands and caves of the Park.

Prescriptions

1. **Promote a study of the inter-relationships between the ground water and the Park's caves in conjunction with WAWA, (see Section 11.4 on Research and Monitoring). (Priority 1).**

2. **Continue to encourage a program of monitoring the water quality and quantity of the lakes by WAWA and the EPA (linking with the existing CALM research data base on wetland nature reserves) and caves. (Priority: Ongoing).**

3. **Continue to encourage a program of monitoring the inter-relationships between the ground water and wetlands in conjunction with WAWA. (Priority: Ongoing).**

4. **Maintain a close liaison with other authorities, particularly WAWA, regarding future ground water abstraction. (Priority: Ongoing).**

5. **Identify and modify or restrict Park operations which interfere with ground water and surface water bodies, for example, the use of chemicals and fertilisers (see also Section 9.0). (Priority: Ongoing).**

6. **Consider the dependency of the wetlands and caves on the ground water in future management practices in areas to the east of the Park, for example, harvesting of pines in State Forest No. 65, and alter practices if necessary. (Priority: Ongoing).**

7. **Investigate the effect of ground water abstraction by CALM in the recreation area and take appropriate steps if the effect is significant. (Priority 2)**

7.0 VEGETATION

The flora of the Park is diverse, ranging from heathlands to forest, with wetland and dryland species associated with varying depths of waterlogged soils, yellow to brown soils and limestone.

7.1 TERRESTRIAL VEGETATION

The Park lies within the Drummond subdistrict of the Darling Botanical Province. The vegetation is predominantly representative of the Spearwood System. Some of the vegetation is more characteristic of the drier, Jurien system or the coastal, Guilderton system (Beard 1979).

The vegetation associations of the Park have been broadly described by Speck (1952), Havel (1968, in respect of the adjacent State Forest No. 65), Seddon (1972), Beard (1979, 1981) Heddle et al (1980) and Mattiske (1985).

There are 7 vegetation associations, these are depicted in Figure 5. Their occurrence is closely related to the type, depth and moisture content of the soil and more specifically, to the proximity of limestone. In general, boundaries between vegetation associations are diffuse rather than sharp.

The flora is influenced by a climate of wet, mild winters and hot, dry summers. The Park is close to the northern-most rainfall limit of Jarrah and Tuart woodlands of the south-west and within the transition zone from this vegetation-type to Banksia low woodland and scrub/heath (Beard 1979). The Park's annual mean rainfall is 770 mm with nearly 80 percent falling between May and September, which is 12 percent less than Perth's rainfall (Butcher, 1986).

The vegetation associations are as follows:

1. ***Eucalyptus gomphocephala* (tuart) association** (Beard 1979 and the `Tuart Forest' of Speck 1952). This occurs where limestone is close to the surface and consists of *E. gomphocephala* as the overstorey, at times in association with *E. calophylla* (marri) and *E. marginata* (jarrah), with a lower storey of *Banksia attenuata, B.*

menziesii, B. grandis and *Allocasuarina fraseriana* (sheoak). The understorey commonly has *Xanthorrhoea preissii* (blackboy) and *Macrozamia riedlei* (zamia palm). The shrub layer is rich and variable with different species taking dominance.

2. ***Eucalyptus marginata* (jarrah) association** (Beard 1979). This association occurs where soils overlying the limestone are deepest. It is only represented in small areas of the Park, but is more extensive in Ridges State Forest. This association consists of an overstorey of *E. marginata* and occasionally *E. calophylla* and a lower storey of *Banksia* species. The understorey differs from the tuart association, with no lime-tolerant plants.

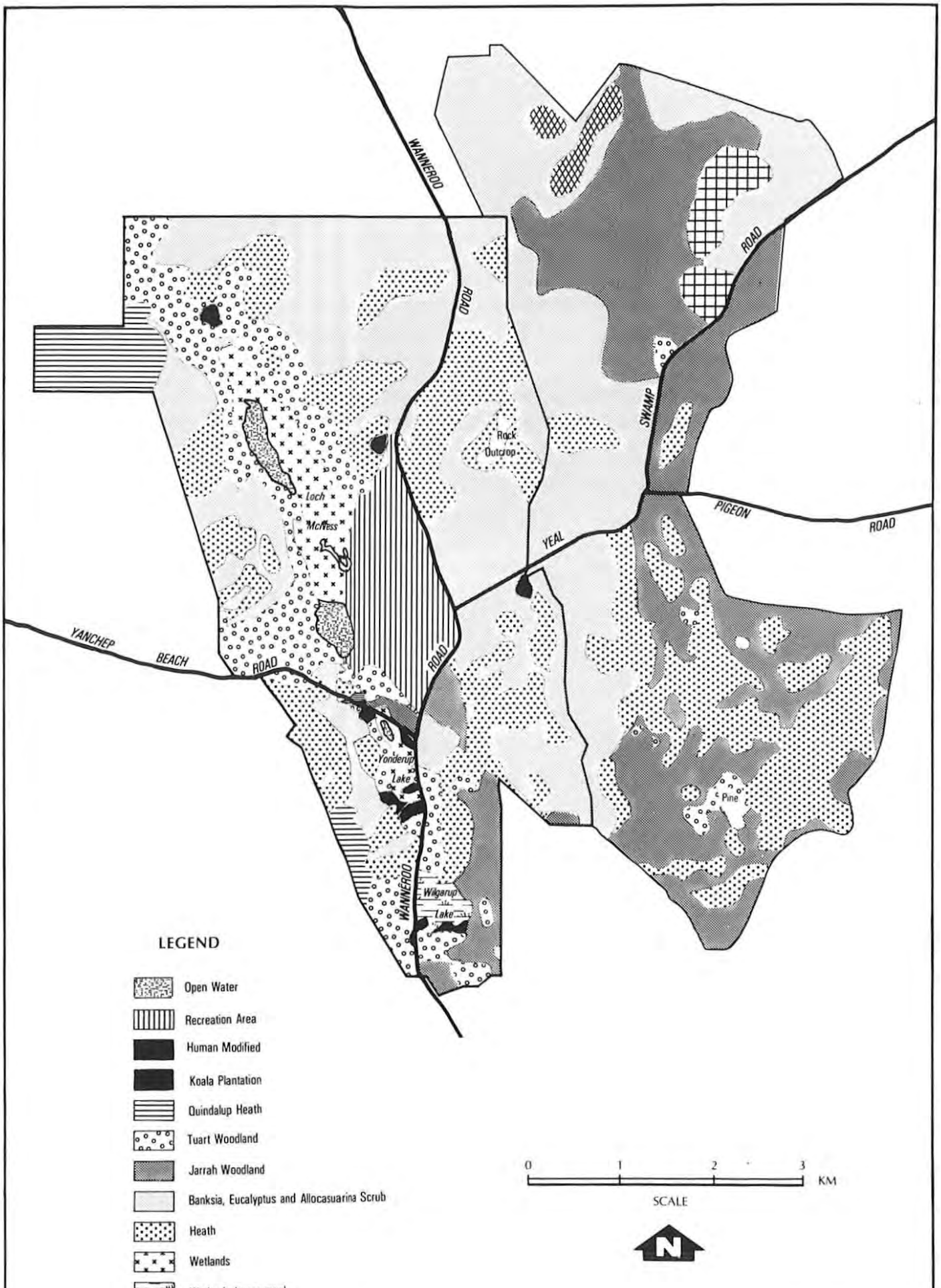
3. ***Banskia* Low Woodland** (Beard 1979). This association is more typical of the Jurien vegetation system, described by Beard (1979) as the vegetation of the Spearwood Dune System under reduced rainfall. It consists of *Banksia attenuata, B. grandis, B. menziesii* and occasionally *B. ilicifolia, Allocasuarina fraseriana* and *Eucalyptus todtiana* (pricklybark).

4. ***Banksia/Eucalyptus/Allocasuarina* Woodland**. This vegetation type is associated with the deeper soils on limestone and is common in Ridges State Forest. *Banksia menziesii, B. grandis, B. attenuata, Allocasuarina fraseriana* and *Eucalyptus todtiana* form a mixed overstorey. The understorey has a diversity of species with *Xanthorrhoea preisii, Hibbertia hypericoides and Stirlingia latifolia* often dominating.

5. ***Dryandra - Calothamnus* Heath** (Beard 1981). This association occurs on limestone ridges. With bare limestone outcrops and shallow yellow/brown sand, the soil is too shallow to support trees. This association is characterised by lime-tolerant plants. It is dominated by *Dryandra sessilis* (parrot bush) and *Calothamnus quadrifidus* (one-sided bottlebrush) and can be almost exclusively covered by either species.

6. ***Melaleuca/Dryandra/Acacia* Heath**. This association is restricted to limestone ridges in the north-west section of Ridges State Forest. Commonly occurring species include *Melaleuca aff. scabra, M. huegelii, Grevillea thelemanniana, Acacia rostellifera*, and *Dodonaea aptera.*

7. ***Melaleuca acerosa* Heath**. This occurs on the Quindalup soils, which are characterised by calcareous sand. It has been variously described as *Melaleuca acerosa* low scrub (Speck 1952) and a low dense thicket with characteristic



VEGETATION
Preliminary Interpretation
(by D. Lamont)

FIG. 5

dominants *Acacia lasiocarpa* and *Melaleuca acerosa* (Beard 1979).

7.2 WETLAND VEGETATION

In the Park there are three permanent wetlands (Loch McNess, Yonderup and Wilgarup Lakes) and a seasonally inundated swamp in the north-east of Ridges State Forest (also refer to Section 9.0 on Wetlands).

7.2.1 LOCH McNESS

The vegetation of Loch McNess has been described by McComb and McComb (1967) (Refer to Figure 6a). They divided Loch McNess into three sections: the eastern section (East Loch McNess) - ornamental lakes and the golf course, 16 ha; the southern section (South Loch McNess) - open water, 27 ha; and the northern section (North Loch McNess) - overgrown with dense vegetation, 150 ha.

Description of Vegetation

Open Water: Minute drifting plants (phytoplankton) are the only plants inhabiting the open water. These were studied by McComb and McComb (1967) and by Gordon *et al.* (1981). Compared with two other metropolitan lakes (Joondalup and Monger Lakes) Loch McNess has little phytoplankton, probably because of lower phosphorus and nitrogen levels, as Loch McNess is the least disturbed of the three lakes (Gordon *et al.* 1981).

Vegetation Fringing Open Water: Encroaching on the open water are sedge communities consisting mainly of *Schoenoplectus validus* and *Lepidosperma drummondii*. At the southern section of the lake there is an overstorey of *Melaleuca rhaphiophylla* (freshwater paperbark).

Sedge communities: The northern and eastern sections of the lake consist predominantly of dense sedge communities, the sedge type relating to the depth of water. *Schoenoplectus validus* and *Baumea articulata* occur in deeper water, *Typha orientalis, Baumea laxa* and *B. juncea* occur in shallower water which may dry out in summer. *Lepidosperma gladiatum* occurs densely in some areas, particularly around the border of sedge communities and adjacent woodlands, and also in deeper water (McComb and McComb 1967). Over the last ten to fifteen years *Typha orientalis* has been establishing itself further, particularly in North Loch McNess, diminishing the areas of open water.

Fringing Melaleuca Community: The *Melaleuca rhaphiophylla* community occupies a narrow zone around the fringe of the lake, and is largest around South Loch McNess. This area is seasonally inundated. *Eucalyptus rudis* (flooded gum) sometimes occurs in association with this species. The lake also has a number of exotic species, for example *Paspalum dilatatum* and *Geranium molle* (Dove'sfoot, Cranesbill) (McComb and McComb 1967).

7.2.2 YONDERUP LAKE

The vegetation of Yonderup Lake is shown in Figure 6b. Yonderup Lake has areas of open water and water overgrown by a dense growth of rushes and sedges, including the introduced species *Typha orientalis* (bulrush). Close to the water's edge is a zone of *Melaleuca* closed woodland. Further from the water, in the less water-logged soils, Banksia closed woodland comprising *Banksia littoralis* and *B. ilicifolia* predominates (E.P.A. in prep.). The presence of *Typha orientalis* may indicate unnatural disturbance of the lake (E.P.A. in prep.).

7.2.3 WILGARUP LAKE

The vegetation of the lake is illustrated in Figure 6c. It has little open water, with dense sedges and rushes surrounded by *Melaleuca* species and *Eucalyptus rudis* communities.

7.2.4 SEASONALLY INUNDATED WETLAND

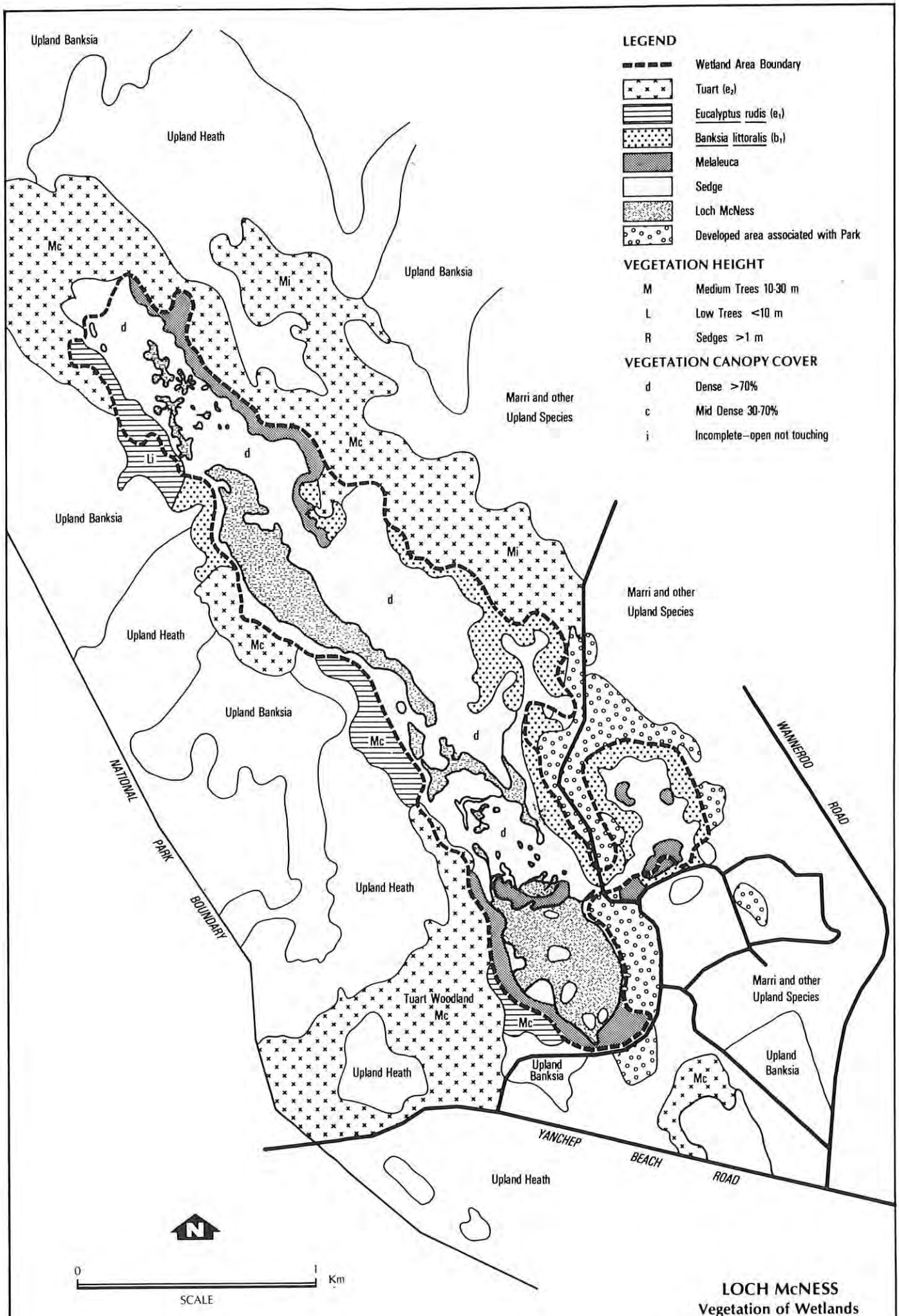
Large *Melaleuca* species (paperbarks) dominate throughout this association. *Eucalyptus rudis, Adenanthos cygnorum, Banksia ilicifolia* and *Verticordia nitens* also occur. The understorey is almost non-existent, but where present it is often Cyperaceae species.

7.3 RARE AND RESTRICTED FLORA

The Park contains several flora species which are either rare or restricted. They are all associated with limestone and most are located in Ridges State Forest (see Table 2).

Eucalyptus aff. conglobata is a recently gazetted rare species (listed as *Eucalyptus* species Yanchep MIH Brooker 8608). This species is known from only one other smaller population near Wabling (S. D. Hopper, pers. comm.).

Eucalyptus aff. falcata, another limestone endemic species, is found in the western part of the Park. It has a restricted distribution, occurring in isolated populations in about 10 sites



LOCH McNESS
Vegetation of Wetlands
Preliminary Interpretation
(E.P.A. Unpublished)

FIG. 6(a)

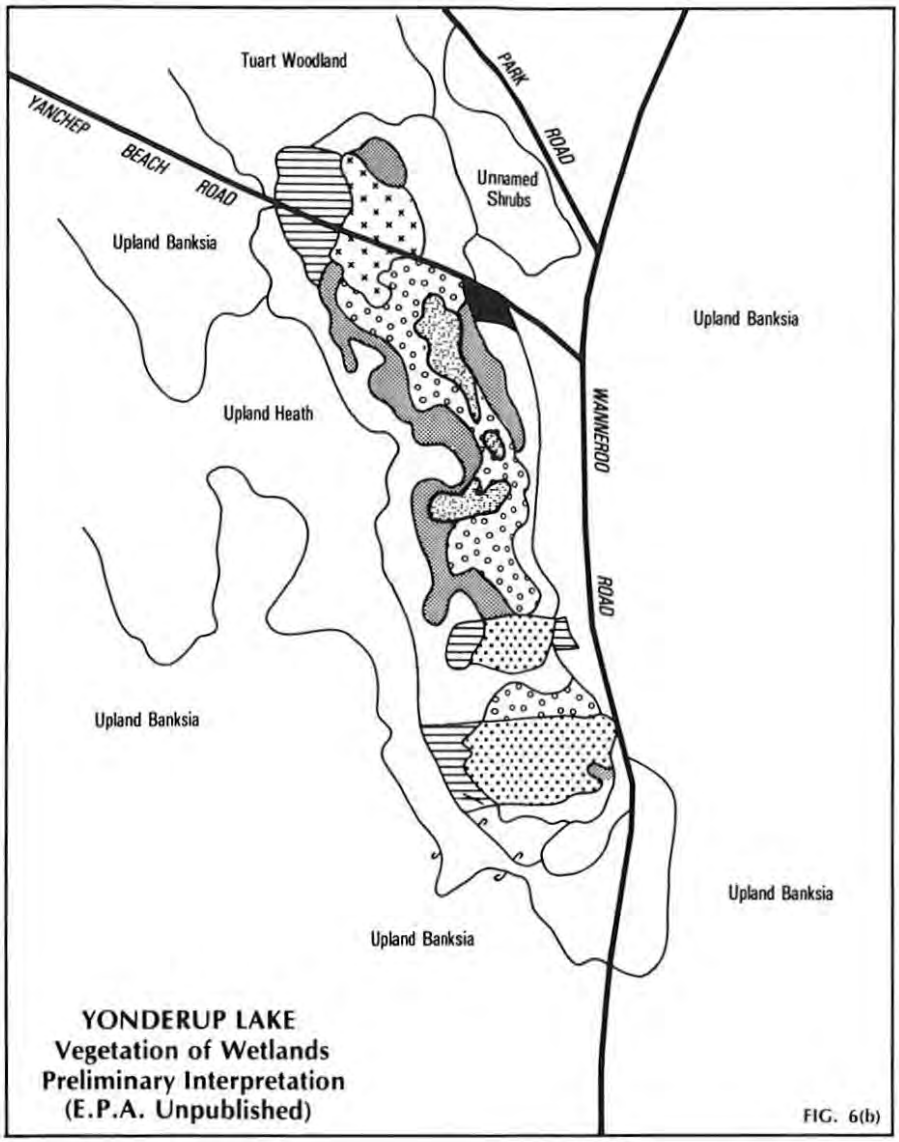
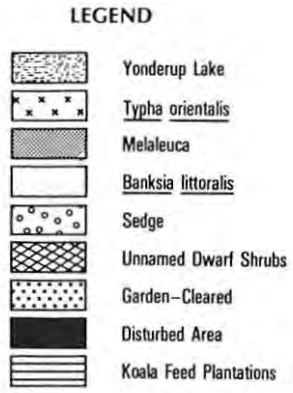

Tuart Woodland
YANCHEP BEACH ROAD
PARK ROAD
Unnamed Shrubs
Upland Banksia
Upland Banksia
Upland Heath
WANNEROO ROAD
Upland Banksia
Upland Banksia
Upland Banksia
YONDERUP LAKE
Vegetation of Wetlands
Preliminary Interpretation
(E.P.A. Unpublished)

FIG. 6(b)


N
0
250
500
metres
SCALE


LEGEND
Yonderup Lake
Typha orientalis
Melaleuca
Banksia littoralis
Sedge
Unnamed Dwarf Shrubs
Garden–Cleared
Disturbed Area
Koala Feed Plantations

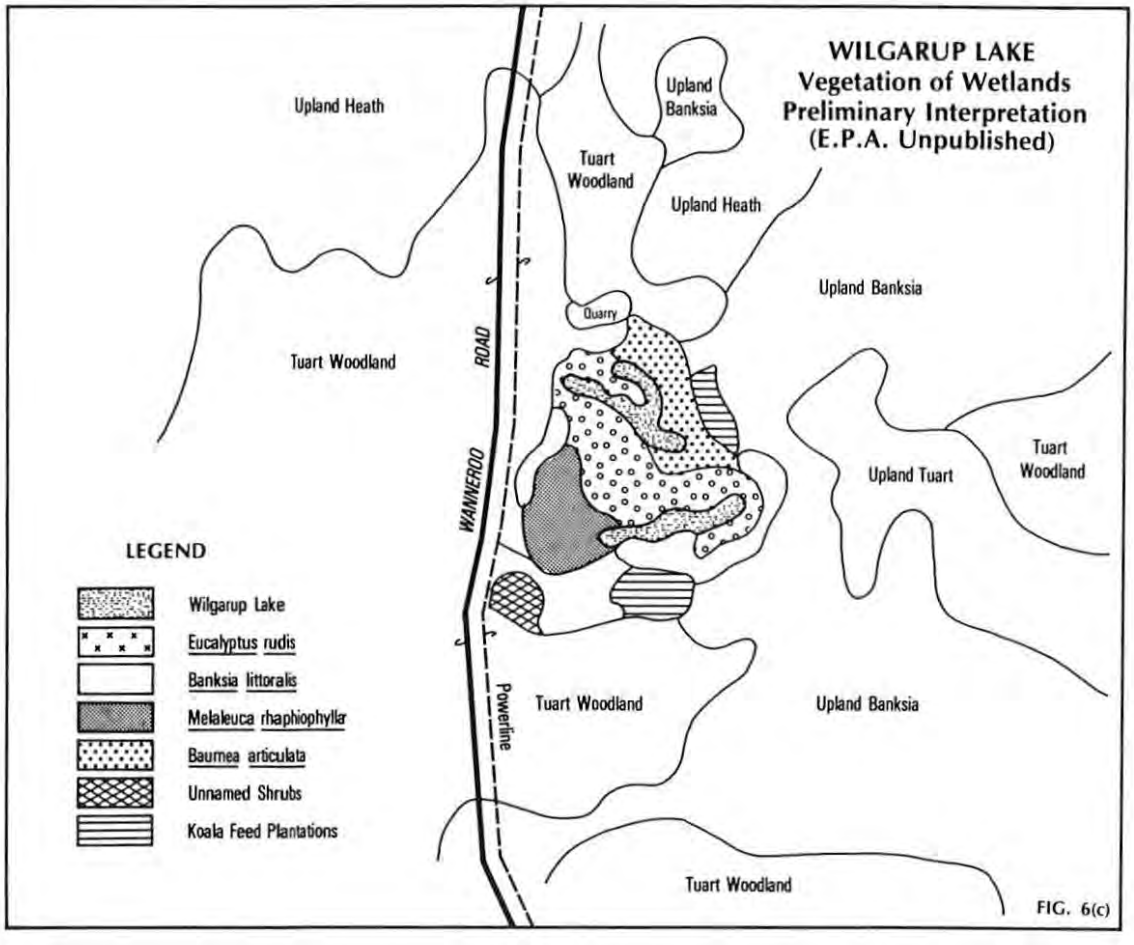

WILGARUP LAKE
Vegetation of Wetlands
Preliminary Interpretation
(E.P.A. Unpublished)
Upland Heath
Upland Banksia
Tuart Woodland
Upland Heath
Upland Banksia
Quarry
Tuart Woodland
ROAD
WANNEROO
Upland Tuart
Tuart Woodland
Powerline
Tuart Woodland
Upland Banksia
Tuart Woodland
LEGEND
Wilgarup Lake
Eucalyptus rudis
Banksia littoralis
Melaleuca rhaphiophylla
Baumea articulata
Unnamed Shrubs
Koala Feed Plantations

FIG. 6(c)

between Eneabba and Yalgorup. The status of this undescribed species is unknown (S. D. Hopper, pers. comm.).

Eucalyptus foecunda (narrow-leaved red mallee) occurs in limestone areas in the Park. It occurs infrequently from Lancelin to Yalgorup (S.D. Hopper, pers. comm.).

Stylidium aff. affine grows on limestone ridges. It is an undescribed species known from a number of coastal localities from Yalgorup through to about Lancelin (A. H. Burbidge, pers. comm.). This is the farthest inland known occurrence.

Other species of note, though not rare or restricted, include *Pteris vittata* (Chinese brake fern) and *Conostylis pauciflora* subsp. *euryhipis*. The *Conostylis* is of interest as it is occuring at its southern most limit in the Park (S. D. Hopper, pers. comm.). The brake fern grows in seepages near Gloucester Lodge and is unusual in that it is a Northern Australian species. There are three known localities in the south-west, all limited in extent (N. Marchant, pers. comm.). The species of *Conostylis* and *Eucalyptus* have lignotubers and thus regenerate well after fire, although probably seed recruitment is difficult with frequent fire (S. D. Hopper, pers. comm.). Little more is known of their ecology.

TABLE 2

RARE AND RESTRICTED FLORA

RARE
Eucalyptus aff. conglobata (Eucalyptus species Yanchep MIH Brooker 8608).

RESTRICTED
Eucalyptus aff. falcata
Eucalyptus foecunda
Stylidium aff. affine

Implications for Management

1. The fire ecology of most species is unknown and there is little data on fire sensitive species; in order to maintain diversity and richness of the flora a range of fire regimes is desirable.

2. Conservation of rare species is required under the Wildlife Conservation Act (1950).

3. The vegetation of the wetlands is vital in the maintenance of water quality and so should be managed for wetland protection including rehabilitation where necessary.

4. It is important that the range of water depths, resulting in the diversity of vegetation types in Loch McNess, is maintained.

5. The Park is close to the northern-most rainfall limit for jarrah and tuart forests; this increases the conservation value of the Park.

6. The continued spread of *Typha orientalis* is changing the range of habitats in Loch McNess. Further investigation is required to determine the effects and desirability of this spread.

Management Objectives

1. To maintain the variety of vegetation types including their age, distribution and community structures.

2. To maintain viable populations of rare and restricted flora.

3. To develop the interpretive potential of the different vegetation associations.

Prescriptions

1. Develop a range of fire regimes which will maintain a variety of vegetation types, ages and community structures and which will maintain or enhance viable populations of rare and restricted flora. (Priority: 1).

2. Continue to monitor and conduct surveys of rare and restricted flora in the Park, and where possible other flora. (Priority: Ongoing).

3. Determine fire vulnerable species in the Park. (Priority 1).

4. Investigate the spread of *Typha orientalis* in Loch McNess and determine the need or desirability to alter or control its spread. (Priority 2).

5. **Identify degraded areas requiring rehabilitation. (Priority 2).**

6. **Progressively rehabilitate degraded areas (see also section 7.4). (Priority: Ongoing).**

7. **Develop nature trails which encompass the major vegetation associations in the Park. (Priority 2).**

7.4 REHABILITATION

A number of strategies to rehabilitate specific areas have been recommended in this plan. (These are summarised in Table 3).

Rehabilitation of an area:

i) improves the natural integrity of the Park

ii) increases and enhances the fauna habitat

iii) assists natural regeneration in disturbed areas

iv) prevents soil erosion

v) improves visual amenity.

Management Objective

To rehabilitate degraded areas, re-creating as close to natural communities as possible.

Prescriptions

1. **Carry out rehabilitation operations according to CALM Policy Statement No. 10. (Priority: Ongoing).**

2. **Identify areas within the Park requiring rehabilitation (see Sections 5.O and 7.0). (Priority 2).**

3. **Assign priorities to implement rehabilitation programs. (Priority: Ongoing)**

4. **Determine optimum site preparation, species (using local seed) and planting techniques/patterns, and manage accordingly. (Priority: Ongoing).**

TABLE 3 REHABILITATION PRESCRIPTIONS

SECTION	STRATEGY	PRIORITY
5.0 Geology Soils and Landforms	. Rehabilitate old quarries. . Rehabilitate eroded areas.	3 ongoing
7.0 Vegetation	. Progressively rehabilitate degraded areas.	ongoing
9.0 Wetlands	. Rehabilitate former koala feed plantations. . Rehabilitate cleared areas around lake perimeters and the swamp in Ridges State Forest.	ongoing 2
10.0 Protection	. Rehabilitate areas in which weeds have been controlled.	ongoing
Recreation Area 14.4.1(a) Vehicle circulation	. Rehabilitate all former roads/tracks.	ongoing*
14.4.1(b) Carparking	. Rehabilitate all former carparks.	ongoing*
14.4.4(b) Ranger's office building	. Rehabilitate the area (when the office is removed).	1*
14.4.4(c) Kangaroo/emu enclosure	. Remove existing enclosure and rehabilitate.	1*
14.4.5(g) Swimming pool	. Rehabilitate the area (when the swimming pool is removed) and revert to natural streams.	1*
14.4.6(c) Maintenance Service Area	. Rehabilitate formerly used areas.	3
14.4.6 (g) Ranger houses	. Rehabilitate former house areas.	2
15.0 Caves	. Rehabilitate access tracks to restricted entry caves.	2

* A priority 1 once removal works are completed, since these are in public viewing areas.

8.0 FAUNA

The natural habitats of the fauna of the Swan Coastal Plain have significantly diminished over the last century, particularly the wetlands and eucalypt woodlands. This has contributed to a decline of the native fauna.

The Park has a range of wetland and terrestrial habitats hosting a diversity of animal species including mammals, birds, amphibians, reptiles and terrestrial and aquatic invertebrates.

There are five fauna species that are declared rare or otherwise in need of special protection and a number of species with a restricted distribution which have been recorded in the Park. The fauna of the Park have not been comprehensively surveyed. Data are from W.A. Museum records, a 1977-1978 Northern Swan Coastal Plain Survey (W.A. Musuem 1978) and in October 1987 CALM commenced fauna surveys of the Park. There is very limited ecological information for the species in the Park. Declared rare species are shown in Table 4.

TABLE 4

RARE FAUNA
Dasyurus geoffroii (Western Native Cat)
Morelia spilota imbricata (Carpet Python)
Vermicella calonotos (Black-striped snake)
Stictonetta naevosa (Freckled duck)
Falco peregrinus (Peregrine falcon)

8.1 MAMMALS

Thirty-three native mammals have been recorded on the Northern Swan Coastal Plain (Kitchener *et al.* 1978). Fifteen indigenous mammals and six introduced mammals have been found at Yanchep National Park. Over the years there has been a decline in mammals on the Coastal Plain. Suggested reasons include the introduction of feral species, large scale clearing, urbanization and changes in fire regimes.

Indigenous Mammals

The 1987 survey showed the decline of at least six indigenous mammals in the Park, with several of these species possibly at or near local extinction. *Dasyurus geoffroii* (Western Native Cat), a species that is Gazetted rare or otherwise in need of special protection, has been recorded in the Park (most recent record is 1972, W.A. Museum). This species is sparsely distributed over the south-west of Western Australia (Arnold 1983), and is possibly now extinct. (A.H. Burbidge pers. comm.).

Two species, *Tarsipes rostratus* (Honey Possum) (recorded frequently in 1987 survey) and *Cercartetus concinnus* (Western Pygmy-possum) (not recorded recently) are limited in extent though common where they do occur (Renfree and Wooller 1983; Smith 1983).

Four bat species have recently been recorded in the Park (A. H. Burbidge, pers. comm.) including *Nyctophilus major* (Greater Long-eared Bat) which is an uncommon species that lives in dry, open woodland; little is known of its biology (Richards 1983).

Another species of note is *Isoodon obesulus* (Southern Brown Bandicoot) whose range has been greatly reduced in Western Australia (diggings recorded 1987, and one road kill in early 1988 A. H. Burbidge, pers. comm.). It is now uncommon in the Park.

The Western Grey Kangaroo (*Macropus fuliginosus*) is common in the Park, particularly in the limestone scrub and recreation area. The kangaroos can be easily observed by the public. They offer an ideal opportunity to observe this animal uncaged and semi-wild in an attractive environment. Regular counts have occurred since 1986 on the ovals, lake front and golf course. Numbers appear to be increasing in these areas (R. Davis, pers. comm.). During the summer months they move from the open scrub to the eucalypt woodland, to avoid heat stress (Kitchener *et al.* 1978). The recreation area is popular with kangaroos, which feed on the gardens (if they are not fenced) and green lawns of the ovals, golf course and picnic areas. Kangaroo numbers are artificially high in the Park because of the easy availability of food and water in the recreation area and in the farmlands surrounding the Park.

Although they were trapped in the late 1970s, in a recent Park survey (October 1987 and April 1988) no native rodents were trapped, however, two introduced rodent species were caught. This apparent decline in numbers is of considerable concern as the native *Rattus fuscipes* was once common in the Park (A. H. Burbidge, pers. comm.). This appears to be a trend also in the northern jarrah forests (W. Schmidt, pers. comm.). Another native rodent, *Pseudomys aldocinerea*, was not caught during the 1987/88 survey.

No brush-tailed possums (*Trichosurus vulpecula*) have been seen in the Park for some years, apart from one or two rehabilitated animals that have been released in the Park. There are feral animals in the Park including foxes, cats, rabbits and feral bees. These animals can have a severe detrimental effect on indigenous species. Management of feral animals is discussed in Section 10.3.

8.2 REPTILES/AMPHIBIANS

The Northern Swan Coastal Plain is rich in reptiles and amphibians, with 70 species (Storr *et al.* 1978a). Forty seven species have been found in the Park, 41 of these were recorded in the 1987/88 survey. Two species, *Morelia spilota imbricata* (Carpet Python) and *Vermicella calonotos* (Black-striped Snake) are declared rare or otherwise in need of special protection.

Eight species occurring in the Park are endemic or almost endemic to the west coast and coastal plain from the North-west Cape south to Geographe Bay. There are 6 skink species *Lerista praepedita, L.elegans, L.lineopunctulata, Hemiergis peronii quadrilineata, Ctenotus leseurii, Morethia lineocellata*, one legless lizard, *Aprasia repens*, and a gecko, *Plethola gracilis* (Storr et al. 1978a). The long-necked tortoise (*Chelodina oblonga*) is found in Loch McNess.

The reptiles and amphibians of the Park occupy a range of environments including sandy areas, freshwater swamps and lakes, limestone, coastal dunes and woodland. They reside in many micro habitats, for example, burrows, under leaf litter, in rock crevices and under loose bark (Tyler *et al.* 1984; Swanson 1987). Some of the micro habitats are destroyed by fire and thus the frequency and area of wildfires are important factors in their protection. All of the amphibians require unpolluted surface water for the development of their larvae (Storr *et al.* 1978a). Certain reptiles also require surface water or damp places (Storr *et al.* 1978a).

Some of the snakes occurring in the Park are capable of causing death through their venom. Modern first aid treatment has decreased the likelihood of this happening and, furthermore, the Park is relatively close to medical facilities. However, due to the considerable variation in colour and pattern of snakes, visitors need to be wary of all snakes and be particularly cautious when bushwalking in spring and summer.

8.3 BIRDS

There have been 134 species of birds recorded in the Park. A further seven species occur at Pipidinny Swamp and are likely to occur in the Park. Ninety-two of these are land birds and 49 are wetland birds. Four feral species are found in the Park.

The Freckled Duck (*Stictonetta naevosa*) (Congreve 1971) and Peregrine Falcon (*Falco peregrinus*), which are declared rare or otherwise in need of special protection, have been observed in the Park. The Freckled Duck inhabits the deeper waters of open lakes and wetlands surrounded by dense vegetation, especially *Typha* and paperbarks (Blakers *et al.* 1984). The Peregrine Falcon is generally sedentary, inhabiting inland tree-lined watercourses, woodland, pasture, swamps and eucalypt forest near the coast (Blakers *et al.* 1984).

Nine species recorded in the Park have seriously diminished in numbers on the Swan Coastal Plain this century. These are the Australasian Shoveller (*Anas rhynchotis*), Musk Duck (*Biziura lobata*) Whistling Kite (*Haliastur sphencerus*), Marsh Harrier (*Circus aeruginosus*), Brown Falcon (*Falco berigora*), Scarlet Robin (*Petroica multicolor*), Golden Whister (*Pachycephala pectoralis*), White-naped Honeyeater (*Melithreptus lunatus*) and Yellow-plumed Honeyeater (*Lichenostomus ornatus*) (Storr *et al*, 1978b). The last four species would predominantly have used the tuart areas in the Park. This adds signficantly to its conservation value. Also, the Emu and Painted Quail have declined (Storr and Johnstone 1988).

Other species of note which have been recorded in the Park are those listed on the Japanese/Australian and/or Chinese/Australian Migratory Bird Agreements. These are the Glossy Ibis (*Plegadis falcinellus*), Garganey (*Anas querquedula*), Greenshank (*Tringa nebularia*), Common Sandpiper (*T. hypoleucos*), White-winged Tern (*Chlidonias leucoptera*), Fork-tailed Swift (*Apus pacificus*) and Rainbow Bee-eater (*Merops ornatus*).

Habitats

The diversity of birds is directly related to the diversity and size of habitats in the Park.

The wetlands and eucalypt woodland habitats have diminished significantly on the Swan Coastal Plain (Storr *et al.* 1978b), and their conservation in the Park is therefore of significance to birdlife.

Few waders occur in the Park due to the lack of suitable feeding areas, that is, exposed or shallow mud flats. However, nearby Pipidinny Swamp provides suitable feeding areas for some species of waders (see Section 11.2.3).

The large areas of heath and Banksia in the Park provide the major food source for an abundance of honeyeaters (G. Shannon, pers. comm.). The type of fire regime adopted is important as burning affects flowering and thus the extent of their food resource.

8.4 FISH

There are three fish species recorded from Loch McNess: the native *Bostockia porosa* (nightfish) and two introduced species *Gambusia affinis* (Mosquito fish) and *Carassius auratus* (Golden Carp) (Sarti and Allen 1978). The lake provides a number of habitats including sedges, undercut banks, open water, cool water and stream outlet (Sarti and Allen 1978).

Gambusia affinis appears to have out-competed all but the one native fish species. *Bostockia porosa* (the only native) is distributed throughout the south-west of Western Australia though restricted to a few areas in the northern Swan Coastal Plain (Sarti and Allen 1978).

8.5 INVERTEBRATES

The invertebrates, especially terrestrial invertebrates, of the Park have not been comprehensively studied. It is likely that they are reasonably abundant given the diversity of flora and other fauna species.

Terrestrial Invertebrate Fauna

The terrestrial invertebrates of the Park have not been surveyed, with the exception of a small collection of butterflies in 1981 by Mr Mark Hunting from Victoria (National Parks Authority records). He collected four common species of butterflies - *Vanessa itea, V. kershawi, Geitoneura minyas* and *G. klugii.*

Aquatic Invertebrate Fauna

The aquatic invertebrate fauna of Loch McNess has been studied by Ayre *et al.* (1977) and Hembree and George (1978). Loch McNess provides a wide variety of habitat types (ten, according to Ayre *et al.* 1977 and all seven types described by Hembree and George 1978).

There are aquatic invertebrates in caves, these are discussed in Section 15.1.

Of a number of lakes on the northern Swan Coastal Plain, Loch McNess is interesting in that it:

contains the highest number of species (Hembree and George, 1978). This may be due to the wide variety of habitats of the lake, some of which have been caused by the long history of human interference (Ayre *et al.* 1977).

has comparatively low numbers of animals per sample (Hembree and George 1978). This may be due to low nutrient levels (J Davis, pers. comm.) and the heavy-sediment lake bottom which, when stirred by wind and waves (and boats), greatly reduces the dissolved oxygen levels and can lead to the release of hydrogen sulphide (Ayre *et al.* 1977). This would make conditions unsuitable for high numbers of animals.

has the highest number of species of molluscs and crustaceans.

has two species not found elsewhere in the lakes sampled: the pea clam, *Sphaerium* species and the marron, *Cherax tenuimanus*. The marron was introduced into the lake after World War II.

The aquatic invetebrate fauna of the lakes does not appear to be rare or unique (Hembree and George 1978), although it can be seen from the above that the lake has considerable conservation value amongst the lakes of the Coastal Plain. The most important habitat is the littoral fringe zone (section of the lake lying close to the edge) where the greatest number and diversity of species was collected (Hembree and George 1978). The aquatic invertebrate fauna of the caves are unique (see Section 15.1).

Implications for Management

1. There is limited information regarding fauna species present in the Park and their ecology. Furthermore, some of the information available may be outdated. The commencement of surveys by CALM is important in the confirmation of species recorded some time ago, in the identification of new species and as a basis for future monitoring. There is a need for studies of the fauna, with priority given to rare, restricted and fire sensitive species.

2. While our knowledge of required fire regimes is incomplete it is considered that a wide range of fire regimes is required to cater for the greatest diversity of species possible. This allows flexibility as more information concerning specific communities and species is forthcoming.

3. Gazetted rare species are present in all the Park's habitats (forest, woodland, limestone ridges, sandy areas and wetlands); therefore all areas of the Park are important for rare species.

4. Maintenance of habitat is essential for the survival of fauna. Wetlands and eucalypt woodlands are particularly important, given their faunal diversity and the ever diminishing representation of natural areas on the Swan Coastal Plain; leaf litter and dead vegetation are important as micro habitats for some reptiles; all these habitats need to be maintained.

5. The littoral zone has the greatest diversity and abundance of aquatic invertebrates and requires protection.

6. The status of kangaroos and their effect on other species needs to be determined and their numbers limited if necessary.

7. Members of the public need to be advised of the potential dangers of venomous snakes and appropriate first aid treatment.

8. There is educative/interpretive potential in the fauna of the Park.

9. Feral animals need to be controlled as their presence is likely to be responsible for the decline in richness and diversity of some Park fauna species (refer to Section 10.3).

Management Objectives

1. To maintain viable populations of all indigenous fauna in the Park.

2. To provide opportunities for visitors to view and gain an understanding of the Park's fauna.

Prescriptions

1. Continue monitoring and surveying the fauna with priority given to rare and restricted species. (Priority: Ongoing).

2. Determine which species in the Park are fire sensitive. (Priority 1).

3. **Arrange for Park staff to record sightings of Gazetted rare species. (Priority: Ongoing).**

4. **Design fire regimes with sufficient variety (in size of burn, intensity, frequency and season), to maintain diverse habitat requirements of fauna, particularly those that are rare or restricted. (Priority: 1).**

5. **Monitor kangaroo numbers and instigate control programs if they are found to have an adverse effect on other species. (Priority: Ongoing).**

6. **Design walk trails, firebreaks and all other developments to minimise habitat damage. (Priority: Ongoing).**

7. **Advise members of the public regarding the potential dangers of venomous snakes and first aid procedures. (Priority: Ongoing).**

8. **Develop opportunities to promote an understanding and appreciation of the Park's fauna, for example:**

   establishment of viewing hides
   prepare information and displays on fauna
   provide guided interpretive walks relating to fauna (see Section 18.0)
   advise tour operators and visitors of the best wildlife viewing times and locations. (Priority: Ongoing).

9.0 WETLANDS

The significant wetlands in the Park are three permanent lakes (Loch McNess, Yonderup Lake and Wilgarup Lake) and a swamp in the north-east of Ridges State Forest, all of which are fresh (see Figures 1 and 5). Pipidinny Swamp, close to the south-west boundary, will be an addition to the Park (refer to Section 11.2.3). Loch McNess has been well studied and is often used as a comparison with other metropolitan lakes because of its high environmental quality (see Section 9.2). Yonderup and Wilgarup lakes have been poorly studied and there has been no study of the swamp. (Refer to Section 6.0 Hydrology, Section 7.0 Vegetation, and Section 8.0 Fauna for further information).

In the `Draft Guidelines for Wetland Conservation in the Perth Metropolitan Area' (EPA 1986), wetland water quality was assessed in relation to natural and human use attributes Loch McNess was given the highest natural attribute score, and the second highest human-

use attribute (or recreational value) score (behind L. Joondalup) of all the wetlands in the metropolitan area. The high scores for both natural and recreational attributes implies a potentially high conflict between these two uses. Loch McNess is one of the five wetlands that have been designated as Category 1 Wetlands, (wetlands of exceptionally high natural and/or human use attributes). Yonderup is designated Category 2 (wetlands with relatively intact natural systems) and Wilgarup Category 3 (wetlands which have been highly modified but which are considered to play important roles in their urban and/or rural settings). This category does not appear appropriate for Wilgarup Lake, which has not been highly modified compared with other lakes in the metropolitan area and category 2 is not appropriate for Yonderup Lake because of the extensive disturbance.

9.1 GENERAL DESCRIPTION

Loch McNess

Loch McNess has three well defined sections that differ in their vegetation types, fauna, and hydrology (both natural and modified). The total wetland area is 255.3 ha consisting of Sedge complex (149.3 ha), Swamp Banksia/Paperbark (56.6 ha) and open water (49.5 ha) (EPA, in prep) (see Figure 6a).

North Loch McNess, compared with other metropolitan lakes, is relatively natural due to lack of modification (little or no clearing of vegetation has occurred and it has none of the impacts associated with urban or rural development). The lake appears shallow but the bottom is actually an unconsolidated peat mat through which water flows to a depth of about 6 m. (A. McComb, pers. comm). In summer, some of the shallower areas dry out. A dense growth of sedges covers much of the lake.

South Loch McNess has a more constant water level which varies by approximately 0.2 m annually (EPA in prep). In the metropolitan region South Loch McNess is the only wetland (for which records are available) which displays this constancy in water level.

Much of East Loch McNess was cleared in the 1930s for an oval which was not developed; it has since regenerated into a swamp, overgrown with sedges, reeds and flooded gums. In part of a stream flowing into the swamp, an ornamental lake was constructed.

Yonderup Lake

Loch McNess is believed to overflow into Lake Yonderup (Bridge 1971). This lake has seasonal variations in water level annually by 0.6 to 0.8 m (EPA, in prep).

There is a variety of habitats which support a diversity of fauna, particularly birds, however, it has been disturbed and contains many weeds.

Wilgarup Lake

This wetland (16.8 ha) is more a swamp than a lake (EPA, in prep), and does not have as wide a range of habitats as the two other lakes, but is less disturbed.

Loch McNess is the most studied wetland because it is recreationally the most important of the three wetlands and thus more information is included on it in this plan.

9.2 ENVIRONMENTAL QUALITY

Modification of wetlands (such as clearing surrounding vegetation and input of pollutants) affects the water quality, which in turn affects all of the components of the complex lake ecosystems. One way of understanding a wetland is to measure the quality of its water including ph, dissolved oxygen, temperature, conductivity, salinity and nutrient levels. Water quality of Loch McNess has been measured by Ayre et al. (1977), Gordon et al. (1981) and Davis (pers. comm.) and is summarized as follows:

* Loch McNess is very fresh (it has a low salinity), which is probably due to the constant inflow of fresh groundwater (Gordon *et al.* 1981).
* Nutrient levels in Loch McNess are very low in comparison to other metropolitan wetlands and the lake has had little unnatural input (Ayre *et al.* 1977, Gordon *et al.* 1981). Comparatively lower numbers of phytoplankton and zooplankton probably relate to the lower nutrient levels (Gordon *et al.* 1981; J. Davis pers. comm.).

Loch McNess has a high environmental quality in that it has a high water quality and is undisturbed, thus acting as a benchmark from which other lakes can be compared. However, being low in nutrients the lake does not support high numbers of invertebrates (see also Section 8.5) which in turn do not support large numbers of aquatic birds; the lake probably acts more as a refuge than a feeding area.

Generally, it appears that the quality of South, East and North Loch McNess differ, probably as a result of different vegetation types and past activities, which have modified East and South, and left the North mostly unaltered.

9.3 FACTORS AFFECTING THE QUALITY OF THE WETLANDS

Loch McNess

Dredging - occurred between 1936 and 1940 and again in 1968 around the periphery of the open water to allow a launch to take visitors around the lake. Dredging had the following effects:

disturbance of sediments

creation of new habitats for flora and fauna including the formation of islands resulting in a greater variety of vegetation types, sedges, aquatic invertebrates and birds.

Construction of a Causeway - separating North and South Loch McNess. It was originally constructed in the 193Os (of silt and earth), and rebuilt in the 1950s and again in 1982 (of crushed limestone), when the Yanjidi Trail was constructed. The hydrology of the lake before the causeway was constructed is not known. The water now appears to flow from East to South Loch McNess; the direction of flow between north and south is uncertain although tests in the 197Os indicated a flow from south to north (R. Waterhouse, pers. comm.). The causeway effectively divides the lake into two quite different sections and possibly restricts water flow.

Septic Tanks - septic tanks have been used in the Park since the 193Os. Nutrients leach from the tanks into the surrounding ground and through to the ground water. The Water Authority estimates that 18 kg of nitrogen seeps into the ground water from one septic tank per year (B O'Leary pers. comm.). Depending on the rate and direction of flow of the ground water, a proportion of this would enter Loch McNess. Since nitrogen levels in the Loch are low, the septic tanks do not appear to have had significant effect on the water quality of the lake. However, this needs further investigation.

Fertilisers - are required in order to maintain lawns and have been added to the lawns, ovals and the golf course once a year for many years. It is not known whether there is run-off and if so, to what extent.

Launch and Rowing Boats - Since the 1930s there have been a launch and rowing boats used on South Loch McNess. The launch operations ceased in 1986. Detrimental effects on South Loch McNess include:

stirring of sediments which increases turbidity and decreases dissolved oxygen levels, possibly decreasing the zooplankton levels (Ayre et al. 1977)

littering of the lake

provision of access to normally inaccessible areas, which can result in damage to vegetation and disturbance of wildlife

noise (particularly from engines) and physical presence which disturbs water birds, especially during breeding seasons

boat wash (mainly from the launch)

dredging was necessary (launch only)

diesel and oil from engines (launch only).

Swimming Pool, Golf Course, Ornamental Lakes and North Oval - Have all affected the hydrology and quality of the East Loch McNess by:

Land fill of some areas (golf course, north oval)

Interruption of natural stream flows into the wetland (swimming pool)

Clearing of vegetation (ornamental lakes, golf course, north oval).

An unknown quantity of chlorine has leaked from the swimming pool via old pipes and construction joints since 1986. The pool has since been repaired. The amount that was leaking into the lake may be significant given that each week an amount of water equivalent to the contents of the pool was lost. This will continue to be a problem while the pool exists in the unstable conditions of the ground water.

Clearing of Vegetation - There has been some clearing of native vegetation in the following areas:

In the developed recreation area

At the northern end of the lake in the vicinity of the ghost house ruins. A koala feed plantation has since been established in this area

A small area to the west of the lake, where koala feed plantations have been established.

The effects of clearing for the recreation area and, koala feed plantation, and subsequent activities on South Loch McNess are not known.

Yonderup Lake

The lake has been modified by:

Farming activities up until the 1950s. The lake has been drained into channels about 3 m apart. Some of the original vegetation in the lake (sedges) was modified by the farming, other species would also have been affected.

Yanchep Beach Road and Wanneroo Road. Both roads cut off sections of the wetland; subsequent drainage from the roads would adversely affect water quality

as a result of foreign materials washing from the road.
Road works and farming activities have caused extensive disturbance to the wetland, which has resulted in the spread of exotic plants.
Establishment of koala feed plantations on former market gardening areas.
A number of weed species occur in the lake and on its margins.

Wilgarup Lake

The lake has had modification to its periphery, with clearing for firebreaks and the establishment of koala feed plantations. However, the vegetation close to, and within, the lake remains very dense, and apparently little disturbed.

Implications for Management

(Further implications are included in Section 6.0 Hydrology)

1. Rehabilitation of cleared areas around wetlands is required.

2. The role of *Typha orientalis* in the lakes is not understood. In some W.A. wetlands it is controlled; the need for control in the Park needs to be ascertained.

3. Koala plantations are not appropriate in natural areas and therefore need to be removed. These areas and other cleared areas around the wetlands require rehabilitation.

4. The effects of past and present management practices and recreational activities on the wetlands have not been investigated. For effective management in the future these effects need to be more clearly understood.

5. Use of powered boats on Loch McNess could have a serious impact on breeding birds.

6. Some wetland vegetation is known to be fire sensitive (for example, paperbarks) while other vegetation types may require specific fire regimes (for example, *Typha* species) and therefore a variety of fire regimes is required.

7. It is important to maintain the high environmental quality of Loch McNess, and to maintain or improve the quality of the other wetlands.

Management Objectives

1. To maintain the environmental quality of the Park's wetlands.

2. To maintain North Loch McNess' pristine state.

3. To continue to use South Loch McNess for low key recreation.

4. To maintain East Loch McNess in a natural state; to restore, where possible, natural water flow.

Prescriptions

1. Instigate research and monitoring of the:

- **a) flora, including the ecological role of *Typha orientalis* and its rate of spread, to assess the need for control**
- **b) fauna, including a survey of the birds of Loch McNess, in particular, information on breeding habits so that the need for modifying boat and launch activities can be assessed (possibly by the RAOU)**
- **c) hydrology (refer to Section 6.0)**
- **d) environmental quality of the wetlands**
- **e) effects of rowboats, the proposed launch, septic tanks and the use of fertilizers on the lake environment.**
- **f) effects of drainage from Wanneroo Road and Yanchep Beach Roads into Yonderup and Wilgarup lakes. If necessary investigate control of drainage. (Priority 1).**

2. If, as a result of research and monitoring, significant adverse effects of activities are found, instigate appropriate actions. (Priority: Ongoing).

3. Progressively remove the koala feed plantations from the vicinity of the wetlands and rehabilitate these areas (see Section 7.4 Rehabilitation) in natural areas. (Priority 2).

4. Rehabilitate cleared areas around lake perimeters and swamp in Ridges State Forest (see Section 7.4, Rehabilitation). (Priority 2).

5. Keep the use of fertilisers (particularly nitrogen) in the recreation area to a minimum, and investigate the use of slow release fertilisers and application

methods to minimise runoff.

6. **Draw up guidelines for the use and management of each section of Loch McNess, including the following:**

no further clearing in the lake's catchment

dieback hygiene practices will be carried out in the lake's catchment

South Loch McNess

no dredging of the lake

any future proposed activity must be demonstrated not to have a detrimental effect on the lake

the effects of row boats and the launch will be monitored

North Loch McNess

North Loch McNess will be a recreation-free zone

East Loch McNess

There will be no further filling of East Loch McNess. (Priority 1).

7. **Investigate alternative names for Loch McNess relating to its Aboriginal heritage (see also Section 4.0). (Priority 2).**

8. **Draw up a program of management of the ornamental lake so that it is maintained for visual amenity.**

10.0 PROTECTION

10.1 FIRE

Australian ecosystems have evolved in the presence of fire (Singh *et al.* 1981) but different species are adapted to different fire intensities and frequencies. Lightning strikes and the use of fire by Aborigines (see Section 4.1 on History) have led to an array of adaptations for regeneration after fire for most West Australian flora species. However, little is known of the frequency, season and scale of fires which are required to maintain species diversity and composition. For example, some species require fire for regeneration (such as *Acacias*) while some plants can be killed by certain fire regimes (such as paperbarks). A given fire frequency could encourage some species and eliminate others.

Most populations of vertebrate fauna can survive even intense wildfires, either by avoiding it or taking refuge (Christensen *et al.* 1981). All species re-colonise regenerated areas (of forests and Banksia woodland) as soon as they reach a stage of growth suitable to the

species, usually within five years (Recher and Christensen, 1980; Bamford 1985); some fauna is particularly vulnerable to frequent fire, or fire at certain times of the year, such as breeding birds in the wetlands.

As ecosystems and their many interactions are complex, so are the effects of different fire regimes on the many components of the ecosystems. As our knowledge of fire ecology increases, so we can more effectively manage ecosystems.

Fire management has two overall aims: to protect life, property, flora and fauna from the devastating effects of wildfire (an uncontrolled fire); and to manage natural ecosystems to maintain the greatest diversity and species richness. There may be a conflict in these two aims, because the the regime required for protection may not be compatible with the maintenance of species richness. Therefore, management needs to find a balance in which the two aims can be achieved.

In the Park there are particular values that need to be protected from wildfire; the visitors, the historic buildings, residences and recreational facilities in the recreation area. Outside the Park there are forests and farms that need to be protected from fires coming from the Park. Repeated, intense wildfires may also cause serious and irreversible damage to various components of the existing ecosystems.

10.1.1 FIRE HISTORY

Fire was used by Aborigines as a tool in hunting and gathering (see Section 4.0). The fire regimes (frequency, season, intensity etc) used by the Aborigines are not known. Little is known of the fire history of the Park prior to 1970, (when accurate records of fire were initiated).

However, local residents have indicated the Park was subject to regular fires as a result of escapes from clearing burns, deliberate lightings or lightning strikes.

Since 1970, fires have occurred in the Park as part of a regular fuel reduction burning program, and there have been many accidental or deliberate fires.

There have been two major wildfires since 1970. One, in April 1977, burnt out 500 ha south of Yanchep Beach Road, and the other, in March 1983, burnt out an area of 800 ha including most of Loch McNess. Fifty percent of the fires in the Park have been deliberately lit, attributable to such activities as burning of stolen cars and illegal lighting of the rubbish dump. Other causes of accidental fires have included: escapes from prescribed

burns (11 percent), lightning (6 percent), with many sources unknown (25 percent).

Fortunately, many of the accidental fires have been quickly detected and contained within a relatively small area; this is due in part to the proximity of the Wanneroo district's fire observation towers, effective fire fighting by CALM staff, and the responsiveness of Park visitors and neighbours.

Although most of the Park has been burnt since 1970, there are some areas that have not been burnt for 20 to 40 years, for example Location 7953 in the north west corner.

Implications for Management

1. Fire has the capacity to degrade or promote conservation values, and to destroy life and property. These consequences need to be considered in planning fire regimes and fire control.

2. An extensive fire which burns most or all of each major vegetation association is considered undesirable as it will lead to a lack of diversity in vegetation structure and habitat types. Thus it is important in planning for fire control and fuel reduction burning that fires are restricted to only portions of any one vegetation association.

3. Specific values which require protection in the vicinity of the Park are: the safety of the visitors to the Park, Park staff, Department residences, buildings and facilities in the recreation area, neighbouring properties, pine forests and koala feed plantations.

4. Knowledge of frequency, season and intensity of fires required to perpetuate the different vegetation communities in the Park is incomplete, and therefore a range of fire regimes (within the constraint of protecting life and property) is desirable to maximise diversity of vegetation ages.

5. Under the Wildlife Conservation Act, burning of rare flora constitutes "taking" of that flora, and therefore Ministerial approval is required prior to conducting a burn which may involve rare species. However, some rare species may require fire for regeneration; these require special prescriptions, still with Ministerial approval.

6. Highest areas of risk of ignition of fire in the Park are along roads and tracks, property boundaries, and within the recreation area (eg. picnic and barbecue sites).

7. Hot dry conditions with strong winds, which the Park experiences frequently in summer, present a high danger for the rapid spread of wildfire.

8. The speed and intensity at which fire burns is related to the quantity of accumulated dry litter or other fine plant material. In some ecosystems, or some high risk/high value situations, accumulated fuel loads can be reduced by fuel reduction burning. This reduces the likelihood of intense fires even under extreme conditions, and improves the capacity for fire-fighters to safely control a fire. Within some major fuel types there is a recognised weight of dry fuel above which fire-fighting forces are not likely to be able to contain wildfires burning under normal hot summer conditions.

9. Education of the public regarding the effects of wildfire is important to reduce the incidence of deliberate and accidental lightings.

10. Fire prevention, fire suppression and evacuation procedures must be maintained and practiced in the event of fires threatening visitors, buildings, and staff residences.

11. The long rectangular shape of the Park, dissected by two major roads and wetlands and surrounded by both private properties and pine plantations, means there is a long perimeter of the Park which requires fuel reduction burns and firebreak maintenance; this reduces the options for a range of fire regimes.

12. Frequent wildfires or burning may reduce species diversity of an area and habitat availability, and increase the presence of weeds (see Section 10.4.1).

13. Frequent high intensity fires can have a long-term impact on an area's visual quality.

14. Caves and sink holes present a hazard to fire fighters and heavy machinery. This hazard may affect the location of fire control lines and the opportunity to contain fires to a relatively small size.

15. The spread of dieback-diseased soil by machinery movement can have, in the long term, a greater deleterious impact on the Park ecosystem than the damage caused by wildfires. Thus the fire suppression strategy adopted for any wildfires must take into account the risk of dieback spread, impact on the ecosystem and addition of new firebreaks.

16. The proximity of pasture to Park boundaries may lead to the invasion of annual weeds and grasses, resulting in a build up of hazardous fuels. This can be aggravated if these perimeters are burnt too frequently or if phosphate fertiliser is allowed to be distributed in areas of the Park.

17. An increase in visitor numbers to the Park, particularly in the natural areas, increases the risk of wildfires and creates a safety hazard for those recreating in relatively remote areas of the Park in the event of a wildfire.

18. Soil movement by heavy machinery on coastal heaths and dunes (on the western edge of the Park) may lead to wind and water erosion.

19. Monitoring of the effects of fire management prescriptions can provide a basis for improving our understanding of fire ecology.

20. Existing water supplies in the Park are considered adequate.

21. CALM has a moral and legal obligation to comply with those provisions of the Bushfires Act (1954-81) relating to fire prevention and control of wildfire on CALM land.

Management Objectives

1. To protect lives of Park visitors, neighbours, fire fighters and staff from wildfires entering or burning within the Park.

2. To protect vulnerable species and ecosystems, buildings, facilities and assets in the Park, and neighbouring properties and plantations from severe damage by uncontrolled fire.

3. To encourage and maintain diversity, natural abundance and composition of vegetation associations and wildlife habitats, within major vegetation and landscape types.

4. To minimise the risk of wildfires burning out large portions of the Park by confining them to single fire management blocks surrounded by strategic buffers and firebreaks.

5. To ensure the survival of populations of rare and restricted flora and fauna species by the maintenance and protection of their particular niche in the Park's ecosystems.

6. To protect vulnerable soils, dunes, and cave sites from the risk of wind and water erosion as a result of wildfires, inappropriate fire regimes, or machinery activity.

7. To protect landscape values from severe damage by uncontrolled fires or from inappropriate burning regimes or suppression techniques.

8. To minimise the introduction or further spread of dieback disease and weeds by fire management operations.

9. To reduce the risk and frequency of unplanned fires starting near to or within the Park as a result of human activity.

10. To provide the opportunity to obtain information about natural processes through the use and non-use of fire.

Overall Strategies

In order to achieve the overal objectives of protecting life, property and environmental values and to manage natural ecosystems, a system of three separate fire regimes will be implemented:

a) Fuel Reduction Regime

Under this fire regime, FRB will be applied whenever ground fuel-loads exceed critical levels at which fire containment, by direct attack, under hot summer conditions, becomes very difficult and unsafe for firefighters. The rotation period between burns will vary from approproximately six to eight years, depending on the rate of fuel accumulation of the vegetation. If further fuel reduction is required within 6 years, mechanical means will be used.

The burns will be arranged in wide buffers to restrict the movement of wildfires through extensive areas. Low fuel areas will also be strategically located adjacent to high risk zones (eg. strategically heavy fuel areas, recreation facilities) and high value zones (eg. private property, pine plantations); consisting of perimeter buffers and strategically located blocks throughout the Park.

b) No Fire Regime

Parts of each major vegetation type will not be burnt by prescribed fire within the life of the plan. These areas are located away from likely ignition sources such as major roads and the recreation areas.

Maximum protection needs to be ensured for these areas, including maintenance of good perimeter access and regular burning of parts of adjacent areas.

c) Vegetation Management Regime (VMR)

Burns in these areas aim to achieve ecological diversity within each of the major land units. Most of these regimes will entail longer rotation burns of about 10-20 years.

It may be necessary to burn some of the VMR areas for protection reasons if it is considered that they constitute a major fire hazard to other values. Each VMR will be reviewed annually to determine whether or not it should be burnt, for ecological or protection purposes.

The aim is to place at least 20 percent of each vegetation type in each of these fire regimes (see Fig. 7 and Table 5). The natural area is compartmentalised into fire protection blocks ranging in areas from 16 to 50 ha, separated by management tracks and firebreaks.

TABLE 5 PERCENTAGE OF VEGETATION TYPES IN EACH FIRE FREQUENCY CLASS

FIRE FREQUENCY CLASS Vegetation Type (see Fig 5)	No Fire	Vegetation Management	Fuel Reduction	Comments
Quindalup Heath	40.7	33.0	26.3	OK
Feed Plantation	29.9	56.1	14.0	See footnote (a)
Modified Areas	---	53.4	46.6	See footnote (b)
Recreation Area	---	---	100.0	See footnote (c)
Tuart Woodland	18.7	28.5	52.8	See footnote (e)
Jarrah Woodland	19.7	22.2	58.1	See footnote (d)
Banksia Wland	33.3	21.5	45.2	OK
Heath	20.6	33.4	46.0	OK
Wetlands	87.4	11.2	1.4	See footnote (f)
" (overgrown)			100.0	See footnote (g)
Mel/Dry/Aca Heath	---	---	100.0	See footnote (h)
Seasonal wetland	---	46.9	53.1	See footnote (i)
Average	22.3	26.1	51.6	OK

Footnotes- for vegetation types with 20% represented in any fire frequency class.

(a) Exotic plantations for koala feed - will be excluded from burns.

(b) Human - modified areas - do not need to match the standard.

(c) Recreation area - must be kept at low fuel levels for safety reasons.

(d) Jarrah Woodland - 19.7 figure not considered a significant shortfall.

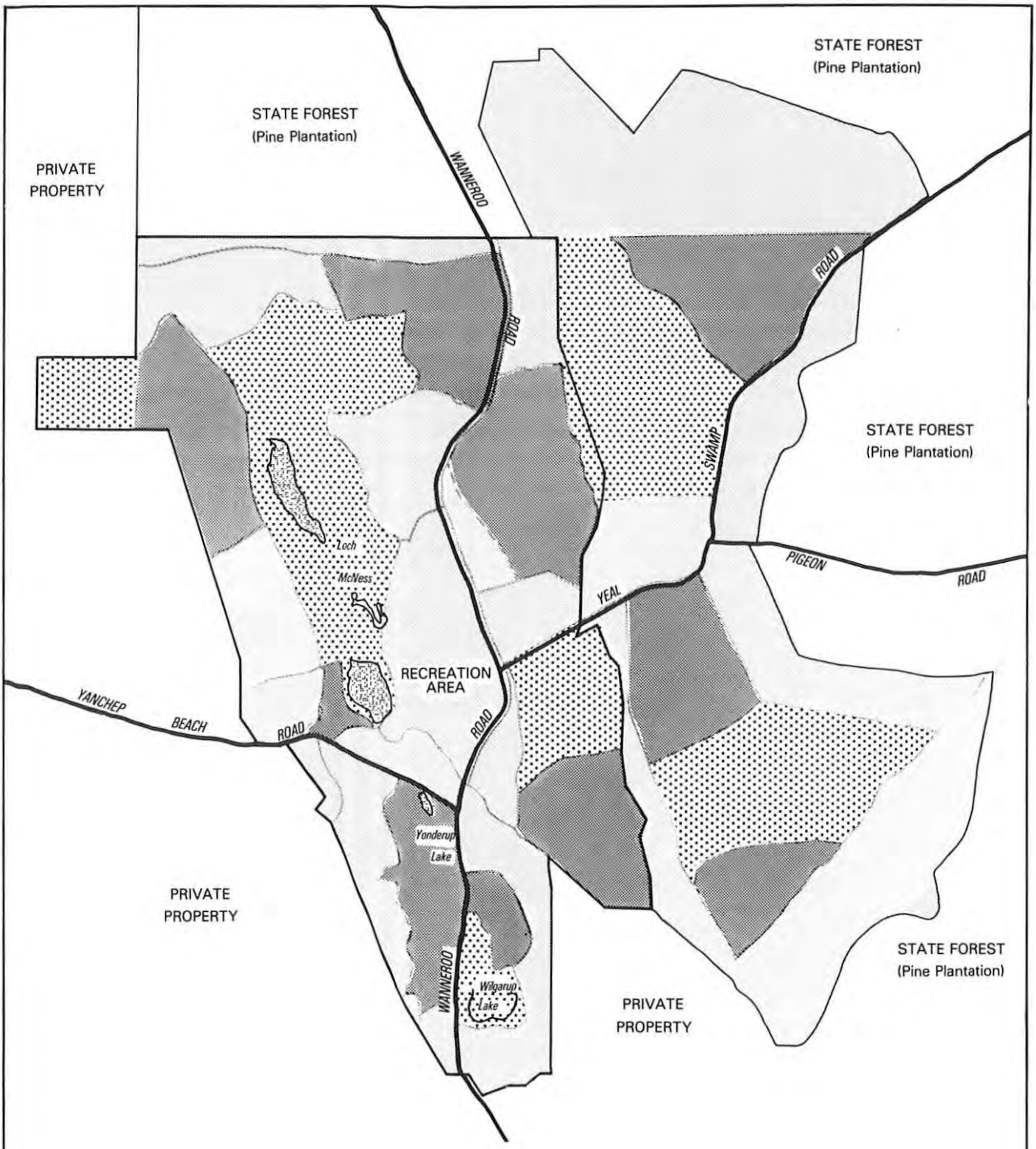
(e) Tuart Woodland - 18.7 figure not considered a significant shortfall.

(f) Wetlands - not proposed to burn at all until more biological data collected.

(g) Wetland (overgrown) - as for (f) above.

(h) Melalenca/Dryandra/Acacia Heath - within a block designated for strategic protection due to pines adjoining to north. Will be excluded from burning of surrounding vegetation.

(i) Seasonally inundated land - portions of this vegetation type will be excluded from burning of surrounding vegetation.



LEGEND

FIRE FREQUENCY CLASSES

- Fuel Reduction Regime
- Vegetation Management Regime (10-20 years)
- No Fire Regime
- Open Water
- Fire Management Unit Boundary on Existing Track
- Fire Management Unit Boundary Requiring Track

0 1 2 3 KM

SCALE

N

FIRE PROTECTION AND MANAGEMENT PLAN

FIG. 7

Prescriptions - Overall

The following prescriptions will be implemented as funds permit. If sufficient funds are not available, fire protection and management will be undertaken according to the objectives for fire.

Fire prevention

1. **Confine burns to established tracks or firebreaks, and burns must comply with written prescriptions approved by CALM's District Manager. Burn frequency will depend on the rate of fuel accumulation, but is not likely to be less than six years. Where possible it is planned to conduct at least 40 percent of burns in each of either autumn or spring seasons. Where possible, successive burns in each block will be programmed in different seasons. (Priority: Ongoing).**

2. **Where there are known gazetted rare flora or fauna within proposed burn areas, the burn will either be modified, relocated or deferred. Where it is a requirement of the species, or it is essential for protection purposes for burning to occur, Ministerial permission to `take' rare flora must be obtained. (Priority: Ongoing).**

3. **Revise strategies and prescriptions as more fire information becomes available or conditions change or whenever major wildfires occur. (Priority: Ongoing).**

4 **Define roads required for fire control and essential management activities. Those roads considered unsuitable for public use will be closed to the public and management vehicles will be subject to hygiene requirements when using closed roads. (Priority: 2).**

Recreation Area

5. **Maintain at least 60 percent of the recreation area at fuel quantity levels of less than eight tonnes per hectare in forest stands, or 6 tonnes per hectare in Banksia woodlands by a combination of prescribed burning, slashing or mowing. Establish a `safe level' for shrub-dominated vegetation eg. heath. (Priority: Ongoing).**

6. **Maintain fuels immediately adjacent (20-40 metres) to all facilities and residences at less than six tonnes per hectare for forested stands and 5 tonnes/**

hectare in Banksia and at a determined 'safe level' for shrub dominated vegetation or a low fuel equivalent (eg. watered lawn). (Priority: Ongoing).

7. Regularly maintain all buildings and residences at a high level of fire safety. Maintenance will include removal of flammable litter and debris off roofs and gutters and away from external walls. (Priority: Ongoing).

8. Promote public education and awareness on fire risk, use of fire and evacuation procedures through pamphlets, information and personal contact by Park staff. (Priority: Ongoing).

9. Continue to provide gas and electric barbecues instead of open fire places in the recreation area (see also Section 14.4.4(f). (Priority: Ongoing).

Natural Areas

10. Develop and promote emergency procedures for the recreation area in the event of a wildfire posing a threat to the recreation area. (Priority: Ongoing).

11. Maintain fuel reduced areas at fuel levels of less than eight tonnes per hectare, with the necessary maintenance of accompanying firebreaks. (Priority: Ongoing).

12. Implement burn rotation within the fuel reduction areas depending on the fuel accumulation rates; it is likely to vary from six to ten years and will also depend on availability of funds. (Priority: Ongoing).

Fire Management (Natural Areas)

13. Implement prescribed burns which have a range of fire regimes, including variation in season, intensity and size, particularly between different blocks. (Priority: Ongoing).

14. Establish trials to study the long term effects of fire and fuel modification treatment on flora and fauna particularly for Banksia woodlands and heath, where possible. (Priority: 2).

15. Monitor selected prescribed burns or wildfire on indicator flora (eg. fire sensitive species), where possible. (Priority: 2).

16. If a fire exclusion area is accidentally burnt, consider exchanging it with an area of similar size and ecological type after careful review of the ecological and protection requirements, if it is possible. (Priority: Ongoing).

17. Liaise with the City of Wanneroo Fire Officers and establish agreements with adjacent landholders where necessary, regarding a co-operative approach to carry out fuel reduction requirements on land adjacent to the Park where areas of the Park close to its perimeter require protection. If conditions change, review the agreements to ensure ongoing protection. (Priority: Ongoing).

Fire Suppression

18. Contain all fires in or threatening the Park to the smallest possible area either by direct attack or by backburning from established firebreaks, roads and fuel reduced areas, taking into account the likely threats to life and property and the impact of the suppression activities on the environment. (Priority: Ongoing).

19. Regularly train Park staff in proper suppression of wildfires, structural fires and evacuation procedures from buildings and the Park. (Priority: Ongoing).

20. Implement suppression of a wildfire in the following order of priority: (i) human life; (ii) community assets, property or special values (including environmental values) (iii) cost of suppression in relation to values threatened. (Priority: Ongoing).

Fire Preparedness

21. Maintain fire equipment at a high level of preparedness throughout the year. (Priority: Ongoing).

22. Maintain a high level of training of fire suppression for staff. (Priority: Ongoing).

23. Maintain water supplies including hydrants and hoses, adequately signposted particularly around the recreation area and buildings, and check ready access. (Priority: Ongoing).

24. **Regularly field check and maintain water supplies for ready access. (Priority: Ongoing).**

25. **Update the Fire Control Working Plan (FCWP) for the Park and surrounding areas annually prior to the start of the fire season. The FCWP which is incorporated in the CALM's Wanneroo District FCWP must include procedural arrangements for actions in the case of wildfires in or near the Park. (Priority: Ongoing).**

26. **Maintain close liaison with the WA Fire Brigade, Police, S.E.S., Bush Fires Board, local Bush Fire Brigades, City Bushfires Advisory Committee and Park neighbours to encourage mutual aid in fire prevention, detection and suppression operations. (Priority: Ongoing).**

27. **Maintain fire detection by the Wanneroo District towers and by ground patrol by the Park Rangers. There will also be a continuing reliance on fire notification from the public, neighbours and City organisations. (Priority: Ongoing).**

28. **Assess the need for all of the firebreaks in the Park and rehabilitate those not required for protection purposes. (Priority: 2).**

10.2 DISEASE

The plant disease of most concern on CALM lands is jarrah dieback disease caused by the fungus *Phytophthora cinnamomi*. Many plant species in the Park are susceptible to the disease. Jarrah dieback disease can alter a natural environment in the following ways:

- it can kill at least 900 plant species, including plants in the Proteaceae (eg. *Grevillea, Banksia*), Myrtaceae (eg. *Eucalyptus*, bottlebrush, myrtles) and Epacridaceae (the heaths) families.
- it can degrade aesthetic values.
- it can increase water production by reducing the amount of rainfall intercepted by plants, which increases surface run off and infiltration. Therefore ground water levels can increase, affecting wetlands.

The disease is spread by disturbance and movement of the soil, particularly by vehicles and also from water flow and on the feet of animals. The impact of the disease is dependent on factors such as landscape, aspect, vegetation type, drainage characteristics and host susceptibility. Once the disease is established at a site it can only be eradicated at high cost.

Control measures focus on prevention of the establishment of the disease or control of its spread.

A preliminary dieback survey of the Park has been conducted. Three confirmed dieback infections have been found, two in the vicinity of the golf course and one in the wildflower garden; no other infections have been found. However, there is a moderate to high chance of the disease being present in areas where unsealed tracks are used frequently by vehicles. The disease would have a high impact on areas of Banksia woodland.

The fungal disease caused by *Armillaria luteobubalina* has been found at one site near Yonderup Cave. This is a soil pathogen which slowly spreads from root to root. A range of species are vulnerable including indigenous and exotic species from trees to understorey plants (Kile 1981). *Armillaria* is difficult to remove and can have a devastating effect in localised patches.

Implications for Management

1. Many of the plant species in the Park are susceptible to dieback disease, and so the disease could have a devastating effect on vegetation.

2. CALM has a dieback policy and established dieback hygiene procedures which must be enforced in the Park.

3. For all operations in the Park, the potential for spread of dieback disease needs to be taken into account.

4. Control of access on management tracks is needed and some management tracks may need to be closed.

5. *Armillaria*, though slow spreading, is potentially a problem in the Park. Spread of the disease needs to be restricted.

Management Objectives

1. To prevent the introduction of diseases into disease-free areas of the Park.

2. To minimise the spread of disease in the Park.

Prescriptions

1. **Train all Park staff in dieback hygiene practices. (Priority 1).**

2. **For each proposed operation involving movement of soil (eg. construction of a firebreak), dieback hygiene practices must be carried out. (Priority: Ongoing).**

3. **Conduct a dieback survey of the Park when resources permit. (Priority 2).**

4. **Isolate the known sites where dieback has been confirmed, by restricting access. (Priority 1).**

5. **Erect barriers at access points off Wanneroo Road and Yanchep Beach Road, and any other points considered necessary, to restrict illegal private vehicle use. Try to minimise environmental damage by vehicles driving through the bush to go around barriers. (Priority 1).**

6. **Avoid disturbance of sites where *Armillaria* occurs, in particular any practices involving the removal of soil or contaminated material which will spread the disease to other locations. (Priority: Ongoing).**

10.3 NON-INDIGENOUS ANIMALS

There are major problems in natural areas throughout Australia due to the introduction of non-indigenous (feral) animals, and Yanchep National Park is no exception. Foxes and cats severely reduce or eliminate native fauna populations, either directly by preying on them or indirectly by competing for food resources and territory; rabbits destroy native vegetation and can cause erosion problems. Honeybees are discussed in Section 11.1, Apiary Sites.

The impact of the two declared pest species, the red fox (*Vulpes vulpes*) and rabbit (*Oryctolagus cuniculus*) along with the cat (*Felis cattus*), feral bees (*Apis mellifera*) and the black rat (*Rattus rattus*) are of greatest concern in the Park. Many foxes, cats and rabbits have been sighted and there are approximately 100 feral bee hives in the Park. Control programs for foxes, rabbits and cats have been conducted for a number of years in the Park. Cat control programs in the late 1970s resulted in noticeable improvements in bird populations (R. Waterhouse, pers. comm.).

Implications for Management

1. Non-indigenous animals require monitoring and control where possible.

2. Due to the fact that wetlands provide major habitats for native fauna, priority in control programs needs to be given to these areas.

Management Objective

To reduce the deleterious effects of non-indigenous animals on the native fauna and flora of the Park.

Prescriptions

1. **Establish an effective monitoring program of populations of feral animals, particularly rabbits, cats, foxes and feral bees. Regularly assess results of the program to gauge population sizes. (Priority: Ongoing).**

2. **Consider setting up exclusion plots for monitoring rabbit impacts on vegetation. (Priority: 3).**

3. **Continue and increase control programs for foxes and cats, with an emphasis on control in wetland areas. (Priority: Ongoing).**

4. **Instigate a rabbit control program when resources permit. (Priority 1).**

5. **Locate and eradicate feral bee hives when resources permit. (Priority 2).**

10.4 NON-INDIGENOUS PLANTS

Non-indigenous (ie exotic) plants are any which are not naturally-occurring in the Park. There is a variety of exotic plants in the Park; their occurrence is related to past use and management practices. They fall into three categories, relating to their origin and purpose: weeds; eucalypts in koala feed plantations; and ornamental trees within the recreation area, on Wanneroo Road and other locations. Ornamental trees and gardens in McNess Recreation Area are discussed in Section 14.4.4(d) on Gardens and Trees.

10.4.1 WEEDS

Weeds are opportunists thriving in the environment to the detriment of native species. The spread of weeds is accelerated by changes in the frequency and intensity of fires, additional inputs of nutrients into ecosystems from aerial dust, and disturbance to the soil from clearing and trampling (Bridgewater and Backshall 1981). They are generally vigorous, fast growers competing for nutrients and moisture and with repeated disturbance they can dominate the understorey. If the tree and shrub cover is not maintained, the weed growth is further encouraged by increased light penetration (Wycherley 1984).

Areas in the Park where major weed infestations are located include the recreation area, including Boomerang Gorge, the wildflower garden and bushland close to developments and the remainder of the Park around koala feed plantations, firebreaks, roads, old rubbish sites and other areas of disturbance and clearings.

The Park is increasingly susceptible to the invasion of weeds because of its proximity to the metropolitan area (the main source of nutrient-rich aerial dust) and the surrounding farming and urban areas (the main seed source). Frequently burnt low fuel zones close to boundaries and roads are the most vulnerable to weed invasion.

The weeds in the Park include Cape tulip (*Homeria flaccida*), Fennel (*Foeniculum vulgare*), Apple of Sodom (*Solanum sodomeum*), Stinkwort (*Dittrichia graveolens*), Bridal Creeper (*Asparagus asparagoides*), Pelargonium (*Pelargonium capitatum*), Kikuyu grass (*Pennisetum clandestinum*) and Wild Oat (*Avena fatua*).

Cape tulip and Apple of Sodom are declared plants under the Agriculture and Related Resources Protection Act (1976-1983) and must be controlled. Annual control programs are carried out in the Park.

Cape tulip is present in the sparse understorey on the fringes of Loch McNess and is widespread in other areas of the Park, particularly in areas where walkers and vehicles frequent (N McQuoid pers. comm.). Apple of Sodom occurs in isolated outbreaks and thus can be relatively easily eradicated. Annual grasses occur mainly on firebreaks (and boundaries) and in the vicinity of the recreation area. They thrive in disturbed and frequently burnt areas. Dry grasses increase the fuel load thus increasing the fire hazard and changing the nature of fires (Wycherley 1984). Black flag (*Ferraria crispa*) is located in two areas and appears to be spreading, but can be quite easily eradicated while it is of limited extent. The extent and location of declared weeds in the Park were mapped in spring 1987.

Kikuyu grass is spreading from the developed areas into the Loch McNess wetland vegetation; this species has the potential to rapidly spread around the lake, significantly altering the natural habitat.

Weeds can be controlled by mechanical (physically removing them), chemical (using herbicides) and/or biological methods. All methods have advantages and disadvantages: mechanical - do not harm the environment but the disturbance of the soil can encourage more weeds; chemical - does not disturb the soil but may be detrimental to the environment; biological - may affect indigenous species. It is CALM policy that

> `The Department will continue a vigorous control of declared weeds on CALM land. Where funds are available and conservation priorities dictate, the Department will also attempt the control of non-declared weeds of ecological significance on CALM land. All available methods of control must be considered (physical, chemical and biological). The final choice will depend on a comparison of the feasibility, cost, efficiency and environmental efficacy of the alternatives.'

Rehabilitation of indigenous species is an important adjunct to control of weeds so that the space left by a weed is taken up by indigenous species and not by more weeds (see Section 7.4 on Rehabilitation).

Implications for Management

1. The presence of non-indigenous plants is not compatible with the purpose and philosophy of a national park.

2. Weeds are opportunists that out-compete smaller indigenous species and inhibit the normal growth of larger indigenous species. Declared weeds and where possible all other weeds must be controlled.

3. Control programs should not be to the detriment of the environment. The effect of the control of a weed needs to be balanced against the effects of carrying out no control.

4. The Park is increasingly susceptible to the invasion of weeds, particularly in the frequently burnt low fuel zones, close to boundaries and roads.

5. The presence of weeds in areas that are shown to visitors to the recreation area as examples of natural bushland is not desirable.

Management Objective

To reduce the extent and effects of weeds, and minimise detrimental effects of control on the Park environment.

Prescriptions

1. **Map selected weeds of the Park annually (including those species that are not declared plants) monitoring their location, extent, the effectiveness of control programs and where possible, ecological effects. (Priority: Ongoing).**

2. **Conduct control programs in the following order of priority:**
   - **areas of greatest conservation value (eg. Loch McNess)**
   - **areas of greatest perceived environmental threat**
   - **areas of small new infestations. (Priority: Ongoing).**

3. **Control the outbreaks of Apple of Sodom (*Solanum sodomeum*). (Priority: as for 2).**

4. **Continue control of Cape tulip (*Homeria flaccida*). (Priority: as for 2).**

5. **Control annual grasses in the recreation area to reduce fire hazard. (Priority: as for 2).**

6. **Instigate control of kikuyu grass around Loch McNess. (Priority: as for 2).**

7. **Continue control of Black flag (*Ferraria crispa*). (Priority: as for 2).**

8. **Conduct regular control programs of exotic species in `natural' areas in the recreation area, for example in Boomerang Gorge and White's Grotto. (Priority: as for 2).**

9. **Where non-declared weed species are determined to be having adverse ecological effects, instigate control as resources permit. (Priority: as for 2).**

10. **Rehabilitate areas in which weeds have been controlled to prevent further weed invasion (refer to Section 7.4 on Rehabilitation). (Priority: Ongoing).**

11. **Where practical, slash low fuel zones rather than burn in areas of weed infestations. (Priority: Ongoing).**

10.4.2 KOALA FEED PLANTATIONS

There are about 6000 koala feed trees in the Park, growing in a variety of small plantations. These include areas adjacent to the three wetlands and around the golf course (see Figure 5). Species include *Eucalyptus rudis* (flooded gum) which is the most common, *E. saligna, E. viminalis, E. tereticornis, E. robusta, E. botryoides* and *E. punctata.* These are a range of Western Australian and Eastern States eucalypts, providing variety in the diet of the koalas.

The areas in and around the plantations are cleared, with re-growth of predominantly weeds and some native undergrowth.

Implications for Management

1. The presence of non-indigenous species in natural areas is not compatible with the purpose and philosophy of a national park.

2. Plantations need to be located close to the Park for management purposes but not necessarily within the Park.

3. The presence of plantations at the golf course is compatible with the functions of the course and the recreation area.

Management Objectives

1. To greatly reduce the extent of non-indigenous trees in natural areas of the Park.

2. To provide sufficient fresh feed for koalas.

Prescriptions

1. **Progressively establish koala feed plantations in designated areas in nearby State forest. (Priority: Ongoing).**

2. **Progressively remove all plantations from the Park, except at the golf course (which is not a `natural area'), with priority to those in the vicinity of the wetlands. (Priority: Ongoing).**

3. **Rehabilitate all sites (refer to Section 7.4 on Rehabilitation). (Priority 2).**

4. **Maintain all plantation trees for a suitable ongoing supply of fresh feed (seeking professional horticultural advice when necessary). (Priority: Ongoing).**

10.4.3 ORNAMENTAL AND EXOTIC TREES

Lemon-scented gums (*Eucalyptus citriodora*) form an attractive avenue along Wanneroo Road to the Park turn-off however, a number have died breaking the continuity of the avenue. It is somewhat of a contradiction that the entrance to the Park consists of trees not naturally occurring in the Park. *Eucalyptus maculata, E. calophylla `rosea', E. ficifolia, E melliodora, E. punctata, E. boytryoides, E. mannifera* and *E erythrocorys* have been planted along the entrance road to the Park. It is not considered that any of these are having an adverse ecological effect on the native vegetation, although *E. citriodora* is encroaching into the bushland along Wanneroo Road,

There are also non-indigenous trees around the ghost house ruins, obviously planted by the early users of the house. These include: *Eucalyptus maculata* (Spotted Gum), *Citrus lemon* (Lemon tree), numerous *Brachychiton acerifolium* (Flame tree), *Araucaria heterophylla* (Norfolk Island Pine), *Eucalyptus citriodora* (Lemon-scented Gum), *Eucalyptus punctata* (Grey Gum), *Callitris preissii* (Rottnest Island Pine) and *Ficus carica* (Fig tree).

Implications for Management

1. The presence of non-indigenous species is generally regarded as not compatible with the purpose and philosophy of a national park. However, in Yanchep National Park it is considered that non-indigenous species are compatible with the recreation area.

2. The ornamental trees have aesthetic value and are an attractive feature of the Park; some are part of the cultural history of the Park, and so have historic as well as scenic value. Therefore it is considered acceptable to retain significant trees.

3 There is interpretive potential in the wide variety of ornamental trees.

Management Objectives

1. To limit the extent of existing non-indigenous trees to those which are of high scenic and/or cultural value.

2. To develop the interpretive potential of non-indigenous trees.

Prescriptions

1. **Progressively remove all non-indigenous trees except those which are within the recreation area, along Wanneroo Road and at the ghost house ruins; replace with species naturally occurring at that site. (Priority: Ongoing).**

2 **Develop a public education/interpretation program highlighting non-indigenous and indigenous trees in the McNess recreation area. (See Section 18.0 on Information and Interpretation). (Priority: Ongoing).**

3. **Maintain the existing avenue of *Eucalyptus citriodora* (lemon - scented gums) along Wanneroo Road, replanting where necessary to retain continuity. Regularly remove any seedlings which do not form part of the avenue. (Priority: Ongoing).**

11.0 OTHER MANAGEMENT ISSUES

11.1 APIARY SITES

The Department of Agriculture has for a number of years used the Park exclusively for a bee breeding program involving between 80 and 100 hives; no other apiary sites have been permitted in the Park since the program requires isolation from other bee hives. The program exports queen bees throughout Australia and also overseas (B. Burking pers. comm.). The value of the program and its potential to improve the returns of beekeepers throughout Australia is considerable. The Park is an excellent site for this purpose because it provides the isolation required and is close to Perth. The apiary site is situated well away from public areas within a managed natural area unit (see Section 3.0).

There are three approved apiary sites in Ridges State Forest. In addition to the apiary sites it is estimated there are over 100 feral bee hives (wild honeybees) in the Park.

There is potential for honeybees to have adverse effects on native bees and vegetation (Douglass 1977; Mathews 1984; Pyke and Balzer 1986).

Implications for Management

1. Although there is evidence that honeybees competetively interfere with other pollinators, there is no clear evidence that there is a resulting effect on ecosystems. More research is needed on the effects of honeybees in W.A.

2. The apiary site used by the Department of Agriculture is an important research and commercial enterprise. The ideal conditions provided in the Park would be difficult to find elsewhere.

3. There are over 100 feral bee hives in the Park which require control.

4. It is proposed to encourage an increase in some recreational activities in natural areas of the Park (see Section 14.0) and this could create a safety conflict with apiary sites.

Management Objective

To minimise the effects of honeybees and feral bees on the Park environment.

Prescriptions

1. Encourage research on the effects of honeybees on W.A. ecosystems. (Priority: 1).

2. Continue to allow the existing apiary sites to remain in the Park, including in the Ridges State Forest addition, for the life of the plan. (Priority: Ongoing).

3. Permit no other apiary sites in the Park. (Priority: Ongoing).

4. Investigate the efficacy of a control program on feral bee hives. (Priority: 2).

11.2 ADDITIONS TO THE PARK

As outlined in Section 1.3, there are three proposed additions to the Park: Ridges State Forest, Pipidinny Swamp, and a section of State Forest No. 65 south of Ridges State Forest,

to the east of the Park (see Fig. 2). Overall, these additions will add about 3 100 ha to the Park, increasing its area from 2 799 ha to about 5 900 ha.

The reasons for the additions are mainly because of their conservation value and the need to buffer the Park from ever increasing pressure as the population increases. It is anticipated there will be increased use of the Park in the future, and an increased demand for use of the natural areas. Recreational activity, therefore, needs to be spread over a greater area to protect the Park environment from over use.

11.2.1 RIDGES STATE FOREST

This area is part of State Forest No. 65, which the former Forests Department managed for conservation of flora, fauna and landscape. It is 1260 ha in area.

It consists of distinct limestone ridges, hosting a variety of heath vegetation, a seasonal wetland with an outstanding mature woodland of *Melaleuca preissiana* (paperbark) and extensive areas of jarrah woodland (close to its northern limit of growth). The limestone ridges contain one declared rare plant species and a number of restricted and undescribed species (see Section 7.3). There has been no fauna survey of the area. The inclusion of these limestone areas within such a large area reserved for conservation will greatly improve their chance of survival in the future.

Yanchep National Park does not contain such limestone ridges, and has only small areas of jarrah woodland, so that area of Ridges State Forest would add significantly to the diversity of flora in the Park.

The area is within the Gnangara water reserve area (WAWA 1986). There are pine plantations along the northern and eastern boundaries of the area.

The System Six Report (1983) considered the area as having high conservation and recreation value, and is important as a supplement and buffer to the Park; it contributes to an area of open space of regional significance. The CALM Northern Forest Regional Management Plan (1987) has proposed that the area be added to Yanchep National Park.

The area has been or will be subject to the following pressures:

i) Mining - There has been some limestone extraction, resulting in four open cut quarries. Limestone is in demand for road construction and cement manufacture. There are currently two mining leases in the area, covering about 240 ha. These are

subject to a number of conditions set by the EPA and CALM. The leases are for 21 years, and are due to expire in the year 2006. There are applications pending for prospecting licences for most of the southern portion of the area. The areas covered by the mining leases include Parrot Ridge which is a significant area for flora.

ii) Proposed Water Authority works consisting of a borefield and collector mains, a service reservoir, pump station and interconnecting pipelines to facilitate future water supply to the north-west corridor. The Water Authority is proposing to formally apply for acquisition of 30 ha of land for a service reservoir.

iii) Illegal use by private vehicles, which can involve such illegal activities as kangaroo shooting and firewood collection.

iv) Past logging of mature trees followed by regeneration of young trees.

v) There are several pine plots within Ridges State Forest. These were established as trial growth plots. Some contain commercial volumes of wood. The Haddrill Road plot is part way through its growth regime.

vi) Mining for diatomaceous earth in part of the seasonal wetland has occurred.

vii) Three approved apiary sties.

viii) Future extraction of ground water from the Gnangara Mound could reduce the ground water level by up to 1 m (WAWA 1986). The Water Authority (1986) has predicted a very low potential impact, caused by the Gnangara Mound development on the wetland in the northeast of the area. This is vulnerable to long term water level changes, and could undergo major changes in vegetation types. Monitoring of a vegetation transect in the area to collect baseline information prior to any development is being undertaken by the Water Authority.

Management Objectives

1. To add Ridges State Forest to Yanchep National Park.

2. To manage the area with the same objectives as Yanchep National Park.

Prescriptions

1. **Instigate the necessary administrative procedures to change the purpose of Ridges State Forest to National Park. (Priority 1).**

2. **Ensure all operations in the area are carried out under strict conditions to minimise impacts of the operations. These include dieback hygiene procedures, rehabilitation of affected areas, and avoidance of areas with rare or restricted plant species, in particular, Parrot Ridge. (Priority: Ongoing).**

3. **Liaise with Water Authority regarding their proposal to acquire 30 ha for the McNess East Service reservoir site ensuring the location, construction and operation of its facilities have a minimal effect on the environment, particularly regarding clearing of vegetation and landscape values. Keep any developments as close to the perimeter of the additions as possible. (Priority 1).**

4. **Deal with any applications for the renewal of mining and prospecting licences according to the Government's policy on mining in national parks. (Priority: Ongoing).**

5. **Exclude the pine plots from the proposed national park and manage for maximum economic returns; harvest for removal at the end of their cycle, rehabilitate the sites and add the areas to the national park. (Priority: Ongoing).**

6. **Implement strategies outlined in other sections of this plan for the management of `natural areas' and `managed natural areas' in the Park (for example vegetation, fauna, fire, recreation in the natural environment, protection) for the Ridges State Forest. (Priority: Ongoing).**

11.2.2 PART OF STATE FOREST NO. 65

The area is to the south and east of Ridges State Forest and to the east of the Park and is part of the State Forest No. 65 (see Figure 2). It is about 1 818 hectares in area.

The area has soils varying between sandy and limestone Karrakatta associations. Vegetation accordingly varies with jarrah and marri woodland, Banksia woodland and heath with predominantly *Dryandra sessilis* (parrot bush).

The area is dissected by few tracks and so is relatively undisturbed. There are pine plantations along the north-eastern border of the area. There are no plans to establish a pine plantation within the area. It is recommended in the Northern Forest Region Management Plan (1987) that most of this area be added to the Park. It is further recommended in this plan that an area to the south of Haddrill Road be added (see Figure 2).

The area would be a valuable addition to the Park, to maximise the size of the Park environment, and thus maximise its ability to sustain viable ecosystems, particularly with likely increasing pressures in the future from an expanding population. It is important to safeguard the Park's future by buffering impacts as much as possible. The area also has substantial limestone areas which may have special vegetation. Hence this addition will contribute to the objectives of the Park being achieved.

The area has been, or will be, subject to the following pressures:

- Mining for limestone (as with Ridges State Forest). There are a number of prospecting licences under application, which cover most of the proposed area.
- Regular illegal firewood collection.
- Past logging of mature trees and regeneration of young trees.
- A small pine plot within the southern boundary of the proposed area.

Management Objectives

1. To add the area of State Forest No. 65 shown in Figure 2 to the Park.

2. To manage the proposed area with the same objectives as the Park.

Prescriptions

1. **Instigate the necessary administrative procedures to have the area of State Forest No. 65 included in Yanchep National Park. (Priority 1).**

2. **Deal with any application for the renewal of any mining or prospecting licences according to the Government's policy on mining in national parks. (Priority: Ongoing).**

3. **Implement strategies outlined in other sections (eg. vegetation, fauna, fire etc) for the management of "managed natural areas" and "natural areas". (Priority: Ongoing).**

11.2.3 PIPIDINNY SWAMP

Pipidinny Swamp is located close to the south-west corner of the Park (see Figure 2).

Most of it has been owned by Landbank and part of it is leased for market gardening. It is currently reverting to vacant Crown land under the jurisdiction of the Department of Land Administration. A portion of its southern end is privately owned.

It lies on the boundary of the Quindalup and Spearwood dune systems, and consists of areas of open deeper water and overgrown shallow areas. The water levels fluctuate, but the lake rarely dries out completely (D Lamont pers. comm.). Vegetation consists of surrounding fringes of tuart (*Eucalyptus gomphocephala*) and Quindalup healthland, and paperbarks (*Melaleuca rhaphiophylla*), with extensive sedge meadows (*Baumea articulata, Typha orientalis, Juncus spp*) throughout the wetland. The swamp provides a wide range of habitats to 29 species of birds. The RAOU has been studying the area since 1984. The swamp is host to a variety of breeding birds, including Little Pied cormorants, Swans, Musk ducks, and waders, including Black -winged stilts, the habitats of which are not readily available in other wetlands in the Park.

The swamp is included in the Park (as area M3) in the System 6 Report (1983). The former MRPA (now the SPC) North-West Corridor Plan recommended it become, together with Beonaddy Swamp, part of an Open Space linkage between Yanchep and Neerabup National Parks.

Pipidinny Swamp has been subjected to the following pressures:
- market gardening on its eastern margins
- grazing from stock from adjacent properties
- filling in on its southern end
- associated inputs of nutrients from fertilizers and animal faeces
- SEC powerlines which run along its northern end and across its centre.

These pressures have caused some degradation of vegetation and increased nutrient levels which may have caused algae blooms. Despite these pressures, Pipidinny Swamp remains an important bird habitat, which complements the other wetlands in the Park, and other Wanneroo linear wetlands.

Management Objectives

1. To add Pipidinny Swamp to the Park.

2. To manage the area with the same objectives as the Park.

Prescriptions

1. **Negotiate with the Department of Land Administration regarding addition of Pipidinny Swamp to Yanchep National Park. (Priority 1).**

2. **Consider the purchase of the privately owned section of the Swamp. (Priority 2).**

3. **Instigate the necessary administrative procedures to change the purpose of those parts of Pipidinny Swamp to be added to the Park. (Priority 1).**

4. **Implement appropriate strategies for management of the swamp outlined for the other wetlands of the Park, in particular rehabilitation of degraded areas. (Priority: Ongoing).**

11.3 RESEARCH AND MONITORING

Scientific knowledge, which is the basis for planning and management, is often incomplete. Priority in research must therefore be given to present and future areas of management activity.

Overall, previous research in the Park has been limited; furthermore, data where available, may be outdated. Some areas, however, are well documented, for example, water quality of Loch McNess.

CALM has commenced flora and fauna surveys which will form the basis of an important monitoring program in the Park. The Water Authority is sponsoring monitoring of the wetlands and of terrestrial vegetation in the Park (see Section 6.0). Recommendations for areas requiring research and monitoring are included in Sections 6.0, 7.0, 8.0 and 9.0; these are summarised in Table 6.

The major constraint in all projects is the availability of finance; all avenues for implementing monitoring and research will be explored and encouraged, including work by CALM staff, other relevant authorities , and also tertiary institutions and voluntary groups. All research activities must be in accordance with the Park's objectives; groups outside CALM will require authorisation.

Management Objective

To develop and maintain knowledge regarding the biological, physical and social environment of the Park and future management.

Prescriptions

Carry out research and monitoring in the prescriptions in Table 6, as funds permit. (Priority: Ongoing).

TABLE 6 SUMMARY OF RESEARCH AND MONITORING PROGRAMS

SECTION	PROGRAM	PRIORITY
6.0 Hydrology	. Continue to encourage a program of monitoring the inter-relationships between the ground water and the Park's wetlands.	1: Ongoing
	. Promote a comprehensive study of the inter-relationships between the groundwater and the Park's caves.	1
	. Investigate the effect of ground water abstraction by CALM within the recreation area (for watering and other purposes) and take appropriate steps if effects are significant.	3
	. Conduct monitoring of the water quantity in some caves.	1:Ongoing
7.0 Vegetation	. Continue to conduct surveys and monitoring of rare and restricted species, and where possible other flora and fire ecology.	Ongoing
8.0 Fauna	. Continue to conduct surveys and monitoring of rare and restricted species, and where possible other fauna and fire ecology.	Ongoing
	. Monitor kangaroo numbers	1: Ongoing

SECTION	PROGRAM	PRIORITY
9.0 Wetlands	. Instigate and carry out research and monitoring of	
	a) flora, including the ecological role of *Typha orientalis* and its rate of spread to assess the need for control.	1
	b) fauna, including a thorough survey of the birds of Loch McNess, in particular information on breeding habits.	1
	c) environmental quality.	1
	d) effects of rowboats, the proposed launch, septic tanks and the use of fertilizers on the lake environment.	1:Ongoing
	e) effects of drainage from Wanneroo Rd and Yanchep Beach Rd into Yonderup and Wilgarup lakes. If necessary investigate control of drainage.	3
10.2 Disease	. Conduct a dieback survey of the Park when resources permit.	3
10.3 Non-indigenous fauna	. Monitor populations of feral animals particularly rabbits cats, foxes and feral bees.	1:Ongoing
10.4 Non-indigenous flora	. Map selected weeds of the Park annually(including those species that are not declared plants)monitoring their location, extent and where possible, ecological effects.	2:Ongoing
15.0 Caves - tourist	. In conjunction with the proposed Caves Management Committee, set up a program to monitor air flow, carbon dioxide, temperature and humidity levels.	1:Ongoing
Supplementary Papers	Continue to conduct visitor surveys.	Ongoing

12.0 LANDSCAPE

The primary components of landscape result from unique combinations of landforms, vegetation, waterbodies and land use. Much of a recreational experience in a national park is visual, therefore the visual resources (landscape) are of prime importance, and require careful and sensitive management. Some of the Park's visual resources are shown in Figure 8.

Yanchep National Park has a landscape characterised by landforms of gently undulating parallel ridges or dunes with interdunal valleys or depressions; wetlands are features of these depressions; vegetation associations range from low heathlands to Banksia/Eucalypt woodlands, depending on the soil type and depth. The landscape features of the Park fall into two categories: natural and cultural.

Natural Landscapes

These are characterised by features of landform : ridges provide view positions (points from which to view the landscape) and visual focal points (points to look at in the landscape); geology : limestone outcrops and cliffs provide contrast in colour, texture and composition; vegetation : the seven different vegetation associations provide contrasts in height, texture, density and diversity of composition; water bodies : are important focal points providing colour and texture diversity (see Figure 8).

Natural areas of relatively high scenic quality in the Park which are a focus of viewing, fall into two categories: areas of uniqueness in rock outcropping, water and other natural features; areas of vegetative diversity and general landscape variety. Specifically these include limestone ridges and outcrops, the wetlands (particularly Loch McNess), caves, concentrations of tuart and jarrah woodlands, and boundaries between vegetation types. Some optimal view positions (points which provide good views of features of the landscape) are indicated in Figure 8.

Cultural Landscapes

The history of use of the Park has resulted in many modifications to the naturally established landscape, including lawns, ornamental trees, gardens, buildings, tracks, roads and carparks. Some of these modifications have had a positive effect and some negative.

Modifications in the recreation area have created a unique landscape which contributes largely to the character of the Park; the buildings (McNess House, the Administration

building, Yanchep Inn and Gloucester Lodge) complement each other in architecture, give the Park an `olde worlde' charm and provide special visual focal points; the extensive lawns, trees and gardens provide an attractive setting for recreational activities. The ghost house ruins, and associated exotic trees in combination with tuarts, provide a focus area of special visual interest.

Much of the recreation area with its lawn and garden areas blending with historic buildings and naturally established bushland, providing canopied views to Loch McNess and bushland, is of high scenic quality (see Figure 8).

Existing or past land use areas which have a negative impact on the landscape include quarries, rubbish tip sites, power lines, large carparks and some roads.

Views from Existing Travel Routes

Travel routes through the Park which provide views to naturally and culturally established landscapes of high scenic quality include: Wanneroo Road with its avenue of *Eucalyptus citriodora*; the entrance road from Wanneroo Road to Yanchep Beach Road with views of Loch McNess, tuarts and *Melaleuca* woodlands; the track leading to the ghost house ruins featuring a number of vegetation types and views across Loch McNess; Abidos Road and parts of Yeal Swamp Road; Yandjidi and Boomerang Gorge Trails.

Implications for Management

1. Natural and cultural aspects of the landscape of the Park are of relatively high scenic quality and require protection.

2. Optimal view positions may be incorporated in interpretive or educational programs or trails, and can be carefully assessed for potential to enhance vehicular and pedestrian circulation systems.

3. Visual focal points and views from existing travel routes within the Park need to be protected and/or enhanced.

4. Past modifications to the landscape which have imposed negative impacts will require rectification and/or rehabilitation.

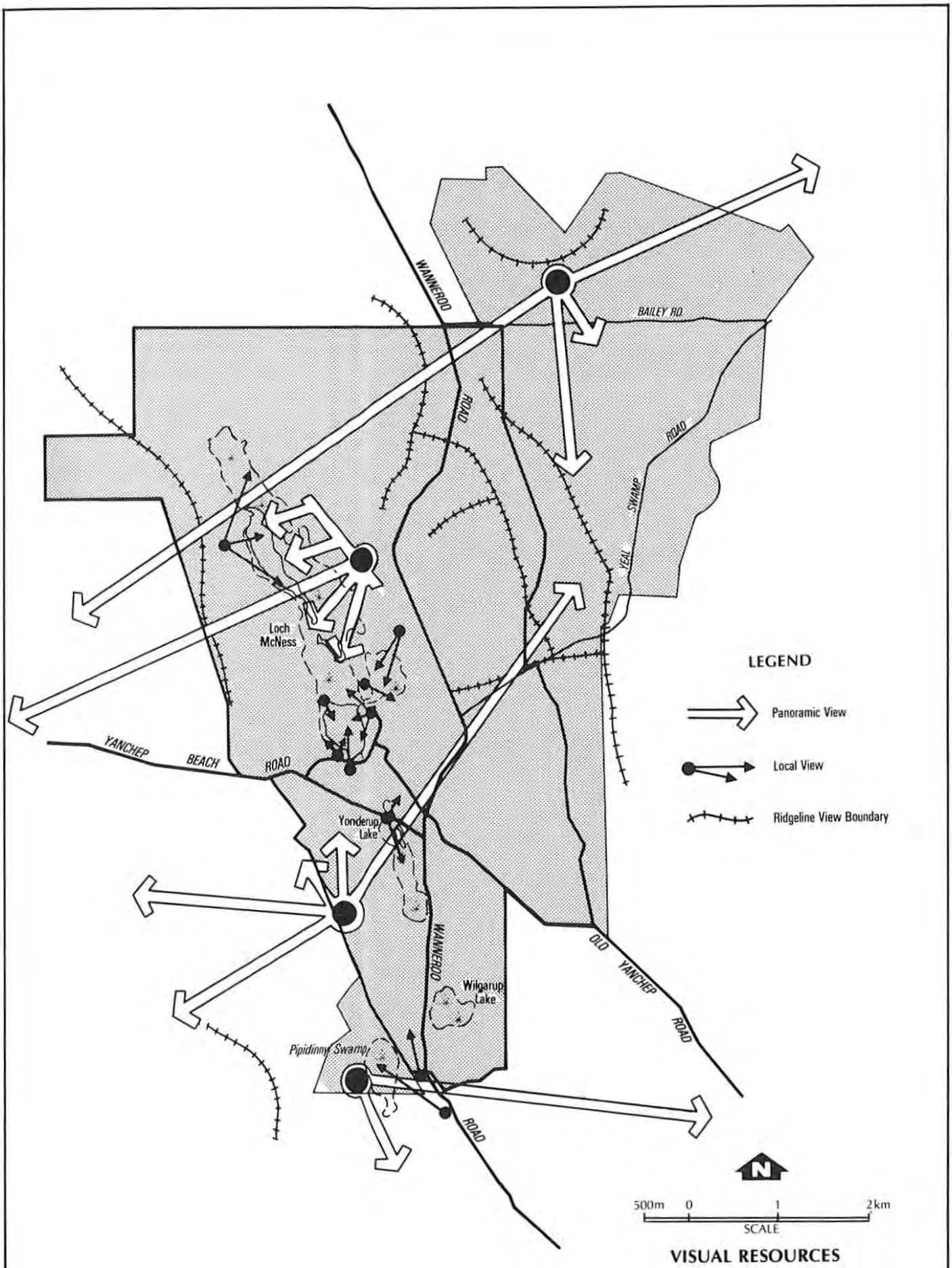

WANNEROO ROAD
BAILEY RD.
ROAD
ROAD
SWAMP
YEAL
Loch McNess
YANCHEP BEACH ROAD
Yonderup Lake
WANNEROO
OLD YANCHEP ROAD
Wilgarup Lake
Pipidinny Swamp
ROAD
LEGEND
Panoramic View
Local View
Ridgeline View Boundary
N
500m 0 1 2km
SCALE
VISUAL RESOURCES

FIG. 8

Management Objectives

1. To protect and enhance the cultural and natural landscape values of the Park.

2. To provide opportunities to appreciate aspects of the landscape of the Park and the region.

Prescriptions

1. Ensure that alterations to the established landscape are subtle, remaining subordinate to natural elements, by borrowing extensively from form, line, colour, texture and scale found commonly in the surrounding landscape. (Priority: Ongoing).

2. Prepare a site development plan prior to implementation of any development or rehabilitation project and submit to the Regional Manager or a representative for approval. (Priority: Ongoing).

3. Ensure all buildings (new and existing) are unified in form, colour, construction materials and texture as far as possible; and are sited to complement the surrounding landscape; ensure they are of a height no greater than existing buildings. (Priority: Ongoing).

4. Locate any additional essential firebreaks so they follow natural landform and vegetation, and avoid prime focal areas. (Priority: Ongoing).

5. Design walk trails so they provide vantage points for views of special features and scenery and so they highlight a variety of viewing experiences, for example, develop a lookout off Wanneroo Road to provide views across Loch McNess. (Priority: Ongoing).

6. Maintain the existing avenue *Eucalyptus citriodora* along Wanneroo Road, replanting where necessary (see Section 10.4.3). (Priority: Ongoing).

7. Develop the master plan for the recreation area, including relocation of carparks and parts of roads, the screening of carparks and the development of a scenic drive (see Sections 14.3 and 14.4). (Priority: 1).

8. Rehabilitate degraded areas (see Section 7.4). (Priority 2).

PART D MANAGEMENT FOR VISITORS

13.0 REGIONAL RECREATION OPPORTUNITIES

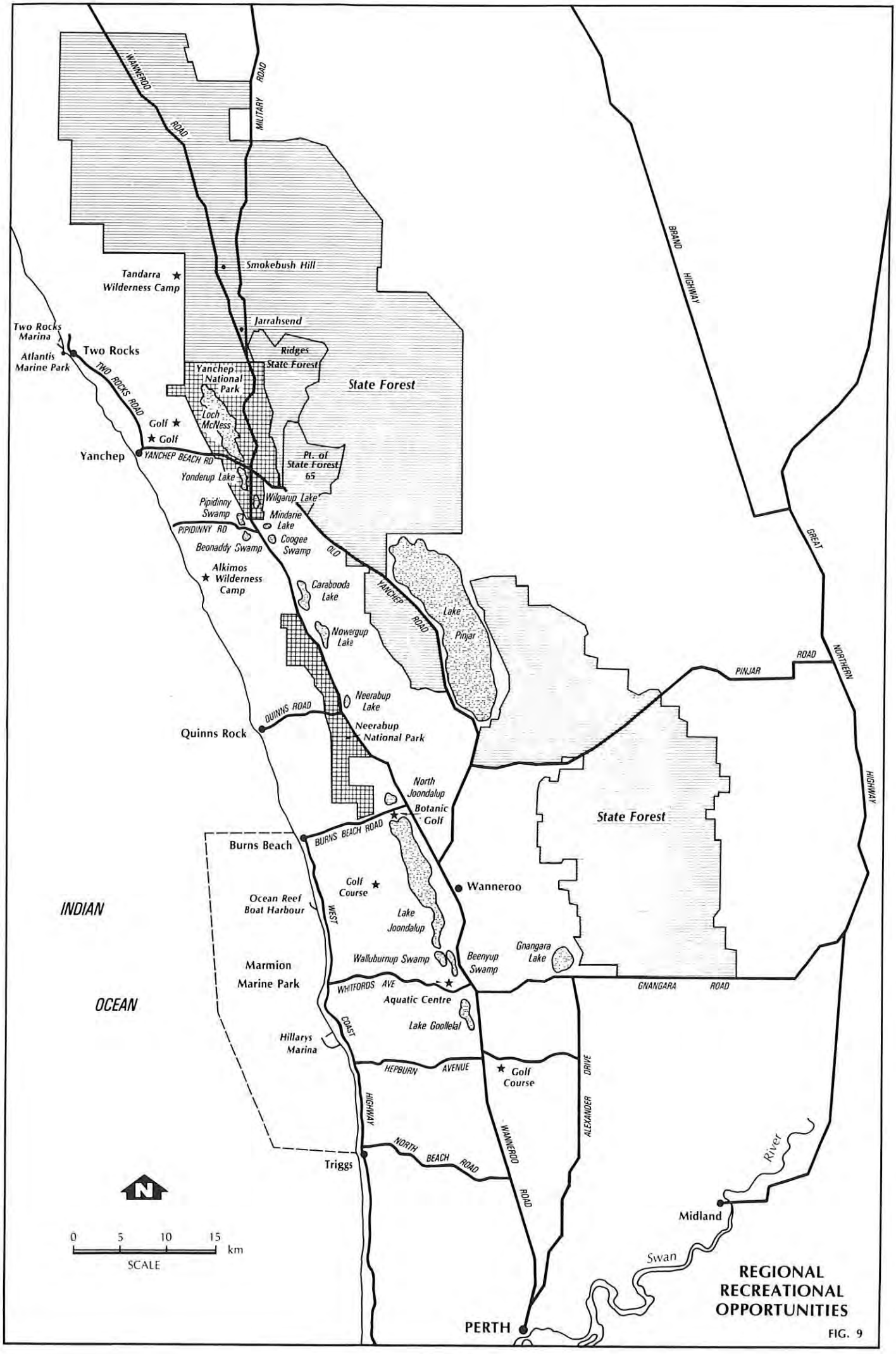
There are many recreational opportunities available in the region in which the Park is situated, mainly within the City of Wanneroo, which makes the region an attractive destination for the people of W.A. and tourists alike. The W.A. Tourism Commission found for the year 1985/86, 11 percent of person-day-trips from Perth were made to the Wanneroo region (WATC, 1987a). This was (with the Darling Scarp area) one of the two most visited regions in the metropolitan area.

Recreational opportunities in the region are indicated in Figure 9. Natural environments that cater for a variety of recreation activities in the region include Neerabup National Park, areas of State Forest (managed by CALM), a number of lakes (managed by the City of Wanneroo, CALM and SPC), and extensive areas of coastal reserves, (managed by the City of Wanneroo).

It is proposed to leave a `green corridor' (known as the Gnangara Metropolitan Park) of natural vegetation from Lake Joondalup, through Neerabup National Park, north past Yanchep National Park and east through the State Forest (SPC 1987). There are two areas of regional open space, at Alkimos and Caraban, which extend across from the green belt to the coast. This will leave a natural corridor for wildlife and recreation.

There are two bush camps in the region provided by the City of Wanneroo, one near Two Rocks (called Tandarra) and one at Alkimos. These provide basic facilities for camping.Sports-orientated recreation is provided by City of Wanneroo recreation facilities throughout the City. There are four private golf courses in the region including one at St. Andrews, close to the western boundary of the Park, Botanic Golf at Burns Beach, and one public course being developed by the City of Wanneroo. The City of Wanneroo is constructing a swimming pool complex at Pinaroo.

Facilities provided for tourists and special activities include Atlantis Marine Park, Dizzy Lamb Park, a small wildlife park, and a number of food outlets. Ocean-based activities are popular in the region; there are three marinas-at Hillarys, Ocean Reef and Two Rocks; and the recently declared Marmion Marine Park is within the region. A range of accommodation is provided in the region, from a caravan park to villas and a motel, at Yanchep/Two Rocks.



REGIONAL RECREATIONAL OPPORTUNITIES

FIG. 9

14.0 RECREATION AREA

The recreation area is shown in Figure 3. It is defined as the area that is developed and modified, and which supports extensive visitor use; it includes south Loch McNess.

14.1 BACKGROUND INFORMATION AND RECREATIONAL OPPORTUNITIES

The wide range of recreational opportunities in the Park make it a popular and unique recreation area. The setting is very attractive, with the backdrop of Loch McNess, substantial areas of grass with picnic facilities provided, shaded by many types of trees from all over the world and framed by gardens. The sound and sight of many birds (including the friendly ducks and swans) delights visitors. Surrounding these grassed areas is bushland of tuart woodland, heath and wetland vegetation which supports many birds and animals and many different plants, which provide a spectacular display of wildflowers, particularly in spring.

Within this tranquil, attractive environment there are many recreation opportunities. Visitors can: simply have a picnic and go for a walk around the recreation area or on one of the two nature trails provided (Yanjidi and Boomerang Gorge); view koalas, kangaroos and emus in enclosures; participate in a social game on grassed areas and the ovals; visit the Gloucester Lodge Museum which features displays and information on the history and natural features of the Park and the Wanneroo area; row out on Loch McNess; go on a tour of Crystal Cave; enjoy a beer, and lunch or dinner at the Yanchep Inn, and stay overnight at the Inn if they choose; have a game of golf with the kangaroos looking on; cool down in the swimming pool in summer; have a snack or lunch from the kiosk.

It is this unique combination of activities available in a single attractive setting which creates the character of Yanchep National Park and makes it a special and popular asset. It is also this combination which makes the Park very different from other National Parks; and produces a number of management issues, both problems and opportunities.

Since the resolution of these issues and conflicts is complex, this section firstly deals broadly with the issues and their resolution, and is followed by a more detailed outline of each issue and facility. This will provide both the necessary overview of the recreation area, as well as a more detailed explanation of management concerns and proposals.

14.1.1 VISITOR USE PATTERNS

The visitor use patterns in the Park vary according to the time of day, the day of the week, the month or season, and school and public holidays.

Overall, the number of visitors annually reached a peak in 1981/82, and declined in the following two years. This corresponded to a decline in visitation to National Parks throughout Australia generally and was associated with a period of economic downturn. Since 1984 visitor numbers have remained static.

The peak months in the Park are January (the highest), April, September and October. These correspond with school holidays, Easter holidays, public holidays and the Spring season. The lowest visitation months are in winter.

The peak days in the Park are Boxing Day, Easter Sunday and Mothers' Day with other public holidays also very busy. On these days there can be up to 1 300 cars in the Park, corresponding to over 4 000 people.

Within each day, the peak time is usually between 11 am and 2 pm (picnic lunch time). The Park is particularly popular during those times on hot summer days, when the cool shady areas are a welcome relief.

A normal week pattern entails fairly low visitation from Monday to Friday (with numbers rising in Spring), a moderate number of visitors on Saturday and the highest number on Sundays.

During the peak times and on peak days the experience of visitors to the Park is quite different than on normal weekdays. The Park is very crowded on these days, there are long waits for barbecues and other facilities (the source of numerous complaints), carparking creates congestion, and generally visitors can have significant effect on each other's recreational experience. On the quieter days, visitors have much less effect on each other and the experience is more quiet and peaceful, with usually no queues for facilities.

For reasons of an increasing population and expected increases in the number of tourists to W.A., it is expected that visitor numbers to the Park will increase in the future. Existing use patterns may change in the future with changing work and social patterns. Increased leisure time will probably make parks such as Yanchep more popular over a greater range of days. Patterns may also change with an increase in tourist numbers, resulting in higher numbers throughout the week.

Implications for Management

1. Visitor use patterns affect management in the number of staff required to cater for and clean up after visitors. Peak days (and the day after) require a larger than usual staff contingent. The quiet days are needed to carry out normal maintenance work.

2. Peak days in the Park put some facilities under pressure.

3. A balance needs to be found between providing sufficient facilities to cater for peak days and for quiet days. Catering for high peak days leaves many facilities under-utilised during most days, whereas catering for quiet days results in inadequate facilities on many occasions.

4. The Park has a capacity (environmental, social, number of facilities and staff) beyond which it cannot adequately sustain high numbers of visitors.

5. Management (in terms of staff allocation and provision of facilities) needs to be flexible to cater for changing leisure patterns in the future.

Management Objective

To provide adequate facilities and services for average peak days in the Park.

Prescriptions

1. In the provision of most facilities (eg. picnic facilities, see Section 14.4.4(f)) cater for an average peak day (eg. Sunday in Spring). (Priority: Ongoing).

2. Determine the carrying capacity of the recreation area and restrict entry beyond that number (see Section 14.4.6(h)). (Priority: 1).

3. Continue to roster staff according to the expected numbers of visitors to the Park. (Priority: Ongoing).

14.1.2 SUMMMARY OF CURRENT CONFLICTS AND MANAGEMENT ISSUES

There are a number of conflicts and management issues arising from the design and layout of the recreation area. It is not surprising that an area that was developed in the 1930s needs to be improved to cater for the demands of the 1990s. The overall effect of the

current layout is an impairment to the enjoyment of the Park; the recreation area has a high potential to be a first class recreation and tourist destination providing a high quality experience, but at present that potential is not fully realised.

Figure 10 shows a summary of the conflicts and management issues. These are also outlined for each facility in Section 14.3.

14.2 RECREATION AREA MANAGEMENT OBJECTIVES

In looking 20 years hence, management objectives have been formulated to guide future development and use of the recreation area, so that the essential character and uniqueness of Yanchep National Park remains, and aspects that are not satisfactory now will be progressively improved. These objectives complement the overall Park objectives. All existing and proposed facilities and activities discussed in this plan have been assessed according to these objectives.

They are:

1. To ensure uses of the recreation area are compatible with:
   a) maintaining the Park character (its peacefulness, atmosphere, landscape);
   b) enjoyment of and interaction with the Park environment; and
   c) a dependence on the Park's natural and cultural values.

2. To maintain the current level of diversity of recreational opportunities, provided they are compatible with Objective 1.

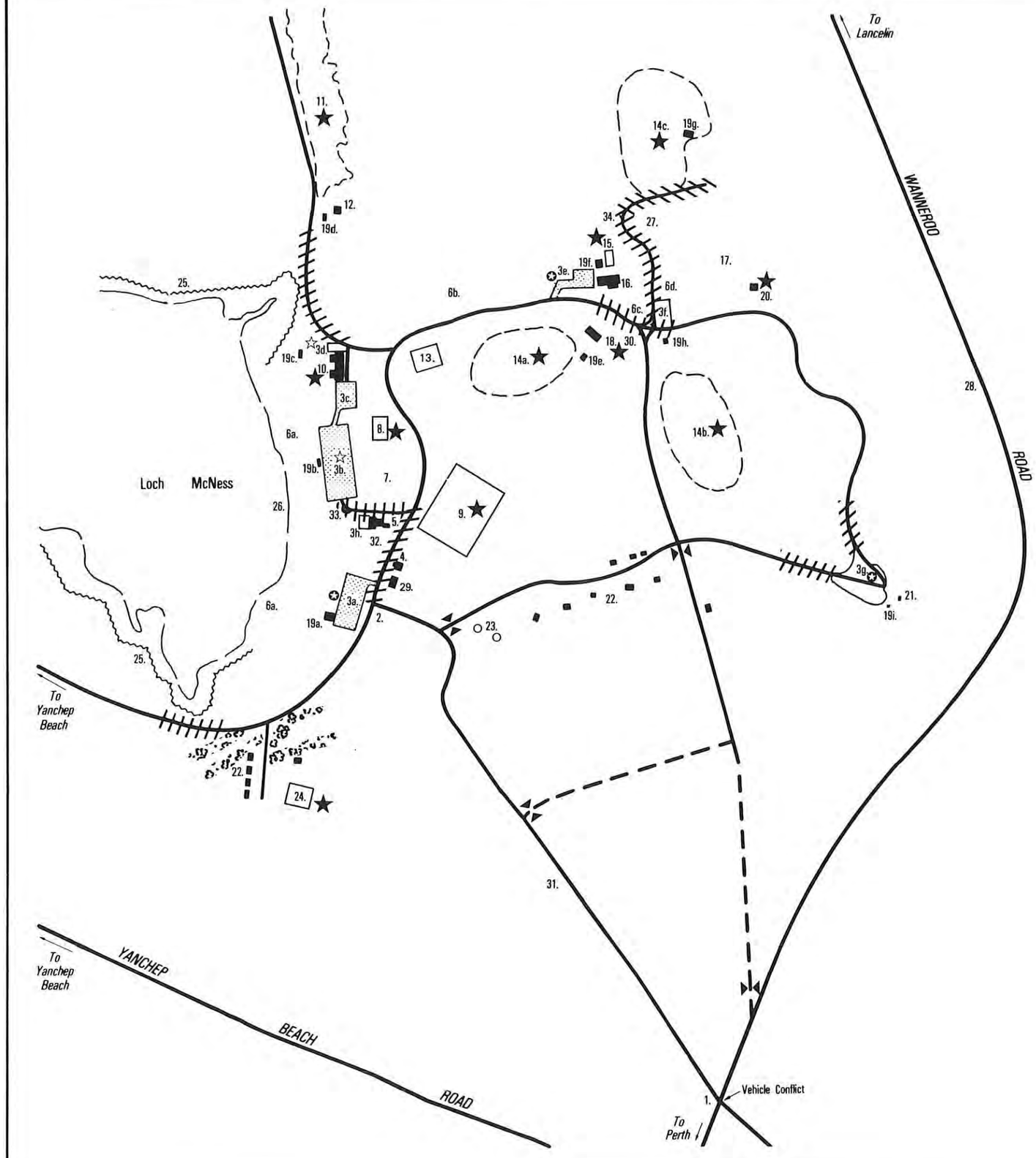
3. To maintain a high quality of amenity, service and facility.

4. To restrict intensive activities to within the boundaries of the existing recreation area.

5. To retain and restore natural bushland within the recreation area.

14.3 OVERALL STRATEGIES - MASTER PLAN OF THE PARK

The main strategy to resolve the conflicts and issues of the recreation area has been the development of a master plan for the recreation area. This takes into account past, present and future use, the views of Park visitors, management requirements, and CALM's



LEGEND

1. Recreation Area Entrance
2. Ticket Collection Area
3. Car Parks
   - 3a. Loch front south
   - 3b. Loch front
   - 3c. Inn south
   - 3d. Inn north
   - 3e. Gloucester Lodge/Swimming pool
   - 3f. Boomerang Gorge
   - 3g. Caves
   - 3h. McNess House
4. Administration Building
5. McNess House and Kiosk
6. Picnic Areas
   - 6a. Loch front
   - 6b. Secluded areas
   - 6c. Gloucester Lodge
   - 6d. Boomerang Gorge
7. Wildflower Garden
8. Koala Enclosure
9. Kangaroo/Emu Enclosure
10. Yanchep Inn
11. Golf Course
12. Golf Clubrooms
13. Tennis Courts
14. Ovals
    - 14a. West
    - 14b. East
    - 14c. North
15. Swimming Pool
16. Gloucester Lodge Museum
17. Boomerang Gorge
18. Hall
19. Toilets
    - 19a. Loch front south
    - 19b. Loch front centre
    - 19c. Loch front north
    - 19d. Golf course
    - 19e. West oval
    - 19f. Swimming pool
    - 19g. North oval
    - 19h. East oval
    - 19i. Caves
20. Tram Bungalows
21. Crystal Cave
22. Staff Residences
23. Water Storage Tanks
24. Maintenance/Service Area
25. Yanjidi Trail
26. Row-boat Hire
27. Ornamental Lakes
28. Wanneroo Road
29. Staff Office
30. Gloucester Lodge Intersection
31. Entrance Road from Wanneroo Road
32. Entrance Road
33. Loch Front Roundabout
34. North Oval/Ornamental Lakes Road

- Conflict–Moving and/or Parked Vehicles and Pedestrians.
- Car Park Requires Blending.
- Car Park Requires Formalisation and/or Redesign.
- Car Park, Inappropriate Location.
- Illegal Access Problem.
- Function of Facility needs Review.
- Screening Required.

N

0 100 200 300 400 metres

SCALE

SUMMARY OF CONFLICTS AND MANAGEMENT ISSUES

FIG. 10

recreation policy (Policy Statement No. 18).

It is a guide for development of the Park for the next 20 years. It will enable the rationalisation of existing facilities and the development of those which are more compatible with the philosophy of a national park.

The master plan is shown in Figure 12 and involves:

i) allocation of a specific name to the recreation area, to distinguish it from the remainder of the Park;

ii) re-design of the vehicle circulation system, including re-location of some stretches of road and upgrading of others, producing a two-way road loop; (see Section 14.4.1(a))

iii) relocation, upgrading, formalisation and screening of carparks; (see Section 14.4.1(b))

iv) provision of a scenic drive; (see Section 14.4.1(c))

v) improvement of the entrance to the recreation area; (see Section 14.4.1(d))

vi) provision of pedestrian corridors to separate pedestrians from vehicles; (see Section 14.4.2(a))

vii) provision of more nature trails; (see Section 14.4.2(b))

viii) a change in the function of some buildings eg. McNess House to become a part of visitor information facilities (see Section 14.4.3)

ix) the removal of some buildings eg. the hall, ranger houses; (see Section 14.4.4)

x) a rationalisation of recreation facilities eg. upgrading of most gardens into wildflower displays; upgrading of picnic facilities; removal of the kangaroo/emu enclosure; conversion of two of the three ovals to parkland areas; (see Section 14.4.4)

xi) the leasing out of a number of facilities in the Park, eg. rowboats, swimming pool, golf course; (see Section 14.4.5)

xii) rationalisation of management and maintenance services; (see Section 14.4.6) and

xiii) the provision of new facilities and activities eg. a visitor information facility; a children's adventure playground; a small-scale backpack camping area; interpretive programs; a new kiosk to be built (see Sections 14.5 and 18.0).

The master plan will help to transform the Park into a recreation area and tourist destination of international standard which can provide a high quality, enjoyable learning experience.

14.3.1 MANAGEMENT SUB-UNITS OF THE RECREATION AREA

For management purposes the recreation area has been divided into management sub-units so that compatible activities are linked together to reduce conflict; it allows for better utilisation of the recreation area by visitors; and helps to guide management, for example so that new activities can be appropriately located.

The following management sub-units have been designated and are shown on Figure 11.

Management Sub-units	**Criteria Defining Boundary**
Yanchep Inn Golf Course/ Swimming Pool	Area defined on the basis of existing building, grounds, carpark, entrance road, forecourt. The golf course and swimming pool to be maintained under the same lease, if possible.
Maintenance/Service	Defined by existing maintenance area,buildings and existing clearing. An area should be set aside within this unit for construction materials storage.
Bushland	Area defined by road boundaries, other management sub-units; largely undeveloped bushland containing trails, and compatible activities.
Parkland Recreation	Area of existing grassed surfaces. Barbecue and picnic areas including amenities and toilets, and generally areas planted with ornamental trees.
Residential	Area immediately adjacent to maintenance/service area including buildings and road access activities.

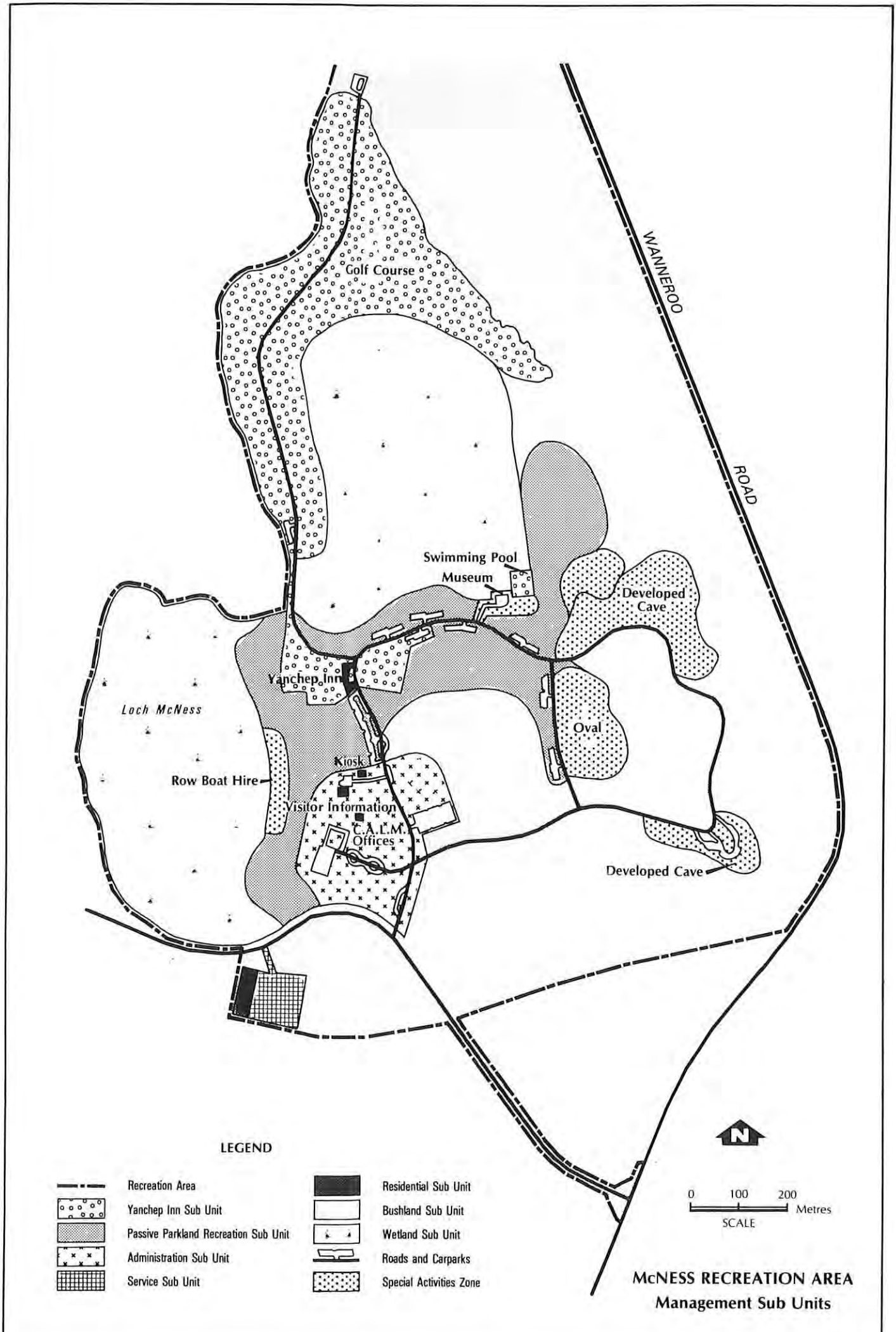

WANNEROO ROAD
Golf Course
Swimming Pool
Museum
Developed Cave
Yanchep Inn
Loch McNess
Oval
Kiosk
Row Boat Hire
Visitor Information
C.A.L.M. Offices
Developed Cave
LEGEND
Recreation Area
Yanchep Inn Sub Unit
Passive Parkland Recreation Sub Unit
Administration Sub Unit
Service Sub Unit
Residential Sub Unit
Bushland Sub Unit
Wetland Sub Unit
Roads and Carparks
Special Activities Zone
N
0 100 200 Metres
SCALE
McNESS RECREATION AREA
Management Sub Units

FIG. 11

Management Sub-unit	Criteria Defining Boundary
Administration	Includes a visitor information facility, carparks, ticket collection area, kiosk, CALM office.
Roads and Carparks	These include new roadworks, roundabouts, new carparks and existing improvements.The management sub-units should be defined as the edge of shoulder or kerb.
Wetland	Defined by waterbody, extent of wetland vegetation and wetland fringe vegetation including natural foreshores.
Special Activities	Includes the following: Museum Launch Rowboat Hire Adventure Playground Developed Caves Wildlife Enclosure Ovals

14.3.2 A DEVELOPED RECREATION AREA WITHIN A NATIONAL PARK

The recreation area is a very attractive, special feature of the Park. This highly developed and modified recreation area reflects past attitudes and concepts of the nationals parks. Current directions in national park management would not result in the same high level of development in other national parks. It is therefore considered important to distinguish between the developed recreation area and the remainder of the Park.

Prescription

Designate the recreation area `McNess Recreation Area'. (Priority 2).

14.4 SPECIFIC RECREATION FACILITIES AND ISSUES

The following is a more detailed analysis of the existing facilities in the recreation area with objectives and prescriptions for the resolution of conflicts and rationalisation of facilities.

14.4.1 VEHICLES AND ROADS

(a) VEHICLE CIRCULATION

The present road system (along a single main road way) leads to poor internal circulation, congestion of vehicles and a repetition of experience on the way out.

There are conflicts between vehicles (including buses), pedestrians and carparking throughout the Park (see Figure 10). Some roads cut through prime recreational areas; for example the road at the entrance (No. 31); around the ornamental lake (No. 33), the roundabout in the Loch Front picnic area (No. 32), and the four way intersection near Gloucester Lodge (No. 30).

Other issues relating to vehicle circulation are: insufficient control of access into the recreation area from several entry points; it is difficult for visitors to orientate themselves and find facilities when they enter the Park; the entrance from Wanneroo Road is located so that there is a safety hazard, and is of an angle to make entrance from the north difficult.

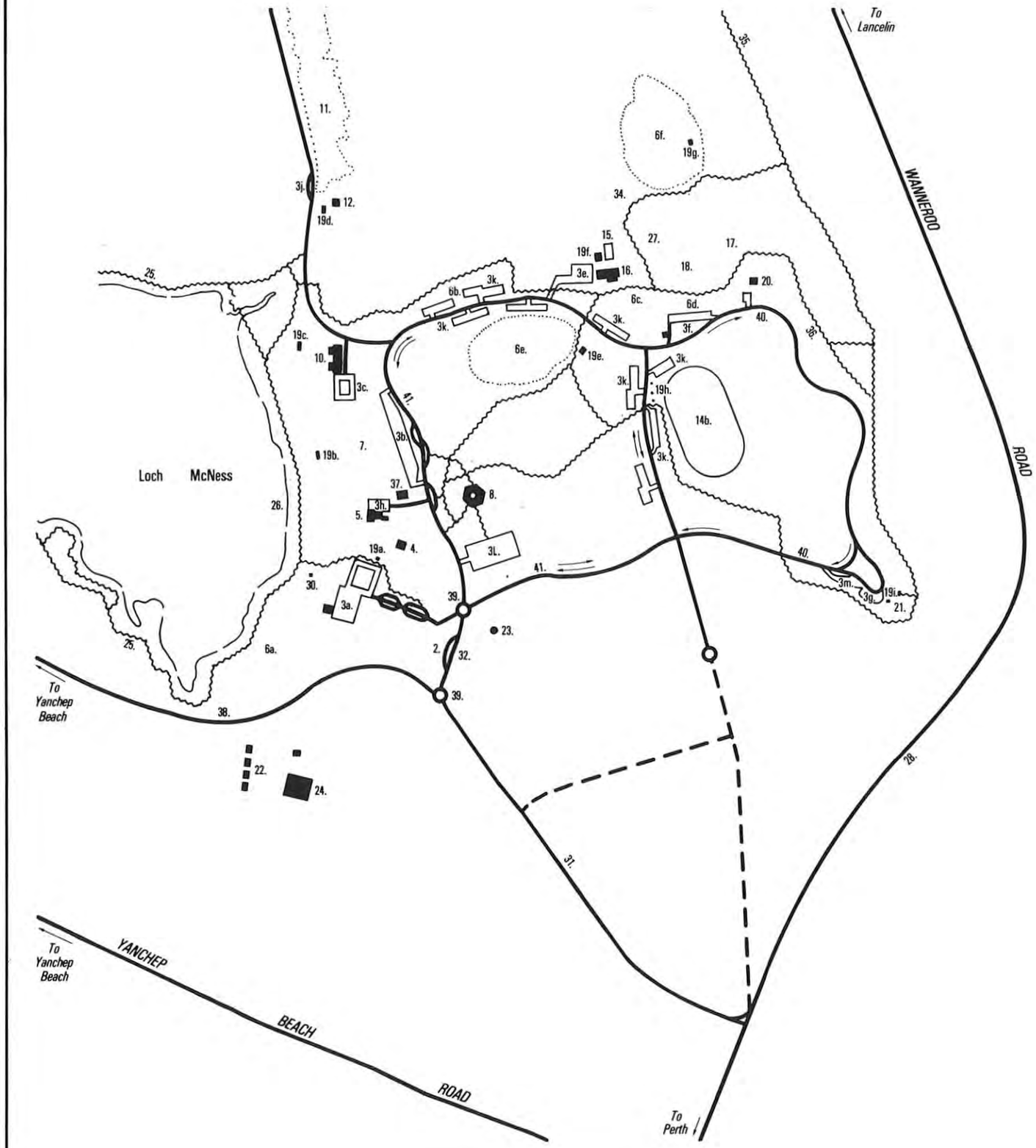
Management Objective

To provide an efficient vehicle circulation system which separates, as much as possible, pedestrian and vehicle activity.

Prescriptions

1. Redesign the vehicle circulation system according to Figure 12, which involves:

- **provision for internal circulation and a separate Scenic Drive By-Pass Road (see Section 14.4.1(c)).**
- **a new short stretch of roadway controlled by a ticketing office, providing an indirect connection to the internal circulation roadway, from the new Scenic Road.**
- **a two-way loop access roadway along existing roads, allowing continuous circulation within the recreation area (No. 41).**
- **a one-way loop road for caves access (No. 40).**



LEGEND

2. Recreation Area Ticket Collection
3. Car Parks
   - 3a. Loch front south
   - 3b. Loch front
   - 3c. Yanchep Inn
   - 3e. Gloucester Lodge/Swimming pool
   - 3f. Boomerang Gorge
   - 3g. Caves
   - 3h. McNess House
   - 3j. Golf course
   - 3k. Off-road car parks
   - 3l. Koala's/Loch front
   - 3m. Bus parking
4. Administration Building
5. McNess House Visitor Information Facility
6. Picnic Areas
   - 6a. Loch front
   - 6b. Secluded areas
   - 6c. Gloucester Lodge
   - 6d. Boomerang Gorge
   - 6e. Parkland west
   - 6f. Parkland north
7. Wildflower Garden
8. Koala Enclosure
10. Yanchep Inn
11. Golf Course
12. Golf Clubrooms
14b. East oval
15. Swimming Pool–Gloucester Lodge Intersection
16. Gloucester Lodge Museum
17. Boomerang Gorge
18. Adventure Playground
19. Toilets
    - 19a. Loch front south
    - 19b. Loch front centre
    - 19c. Loch front north
    - 19d. Golf course
    - 19e. Parkland west
    - 19f. Swimming pool
    - 19g. Parkland north
    - 19h. East oval
    - 19i. Caves
20. Lookout
21. Crystal and Yonderup Caves
22. Staff Houses
23. Water Storage Tanks
24. Maintenance/Service Area
25. Yanjidi Trail
26. Launch and Row-boat Hire
27. Ornamental Pools
28. Wanneroo Road
30. Pumphouse
31. Entrance Road from Wanneroo Road
32. Entrance Road
34. North Parkland and Ornamental Lakes Path
35. Ghost House Trail
36. Caves Interpretation Trail
37. Kiosk/Tearooms
38. Scenic Drive
39. New Roundabouts
40. Caves Road
41. Main Access Road

Building
Walk Trail

N

0 100 200 300 400 metres

SCALE

MASTER PLAN
(Concept)

FIG. 12

- relocation of the entrance road to the east of its present location, to rejoin the existing road near the present koala enclosure (No. 32). This will provide an uninterrupted visual and pedestrian link between the parkland and picnic areas and associated buildings and will remove a safety hazard.

- use of a roundabout at the new entrance to control intersection movements and to slow vehicles (No. 39).

- removal of the north oval road as a formal access; conversion to a management track (No 34). This will allow for pedestrian access along an attractive area, past the ornamental pools, to the north oval and Cabaret Cave without the dangers and intrusions associated with vehicle use.

- a relocation south of the road near Gloucester Lodge (No. 16).

- re-design of the entrance from Wanneroo Road, including a shift in location.

2. Implement the redevelopment in the following priority:

   i) re-location of the entrance road including the construction of two roundabouts, new section of road and the scenic drive, (see Section 14.4.1(c)) the ripping up and regrassing of former road areas(Priority 1)
   ii) closure of the North Oval road; (Priority 1)
   iii) upgrading of the two-way loop road; (Priority 1)
   iv) redesign of the entrance from Wanneroo Road; (Priority 2)
   v) relocation of part of the Gloucester Lodge road; (Priority 2)

3. Design the roads so they have a minimal impact on the natural and visual resources. (Priority: Ongoing)

4. Rehabilitate all former road areas. (Priority: Ongoing).

5. Use the new sign system to allow easy orientation around the new road system (see Section 14.4.6(f)). (Priority 1).

6. **Continue to include regular maintenance of roads in the Park's annual works program. (Priority: Ongoing).**

14.4.1(b) CARPARKING

The location and lack of screening of some carparks creates visual intrusions, while cars close to picnic spots intrude on peaceful recreation experiences. The lack of formalisation of carparks leads to chaotic parking and reduces the carrying capacity of the carparks. On busy days parking occurs along the roadsides which degrades roadside vegetation, creates hazards for pedestrians and is visually cluttered and unattractive. The carparks are shown in Figure 10.

Specifically:

- The carpark next to the ticket collection area (Loch front south) (No. 3A) is situated on sloping ground which intrudes on sweeping views of Loch McNess from the entrance road, it is an irregular shape with no internal markings to guide usage.

- The Loch Front carpark (No. 3B), is located within the most popular picnic area; an eyesore which intrudes on the peaceful picnic area; its internal arrangement is poor.

- The roundabout and nearby overflow carpark (No. 3H), intrudes into, and detracts from, the prime Loch front picnic area.

- The carpark to the south of Yanchep Inn (No. 3C) is often used as a thoroughfare between the Inn and the Loch front areas, parking is disorganised; and on busy days there is congestion.

- The carpark to the north of the Inn (No. 3D), with bitumen extending to the edge of the building, detracts from the aesthetics of the building and its surrounds. It is inappropriately sited.

- Car parking in the vicinity of Gloucester Lodge and Boomerang Gorge (No. 3E and 3F) is not adequate; it creates congestion at a difficult intersection, and detracts from the attractive setting.

- The main entrance road (No. 32) is used for parking by cars and buses. It is an unsightly view for visitors entering the recreation area; and creates a conflict between pedestrians, traffic and parked vehicles.

- The car park at the caves (Crystal and Yonderup), (No. 3G) is an unsightly and congested introduction to the caves.

- Bus parking creates visual and noise conflicts in prime use areas: the entrance area, Loch front, koala enclosure and caves.

Management Objectives

1. To provide carparks which:
   - provide direct and ready access to facilities and amenities;
   - do not detract from views and visual attributes of the Park;
   - keep roadways free of parked vehicles
   - make use of the available space
   - cater for an average peak day.

2. To confine all parking within designated carparks.

Precriptions

1. Redesign car parking according to Figure 12, in conjunction with redesign of internal roads. This will involve:

- **carpark (No. 3A) - arrange in terraces down the slope with screen plantings, providing cellular parking which does not detract from the surroundings.**

- **provision of a new carpark (No. 3L), off the new entrance road. This will cater for much of the parking requirements for the Loch front picnic area, the koalas and wildflower garden, and is discretely located so as not to intrude on the Park visually. It will encourage people to walk through the new enlarged Loch front parkland, rather than use vehicles.**

- **removal of the Loch front carpark (No. 3B) to create a more continuous, scenic parkland setting.**

- **relocation of the koala enclosure (No. 8), adjacent to the new eastern carpark (No. 3L), and conversion of the existing koala area to a cellular carpark (No. 3B). This will also provide parking for the Loch front**

area and the wildflower garden.

- provision for bus parking in the vicinity of areas of interest, with drive in and out facilities in conjunction with the tourism industry.

- provision of carparking areas along the periphery of roadways, designed to integrate with park and bushland areas (for example along the road towards Gloucester Lodge, and the East Oval (No. 3K)).

- relocation and re-design of Crystal Cave parking (No. 3G); and rehabilitation of the area around the Cave entrance to an attractive bushland setting.

- relocation of Boomerang Gorge carpark (No. 3F), to improve views into the gorge and better cater for the demand for parking. Facilities for the disabled will remain.

- the provision of the carpark south of the Yanchep Inn for Inn users only.

- the hard surfacing and marking out of all carparks.

2. Design carparks which blend with the surrounding areas, including making use of existing bushland; shape, colour and texture of materials; screen plantings with indigenous vegetation where necessary. (Priority: Ongoing)

3. Provide parking suitable for the disabled throughout the recreation area. (Priority 1).

4. Implement the redevelopment of carparks in the following priority (in conjunction with the redesign of roads):
   1) Loch front south (Priority 1)
   ii) caves (Priority 1)
   iii) Gloucester Lodge/pool (Priority 2)
   iv) cellular parking off roads (Priority 2)
   v) new koala enclosure parking (Priority 2)
   vi) current koala enclosure (Priority 3)
   vii) remove Loch front carpark (Priority 3).

5. **Determine the required number of parking bays for an average peak day. (Priority 1).**

6. **Develop enough carparking to cater for an average peak day. (Priority: Ongoing).**

7. **Monitor the sufficiency of parking provided, and progressively develop more according to the master plan. Limit the total amount of parking provided according to perceived environmental and visual impacts, the carrying capacity of the recreation area (see Section 14.4.6(h)) and the need to retain natural bushland within the recreation area. (Priority: Ongoing).**

8. **On peak days, and when the limit of carparking provided is reached, consider providing carparking outside the recreation area and operating a shuttle bus service (see Section 14.4.6(h)). (Priority N/A).**

9. **Provide signs to indicate where parking is available within the new sign system (see Section 14.4.6(f)). (Priority 1).**

10. **Rehabilitate all former carparks. (Priority: Ongoing).**

11. **Include regular maintenance of carparks in the Park's annual works program. (Priority: Ongoing).**

14.4.1(c) SCENIC DRIVE

There is currently no provision for a scenic drive in the Park. As part of the redevelopment of the vehicle circulation in the Park, the provision of a scenic drive, based largely on existing roads, becomes possible. The scenic drive will follow the existing entrance road (off Wanneroo Road) and continue along the existing road past the southern end of Loch McNess to Yanchep Beach Road (see Figure 12). The only new portion of road required would by-pass the existing ticket collection/entrance area. Hence visitors would have a choice either to go to the McNess Recreation Area, to simply experience some of the Park by driving through an attractive portion of it, or both.

The provision of a scenic drive will give the opportunity for more people to experience the Park, without having to go into the recreation area. The scenic drive will not involve a great deal of roadworks, construction of a small section of new road and some upgrading of the existing roads, (therefore costs will not be high), will involve little major change in

vehicle patterns, (as opposed to construction of a new road where none presently exist) and will provide an additional recreational opportunity in the park.

Management Objective

To provide an additional vehicle-based recreation opportunity in the Park.

Prescriptions

1. **Design the exact route of the new road section of the scenic drive (Priority 1).**

2. **Construct the scenic drive as part of the first priority for the redevelopment of the entrance of the recreation area (refer to Sections 14.4.1(a) and (d)). (Priority 1).**

3. **Upgrade those parts of the existing road which are not up to standard. (Priority 1).**

4. **Include in the major directional signs off Wanneroo Road and Yanchep Beach Road the location of the scenic drive, as part of the new sign system (see Section 14.4.3). (Priority 1).**

14.4.1(d) ENTRANCE TO THE RECREATION AREA

There are a number of problems relating to the entrance of the recreation area (see Figure 10, No's 2, 31 and 32). The road design is cumbersome and at busy times there is often congestion and queues of vehicles from two directions converging on one point. The vehicles are slowed at this point to pay the entrance fee, either to Park staff in a ticket collection kiosk or to a fee collection box. (The issue of entrance fees and their collection is discussed in Section 14.4.6(e)). The collection point is located on a slope overlooking Loch McNess and therefore intrudes on views as visitors first enter the area (see Figure 10, No. 2). The area is cluttered with a number of different signs. As visitors advance from this area they are presented with an unattractive view of parked cars, bitumen and congestion.

Implications for Management

The entrance to the recreation area is unsatisfactory and requires improvement for easier traffic flow and better visual amenity.

Management Objective

To provide an attractive entrance to the recreation area which allows the smooth through-flow of vehicles, for an average peak day.

Prescriptions

1. **Redesign the entrance area according to Figure 12, which involves:**
   - **its relocation to the east of its present site**
   - **a right or left turn into an entrance road, or with an option to continue on the scenic drive (see previous section)**
   - **placement of the ticket collection kiosk and machine within a central median, allowing easy access and through flow by vehicles from one direction only (see also Section 14.4.6(e)).**
   - **an approach lane which veers to the left requiring vehicles to slow down, thereby creating a directional slow point**
   - **the new entrance road rejoining the existing road close to the present kangaroo/emu enclosure**
   - **provision of an information bay.**
   - **an attractive entrance experience to the Park**

2. **Implement the re-location of the entrance area as part of the first priority for the redevelopment of the recreation area (refer to Sections 14.4.1(a). (Priority 1).**

3. **Provide simple, standard signs giving directional and general information, allowing easy orientation, as part of the redesign of the sign system (see Section 14.6(f)). (Priority 1).**

14.4.2 PEDESTRIANS

(a) PEDESTRIAN ACCESS

At present most of the pedestrian access around the recreation area is on roads, which creates conflict and hazards between pedestrians and vehicles and does not allow for quiet `natural' walking experiences. As such, vehicle access is favoured over pedestrian access in the Park; so the experience of the Park for pedestrians is impaired. There are a few informal tracks leading to some facilities, however, they are not well sign-posted and not well used.

Implication for Management

Better pedestrian access is needed throughout the recreation area to allow the Park environment to be enjoyed without the intrusion of vehicles.

Management Objectives

1. To keep, as much as possible, pedestrians separate from vehicles.

2. To provide pedestrian corridors throughout the recreation area which
   a) link up to major facilities, features and carparks;
   b) allow disabled access to most areas;
   c) link up with nature trails; and
   d) spread use of the recreation area.

Prescriptions

1. Provide a network of paths throughout the recreation area which link with roads and carparks, according to Figure 12. (Priority: Ongoing).

2. Progressively construct the network of paths. (Priority 1).

3. Ensure disabled access is possible along paths to all the major facilities. (Priority 1).

4. Construct the paths of a durable natural material which blends with the environment. (Priority: Ongoing)

5. Include in annual works programs regular maintenance of all paths. (Priority: Ongoing).

6. Provide signs which indicate the presence of all paths, and their destination, distance and length of time required within the new sign system (see Section 14.4.6(f)). (Priority 1).

14.4.2 (b) NATURE TRAILS

Nature trails are those which provide educational and/or interpretive opportunities for the appreciation and greater understanding of the environment.

There are two nature trails in the recreation area: Boomerang Gorge, which caters for the disabled, including the visually impaired (see Figures 10 and 12, No. 17), and provides information on plaques; and Yandjidi Trail which meanders around south Loch McNess (see Figures 10 and 12, No. 25); seating, trail indicators and a pamphlet are provided. Vandalism is a problem, particularly for the Yandjidi Trail, which increases maintenance costs.

In the visitor survey the response to the statement `Yanchep National Park needs more places where you can walk in the bush' was: Agree 38 percent, Disagree 38 percent, Undecided 24 percent. This is a surprisingly high percentage of "agree", since many of the Park's visitors have traditionally only experienced and expected the developed part of the Park.

Implications for Management

1. Nature trails are desirable because they allow opportunities for visitors to interact with the Park environment with a minimal impact, they help to redistribute use and visitor impacts, and alleviate crowding.

2. The two existing nature trails require regular maintenance.

3. Vandalism to the trails needs to be reduced.

4. There is potential to develop more nature trails in the recreation area, linking with those proposed in the natural area (see Section 16.0).

5. There is potential to provide ranger-guided walks on the nature trails.

Management Objective

To provide opportunities for visitors to interact with the environment.

Prescriptions

1. Develop nature trails which will highlight interesting or special features of the recreation area, and link up with pedestrian access paths and trails in the natural areas and include:

a) a caves trail which highlights the surface features of Crystal Cave, and links up with Boomerang Gorge Trail and the Ghost House Trail. (Priority 1).

b) a trail which links up with the proposed Yaberoo Budjara Heritage Trail (discussed in Section 14.0). (Priority 1).

2. **Construct the paths of durable natural materials which blend in with the enviroment.**

3. **Provide information in the form of signs or pamphlets. (Priority 1).**

4. **Include regular maintenance of nature trails in the Park's annual works program. (Priority: Ongoing).**

5. **Provide guided walks along the trails (see Section 18.0). (Priority: Ongoing).**

6. **Regularly patrol the trails, for maintenance, clean-ups, vandalism control and interaction with users. (Priority: Ongoing).**

14.4.3 BUILDINGS

14.4.3(a) ADMINISTRATION BUILDING

The building was constructed in 1933 and has always housed the administration function in the Park (see Figures 10 and 12 No. 4). For a number of years it has also been an outlet for souvenirs, taken bookings for caves, ovals and the hall and has been the main information outlet in the Park.

The National Trust has classified the building according to all five categories:

20 *architectural/technical accomplishment*
21 *demonstration of a way of life/custom/process or function*
22 *historical significance/of development or cultural phases/important figure(s)*
23 *environmental importance/townscape or landscape value/high degree of unity (or diversity)/setting*
24 *scarcity value/a particularly fine (or unique) example*

`The building matches the style of the two lodges and the Yanchep Inn which were built at the same period which adds to its value. It has a prominent gable roof with Tudor strapwork. The entrance porch is supported on natural limestone columns. Very few examples of structures of this type now remain.' (National Trust of W.A. 1987).

Public Comment - In the visitor survey 19 percent visited the souvenir shop/office. Of 100 responses regarding the souvenir shop/office, 50 percent were favourable, 34 percent were neutral and 16 percent were unfavourable. Specific comments included: `need to upgrade' or `improve the souvenir shop'

The building is not satisfactory for all of its present functions. There is insufficient space to accommodate all of the administrative functions; so the Park staff office is in an adjacent building. The internal design is not suitable, and the space is not well utilised. The building needs renovation work.

Implications for Management

1. All or some of the functions of the administration building need to be changed and/or relocated.

2. It is desirable to have all of the administrative functions housed in one building.

3. Since it has been classified by the National Trust any changes to the building need to retain its basic structure and character.

4. The building requires considerable upgrading.

Management Objective

To upgrade the administration building to effectively incorporate the administrative function of the Park, while enhancing the heritage value of the building.

Prescriptions

1. **Arrange for the administration building to be upgraded and extended if needed to a high standard, sufficient to accomodate the administration function of the Park. (Priority: 1).**

2. **Transfer the administration and information function to the Park staff office while renovations take place (see Section 14.4.3(f)). (Priority: 1)**

14.4.3(b) MCNESS HOUSE

McNess House was built incorporating the original Cave House (see Figures 10 and 12 No.

5). From the 1930s it functioned as a guest house. As the demand for overnight accommodation in the Park fell, McNess House closed in the 1970s. For many years a kiosk has been operating from a small asbestos extension to the building. The building itself is not in use.

The National Trust has classified the building according to four categories:

21 *demonstration of a way of life/custom/process or function*
22 *historical significance/of development or cultural phases/important figure(s)*
23 *environmental importance/townscape or landscape value/high degree of unity (or diversity)/setting*
24 *scarcity value/a particularly fine (or unique) example.*

`The building is important as the first accommodation for visitors to the Park and for its connection with Sir Charles McNess. Incorporated in it is the original Cave House. The style of the building is in character with the Inn, Gloucester Lodge and the Administration building and few structures of this type now remain.' (National Trust of W.A. 1987).

It was not classified according to category 20 (architectural/technical accomplishment) because of the asbestos extensions to the building (the existing kiosk and closed-in verandahs).

Due to its lack of use, the building is in a deteriorating condition. The current kiosk facility is totally inadequate, and does not meet the health requirements of the Wanneroo City Council. McNess House is not of a suitable design to remodel into a kiosk. It is a waste of resource not to use McNess House since it is of cultural and heritage value, effective utilization of the building would enhance its value, and ensure it will be maintained adequately.

Implications for Management

1. McNess House is unsuitable for use as a kiosk and is not large enough to accomodate an extensive visitor information facility.

2. The building requires restoration and renovation which may be costly.

3. The building needs to be more fully used.

4. Since it has been classified by the National Trust any changes to the building need to retain its structure and character.

5. The asbestos additions to the building detract from its heritage value.

6. A visitor information facility will be provided in the Park, and it needs to be in a central location (see Section 18.1).

Management Objective

To renovate McNess House so it will be an inegral part of the visitor information facility, while maintaining its heritage value.

Prescriptions

1. Assess the requirements and cost of renovating McNess House. (Priority 1).

2. If CALM cannot finance the project, raise the necessary funds to do so. (Priority 1).

3 Renovate McNess House so it becomes an integrated part of the visitor information facility, in consultation with the National Trust, including:

- **the removal of the asbestos additions;**
- **the provision of office and storage space**

4. Develop any other parts of the visitor information facility to blend in with the building.

14.4.3(c) KIOSK BUILDING

The draft management plan proposed that the kiosk be incorporated in the administration building, however, subsequent assessment revealed that a high quality kiosk would not be able to be produced. Therefore a new building will be constructed.

Implications for Management

1. The kiosk building needs to be in character with the other buildings of the Park.

2. The kiosk attracts many visitors and so needs to be in a central location with sufficient parking in the vicinity.

Management Objective

To ensure the kiosk building is of a high standard, in character with the other buildings of the Park.

Prescriptions

1. **Liaise with the kiosk leessee on the design and location of the building (see Section 14.4.5(a)). (Priority: 1)**

2. **Ensure the building is in the vicinity of the visitor information facility. (Priority: 1)**

14.4.3(d) BUNGALOW TRAMS

There are two bungalow trams, close to Boomerang Gorge (see Figure 10 No 20). They were originally trams, built in Perth by the WAGR in 1913; this particular type of tram is now very rare, they are possibly the last survivors of their type (M. Stukely pers. comm.). Originally eight trams were converted in the 1930s; after they were no longer needed for accommodation they gradually fell into disrepair and were vandalised or burnt; all but the remaining two were removed because of the damage.

The National Trust has classified the bungalow trams according to the following categories:
21 - *demonstration of a way of life/custom/process of function.*
22 - *historical significance/of development or cultural phases/ importance figures.*
23 - *scarcity value/a particularly fine (or unique) example.*

`The trams are of interest in themselves as examples of early models used by the Perth Tramways, their form still being visible, and also for the uses to which they have been put. Few examples of this model remain in W.A. The setting is attractive, above the Boomerang Gorge.' (National Trust of W.A. 1987).

Implications for Management

1. The bungalow trams are in disrepair and are vulnerable to further damage; if they are to be retained they require upgrading, regular maintenance and supervision.

2. CALM does not have the expertise, and has limited resources, to carry out upgrading, maintenance and adequate supervision.

3. The tram bungalows have heritage value as rare examples of early model trams and also for their role in the Park as bungalows. There is some feeling in the community that the tram bungalows should be restored and remain in the Park.

4. The Perth Tramways Society (a non-profit organisation which owns and operates the Whiteman Park Tramway Museum) has proposed to remove the two trams from the Park, and use the two to produce one restored example; to be placed at Whiteman Park, initially as a static display, and eventually as rolling stock.

Management Objective

To ensure the preservation of the trams.

Prescriptions

1. Investigate the availability of external funding and volunteers or other organisations to restore the bungalow trams and for continued maintenance, for display in the Park. (Priority 1).

2. Locate the trams to ensure their long term protection. (Priority 1).

3. If volunteers and funding are not available or feasible liaise with the Perth Tramways Society regarding the removal and restoration of the trams. (Priority 1).

4. Arrange for the installation of a plaque in Whiteman Park indicating the trams' previous association with the Park. (Priority 1).

14.4.3(e) HALL

The hall was originally built during World War II at Crawley (near Perth) and was used as a rehabilitation hall for American Catalina crews. After the war it was dismantled and transported to the Park (see Figure 10 No. 18). It was used for picture shows, dances, parties and wedding receptions.

In more recent years it has been used for functions, meetings and scout and cub gatherings.

In the last few years it has had a low level of use; in 1986/87 it was booked on only nine occasions, and in addition it is used by a local cub group and the Two Rocks play group. The play group has only recently been using the hall, due to the Yanchep/Two Rocks Recreation Centre at Yanchep being declared unsafe. Until the Recreation Centre is renovated (the City of Wanneroo will commence work in 1988) the hall provides the only such venue in the Yanchep area.

Implications for Management

1. The hall is not a major asset of the Park; it has a low level of use, it is not an attractive feature, and has no heritage value (it was not classified by the National Trust). Therefore its presence in the Park is of questionable value.

2. When the Yanchep Two Rocks Recreation Centre is upgraded, there will be an alternative venue in the area.

3. Use of the hall does not involve interaction with the Park environment and does not depend on Park values and so is not compatible with objectives 1(b) and (c) of the recreation area.

4. The building requires major upgrading; it has been the subject of vandalism many times.

Management Objective

To remove the hall.

Prescriptions

1. Arrange, under tender, for the removal of the hall, once the Yanchep/Two Rocks Recreation Centre is re-opened. (Priority 1).

2. Plan for some of the resulting area to be developed as a new section of road past Gloucester Lodge (as outlined in Section 14.4.1(a)) and the remainder to be maintained as a grassed area. (Priority 2).

14.4.3(f) PARK STAFF OFFICE BUILDING (EX-SUPERINTENDENT'S HOUSE)

The Park staff office is located next to the current administration building (see Figure 10 No. 29); it was built in 1969 and was originally the Park Superintendent's house.

Implications for Management

1. The Park administration function (including the Park staff office) will be moved to the upgraded administration building and McNess House (see Section 14.4.3(b)).

2. While the administration building is being upgraded, the present building will need to accommodate both office and ranger staff.

3. Once the transfer of functions has occurred, the building will not be needed by CALM.

4. The building is out of character with the architecture and character of the other buildings in the Park.

Management Objectives

1. In the short term, to make effective use of the Park staff office building for the administration function of the Park.

2. In the long term, to remove the Park staff office building.

Prescriptions

1. Make necessary temporary alterations to the building so it can effectively accommodate rangers and office staff. (Priority 1).

2. Erect signs to indicate the location of the information function. (Priority 1).

3. Once McNess House is renovated, call for tenders to remove the building and all associated structures. (Priority 2).

4. Rehabilitate the area. (Priority 2).

14.4.4 RECREATION FACILITIES

14.4.4(a) KOALAS

Koalas and Yanchep National Park are synonomous in the minds of many West Australians; they have been a traditional part of the experience of the Park for many years. They are an important part of the `taste of Australia' experience for overseas visitors (in particular) and together with the caves are a major drawcard for tourists to the Park.

The original koala colony was established in the Park in 1938, being transferred from the Perth Zoo because it could not provide enough feed for the animals. The original colony died prior to 1940. A new colony was re-established in 1948. For many years Yanchep National Park was the only place in W.A. where koalas could be viewed; they can now also be viewed at the Perth Zoo and Cohunu Wildlife Park.

There are 11 koalas currently in the colony. It is not a viable population because there has been no successful breeding for a number of years. One strong contributing factor is that many of the koalas are afflicted with *Chlamydia* disease, which is common in koalas throughout Australia. It causes conjunctivitis (in its mild form) and Cystitis or pneumonia (in its severe form); this can cause infertility (it is likely all the females in the Park are infertile, though not all necessarily due to *Chlamydia*). They are extremely delicate animals, and they may die or fall ill from a variety of other causes, and due to the infertility, are not being replaced by natural reproduction.

Due to their fragility, koalas require specialist care and diet (Muir 1983). Currently the equivalent of 1.5 staff full time are required to manage the koalas, with regular veterinary assistance, this includes maintenance of 6 000 koala feed trees (see Section 10.4.2); daily feed collection; maintenance of the compound; regular examination and treatment of the animals.

Public Comment - In the visitor survey, 75 percent visited the koalas. Of the 450 responses on koalas, 91 percent were favourable, 7 percent were neutral and 2 percent were unfavourable. Specific comments included: `loved the koalas; provide koala feeding times; koalas now at other places, discontinue in the Park'.

Implications for Management

1. The koalas are the most popular feature in the Park.

2. The koalas are part of a combination of features of the Park (including kangaroos, caves, the landscape) which is unique in recreational and tourist destinations in this State, and probably Australia.

3. Koala care requires considerable staff time.

4. The health of the koalas needs to be improved; the only way for there to be a koala colony in the Park in the future is by introducing new stock. New stock and currently `diseased' existing stock will need to be separated so not to spread the disease.

5. Any animal which is suffering as a result of disease, and which cannot quickly be treated, needs to be destroyed.

6. Keeping animals in captivity is not compatible with the philosophy of national parks.

7. Additional funding through sponsorship of the koalas may be attracted to reduce costs.

8. The koalas have educational and interpretive potential.

9. Koala feed plantations are required in or close to the Park (see Section 10.4.2).

Management Objectives

1. To maintain a healthy, viable koala colony.

2. To provide opportunities for greater understanding and appreciation of koalas.

Prescriptions

1. Continue to provide a high standard of care and hygiene to the koalas, providing veterinary assistance when required. (Priority: Ongoing).

2. Continue to keep separate *Chlamydia* positive and negative animals. (Priority: Ongoing).

3. **Add to the Park staff a suitably qualified person to provide long term care for the koalas and feed plantations. (Priority 1).**

4. **Negotiate with relevant authorities in Victoria and/or South Australia regarding the acquisition of undiseased animals (from localities which are overpopulated and therefore require the removal of animals). (Priority 1).**

5. **If animals are available from the Eastern States, organise their transport to the Park.**

6. **Liaise with the Perth Zoo regarding the ongoing care and breeding of the koalas. (Priority: Ongoing).**

7. **Plant suitable trees in the area proposed for a new enclosure. (Priority 1).**

8. **Design and construct a new koala enclosure (see Section 14.4.4(b)). (Priority 2)**

9. **Progressively plant new koala feed plantations outside the Park (see Section 10.4.2). (Priority: Ongoing).**

10. **Keep up to date with the latest research on koalas, particularly diseases. (Priority: Ongoing).**

11. **Investigate alternative funding to assist in the care of the koalas. (Priority 1).**

14.4.4(b) KOALA ENCLOSURE

The present koala enclosure is a high quality facility which provides good viewing of koalas, and the four separate pens allow different groups of koalas to be separated from each other (for purposes of disease and breeding) (see Figure 10 No. 8). There is also a koala sick bay at the maintenance/service area.

Within the planned redevelopment of the recreation area, it became clear that in order to: remove the inappropriately located Loch front carpark (see Figure 10 No. 3B) and provide alternative parking; and to provide pedestrian access around the enclosure and kiosk area without the intrusion of a road, the existing koala enclosure needed to be re-located (also to keep diseased and disease-free animals separate). The proposed location is shown on Figure 12. Carparking for the Loch front will be provided in the existing koala enclosure area. The new enclosure location will be part of the pedestrian corridor which will extend throughout

the recreation area, with little intrusion from roads.

Implications for Management

1. The new koala enclosure is part of the 5-10 year program of implementation of this plan.

2. Planting of suitable trees in the area will need to be carried out as soon as possible so that by the time the enclosure is built the trees will be able to support the koalas.

Management Objective

To provide a high quality koala enclosure which provides good viewing of the koalas and conditions suitable for the maintenance of a healthy colony.

Prescriptions

1. Include regular maintenance of the existing enclosure in the Park's annual works program. (Priority: Ongoing).

2. Prepare a preliminary design of a new koala enclosure. (Priority 1).

3. Plant suitable trees to fit into the preliminary design as soon as possible. (Priority 1).

4. Prepare a more detailed design of the new koala enclosure, which will blend with the environment. (Priority 2).

5. Construct the enclosure, using materials which blend with the environment. (Priority 3).

6. Ensure there is access for the disabled to the new enclosure. (Priority 1).

7. When the animals have been transferred, remove all of the existing enclosure facilities, and construct a carpark (see Section 14.4.1(b)). (Priority 3).

8 Until a new enclosure is constructed ensure that high hygiene standards are maintained, and disease-free koalas are segregated from diseased koalas.

Modifications to the existing enclosure may be necessary to ensure this is achieved.

14.4.4(c) KANGAROO/EMU ENCLOSURE

The kangaroo/emu enclosure was originally set up to constrain tamed kangaroos that became unpredictably aggressive to visitors. At present it holds four kangaroos and two emus. It consists of an area of grass, which provides a viewing area for visitors while the kangaroos feed, and several hectares of bushland. (See Figure 10 No. 9).

The kangaroo/emu and koala enclosures together provide an experience of three of Australia's most well known animals.

As mentioned in Section 8.1, wild kangaroos gather throughout the recreation area to feed on lawns in the early morning and late afternoon; many allow people to approach up to a few metres. Hence at the cooler times of the day there are excellent opportunities to view kangaroos in a natural setting. Current management is carried out by Park staff.

Public Comment - The visitor survey indicated that 40 percent visited the kangaroo/emu enclosure. Of the 319 comments on the enclosure, 27 percent were favourable, 22 percent were neutral and 51 percent were unfavourable. Specific comments included: `introduce more animals'; `where are the animals?'; `upgrade the enclosure, include a walk-through section'; `discontinue the enclosure'; `decrease costs by seeking sponsorship or leasing out to private concession'. There was considerable dissatisfaction expressed regarding the absence of animals in the enclosure; this was due to the visitor survey being conducted in summer daylight hours when most of the animals were sheltering from the heat in the bushland and were therefore out of sight.

Implications for Management

1. The viewing of kangaroos is an important part of the experience of the Park (particularly for overseas visitors). However, the present enclosure requires major upgrading and does not always satisfy the expectations of visitors, particularly during summer when the animals are out of view.

2 Keeping animals in captivity is not compatible with the philosophy of national parks; particularly when the same animals may be seen in their natural habitat throughout the Park, providing `natural' viewing opportunities.

3. There is interpretive potential with easily-viewed animals, for visitors to learn about the habits and ecology of the animals.

Management Objective

To provide opportunities for visitors to view and gain a greater understanding of kangaroos and emus in the Park environment.

Prescriptions

1. **Inform tour operators and visitors of the best times and locations to view wildlife in the Park. (Priority: Ongoing).**

2. **Provide information and interpretive opportunities regarding kangaroos and emus. (Priority: Ongoing).**

3. **Investigate other avenues for providing opportunities to view and appreciate the kangaroos and emus. (Priority: Ongoing).**

4. **Remove the existing enclosure and rehabilitate the area. (Priority 2).**

14.4.4(d) GARDENS AND TREES

One of the main features which makes the recreation area attractive is its gardens and trees. Originally all the garden beds in the Park consisted of plants of European origin eg. roses. Over the last fifteen years, as attitudes have changed, some of these cultivated gardens have been replaced with W.A. native plants. A wildflower display garden was established in 1969 adjacent to the koala enclosure to further enhance the experience of visitors (See Figures 10 and 12 No. 7). However, its quality has deteriorated. This is evident in the public comment (see below).

The two main remaining cultivated gardens are of special interest. The gardens in front of the Yanchep Inn provide an attractive foreground to the building; one garden bed has for many years been known as the `memorial rose garden'; it is believed it is a memorial planted by the McNess family as a gesture for his contribution to the Park. For many years these gardens have been maintained by Park staff; the Inn lessee has recently agreed to take over their maintenance. The vivid display of colourful flowers highlighting the unique architecture of the administration building has been a favourite photography subject for visitors.

The trees in the recreation area consist of the indigenous tuarts (*Eucalyptus gomphocephala*) and a variety of species from around the world. Most of the exotic trees are over 50 years old, and they add to the variety of the landscape of the recreation area.

Management and maintenance has been the responsibility of Park staff. The gardens require considerable maintenance; dead limbs of trees are regularly removed to reduce hazards to picnickers.

All of the gardens currently require fencing to prevent kangaroos from feeding on them. However, chemical repellents are being considered, which will deter but not harm kangaroos.

Public Comment -The visitor survey indicated that 21 percent visited the wildflower garden, although this figure is probably unrepresentative (see Supplementary Papers).
Of the 109 comments on the wildflower garden, 68 percent were favourable, 11 percent were neutral and 29 percent were unfavourable. Of the 12 comments on gardens generally, all were unfavourable. Specific comments included: `all gardens are in poor condition and need upgrading'; `seek sponsorship or volunteer assistance'; `the wildflower garden is important for tourists'; `convert all gardens to native plants'; `more wildflower gardens are needed'.

Since the public comment was received, maintenance of the gardens has increased and they have improved considerably.

Implications for Management

1. The wildflower display garden and other wildflower gardens are an important part of the taste of Australia' experience for visitors; they can play a key role in the development of the Park to a `gateway to the natural environment', showing displays of flowers from throughout the State (see Section 18.0).

2. Gardens of W.A. native plants are more compatible with the philosophy of national parks than gardens of plants of European origin.

3. Two gardens of plants of European origin are of special interest; the memorial rose garden needs to be retained, however, the garden at the administration building could be replaced with W.A. natives and designed to provide a display of flowers throughout the year without detracting from its photographic potential.

4. There is interpretive potential in the variety of trees and in providing displays of plants from throughout W.A.

5. Many of the gardens have deteriorated; there is some public disapproval of their state.

6. The removal of dead limbs of trees in picnic areas will need to be continued in the interests of public safety.

Management Objectives

1. To provide opportunities for the appreciation of the wildflowers of W.A.

2. To maintain trees in as safe as possible a condition.

3. To maintain the cultural value of some exotic plant gardens.

Prescriptions

1. Produce a plan for W.A. native wildflower beds throughout the recreation area. (Priority 1).

2. Upgrade the main wildflower garden and other gardens so that each bed represents a different region in the State (taking care with the dieback infected area at the southern end). (Priority 1).

3. Include for each garden bed:
- **mass plantings of a number of species (which will be pleasing to the eye and easier to maintain).**
- **enough of a variety of species so that where possible something is always in flower. (Priority: Ongoing).**

4. Include regular plantings and maintenance of gardens on the Park's annual works program. (Priority: Ongoing).

5. Include maintenance of gardens in front of Yanchep Inn and the conversion of all but the memorial rose garden to native plants with the Inn lease. (Priority 1).

6. **Convert the garden in front of the administration building to W.A. native species. (Priority 1).**

7. **Progressively label plants, garden beds and trees. (Priority 2).**

8. **Investigate alternative sources of finance, such as sponsorship of garden beds, and labour, such as volunteers. (Priority 1).**

9. **Implement water supply strategies as outlined in Section 14.4.6(b). (Priority 1).**

10. **Conduct an annual inspection of trees for safety hazards; continue removal of dangerous dead limbs or trees in picnic areas; where possible maintaining the natural look of the trees. Progressively replace *Eucalyptus citriodora* trees with other species. (Priority: Ongoing).**

11. **Consider the progressive planting of suitable trees in the recreation area to replace those that will die out. (Priority: Ongoing).**

14.4.4(e) PICNIC AREAS

There are a variety of grassed sites in the recreation area that provide for picnicking; the most popular sites are along the eastern shore of Loch McNess (see Figure 12, No. 6A) and the surrounds of Gloucester Lodge (No. 6C). More secluded sites are provided between Gloucester Lodge and Yanchep Inn (No. 6B), and at the north oval (No. 6F). For many years groups have been able to book sections of picnic areas (and ovals) for large social gatherings.

The picnic areas provide a variety of attractive settings, including panoramic views of Loch McNess, and secluded spots surrounded by native vegetation, all of which are well-endowed with a variety of trees (both indigenous and non-indigenous). Combined, the picnic areas provide a range of experiences of the Park (including secluded and crowded areas), and are capable of accommodating different numbers of people. On Sundays and other peak days the Loch front and Gloucester Lodge picnic areas can become over-crowded, creating parking congestion and detracting from the experience of many of the visitors. In winter the Gloucester Lodge picnic area becomes inundated with water, and so is sometimes un-useable. There are sometimes problems of safety and inconvenience when informal active games (such as frisbee -throwing or cricket) are played in populated picnic areas.

Gas and electric barbecues and picnic tables are provided at most of the picnic areas. Issues relating to these picnic facilities are dealt with in the following section (14.4.4(f)).

Public Comment - The visitor survey indicated that 57 percent of visitors used the barbecue/picnic areas. Of the 296 comments on the picnic areas, 84 percent were favourable, 14 percent were neutral and 2 percent were unfavourable. Specific comments included: `City of Wanneroo should lease or assist with the maintenance of picnic areas'; `contract out maintenance of picnic areas'; `need to control active games in picnic areas'; `develop more bush areas for picnic facilities'.

Current management involves the maintenance of lawns by Park staff.

Implications for Management

1. It is expected that the demand for picnic areas will increase as the numbers of visitors to the Park will increase. The pressure on the popular picnic areas, particularly the Loch front, will also increase. Potentially the resource could degrade, and the experience of visitors become marred by over-crowding. (See also Section 14.4.6(h) on the carrying capacity of the recreation area).

2. The provision of a range of different picnic areas appears to be popular; therefore a range should continue to be provided.

3. Active games need to be separated from picnic areas.

Management Objective

To provide high quality picnic areas that offer a range of experiences of the Park.

Prescriptions

1. **Develop the proposed vehicle circulation system, with associated signs and carparks, to achieve more effective distribution of use of the recreation area (as outlined in Sections 14.4.1 and 14.6(f)). (Priority: Ongoing).**

2. **Convert the west oval (see Figure 12, No 6E) and continue to convert the north oval (No. 6F), to informal parkland areas, providing for small scale games and picnics (as outlined in Section 14.4.4(j)). (Priority 2)**

3. **Close off the road to the north oval to provide a picnic area isolated from vehicles (see Figure 12, No. 34) as outlined in Section 14.4.1(a). (Priority 1).**

4. **Contract out mowing and maintenance of lawns in picnic areas (in addition to the lawns on ovals). (Priority 1).**

5. **Restrict the provision of picnic areas to existing grassed areas. (Priority 1).**

6. **Install a reticulated watering system for picnic areas (as outlined in Section 14.4.6(b)). (Priority: Ongoing).**

7. **Restrict all active games (informal and formal) to suitable areas where conflicts will not occur with picnickers, such as the west oval. Inform visitors of the designated areas. (Priority 1).**

8. **Continue to allow suitable sections of picnic areas to be booked, on a first-come-first-served basis. Charge a fee to cover the administrative costs. (Priority: Ongoing).**

9. **Upgrade the Gloucester Lodge picnic area to avoid inundation. (Priority 2).**

10. **Develop access for the disabled to major picnic areas. (Priority 1).**

14.4.4(f) PICNIC FACILITIES

Picnic facilities are provided throughout the recreation area. At most of the picnic areas, gas or electric barbecues and picnic tables are provided. Shelters are also provided at various sites.

For many years wood barbecues were used in the Park, however, these were replaced with coin-operated gas and electic units mainly to reduce the labour involved with maintaining a wood supply, and to eliminate a fire risk associated with the wood fires. Overall, there has not been a significant reduction in labour required because the barbecues often break down due to some inherent design problems; the plates on many of the barbecues are aluminium and require more cleaning than steel plates; and so maintenance time and costs are higher than they should be.

Public Comment - The visitor survey indicated that 57 percent of visitors used the barbecue/picnic areas. Of the 56 comments on picnic facilities, all were unfavourable.

Specific comments included: `provide more barbecues'; `not enough barbecues'; `we waited 4 hours for a barbecue'; `some not in working order'; `need better cleaning'; `dislike gas, prefer wood barbecues'; `don't like paying at entrance and again for use of barbecue'.

Current management involves cleaning and maintenance by Park staff; a Park maintenance worker has recently been trained to carry out repairs, which are now carried out more efficiently.

Implications for Management

1. There is dissatisfaction with some visitors regarding there being not enough barbecues on busy days, the fact they are gas or electic and not wood, that payment is required to operate them and with the standard of maintenance and cleaning.

2. The design of the barbecues creates maintenance problems, and therefore more efficient barbecues need to be provided.

Management Objective

To provide enough efficient, easy-to-maintain barbecues to cater for an average peak day visitation.

Prescriptions

1. Convert the existing barbecues from coin-operated to push button operated so that use is free (see also Section 14.4.6(e)). (Priority 1).

2. Assess the required number of barbecues for an average peak day, for example a Sunday in Spring. (Priority 1).

3. Progressively acquire and install the required number of barbecues, and gradually replace the existing ones. Acquire barbecues which will have long term economic efficiency (in terms of power, maintenance and cleaning costs). (Priority: Ongoing).

4. Site the barbecues at the most suitable locations and consider grouping several barbecues together at various sites for greater economy. (Priority: Ongoing).

5. Ensure some picnic facilities cater for the disabled. (Priority 1).

6. Contract out the regular cleaning and maintenance of barbecues. (Priority 1).

14.4.4 (g) OVALS

There are three ovals in the Park, commonly known as the north, east and west ovals (see Figure 10 No's 14A, 14B, 14C). They are used for formal sporting events or informal social games and occasions. Picnic facilities and children's play equipment are provided at the ovals to complement these functions. Since 1976 the north oval has been divided by tree plantings into three informal free play areas. This provides an alternative, quieter picnic area away from the more frequented spots, and has been popular.

In 1986/87 the east and west ovals were booked on 99 occasions; the most popular time is December with many Christmas functions occurring. Use of the ovals for social games and functions generally involves the enjoyment of and interaction with the Park environment, and depends on the Park's natural values, therefore they are compatible with the objectives (a), (b) and (c) of the recreation area.

Current management is carried out by Park staff. The ovals are managed as low maintenance facilities.

Implications for Management

1. One sports oval can cater for most of the current demand since the majority of users do not require a full size oval; and there are other ovals available outside the Park in the Yanchep area, therefore the provision of two sports ovals needs to be examined.

2. It is CALM policy to consider the elimination of active sports orientated facilities, such as ovals, from national parks.

Management Objective

To provide one formal sports oval and develop parkland areas from the other two existing ovals.

Prescriptions

1. Continue to maintain the East oval as a formal sports area. (Priority: Ongoing).

2. **Convert the West oval to an informal parkland area, providing for small scale games and picnics, including landscaping and planting of trees (see also Section 14.4.4(e)). (Priority 2).**

3. **Continue conversion of the North oval to an informal parkland area (see also Section 14.4.4(c)). (Priority 2).**

4. **Review the provision of picnic facilities as outlined in Section 14.4.4(f). (Priority 2).**

5. **Continue to allow bookings of the East oval and sections of the West oval, on a first-come-first-served basis; charge a fee to cover administrative costs. (Priority: Ongoing).**

14.4.4(h) CHILDREN'S FACILITIES

The facilities for children (play equipment) in the Park need improving. The equipment is antiquated, is in poor condition and needs to be repaired frequently to maintain safety standards; their design is such that there is a limited range of activities available, and children are not challenged by the equipment.

The visitor survey showed that 59 percent of visitors were under the age of 15; hence over half of the visitors are not being well catered for. Of the 25 comments, all either commented there was no adequate children's playground, or requested that such facilities be provided.

Usually play equipment is not provided in national parks. The natural environment is considered to be a playground in itself. However, as has already been noted, Yanchep National Park is not like other national parks. Most of the experience of the Park for visitors is of a modified environment, and this is also the case for the children. It is important to cater well for the present uses of the Park and also encourage wider use and appreciation of the natural environment.

Implication for Management

The facilities in the Park for children require major improvement.

Management Objective

To provide high quality, safe opportunities for children to explore and experience the environment.

Prescriptions

1. **Engage a consultant to design an imaginative adventure playground. (Priority 2).**

2. **Consider either providing one extensive playground or several smaller ones around the recreation area. (Priority N/A).**

3. **Select a suitable site for the playground, which allows for a variety of opportunities to be developed and has the capacity to sustain the activities. (Priority 2).**

4. **Construct the children's adventure playground, as funds permit. (Priority 2).**

5. **Incorporate special children's and school holiday activities within interpretive programs (see Section 18.0). (Priority: Ongoing).**

14.4.4(i) CAMPING IN THE RECREATION AREA

There are no formal facilities for camping in the recreation area, and it is generally not allowed (camping in the natural areas is discussed in Section 16.0). However, educational groups occasionally utilise areas at White's Grotto (south of Loch McNess) and the ghost house ruins.

There are sometimes problems with these groups, particularly since no facilities are available to accommodate them, and so damage to the areas sometimes occurs; some groups do not behave appropriately.

If backpackers arrive at the Park in the evening expecting to be able to camp, they are sometimes accommodated at the North Oval.

Public Comment - In the visitor survey the response to the statement, Yanchep National Park needs a camping area was: Agree 41 percent, Disagree 45 percent, Undecided 14 percent. Of the 11 comments on camping, 81 percent favoured camping and 19 percent did

not favour camping. The types of camping suggested in the comments ranged from simple backpack style to a caravan park; other comments included: `camping areas should not interfere with picnic areas'; `keep camping to a small area'; `charge enough to cover expenses'.

Implications for Management

1. Provision of camping facilities would allow visitors the opportunity to enjoy the Park in a way that has not been available; the Park at night is a very different experience.

2. There is some support for the provision of a variety of styles of camping in the Park.

3. The present situation of sometimes allowing camping, without proper facilities, needs to be resolved; either camping is to be catered for, and the necessary facilities provided, or camping is not to be allowed at all.

4. Provision of camping requires ongoing supervision, management and maintenance.

5. Numbers of campers must be controlled so that the experience of campers is not marred by too many people.

Management Objective

To provide opportunities to experience natural areas of the Park after daylight hours, in an atmosphere of solitude and privacy, while minimising impacts on the environment.

Prescriptions

1. Select a site for backpack camping which
- **is within a reasonable distance to the recreation area**
- **requires pedestrian access of at least 500 metres**
- **provides access for management**
- **has the capacity to sustain small scale camping**
- **is not environmentally sensitive**
- **is separate, both physically and visually, from public areas.**

(Priority 1).

2. **Develop a site for backpack camping with minimum facilities. (Priority 2).**

3. **Provide for a limited number of tent sites, consistent with the capacity of the physical environment and an experience of peacefulness and privacy for campers. (Priority 2).**

4. **Provide parking for campers, with a location that gives some security for cars. (Priority 2).**

5. **Establish limits of acceptable change for the camping area, after which ameliorating actions will occur.**

6. **Establish a system whereby camping is by booking only, and information is given on rubbish removal being on a `carry in/carry out' basis, and the fire situation. (Priority 2).**

7. **Regularly patrol the camping area for supervision, maintenance and cleaning up. (Priority: Ongoing).**

8. **Include regular maintenance of the camping area in the Park's annual works program. (Priority: Ongoing).**

14.4.5 LEASES AND CONCESSIONS

Ever since the Park was developed in the 1930s, there have been services run by private concessionaires in the Park. Originally there were three places of accommodation, McNess Guest House, Yanchep Inn and Gloucester Lodge. Today the three commercial operations in the Park are the kiosk, Yanchep Inn and Gloucester Lodge Museum. Each of these operations has a lease with CALM; the two profit-making commercial operations (kiosk and Yanchep Inn) pay lease fees, while the Museum (is a non-profit-making operation) does not.

There are functions which, if carried out by way of lease or concession would enable Park staff to more effectively carry out Park management functions, including providing information and interpretation services. These functions include management of the golf course, swimming pool, rowing boats and souvenir sales. Most of these, with the exception of the swimming pool, can be profit-making and so feasible for a commercial operation, thereby freeing up staff time.

Applications expressing interest in the leasing of the facilities in the Park were invited in late 1986; this was to gauge the level of interest, and to ascertain the best and most appropriate proposals for the management of the facilities. There has been considerable interest expressed, ranging from the management of one facility to the management of the whole recreation area, and including ideas for new facilities such as cycle hire and archery.

The proposals have included combinations of various lease packages. Management of individual facilities is dealt with in the following sections; proposed new facilities are dealt with in Section 14.5.

Implications for Management

1. CALM is currently managing some facilities that could be well managed as commercial operations.

2. Leases need to be of a sufficient term to enable a return on investments.

3. Conditions need to be included in leases which will ensure the management and operation of facilities are compatible with the objectives of the Park and of the McNess Recreation Area.

4. Supervision of the lessees by CALM will be required.

5. The standard of service, facility and products available in the Park are a reflection of the quality of the Park as a whole.

Management Objective

To ensure the operation and management of leases and concession facilities in the Park is compatible with the objectives of the Park and of the McNess Recreation Area.

NOTE: The objectives of the Park and the recreation area encompass all aspects within which the leases and concessions need to operate; it is the responsibility of CALM to ensure these objectives are achieved; therefore the same objective applies for all commercial operations.

Prescriptions

1. Arrange two main lease packages, one including Yanchep Inn, golf course, and

possibly bicycle hire and souvenir sales, swimming pool; the other with the kiosk, souvenir sales, rowboat hire, and possibly bicycle hire. This option is recommended because it groups compatible functions together, and includes enough activities in each lease package to produce two reasonable profit-making ventures. The two lease packages may be operated by one concessionaire. (Priority 1).

2. **Draw up leases which include:**
   - **a lease term which reflects the level of input of the lessee**
   - **accountability for standards of service, amenity and facility**
     maximum numbers of users, where appropriate
     maximum fees to be charged
   - **responsibility for maintenance and provision of support services**
   - **constraints on operations so they are compatible with the objectives of the Park and of the recreation area**
     the provision for termination of the lease if conditions are not met
     the boundary within which the lease operates and the lessee is responsible for maintenance
   - **provision of access for the disabled to appropriate facilities.**

   (Priority 2).

14.4.5(a) KIOSK

A kiosk has operated in the Park for many years. It provides an essential service to the visitors of the Park. It has been operating from a small extension of McNess House, which is an unsatisfactory arrangement (see Section 14.4.3(b)).

Public Comment - The visitor survey indicated that 40 percent of visitors used the kiosk. Of the 239 responses on the kiosk, 54 percent were favourable, 24 percent were neutral and 22 percent were unfavourable. Specific comments included: `long queues at kiosk'; `afternoon tea service wanted'; `provide more kiosks and service'; `improve kiosk'.

Implications for Management

1. The present kiosk building is unsatisfactory; a new kiosk building will be constructed by the lessee (See Section 14.4.3).

2. In its present building the kiosk has only been able to provide a limited range of food; there is a demand for a wider variety of food, including Devonshire teas and

also food catering for overseas visitors. There is also a demand for facilities to enable patrons to sit down and eat, rather than just take-away.

3. The types of products sold in the kiosk generate litter in the Park, creating pollution and increasing management costs.

4. The kiosk function will be linked with rowboat hire, souvenir sales and possibly bicycle hire into one lease package (See section 14.4.5).

Management Objective

To ensure the operation of the kiosk (and associated functions) is compatible with the objectives of the Park and the recreation area.

Prescriptions

1. **Proceed with arranging the leasing of the kiosk, rowboats and souvenir sales and possible bicycle hire. (Priority 1).**

2. **Liaise with the lessee on a suitable design and location to construct a new kiosk building. (See also Section 14.4.3(a)). (Priority 1).**

3. **In addition to the conditions outlined in Section 14.4.5, include the following in the kiosk lease:**
   - **responsibility for maintenance of the surrounding grounds and gardens to the kiosk lessee (see also Section 14.4.4(d)).**
   - **emphasis on products with little packaging**
   - **provision of some products which reflect values of the Park ie. natural and healthy**
   - **a contribution to the costs of cleaning up litter in the Park.**

   (Priority 2).

14.4.5(b) ROWBOATS

Rowboats have been available for hire for use on Loch McNess since the 1930s. They are therefore a traditional part of the Park experience. They add to the diversity of recreational opportunities in the Park and they allow greater access to, and therefore appreciation of, the lake. However, this greater access also leads to damage of the vegetation, littering and disturbance of lake sediments. Disturbance of sediments may have detrimental effects on

the lake ecosystem (Ayre *et al.* 1977) (see Section 9.0 on Wetlands). However, it is difficult to quantify the level of impact of rowboats on the lake environment.

The rowboats are a popular feature, particularly on weekends when there are often queues of people waiting their turn. During 1986/87 boats were hired on 7498 occasions. They provide an experience offered on few lakes in W.A.

Public Comment - The visitor survey indicated that 23 percent of visitors used the rowboats. Of the 134 responses regarding rowboats, 69 percent were favourable, 15 percent neutral and 16 percent were unfavourable. Specific comments included: `boats in poor condition'; `boats difficult to handle'; `had to wait 40 minutes for a boat'; `cause damage to lake therefore discontinue'; `provide more boats'; `lease out to private concession'; `boats need replacing'.

The rowboats have traditionally been managed by Park staff. Current management involves tickets being sold by office and casual staff, minor maintenance and repairs carried out by Park staff, and major repairs carried out by tender. Other management, such as retrieval of abandoned boats, is carried out by Park staff.

Implications for Management

1. Rowboats are a traditional and popular part of the experience of the Park, however, they can cause adverse impacts on the lake environment. Therefore there is a conflict between the high conservation value of the lake and its high recreaton value. However, their environmental impact can be reduced by education of rowboat users.

2. Hire of rowboats is a suitable operation to be handled as a concession.

3. There is educational and interpretive potential to encourage users to learn about and understand the lake.

4. There is some dissatisfaction with users of the boats because the present fleet is deteriorating and needs replacing, and the present number of boats (13) is not sufficient to meet demand.

5. Use of rowboats is in keeping with the Park's character, involves interaction, enjoyment of the environment and is dependent on Park values and so is compatible with objectives 1(a), (b) and (c) of the recreation area, but may be incompatible

with objective 2 of the Park. (Providing opportunities and facilities for appropriate public recreation consistent with protection of the natural environment).

Management Objectives

1. To ensure the operation of the rowboats is compatible with the objectives of the Park and the recreation area.

2. To facilitate greater understanding of the lake.

Prescriptions

1. **Include leasing of rowboats with the lease of the kiosk and souvenirs (see Section 14.4.5(a)). (Priority 1).**

2. **Proceed with arranging the leasing and operation of the kiosk, rowboats and souvenirs. (Priority 1).**

3. **In addition to the conditions outlined in Section 14.4.5, include the following in the rowboats/kiosk lease which will help to reduce the impact of the rowboats on the lake, such as**
   - **a maximum number of rowboats (set by CALM)**
   - **safety standards**
   - **responsibility for cleaning up of litter in the lake**
   - **liaison with CALM regarding dissemination of information and interpretive programs. (Priority 2).**

4. **If possible, monitor the effects of rowboats on the lake environment. (Priority 2).**

5. **Develop interpretive programs to encourage greater understanding of the lake environment. (Priority: Ongoing).**

14.4.5(c) SOUVENIRS

Souvenirs have been sold by Park staff from the Administration building for a number of years and are popular with tourists. A variety of products are sold, many of which are specifically tailored for the Park (eg. featuring koalas). The operation has always been small scale and has returned modest profits. The sale of souvenirs occupies a significant

proportion of office staff time. The present internal design of the Administration building does not provide enough space or an appropriate area in which to display souvenirs. The overall standard of presentation could be improved.

Implications for Management

1. The standard of presentation and type of souvenirs sold are a reflection on the quality of the Park.

2. A greater range of products would attract more interest.

3. The sale of souvenirs is more appropriate for private concession, thereby freeing up office staff time.

4. It is recommended (in Section 14.4.5) that souvenir sales be incorporated in a lease package with the kiosk.

Management Objective

To ensure the souvenir sales operation is compatible with the objectives of the recreation area.

Prescriptions

1. Include souvenir sales in the lease package with the kiosk and rowboat hire (see Section 14.4.5). (Priority 1).

2. Include in the lease the following conditions:
- **the sale of high quality, tasteful souvenirs which are preferably Australian-made.**
- **the sale of types of souvenirs which reflect the Park's values**
- **a high standard of presentation**
- **a maximum profit margin on souvenirs.**

(Priority 2).

14.4.5(d) YANCHEP INN

The Inn was built in 1936; it provides overnight accommodation, a restaurant, a public bar facility and provides for functions and conventions.

The National Trust has classified the building in all 5 categories:

20 *architectural/technical accomplishment*
21 *demonstration of a way of life/custom/process or function*
22 *historical significance/ of development or cultural phases/important figure(s)*
23 *environmental importance/townscape of landscape value/high degree of unity (or diversity)/setting*
24 *scarcity value/a particularly fine (or unique) example*

`The building is interesting for its Tudor type architecture, with limestone walls and piers, leadlight windows and internal wooden panelling - also for the fact that an attempt was made to reproduce the character of an English Inn. With the other three stone buildings it completes a homogeneous setting of some rarity. The exterior at the front and the public rooms at the front have a distinct character which should be retained.' (National Trust of W.A. 1987).

The Inn provides a number of benefits to the Park. Overnight stays allow a longer time for enjoyment and appreciation of the Park; it is a beautiful setting for functions and conferences. The restaurant is an essential support service for the overnight capacity of the Inn and provides a service to visitors who require a meal during their visit.

The operation of a public bar can produce behaviour detrimental to the Park and the enjoyment of other visitors.

The current lessee has volunteered to maintain the gardens in front of the Inn (see Section 14.4.4(d)); CALM maintains the surrounding carparks. Some parking associated with the Inn detracts from its aesthetic values (see Section 14.4.1(b)).

Public Comment - The visitor survey indicated that 24 percent of visitors used the Yanchep Inn; 1 percent stayed more than one day ie. overnight. Of the 128 responses on the Inn, 74 percent were favourable, 14 percent were neutral and 12 percent were unfavourable. Specific comments included: `modernise the Inn'; `shabby interior'; `food poor and expensive for the area'; `upgrade the Inn'; `enjoyed the beer'; `public bar not appropriate in a national park'.

Implications for Management

1. Yanchep Inn provides an opportunity for visitors to stay for a period of time in the Park so its many and varied aspects can be more fully enjoyed. Interpretation

activities maybe catered for Inn guests with night or twilight excursions.

2.. The public bar facility causes problems for management of the Park and some aspects of its use are not compatible with objectives 1 (b) or (c) of the recreation area.

3. It is recommended that the Yanchep Inn be part of a lease package which includes the golf course, swimming pool and possibly souvenir sales and bicycle hire (see Section 14.4.5).

4. The building needs renovation, and some facilities are antiquated and require modernisation.

5. As it has been classified by the National Trust any changes to the building need to retain its basic structure and character.

Management Objectives

To ensure the operation of the Yanchep Inn is compatible with the objectives of the Park and the recreation area.

Prescriptions

1. **In addition to the conditions outlined in Section 14.4.5, the future lease should take the following into account:**
   - **the provision of a high standard of accommodation, food service and amenity by the lessee**
   - **the renovation of the buildings and additions, and modernisation of facilities**
   - **inclusion of management of the golf course and swimming pool if feasible**
   - **the allowance of changes to the buildings (for example extensions, additions and renovation) only if the character and heritage values are maintained**
   - **the re-location of the swimming pool to a closer proximity to the Inn within 2 years by the lessee (if feasible, see Section 14.4.5(a))**
   - **the responsibility for maintenance of surrounding lawns, gardens and carparks with the lessee, within a set boundary**

the responsibility for rubbish disposal with the lessee. (Priority 2).

2. **Liaise with the lessee for ways in which to change the emphasis from a public bar facility to a convention centre; investigate and instigate measures to reduce alcohol-affected behaviour, and encourage use by those who are interacting with other aspects of the Park. (Priority: Ongoing).**

14.4.5(e) GOLF COURSE

The 9 hole golf course has been operating in the Park since 1961 (see Figure 10 and 12 No 11). It is an attractive setting in which to have a game of golf, with highlights provided by grazing kangaroos, particularly in the early mornings or late afternoons.

There is a golf club associated with the course, which has on some occasions assisted with its maintenance. There is a clubroom given to the golf club some years ago, and toilet facilities at the golf course. There is no lease agreement for the club house site. The toilet facilities are in poor condition and require upgrading (see Section 14.4.6(a)). There are other golf courses in the region including St. Andrews and at Marangaroo, Wanneroo and Joondalup (see Figure 9). There will be a number of golf courses developed in the City of Wanneroo in the future (O. Drescher, workshop talk).

Public Comment - The visitor survey indicated that 5 percent of visitors use the golf course. Of the 35 responses, 40 percent were favourable, 17 percent were neutral and 43 percent were unfavourable. Comments from all sources included: `golf course in poor condition, lack of maintenance'; `advertise the golf course'; `most expensive course in Australia when playing fee is combined with entrance fee'; `little justification in keeping course when alternatives available nearby'; `lease out to private concession'; `close and convert to picnic areas'; `more actively collect fees'; `seek volunteer assistance in maintenance'. Over the years there have been many letters to the former National Parks Authority and CALM complaining of the lack of maintenance of the golf course.

Management and maintenance has been carried out by Park staff, and over the past few years the lawn mowing has been done under contract. The course has always been managed as a low maintenance course, with only the greens, tees and fairways reticulated and fertilised.

Implications for Management

1. The golf course maintains the Park character, involves enjoyment of and interaction with, the environment and depends on the Park's natural values (particularly the kangaroos) and so is compatible with objectives 1(a), (b) and (c) of the recreation area. It is mainly the interaction with the kangaroos, and the opportunity to enjoy the bushland surrounding the golf course while strolling along, which makes the golf course function compatible with the recreation area objectives.

2. There is dissatisfaction by some users with the golf course.

3. The golf course is ideal for management by private concession, since it is not a function usually carried out by CALM. There have been a number of proposals to take over the mananagement of the golf course, either by itself, or as part of a lease package with some other facilities or as part of managing the whole recreation area.

4. Use of too much fertiliser on the golf course may have an adverse effect on surrounding wetlands.

5. The golf course needs to continue to be open to the public in the interests of equity because the whole Park is a public facility.

6. The golf course will be included in the lease package with the Yanchep Inn (see Section 14.4.5).

Management Objectives

To ensure the management and operation of the golf course is compatible with the objectives of the Park and of the recreation area.

Prescriptions

1. Continue the current low maintenance program until the Yanchep Inn lease is negotiated. (Priority: Ongoing).

2. Include the management and maintenance of the golf course with the Yanchep Inn lease, if possible. (Priority 1).

3. **In addition to those conditions outlined in Section 14.4.5, include in the lease the following conditions:**
   - **a maximum fee for use of the golf course**
   - **a maximum amount of fertiliser that can be added to the golf course**
   - **the requirement that the golf course remain open to the public**
   - **the requirement to upgrade the toilet facilities at the golf course (see Section 14.4.6(a))**
   - **responsibility for maintenance of all equipment (including bores)**
   - **the requirement for co-operation with the Yanchep Golf Club.**

   (Priority 1).

4. **Negotiate with the Yanchep Golf Club regarding leasing of land for the club rooms and the responsibility of all maintenance and service costs to the club.**

14.4.5(f) TENNIS COURTS

Originally there were three tennis courts in the Park (see Figure 10 No. 13). The two remaining courts are in a state of disrepair. Management and maintenance has been carried out by Park staff. There has been little public use of the courts for a considerable time and there has been minimal maintenance on the tennis courts over recent years.

Implications for Management

1. The tennis courts are in a state of disrepair and need either removing or upgrading.

2. Use of the tennis courts involves little interaction with the Park environment and does not depend on Park values, and so is not compatible with objectives 1(b) and (c) of the recreation area.

3. There is little demand for their use.

Prescriptions

1. **Remove all structures associated with the tennis courts. (Priority 1).**

2. **Rehabilitate the perimeter of the cleared area with indigenous vegetation, to screen it from public viewing. (Priority 1).**

3. **When the recreation area has been redeveloped consider regenerating it to**

bushland, converting to parkland for picnic areas or converting to a carpark depending on the suitability of the site and recreational needs. (Priority 3).

14.4.5(g) SWIMMING POOL

The swimming pool was first built in 1932, and was created from partially damming a freshwater stream flowing from Boomerang Gorge. The quality of water was maintained by the stream flow through the pool. It contained two spring boards and a diving tower. Part of Gloucester Lodge was a `Baths pavillion' which provided a general store, refreshments, two courtyards, dressing rooms, and a roofed balcony upstairs for `dancing or observation'. The pool, with Gloucester Lodge, was a focus for recreational and social activities in the Park. It was also used by the Australian Olympic team for training prior to travelling to the 1936 Berlin Olympic Games.

The pool was reconstructed with concrete, and chlorinated, in 1969, due to health concerns and damage caused to the older structure by ground water movement. This ground water movement continues to cause structural problems with the existing pool, combined with old pipes and joints there has been leakage of chlorinated water into the ground water (approximately 4000 litres per day), which feeds into Loch McNess. The leakage has recently been slowed but structural problems will continue in the longer term.

As the function of Gloucester Lodge changed to a Museum, there was no longer any relationship or compatability between the use of the pool and the Lodge. There is now an unattractive interface between the two facilities, with a mesh fence and an expanse of concrete.

The pool is open from mid-October to the end of March for six days a week. It is used by a number of local schools for swimming lessons, by local people and visitors from elsewhere. It is the only public swimming pool in the City of Wanneroo; however, the Wanneroo City Council has built a swimming pool complex at Pinaroo and a second one is planned for the Wanneroo townsite (O. Drescher pers. comm.).

Public Comment - The visitor survey indicated that 21 percent visited the swimming pool. Of the 162 responses regarding the existing operation and conditions of the swimming pool, 63 percent were favourable, 1 percent were neutral, 36 percent were unfavourable. Specific comments included: `keep the pool open'; `upgrade and beautify'; `keep the pool open for longer hours'; `the City of Wanneroo should take over or assist with management'; `lease out to private concession'; `Education Department should assist'. In response to the planned early closure of the swimming pool in Feburary 1986, (due to a lack of resources

for the management of the whole recreation area) members of the local community held a public meeting to express their opposition to the early closure, and to the possible closure of the pool entirely, due to the lack of any other suitable facility in the area. A petition with 172 signatures was submitted to CALM at the meeting.

Current management is carried out by a swimming pool manager who is available for other Park duties for 4 months of the year. The pool has been operating at a substantial loss for many years; if fees were charged to cover costs in 1986, it is estimated on present use levels, each user would need to pay a $2.50 entrance fee.

Implications for Management

1. Use of the pool does not involve direct interaction with, or enjoyment of, the natural Park environment of the Park. As such the provision of a pool is not consistent with objectives (b) and (c).

2. The pool runs at a loss; management of swimming pools for community use is not a usual national park management function; it is therefore not desirable for CALM to continue its operation as it diverts funds and staff from more appropriate activities in the Park. The City of Wanneroo has declined requests by CALM to take over or assist with management of the pool. The Education Deparment has agreed to assist with the costs of managing the pool.

3. The location of the pool is unsuitable because of the ground water's destabilizing effects which causes structural problems (the pool requires upgrading); the incompatible functions between the pool and Gloucester Lodge and their unattractive interface; there is leaking of chlorine into Loch McNess.

4. The pool requires a manager for the equivalent of eight months per year (due to cumulated leave arrangements). However, management by the Inn lessee will free up Park staff for more appropriate duties.

5. The pool is an important facility for the local community, being the only pool in the area; and so the local residents would like its continuation.

Management Objective

To provide a public/private swimming pool at an appropriate location in the Park.

Prescriptions

1. **Continue current management until the lease of the Yanchep Inn is negotiated, but continue to seek assistance from the City of Wanneroo. (Priority: Ongoing).**

2. **Include a swimming pool in the new Yanchep Inn lease package, if possible. (Priority 1).**

3. **In addition to those conditions outlined in Section 14.4.5, include the following conditions in the swimming pool lease:**
   - **the construction of a new swimming pool in the proximity of the Yanchep Inn, at a site provided by CALM, within two years; of a design suitable for its public role.**
   - **the requirement that the pool be open to the public during Park open hours, and for school swimming lessons; but with provisions for it to be open for guests only when the Park is closed**
   - **a maximum allowable fee. (Priority 1).**

4. **Once the new pool is operational, remove all existing pool facilities. (Priority 2).**

5. **In conjunction with the Gloucester Lodge Museum rehabilitate and landscape the area and revert to natural streams. (Priority 2).**

6. **The ongoing operation of the pool will be dependent either on management of the pool by the Inn lessee, or assistance by the City of Wanneroo and the Education Department for its operation to an acceptable standard. (Priority: N/A).**

14.4.5(h) GLOUCESTER LODGE MUSEUM

The building was constructed in 1933 and was originally known as The Lodge but was re-named Gloucester Lodge when H.R.H. the Duke of Gloucester stayed there in 1934 (see Figures 10 and 12 No. 16). It was closed in 1976 and it was subsequently leased by the City of Wanneroo and developed as a museum; it opened as a museum in 1979.

It is the only museum in the City of Wanneroo, and so has the important function of reflecting the City's heritage. The historic nature of the building is ideal to house the

museum.

The National Trust has classified the building according to all five categories:

20 *architectural/technical accomplishment*

21 *demonstration of a way of life/custom/process or function*

22 *historical significance/of development or cultural phases/important figure(s)*

23 *environmental importance/townscape or landscape value/high degree of unity (or diversity)/setting.*

24 *scarcity value/a particularly fine (or unique) example.*

`With its gabled roof and use of local stone the building is in character with the office, the McNess House and the Inn. With the swimming pool at the rear and the surrounding trees and garden the setting is attractive and as with the other structures examples of this type of building are rare. (National Trust of W.A. 1987).

Attendances have fluctuated since the museum opened, varying from 17 702 in the year 1982/83, to 11 980 in 1986/87.

Public Comment - The visitor survey indicated that 11 percent of visitors went to the museum. Out of 57 responses, ratings were: favourable 67 percent, neutral 28 percent, unfavourable 5 percent.

The museum includes displays on the history of Aborigines in the area, of the Park and the Wanneroo area, vegetation, geology, landforms, fauna and caves.

The museum and building are managed by the Gloucester Lodge Museum Management Committee, which includes representatives of the Wanneroo City Council, the local community and CALM.

The City of Wanneroo is keen to continue using Gloucester Lodge as a museum. Due to an increasing amount of large display pieces that have been donated, the Management Committee has requested permission to erect a shed (of about 18 m x 12 m) to be a storage and display area, construction to be compatible with the architecture of the Lodge.

Implications for Management

1. The Gloucester Lodge Museum serves an important function in the City of Wanneroo and in the Park.

2. Some of the present functions of the museum will overlap with the proposed visitor information facility (see Section 18.1).

3. The proposals for improving the recreation area, including upgrading carparking, spreading out use of the area by pedestrians and cars, interpretive programs and a visitor information facility, will enhance the role of the museum and in turn, the museum can play a key role in some of the developments.

4. The proposal to erect a shed needs to be considered.

Management Objective

To ensure the function and operation of the Gloucester Lodge Museum is compatible with the objectives of the Park and of the recreation area.

Prescriptions

1. **Continue liaison with the City of Wanneroo and the Gloucester Lodge Museum Management Committee, including CALM representation on the committee. (Priority: Ongoing).**

2. **Encourage the Museum to regularly update and change displays, and to advertise more widely to attract more visitors. (Priority: Ongoing).**

3. **Allow the proposed shed to be built, in consultation with CALM regarding the site and building design. Ensure the building blends with the landscape. Adjust the area boundaries of the lease if necessary. (Priority 1).**

4. **As a visitor information facility is developed, liaise with the Gloucester Lodge Museum Management Committee to ensure the roles and operations of the two are complementary. (Priority: Ongoing).**

5. **Liaise with the Gloucester Lodge Museum Management Committee for an integrated approach to enhance the Museums' and CALM's roles as the developments occur in the Park. (Priority: Ongoing).**

14.4.5(i) LAUNCH

Three successive launches were in use on Loch McNess between 1938 and 1986, to take

visitors out to view the lake. Areas of the lake were dredged between 1936-1940 and again in 1968 to allow the passage of the launches. The dredged material was used to create islands around the lake, on which sedges have become established. The last launch was removed from service when it became unserviceable in 1986.

The operation of the launch had an impact on the lake environment. Engine and diesel oil would enter the lake when its bilges were pumped; vegetation was damaged by removal of overhanging limbs to allow safe passage and by the movement of the launch close to vegetated areas; the propeller stirred up the lake sediments, occasionally killing long-necked tortoises; there was a noise and visual impact on wildlife; there was littering of the lake area; dredging changed the types of habitats available on the lake; if there were any breeding birds in the vicinity of the launch they would have been disturbed. The launch also caused a noise and visual impact on Park visitors.

The launch was always quite a popular feature of the Park and a traditional part of the Park experience. During 1985, 8 percent of Park visitors went on a launch trip. The launch provided many benefits to visitors, adding to the diversity of recreational opportunities, and providing an opportunity for an enjoyable experience while appreciating the lake environment.

Public Comment - All 34 comments regarding the current absence of the launch service requested the re-introduction of the launch.

Implications for Management

1. The launch operations had detrimental effects on the lake environment.

2. The launch was popular with visitors, and there is some demand for its re-introduction.

3. The cost of replacement, maintenance and operation of the launch is considered to be prohibitive by CALM.

4. In 1987 the Kiwanis Club (a voluntary service club) proposed to supply and operate a launch service; supervision by CALM would be required.

5. The Minister for CALM has requested the Kiwanis Club develop their proposal.

6. There is insufficient data on the breeding habits of the birds to ensure the launch

operation will not have an adverse effect. A study of the breeding birds will be required before a launch service can be operated on the lake.

Management Objectives

1. To ensure the operation of the launch is compatible with the objectives of the Park and of the recreation area.

2. To minimise the impacts of the launch on the lake environment.

Prescriptions

1. Conduct a survey of the birds breeding around south Loch McNess. (Priority 1).

2. Once the breeding habits of birds in south Loch McNess are known, draw up a detailed agreement between the Kiwanis Club and CALM and include:

a) **guidelines for the design and operation of the launch, to reduce environmental impacts including no dredging requirements, no input of pollutants, low noise levels, the route of the launch.**

b) **the involvement of CALM staff in interpretive programs including tours and production of information.**

c) **the requirement of a high quality, dependable service. (Priority 2).**

14.4.5(j) CRYSTAL CAVE

Tours of Crystal Cave are to be a lease or concession operation. This is discussed in Section 15.2.2(a).

14.4.6 MANAGEMENT AND MAINTENANCE SERVICES

14.4.6(a) TOILET FACILITIES

There are 10 toilet blocks in the recreation area, providing a total of 80 toilets (see Figures 10 and 12 No. 19). Most of the toilet blocks are constructed of limestone with tile roofs, and so blend with the buildings in the Park; the blocks at the east and north oval and golf course are constructed of materials which do not blend so well. The toilet blocks are in varying states of repair. Those along the Loch front, at the hall, East and West ovals are in good condition; the golf course, North oval and caves toilets are in poor condition. The

only toilet facilities which do not cater well for average peak day demand are those at the caves, which are inadequate. For many years the toilets were cleaned by park staff, however, this task has recently been contracted out.

Implications for Management

1. The number of toilet facilities caters well for present average peak day demand, with the exception of the caves toilets.

2. Some toilet facilities require major upgrading or rebuilding.

3. Some septic tanks and leach drains require upgrading, particularly along the Loch front.

4. Contracting out cleaning of toilets frees up Park staff time.

Management Objective

To provide a sufficient number of clean, high quality toilets to meet average peak day demand.

Prescriptions

1. **Continue to contract out the cleaning of toilets. (Priority: Ongoing)**

2. **Rebuild the North oval and caves toilets, to cater for average peak day demand. (Priority 1).**

3. **Upgrade septic tanks and leach drains where appropriate. (Priority 1).**

4. **Upgrade some of the existing toilet facilities to cater for disabled access. (Priority 1)**

5. **Arrange for the lessee of the golf course to meet the cost of re-building the golf course toilets (see Section l4.4.5(e) on the Golf Course). (Priority 2).**

6. **Use materials and designs which are compatible with the existing buildings and the surrounding environment, for all upgrading and building works. (Priority: Ongoing).**

14.4.6(b) WATER SUPPLY

The water supply system consists of bores, pumps, pipes and two water tanks. The system supplies water for use on gardens and lawns, in buildings and toilets and for fire fighting purposes. The system was established in 1931 with a major upgrading in the late 1960s; however, the whole system is now antiquated and in a state of disrepair.

There are continual problems with lack of pressure and burst pipes and joints. In the year 1986/87, 290 Park staff hours were spent on repairs to the water system, in addition to work done by local plumbers. Watering of gardens and lawns is carried out using a combination of manually-operated reticulation systems (of varying ages and states of repair).

Implications for Management

1. The water supply system is antiquated and requires major upgrading or replacement.

2 The watering of lawns and gardens manually is very labour intensive and therefore requires change.

3. Water pressure and supply must be maintained at all times for fire control purposes, and to supply the Inn, residences and facilities.

Management Objectives:

1. To have an efficient and effective water supply throughout the recreation area.

2. To have a watering system which effectively waters the main lawns and gardens, with low labour requirements and minimises water requirements.

Prescriptions

1. Design and install a new water supply system for the recreation area. (Priority 1).

2. In conjunction with the new water supply system, progressively install an automatic reticulation system, in the following order of priority:
(i) Loch front picnic area

(ii) area around the present Administration building
(iii) area around Gloucester Lodge
(iv) the ovals.
(Priority: Ongoing).

3. **Convert gardens to native wildflowers to reduce areas requiring a high level of watering, and establish trickle watering systems (refer to Section 14.4.4(d)). (Priority 1).**

4. **Establish watering practices which conserve water as much as possible.**

14.4.6(c) MAINTENANCE/SERVICE AREA

The maintenance depot is located to the south of Loch McNess, and consists of sheds, garages, workshops, four houses, a koala isolation area and a lockable compound (see Figures 10 and 12 No. 24). The area is not well designed or located; it spreads over a larger area than necessary, and its close proximity to an excellent viewing area of Loch McNess detracts from the area.

Implication for Management

The maintenance/service area requires measures to reduce its impact on the environment.

Management Objectives

To consolidate and blend the maintenance/service area with the surrounding bushland, as much as possible.

Prescriptions

1. **Plant indigenous species around the maintenance/service area to screen it from the scenic drive and Loch McNess. (Priority 2).**

2. **Consolidate existing service facilities into a more compact area. (Priority 3).**

3. **Rehabilitate formerly used areas (refer to Section 7.4 on Rehabilitation). (Priority: Ongoing).**

4. **Set aside an area in the Yanchep Forest settlement suitable for the maintenance/service area in the future. (Priority: Ongoing).**

14.4.6(d) RUBBISH DISPOSAL

The high volume of visitors to the Park generates a substantital amount of rubbish on a daily basis, peaking on weekends, public holidays and school holidays. The rubbish is generated as a result of barbecue and picnic material brought into the Park and the purchase of goods from the kiosk.

Rubbish disposal has been traditionally carried out by Park staff. Rubbish has to be carted to the Wangara rubbish tip, (near Wanneroo) and due to the costs of transport and the time required by Park staff for cartage, the City of Wanneroo is now contracted to provide bulk rubbish bins and to empty the bins three times a week. The City of Wanneroo also empties domestic bins associated with the houses in the Park. A charge is levied against the Park for this service. With the use of contract rubbish removal, the Yanchep Inn, Kiosk and Gloucester Lodge Museum are now required to meet their own rubbish removal needs.

There are problems in rubbish collection from the intensively used Loch front picnic area. There is a wide dispersal of rubbish bins to meet the needs of visitors, and this requires access along the Loch front. The Loch front cannot sustain regular vehicular activity without damage to grassed areas and inconvenience to users.

Rubbish collection and disposal is a major concern. It is an expensive operation. Ideally rubbish disposal should not be handled by Park staff, so they can be freed to perform other duties.

The bins in the Park are old and are made of metal; they detract from the aesthetic values.

Implications for Management

1. The need for rubbish collection and disposal will continue, and will increase as visitor numbers increase.

2. Access along the Loch front will not sustain regular or increased vehicular activity.

3. There are no approved rubbish tip sites adjacent to or near the Park, therefore transport increases the cost of rubbish removal.

4. While there are domestic residences within the Park their rubbish must be satisfactorily removed.

5. The rubbish bins in the Park need replacing with durable, more attractive ones with lids.

Management Objectives

1. To provide a cost efficient, effective and unobtrusive rubbish disposal system.

2. To discourage littering within the Park.

Prescriptions

1. Employ contract services to meet rubbish disposal requirements of the recreation area and residences. (Priority 1).

2. Purchase rubbish bins which are durable, unobtrusive and have a reasonable capacity. (Priority 1).

3. Distribute and locate the bins to cater for the rubbish disposal needs of visitors; and to meet collection route requirements. Enough rubbish bins need to be provided so that people are encouraged not to litter, but not so many that they dominate the landscape. (Priority 1).

4. Investigate the `carry in - carry out' principle of rubbish for some areas of the Park. (Priority 2).

5. Include responsibility for rubbish disposal in the leases of all private concessions. (Priority 1).

l4.4.6(e) ENTRANCE FEE COLLECTION

There is an entrance fee to the Park; fees were raised in late 1986 for national parks throughout the State in response to rising costs and the decreasing availability of resources for management. Currently fees are $4 per car, $2 per motorcycle and $1 per person on a bus.

The entrance fee is collected from a fee collection box during weekdays; on weekends and

public holidays it is collected by casual staff. At busy times there is congestion at the entrance to the recreation area; however this will be relocated and redesigned. (refer to Section 14.4.1(d)).

Public Comment - Of the 99 responses to the current entrance fee, 3 percent were favourable and 97 percent were unfavourable, ie. there were mainly unfavourable responses to the rise in the entrance fee. The survey was conducted soon after the rise in fee, and probably many were reacting to the change. Experience has shown that with time, reactions to change decrease, and it is probable that the level of negative response to the present fees is now much lower. Other comments included: `dislike paying to enter the Park and again for use of other facilities'; `entrance fee should be variable for the length of stay'; `the fee is fair'.

Implications for Management

1. There was some public opposition to the 1986 fee increase and the current fee structure.

2. The present entrance fee collection system is not cost effective; the fee collection box only collects fees from `honest' visitors, and Park costs are higher with the use of casual staff.

3. The proposed re-location and re-design of the entrance area should allow entrance fee collection to be more streamlined.

Management Objective

To have a cost effective collection of entrance fees, which also allows for dissemination of information.

Prescriptions

1. **Purchase an automatic ticket machine which produces a dated or numbered ticket/brochure to be displayed on dashboards and which also caters for annual passes. (Priority 1).**

2. **Install the machine in the new entrance area. (Priority 1).**

3. **Include in the CALM regulations the capacity for Park staff to impose fines for non-payment of entrance fees. (Priority 1).**

4. **Arrange regular patrols by rangers to check for payment of the entrance fee. (Priority: Ongoing).**

5. **Investigate the imposition of different entrance fee structures to include options for use of a certain number of facilities in the Park, in conjunction with the private concessionaires. (Priority 2).**

6. **Install a ticket collection kiosk in the new entrance area to allow collection by Park staff when required (ie. for visitor surveys, peak days, special events, school holiday programs etc). (Priority 2).**

7. **Promote the purchase of an annual pass for regular Park users.**

14.4.6(f) SIGNS

Signs are fundamental tools in communication with visitors, which help them to become orientated, be aware of the opportunities available, and become informed about the Park environment.

In the Park there is no coordinated sign system (signs in the natural areas are discussed in Section 16.4.2); there is an array of signs of varying quality, design and materials. In some locations, too much information is conveyed for that site, and in other locations not enough information is conveyed. The result is confusion for the visitor and ineffective use of the whole of the recreation area (as some areas are over-used and others are under-used).

Public Comment - Of the 85 responses to the current provision of directional and interpretive information, all were unfavourable. Specific comments included: `lack of clear directions to facilities'; `labels for plants needed'; `we couldn't find places easily'.

Implications for Management

1. The sign system in the Park needs to be reviewed and improved.

2. Proper use of signs encourages visitors to make effective use of facilities and areas.

Management Objective

To provide a simple sign system which allows easy orientation for visitors, leads to more effective use of the recreation area and a greater understanding of the Park environment.

Prescriptions

1. **Design and implement a sign system which**
   - **has a minimal number of signs**
   - **targets both pedestrians and vehicles**
   - **is consistent with the CALM sign manual. (Priority 1).**

2. **Obtain standard signs to be used in emergency and temporary situations. (Priority 2).**

3. **Label plants in the wildflower garden and trees of the recreation area. (Priority 1).**

4. **Label significant buildings in the Park. (Priority 2).**

5. **Regularly update signs when changes occur. (Priority: Ongoing).**

6. **Include a regular sign monitoring and maintenance program within the Park's annual works program. (Priority: Ongoing).**

14.4.6(g) PARK STAFF HOUSES

There are 12 Park staff houses in the Parks located throughout the recreation area (see Figure 10 No. 22). The houses are unsuitable for a number of reasons; many are of inferior quality; they are out of character with the bushland settings; some are located in public access areas and thus rangers and their families do not have privacy.

Implication for Management

It is CALM policy to reduce its housing estate and to withdraw from the function of managing a housing estate, however it is necessary to have some Park staff residing in the Park to cover after hours contingencies.

Management Objective

To provide a high standard of housing for the minimum number of Park staff required for after hours park management.

Prescriptions

1. **Determine the minimum housing requirement. (Priority 1).**

2. **Establish the required number of highest quality houses in the residential sub-unit area, (see Fig. 11). (Priority 1).**

3. **Upgrade the houses if necessary. (Priority 1).**

4. **Progressively remove the remaining Park staff houses. (Priority 2).**

5. **Rehabilitate former house areas (refer to Section 7.4 on Rehabilitation). (Priority 2).**

6. **Include the regular maintenance of houses in the Park's annual works program. (Priority: Ongoing).**

14.4.6(h) RECREATION AREA CAPACITY

The capacity of the recreation area to handle numbers of visitors can be measured in a number of ways, mainly (i) carparking capacity (ii) effects of visitors on each other ie. overcrowding (iii) the capacity of the environment before it becomes degraded (iv) the number of facilities provided. On quiet days none of these aspects is important; on peak days all of these aspects combine to produce congestion, chaotic parking, queues for some facilities and visitors affecting the recreational experience of each other.

The developed environment of the recreation area has the capacity to cope with high numbers of visitors with little degradation; it is mainly the other aspects that determine its capacity. As discussed in Sections 14.1.2 and 14.4.1(b) carparking is inadequate, and on peak days parking occurs on roadsides and grassed areas (which can degrade some sites); the amount of carparking available ultimately limits the number of people the recreation area can accommodate. Visitors have different needs and expectations of their recreational experiences; for some it is a `get away from it all' feeling, for others it can be recreating close to many other people. For those who want to get away from it all, most of the Park

on peak days would feel overcrowded and be unsuitable, whereas for others it is a comfortable way of spending a relaxing day.

Obviously there reaches a point with all visitors when overcrowding is experienced. This capacity of the recreation area is in some way self-limiting (if visitors do not like it, they will leave, and choose a different day for their next visit); however, for management it is desirable to reach some middle ground, where the point at which most visitors have an unpleasant effect on each other's experience is avoided.

The amount of facilities (in particular barbecues and picnic tables) and the amount of picnic space available also limits the capacity of the recreation area (as discussed in Sections 14.4.4(e) and (f)); complaints of long waits for barbecues on peak days are not uncommon; obviously the experience of the visitor is marred by a lack of facilities, and they may not choose to return to the Park.

Implications for Management

1. The recreation area has a capacity beyond which it has too many visitors. It is desirable to limit the number of visitors to a point where parking is confined to provided areas, the experience of most visitors is not marred by overcrowding and the number of facilities can reasonably cope.

2. The proposed re-design of the recreation area should spread out use, provide more picnic areas and facilities and make more effective use of carparking space, therefore allow more people to be catered for before the effects of overcrowding are felt. However, it is not possible to quantify this until the new design is implemented.

3. It is anticipated that within the term of this plan, visitor numbers will increase, (for reasons discussed in Sections 13.0, 11.1.1, 16.0 and 17.0); this increase needs to be provided for.

Management Objective

To protect the recreational experience of visitors and the Park environment from the effects of overcrowding.

Prescriptions

1. **Until the redesign of the carparks is implemented, determine the maximum number of vehicles the recreation area can cater for, before there are adverse environmental effects and the experience of visitors is marred by the effects of overcrowding. This allows for past average peak numbers to be catered for, whilst allowing flexibility in determining its future capacity. (see also Section 14.4.1(b)). (Priority 1).**

2. **Restrict vehicle entry to the maximum capacity determined, while allowing for `turnover' of vehicles throughout the day. (Priority 1).**

3. **Once the re-design of the carparks is implemented, restrict vehicle entry to the maximum capacity of the carparks, while allowing for `turnover' of vehicles throughout the day. (Priority 1).**

4. **Include in the CALM regulations the capacity for rangers to impose fines for illegal parking. (Priority 1).**

5. **Review the capacity of the recreation area after the re-designed area has been operational for about three years, and consider either increasing the amount of carparking in the recreation area, or providing carparking outside the recreation area and operating a shuttle bus service. (Priority: N/A).**

14.5 NEW FACILITIES AND ACTIVITIES

A number of new facilities and activities have been proposed for the Park, either by CALM or in response to a call for expressions of interest in the Park. Under the requirements of the CALM Act no new operation can occur unless it is considered within the terms of a management plan. Therefore all new facilities and activities that have been proposed to date (March 1988) are considered in this plan. Many of the proposals have been in response to the invitation for expressions of interest, in the leasing of existing or proposed facilities, by CALM in late 1986.

Recommendations

The following activities or facilities will proceed:

- visitor information facility
- children's adventure playground

- mobile kiosk van(s) (when there is sufficient demand).

The following can proceed once redesign of the roads and pedestrian paths is completed:
- cycle and buggy hire

The following are not recommended:
- canoe hire
- gilgie/trout fishing from Loch McNess
- wildlife park
- archery
- Cabaret Cave restaurant/function centre
- model boat hire
- paddle boat hire.

Management Objective

To ensure the operation of new facilities is compatible with the objectives of the recreation area.

Prescriptions

1. **Proceed with arranging the visitor information facility (see Section 18.1) and the children's adventure playground (see Section 14.4.4(h)).**

2. **When there is sufficient demand, arrange for the kiosk lease package to include a mobile kiosk van, and include in the lease agreement that the operation:**
   - **does not detract from the aesthetics of the Park**
   - **makes provision for rubbish collection in its vicinity**
   - **operates from approved locations.**

3. **When the re-design of the roads and pedestrian paths is completed, bicycle and possibly buggy hire may be included in the lease package of either the Inn or the kiosk and include within the lease agreement:**
   - **the requirements for safety for riders and pedestrians**
   - **a maximum number of bicycles**
   - **a maximum fee.**

15.0 CAVES

The caves in the Park comprise one of the six major cave regions of the State; other cave regions occur in the Nullabor Plain, Leeuwin-Naturaliste Range, Nambung National Park, Cape Range National Park and the Napier and Oscar Ranges in the Kimberley.

There have been over 600 caves documented in the Park. It is thought there may be up to 1 000 caves (M. Butcher pers. comm.). The caves at Yanchep have been formed by underground streams, which flow westwards from the Gnangara Mound. Information on how the caves have formed is in Bastian (1964) and Williamson & Lance (1979). The caves in the Park are quite small in dimension and close to the surface because the ground water is only about 10 m below the surface. In comparison the Leeuwin-Naturaliste Range has a water table of more than 200 metres in depth, and therefore has large caves.

Caves enlarge by the repeated collapse of the cave roof. In the Park collapsed caves frequently open through to the surface, forming a great number of fissures, open collapses (dolines) and small rubbly chambers (Bastian 1964). Boomerang Gorge is thought to have formed from a series of dolines (Williamson & Lance 1979).

Caves have three main values:
* as habitats for certain species of wildlife
* as sites of archaeological and scientific importance
* as attractions to tourists and recreational cavers. (DCE 1978).

A delicate balance of oxygen and carbon dioxide levels, humidity, temperature, light, air and water flow contributes to a cave environment suitable for the establishment of formations and as a habitat for cave fauna. Even small changes in these factors can adversely affect the processes occuring in the caves.

15.1 CAVE FAUNA

The caves in the Park contain the greatest diversity and abundance of invertebrates of all the cave systems in W.A. (B. Knott, pers. comm.). These specially adapted organisms depend on the mats of tree roots for food (Knott 1985). The diversity and richness of cave invertebrates in the Park can be related to the proximity of the caves to the surface allowing many tree roots to reach the cave floor. The invertebrates are dependent on a constant flow of water. Water depths in the caves range from about 2-3 cm to about 30 cm, thus any long term, even minor, changes to ground water levels would have a devastating effect on

the cave fauna (see Section 6.0 on Hydrology).

Species recorded in the caves include invertebrates, night fish (*Bostokia porosa*), frogs and bats. The 19 species of invertebrates found include amphipods (Burt 1982; Knott 1985; B. Knott, pers. comm.) and gilgies (Muir 1985), Copepods, and Isopods (B. Knott, pers. comm.). Some of the amphipods are very uncommon and significant. They are from an extremely ancient lineage, when the Australian continent was part of the Gondwanaland super-continent, about 350 million years ago (B. Knott, pers. comm.). Fossils have also been found in some caves (Bridge 1975).

15.2 CAVE USE

Speleology groups have developed a cave classification system which caters for different caves and user groups and assists in preparing appropriate management strategies. Caves have been classified as either tourist, adventure (mainly used by the general public), wild (more significant caves mainly used by speleologists) and restricted entry (caves of scientific significance, only used by authorised speleologists and scientists) (DCE 1978).

Due to the dynamic nature of caves (that is, floor subsidence with eventual collapse of all or part of the roof) there is an element of risk in their use. Even artificial structural supports (in some tourist caves) cannot ensure the safety of users. There was a collapse as recently as December 1987 in Crystal Cave. There is no expertise or authority in this State which will guarantee a cave to be structurally safe.

15.2.1 USE OF WILD AND ADVENTURE CAVES

Some of the caves are visited by speleologists, special interest groups, scout and school groups and casual recreationists. Increased use of some of these caves has led to degradation of surrounding vegetation and erosion around some cave entrances and in the caves. The safety of users is of concern, particularly if Park staff are not notified of visits, and cavers are not properly equipped. Permission from Park staff is required before entering any caves in the Park.

15.2.2 TOURIST CAVES

Several of the caves have been open for tourists over the past 50 years including Cabaret, Mambibby, Yanchep, Yonderup and Crystal. Crystal Cave is the only one open for tours at the time of preparation of this plan.

Yonderup Cave is of archaeological and ethnographic significance to contemporary Aboriginals. Human bones have been found in the cave (Davidson 1948). The W.A. Museum is researching the origins and background to the skeletal material (refer to Section 4.1). For a number of years a human skeleton was featured in Yonderup Cave tours; the cave was closed in 1984 when there was concern over the use of a cave of significance to Aborigines for such purposes. There has since been discussion between CALM, the W.A. Museum and representatives of the local Aboriginal community regarding the future use of the cave. There has been general agreement that the display of a human skeleton is inappropriate, that the cave can be open for tours provided a sign is placed at the entrance notifying visitors (in particular, Aborigines) of the cave's significance and that tours be conducted sensitively. The burial area is in one of a few passages in the cave; the passage can be avoided in tours. The cave is active (ie. formations are being formed; and the floor is subsiding) and there has been noticeable movement of its floor by Park staff, therefore the safety of users is of concern. The cave facilities need upgrading before it can be opened for use. Since the cave is relatively small, it can only sustain small tour groups.

Cabaret Cave (previously known as Silver Stocking Cabaret Cave) was converted to an underground function centre in the 1930s, with some major modifications to its structure. It was open for daily inspections and was a popular hire venue for private parties, dances etc. The cave was later declared unsafe and closed due to subsidence of the floor (caused by stream movement); there has been further subsidence in recent years according to Park staff. Attempts to have the cave declared structurally safe have so far been unsuccessful. There is a proposal to re-open Cabaret Cave and convert it into a restaurant and function centre

Crystal Cave is a popular feature of the Park. It has been open to the public since the 1930s. It has the highest visitation of any tourist cave in the State; during 1986/87, 68 416 people went on tours of the cave. Jewel Cave, in the Margaret River area, had 47 084 visitors in 1986/87 (Margaret River Tourist Bureau), and Yallingup Cave had 41 571 in the same period (Research and Planning Division, W.A. Tourism Commission).

Public Comment - In the visitor survey, 21 percent visited Crystal Cave. Of the 169 responses to the Crystal Cave tour, 97 percent were favourable, 2 percent were neutral and 1 percent were unfavourable. There were 8 comments regarding the lack of other caves open for tours. Overall there is strong approval of the Crystal Cave tours. Specific comments included: `cave tour excellent'; `increase cave tour fees for more revenue'; `enjoyed Crystal Cave, would like to see others'; `open Cabaret Cave for public use/commercial use'.

There is a problem, common to tourist caves, of algae growth on formations where there is artificial light. Measures have been taken to control algae growth in Crystal Cave by reducing the number of lights.

Current management involves Park staff being responsible for guiding tours, collecting fees and for the overall maintenance of the cave. Cave tours and maintenance occupy much staff time; in 1986/87 it involved the equivalent of 3.1 staff full time.

Implications for Management

1. Cave systems and their features are very fragile, and can be easily damaged or affected by: a reduction in vegetation cover which can lead to vandalism and rubbish dumping; over-use which can lead to erosion problems within and around cave entrances and in tourist caves, the cave environment can be affected; long term changes in the ground water level, which could affect cave fauna and the establishment and continuation of formations.

2. The safety of users in all caves is of concern. Regular safety inspections are required for tourist caves.

3. Caves of signficance to Aborigines require protection under the Aboriginal Heritage Act (1972).

4. The caves have educational and interpretive potential.

5. At present most of the expertise on caves in the Park exists within the W.A. Speleology Group and the Speleology Research Group. It is important that there is a formal arrangement between these bodies and CALM for cohesive management of caves.

6. Tourist caves are popular with many visitors (particularly tourists), therefore continuation of cave tours is important.

7. Crystal Cave is the only tourist cave in the State not operated by a private concession.

8. There is some demand for Yonderup and Cabaret Caves to be opened for use.

9. The use of artificial lights in caves causes algal growth on cave formations; this needs to be controlled.

10. The Aboriginal Cultural Material Committee (which includes representatives of the local Aboriginal community and the W.A. Museum) supports proposals by CALM to conduct tours of Yonderup Cave, avoiding the burial area.

Management Objectives

1. To protect the cave environments from detrimental impacts, as much as possible.

2. To protect areas of scientific, Aboriginal and archeaological significance.

3. To facilitate the low impact, safe enjoyment and appreciation of designated caves.

Prescriptions (For all caves in the Park)

As outlined in the draft Management plan for the Northern Forest Region and Leeuwin-Naturaliste National Park

1. Establish a Cave Management Committee including representatives from CALM and speleological groups, with functions including recommending cave management practices, maintaining an inventory of caves and their use, condition and damage by vandalism. (Priority 1).

2. Draft specific regulations regarding cave management and protection to be included in the National Park Regulations. In the longer term, investigate the need for specific legislation. (Priority 1).

3. Implement a permit system for visitors (anyone other than CALM management) to adventure and wild caves, to be administered by Park staff. (Priority: Ongoing).

4. Establish a set of conditions for receipt of a permit (for example, level of expertise, equipment etc). (Priority 1).

For Yanchep National Park:

5. Classify the caves in the Park as either Restricted Entry, Wild, Adventure or Tourist, and base cave management on the classifications. (Priority 1).

6. Include areas in which caves predominate within the Cave Protection Zone. (Priority 1).

7. Prepare a code of practice regarding management activities (particularly fire, dieback hygiene and use of heavy vehicles) in Cave Protection Zones. (Priority 2).

8. Monitor water levels in some caves to establish long term trends. (Priority 1).

9. Consider, in conjunction with the Water Authority, effects on water levels in the caves in any future management practices in State Forest No. 65.

10. Liaise with other authorities regarding works which may affect the caves (eg. WAWA, MRD). (Priority: Ongoing).

11. Rehabilitate access tracks to Restricted Entry caves. (Priority: Ongoing).

Tourist Caves (In the Park)

12. In conjunction with the proposed Cave Management Committee, set up a program to monitor airflow, carbon dioxide levels, temperature and humidity levels. (Priority 1).

13. Establish carrying capacities of the caves, based on data revealed by monitoring, legal safety requirements and the need for a quality tour. (Priority 1).

14. Design and implement quality tours of specified caves within the carrying capacities. (Priority: Ongoing).

15. Develop alternative cave tours of the Park, in previous tourist caves, using Park staff (including seasonal Park staff), if they are available, and self-guiding tours. (Priority: Ongoing).

16. Arrange regular inspections for cave safety. (Priority: Ongoing).

15.2.2(a) CRYSTAL CAVE

Management Objective

To ensure safe quality tours are conducted while minimising impacts on the cave's environment.

Prescriptions

1. **Lease out the operation of cave tours to private concession, either as part of one of the lease packages with the kiosk or Yanchep Inn, or as a separate operation. (Priority 1).**

2. **Include the following conditions in the lease -**
   - **the continued management of the cave environment by CALM, with costs covered by the concessionaire**
   - **the cost of a cave monitoring program to be met by the lessee**
   - **the requirement for high quality interpretive tours**
   - **a maximum number of tours per day, and number of people per tour**
   - **the involvement of CALM in the dissemination of information**
   - **the need for the safety of visitors to be a primary concern**
   - **the cost of electricity borne by the lessee. (Priority 1).**

3. **As part of the care of the cave by CALM,**
   i) Investigate and implement emergency provisions in particular
      a) Emergency lighting or irridescent tape.
      b) Redesign of the safety exit.
      c) Develop an emergency contingency plan. (Priority 1).
   ii) Investigate and implement measures to reduce algal growth, for example -
      a) Use of less lighting.
      b) Regular relocation of lights.
      c) Treatment with sodium hypochlorite solution. (Priority 2).

4. **Develop the skills and knowledge of Park staff, through training, for conducting alternative cave tours. (Priority: Ongoing).**

5. **Ensure private concession guides are thoroughly trained and equipped for guiding and public safety. (Priority: Ongoing).**

15.2.2(b) CABARET CAVE

Management Objective

To provide opportunities to view Cabaret Cave, while protecting the cave environment and ensuring the safety of visitors as much as possible.

Prescriptions

1. **Continue attempts to have the cave declared structurally safe. (Priority 1).**

2. **If and when the cave is declared safe, make it available for public viewing at regular specified times, and use it as part of interpretive tours of a number of caves of the Park. (Priority 2).**

15.2.2(c) YONDERUP CAVE

Management Objective

To provide safe quality tours while protecting the Aboriginal heritage value of the cave and minimising impacts on the cave environment.

Prescriptions

1. **Assess the safety of Yonderup Cave for use. (Priority 1).**

2. **If it is found to be safe, upgrade the Yonderup cave facilities to a standard suitable for interpretive tours. (Priority 1).**

3. **Establish a carrying capacity of the cave, based on data revealed by monitoring, legal safety requirements and the need for a quality tour and the size of the cave. (Priority 1).**

4. **Erect a sign at the cave entrance referring to the cave's significance to Aborigines. (Priority 1).**

5. **Conduct tours of the cave using rangers, on an occasional basis, without entering the Aboriginal burial area. (Priority: Ongoing).**

6. **Conduct regular safety inspections. (Priority: Ongoing).**

16.0 RECREATION AND USE OF NATURAL AREAS

Most recreational activities in the Park have been focussed on the recreation area, with most visitors not experiencing the Park outside this area (the attributes of the recreation area are discussed in Section 14.1). Some bushwalking occurs, particularly in the north east area and around Loch McNess up to the ghost house ruins. One reason for the general lack of degradation of the Park's natural environment (such as that caused by the spread of dieback disease and over use of areas) is the low level of use of that environment.

The demand for outdoor recreational opportunities is increasing throughout Australia and in many other countries. The visitor survey showed an interesting response to the statement `Yanchep National Park needs more places where you can walk in the bush'. The response was: agree 38 percent, disagree 38 percent, undecided 24 percent. Considering most of the people visiting the Park have traditionally only had expectations of participating in such activities as picnicking, boating and sports within the recreation area, it was therefore a surprisingly high percentage who felt there was a need for more bush activities. Park staff have noticed a much greater demand over the past few years for bush walking tracks.

A heritage trail (called the Yaberoo Budjara Trail) is proposed, to extend from Joondalup Lake through Neerabup National Park to the recreation area of Yanchep National Park. It will focus on the natural and cultural (Aboriginal and European) histories of the area.

There is some indiscriminant use by four-wheel drive vehicles of the many unsealed tracks in the Park, providing access for illegal activities (such as kangaroo shooting and firewood collection). The primary purpose of these tracks is for management activites (fire control and ranger patrols) and private vehicles are not permitted on these tracks. Use is made easier by access to a number of tracks existing off Wanneroo Road and Yanchep Beach Road. Too much use of the tracks degrades the quality of the unconsolidated surfaces making access for essential management difficult; it can also cause erosion; excessive use also encourages the spread of weeds and disease; it creates an unacceptable noise and visual impact on areas zoned as natural and is a hazard to bushwalkers.

The W.A. Equestrian Federation has requested that provision be made for horse riders in the Park. At present horses are not allowed in the Park, although there is some illegal use occurring; horses are only allowed in two national parks in the State (John Forrest and D'Entrecasteaux). Horses can have a variety of impacts on the natural environment. These

include trampling and eating plants, spreading of weeds and disease, disturbance of fauna and soil erosion. These effects have been found in the parks in this State in which horses are allowed and also overseas (Weaver and Dale 1978). No camping occurs outside the recreation area. The City of Wanneroo's two bush camps provide excellent facilities for bush camping in the region. Some users of Tandarra camp enter the Park and participate in illegal and disruptive activities.

With the advent of mountain bicycles, cycling off-road in natural environments is becoming increasingly popular. There is some use of the Park by cyclists at present. It is anticipated this demand will increase. The activity allows for the enjoyment and appreciation of the environment, provided cyclists use hard-surfaced existing tracks and roads. Many of the tracks in the Park are unsuitable for such use, because of the sandy soil.

Implications for Management

1. Participation in recreational activities outside the recreation area, such as bushwalking and cycling, is increasing. In the long term, it is anticipated that with the increasing population and more leisure-orientated people, such activity will continue to increase.

2. The provision of recreation opportunities must be consistent with the protection of the Park environment, particularly in terms of protection from dieback, wildfire, weed invasion and similar disturbances.

3. Consistent with protection of the Park environment, some activities can be encouraged and others need to be discouraged.

4. With a variety of vegetation and landscapes in the Park there is great potential to develop attractive bushwalking opportunities.

5. There is some indiscriminant use by four wheel drive vehicles, and associated illegal and disruptive activities, in the Park. This needs greater control.

6. It is considered the size of the Park is insufficient to support horseriding; and the fragile sandy soils are not suitable for horses.

Management Objectives

1. To provide opportunities for the enjoyment and appreciation of the natural

environment.

2. To protect the environment from the impacts of over-use and inappropriate use.

Prescriptions

1. **Develop nature trails within `managed natural areas' which encompass the different landscapes (see Section 12.0 on Landscape). (Priority 1).**

2. **Develop the proposed Yaberoo Budjara Heritage Trail in the Park and where possible link up with other trails in the Park. (Priority 1).**

3. **Provide only limited facilities on nature trails, such as a fallen log at a stopping point, and where possible make use of existing firebreaks and tracks. (Priority: Ongoing).**

4. **Encourage the following activities in the natural environment of the Park: bushwalking, responsible caving, photography, bird watching, and other activities which have minimal impact on the environment. Provide information on these activities to the public. (Priority: Ongoing)**

5. **Prohibit the following activities in the natural areas: horseriding, private vehicle use (including motorcycles), camping. (Priority: Ongoing)**

6. **Consider the provision of suitable cycling areas and bridle trails within the Northern Forest Region. (Priority 2).**

7. **Erect barriers at access points off Wanneroo Road and Yanchep Beach Road, and any other points considered necessary. (Priority 1).**

8. **Inform and educate visitors about the effects of indiscriminant vehicle use. (Priority: Ongoing).**

9. **Rationalise management tracks (see Section 10.1 on Fire Management). (Priority 2).**

10. **Establish regular patrols of the natural areas. (Priority: Ongoing).**

16.1 FACILITIES IN THE NATURAL AREAS

16.1.1 ARMY BUNKERS

The concrete bunkers are situated close to Wanneroo Road. They were constructed during World War II to house communications equipment, when the armed services used the Park.

The National Trust classified the bunkers according to three categories:

21 *demonstration of a way of life/ custom/ process or function*

22 *historical significance/ of development or cultural phases/important figure(s)*

24 *scarcity value/ a particularly fine (or unique) example.*

`They are of importance as one of the remaining links with activities during the World War when Yanchep National Park was taken over by the armed services. They are well preserved examples of their type, of which few remain.' (National Trust of W.A. 1987).

There are a number of management problems associated with the bunkers. They are easily visible from Wanneroo Road and so attract illegal and destructive activities. The structures have been vandalised and thus detract from the aesthetic qualities of the Park.

Management Objective

To protect and promote the heritage value of the army bunkers.

Prescriptions

1. **Seal off the interiors of the bunkers. (Priority 1).**

2. **Upgrade the exterior of the bunkers. (Priority 2).**

3. **As nature trails are developed, include the bunkers. Erect a sign with points of interest. (Priority 2).**

4. **Include the bunkers on regular patrols of the Park. (Priority: Ongoing).**

5. **Rehabilitate access tracks, retaining walking tracks only. (Priority 1).**

16.1.2 SIGNS (OUTSIDE MCNESS RECREATION AREA)

Road sign information is located at Park boundaries, road intersections and entrances. The signs need improvement for the following reasons:

- there is too much information provided within a short distance, particularly between the Yanchep Beach Road turn-off and the entrance to the recreation area. For example the information sign at the entrance presents too much specific information too close to a major highway; it would be more appropriate closer to the recreation area, where traffic speed has slowed. The result is confusion for the visitor.
- the existing arrangement is visually cluttered.
- there are no signs facing north, providing information for south-bound travellers.
- there is no clear delineation between the developed recreation area and the natural environment of the remainder of the Park.
- at present visitors are only directed to the recreation area. It is proposed to provide other options such as a scenic drive (see Section 14.4.1(c)), and a look out (see Section 12.0).

Management Objectives

1. To provide clear directional information through the use of signs; which do not detract from the visual amenity of the environment.

2. To provide information of the Park's main features and encourage greater use of other natural areas of the Park.

Prescriptions

1. **Provide a minimum number of signs at the entrance road to the recreation area; for example indicating `McNess Recreation Area', `Scenic Drive', `Lookout North', `Jarrahsend Picnic Site'. (Priority 1).**

2. **Provide Park boundary signs on the two major roads. (Priority 1).**

3. **Develop a northern information bay at Jarrahsend (just north of the boundaries of the Park) for south-bound visitors. (Priority 2).**

4. **Investigate the provision of an information bay for north-bound visitors to the south of the entrance. If there is a need for an information bay, and if it is environmentally acceptable, construct the bay. (Priority 3).**

17.0 TOURISM

Yanchep National Park is a major tourist destination of the State. In fact ever since the Park was developed as a `Health and Pleasure Resort' in the 1930s it has been a popular destination for tourists. Tourist trips were arranged by the Government Tourist Bureau in the 1930s, and on Sundays and public holidays there were special motor services available (Daniels and Cockman 1979). In the early days the Park was popular for both overnight stays and day visits. The high overnight visitation was due to the distance to the Park being less easily travelled because of the poor condition of the roads and the early model cars. There was a range of accommodation available: Yanchep Hostel (later McNess House), eight tram bungalows, Yanchep Inn and Gloucester Lodge (Daniels and Cockman 1979).
As the Park became more accessible due to improved roads, improved and more prevalent vehicles and an expanding population, the emphasis changed from overnight stays to day visits. Gradually the places of accommodation closed as demand declined, and today only the Yanchep Inn offers overnight accommodation.

The main single attractions for tourists to the Park have been (and are) the caves and the koalas (M. Healy, pers. comm.). Loch McNess has been a focus of activity since the early days as well, with launch trips and rowing boat hire popular since the late 1930s.

For tourists, Yanchep National Park has always provided a taste of Australia; it brings together a unique combination of Australian wildlife, vegetation and developed and natural landscapes with a mainstay of Australian life, the barbecue. With its green lawns, trees, picnic facilities and gardens it is a pleasant and enjoyable environment in which to enjoy a sample of Australia (without risking life and limb in the bush).

Tourism is the third largest industry in Western Australia (WATC 1987b) and many of the State's best tourist attractions are in national parks (J Hodder, workshop talk). In turn, tourism can assist in developing positive attitudes towards conservation and there is potential to generate funds for Park management, through tourism development, such as corporate sponsorship (J Hodder, workshop talk).

Therefore the Park's role as a destination for tourists is an important one for the State as a whole and also for national parks throughout the State.

The development of other tourist facilities in the Yanchep area, such as Atlantis Marine Park, have consolidated the region as an important tourist area. Tourist numbers to the State, and to the Park, have been increasing, particularly since 1984/85. The W.A. Tourism Commission expects tourist numbers to increase due to a number of factors including devaluation of the Australian dollar, more marketing of the State overseas and increases in international and domestic airline services (WATC, 1987b).

The Park is an important tourist destination of the tourists from outside W.A., the visitor survey revealed that 14 percent were from interstate and 20 percent from overseas; a total of 34 percent from outside W.A. This compares with 4 percent from interstate and overseas visiting the Leeuwin-Naturaliste National Park. In addition, Park visitation figures show that commercial tours account for between 10-15 percent of total Park visitors. Other tourists visit the Park with family and friends or by their own means.

Most commercial tours visit the Park on Sundays. The buses add to the overall congestion that occurs on the Park's most popular day. Cave tours operate almost continuously on Sundays, occupying much of the available staff time.

Implications for Management

1. Yanchep National Park is an important tourist destination, management of the Park should reflect this.

2. The caves and koalas are important tourist attractions in the Park; discontinuation of either would probably affect tourist numbers.

3. If tourist numbers to the State increase, a corresponding increase to the Park is to be expected.

4. Representatives of the tourism industry (W.A. Inbound Tour Operators Association, W.A. Tourism Industry Association and the W.A. Tourism Commission) have indicated that improved food outlets, more information and more educational and interpretive programs would improve the Park's attractiveness for tourists.

5. Park staff need to be trained in dealing with tourists and their needs.

6. Many visitors are from non-English speaking countries; information may need to be provided in different languages.

7. There is potential to attract funding to the Park through tourism development and sponsorship.

8. Ongoing communication between CALM and the tourism industry is important.

Management Objectives

1. To enhance Yanchep National Park's role as an important tourist destination, within the objectives of the Park and of the recreation area.

2. To provide a high standard of service, facility and amenity which cater for tourist needs.

Prescriptions

1. Provide training and support for Park staff in dealing with tourists and their requirements. (Priority: Ongoing).

2. Develop interpretive/educational programs for tourists, for example to develop the theme of `a taste of Australia', and provide the opportunity to experience the Australian bush. (See Section 18.0 on Information and Interpretation). Liaison with the tourism industry in the development of programs would be advantageous. (Priority:Ongoing).

3. Investigate sources of funding to help develop and enhance the Park's tourist role. (Priority: Ongoing).

4. Regularly inform the tourism industry of events and changes in the Park. (Priority: Ongoing).

5. Organise a regular forum with the tourism industry to discuss any issues or problems that may be occurring. (Priority: Ongoing).

6. Include in the lease conditions for commercial operations the need to cater for tourists. (Priority 1).

7. Regularly assess the information needs of tourists, for example the type of information and language requirements. (Priority: Ongoing).

8. **Consider the importance of the caves and koalas to tourists in all management decisions and strategies. (Priority: N/A).**

9. **Appoint a CALM officer in the role of tourism liaison in the Park to coordinate and assist with the implementation of the above prescriptions and also to ensure: that correct information on the Park is received by the tourism industry, is within printed material, advertising etc and is given out by tour guides; the smooth-running of tourist activities in the Park; liaison with commercial operators in the Park to ensure their operations are compatible with tourism objectives. (Priority 1).**

18.0 INFORMATION AND INTERPRETATION

The dissemination of information is an integral part of CALM's role in the management of the national estate. It can inform the public of the recreational opportunities available (information) and provide an avenue for the appreciation and greater understanding of the natural environment (interpretation). It can be a tool to encourage use of the natural environment but at the same time foster appropriate behaviour so that impacts on the environment are minimised.

With over 250 000 visitors per year, there is a great demand for information about Yanchep National Park, ranging from information about the facilities and services provided, to a wide range of queries on the natural and cultural features of the Park. Many schools visit the Park every year for arranged and informal activities. Park staff and particularly office staff have many demands placed on them by visitors seeking information. Information is also conveyed by signs, displays, an information board and brochures. Overall the provision of information in the Park needs to be improved by the development of a co-ordinated integrated system, including a new sign system (see Section 14.4.6(f)), a visitor information facility to act as a central dissemination point, pamphlets, displays updated regularly, training for staff and interpretive activities.

Public Comment - In the visitor survey, the response to the statement `Yanchep National Park should provide more information about the animals, birds, plants etc in the Park' was: Agree 72 percent, Disagree 15 percent, Undecided 13 percent. All 85 responses to the existing provision of information were unfavourable. Specific comments included; `there is a lack of clear directions to and about facilities and services'; `lack of information about plants and animals'; `request handouts, guided walks or tours'; `there is a lack of information about the hours of operation of facilities'.

In a broader context the proximity of the Park to the city of Perth, and its role as a major destination for local, interstate and overseas national park visitors makes the Park a key area for concentrating resources for effective dissemination of information of the whole State.

Implications for Management

1. The provision of information in the Park requires coordinated improvement.

2. There is public support for the provision of more interpretive information.

3. The provision of interpretive programs is compatible with the objectives of the Park and the recreation area.

4. Regular contact between Park staff and visitors is important for the dissemination of information, and to promote a `cared-for' feeling for the Park.

Strategies

The Park will be developed as an important centre for the dissemination of information on the natural environment of the whole State. It is an ideal opportunity to reach many people who may not ordinarily have the opportunity to find out about the natural environment. This will, at the same time, remedy the deficiencies in information dissemination in the Park.

The Park will thus become a major gateway to natural environments of the State. Visitors will find out about national parks and natural environments elsewhere in the State, the recreational opportunities provided, and will be given the opportunity to experience, appreciate and gain a greater understanding of the natural environment within the Park.

This key role of the Park will be developed in the following ways:

- Provision of visitor information facilities.
- Development of wildflower gardens in the recreation area displaying flora of different regions of the State (discussed in Section 14.4.4(d) on Gardens and Trees).
- Development of a wide range of interpretative activities to facilitate interaction and experience with the environment of the Park. Once visitors have participated in such activities in this Park, they may become more aware and appreciative of the natural and cultural values and perhaps be inspired to experience other natural environments elsewhere in the State.

18.1 VISITOR INFORMATION FACILITY

A visitor information facility is essential to fulfil the Park's role as a gateway to the natural environment. It will be a major dissemination point for information on the national parks and environments of the State and of the Park, with Gloucester Lodge Museum maintaining its emphasis on history and caves, if appropriate. It will also provide a venue for environmental education activities for school groups.

It will provide literature, maps and information on the Park and other national parks, and on-going activities, to visitors. It will be a central point from which visitors will be encouraged to explore and discover the Park through interpretive activities and find out about other natural environments of the State.

The exact nature of the information facility will require further investigation. It will be integrated with McNess House (see Section 14.4.3(b)).

18.2 INTERPRETATION PROGRAMS

Interpretation programs will be developed of nature-based activities, which run seasonally each year. A variety of activities will be offered catering for all ages and ranging from camps, to day/evening activities with particular emphasis on school holidays. Activity topics could have the following broad topics:

- physically orientated - eg. survival and adventure courses.
- technically orientated - eg. wildlife photography and botany.
- artistically orientated - eg. pottery and painting.
- educationally orientated - eg. mammal and reptile discoveries.
- recreationally orientated - eg. sensory games, family games.

These programs can be initiated in the Park and then expanded into other Parks of the Northern Forest and Metropolitan Regions (for example John Forest and Walyunga National Parks, Thompsons Lake Nature Reserve and Penguin Island).

Guided activities in addition to guided cave tours, could include:

- adventure cave tours (discussed in section 15.2.2).
- possum and other night animal spotlighting.
- a musical bush experience around a camp fire incorporating Aboriginal and European cultures.
- a `taste of Australia' with damper, billy tea and yarn around the camp fire (particularly for the overseas visitors).

- guided walks featuring different communities and aspects of these environments in different seasons, for example wetlands and frogs, woodlands and insects, and birds.
- a cultural and historical walk incorporating aspects of Aboriginal and European cultures and histories.
- regular feeding times for birds.
- the arts and the environment.

Self guided activities could include:

- walk trails allowing people to experience the wide variety of habitats or communities in the Park.
- an aquatic trail around Loch McNess experienced from the rowboats.
- a tree trail around the recreation area highlighting the variety of Australian and exotic trees within the Park.
- northern stock route trail.

Special activities could include:

- art and craft displays, which involve aspects of the environment.
- cultural activities, for example using the Park as a venue for appropriate Festival of Perth activities.

The programs could cater for the wide range of visitors to the Park, of different ages, interests and backgrounds. The provision of activities and experiences for interstate and overseas visitors will be an important aspect to enhance the Park's role as an important tourist destination (see Section 17.0 on Tourism). Consideration should be given to foreign language programs and the training of tour guides for overseas visitors.

The program will be based on a `user pays' system, so that the costs of running most of the guided activities will be covered (including cost of employing instructors, purchasing materials and advertising) although provision will be made for those on a low income. There may be some programs for which there will be no charge.

Staffing requirements will be diverse. The program will be a collaborative effort within CALM Recreation, Landscape and Community Education Branch, Park staff, Districts and Regions and utilising a combination of specialists, volunteers and Park staff. To develop Park's role as a training Park for interpretation, the involvement of all Park staff in various facets of the program will be important. Specialists, (from within and outside CALM) will need to be co-opted where expertise does not exist within the Park. The use of specialists will also help to train Park staff in specific areas. Volunteers can provide a valuable

contribution to such programs, provided there is a good selection process and training provided.

Management Objective

To develop Yanchep National Park's role as a gateway to the natural environment.

Prescriptions

1. **While the Administration building is being upgraded, shift the information function to the present Park staff office. (see Sections 14.4.3(a) and (e)). (Priority 1).**

2. **Design and construct an innovative visitor information facility which is a central point for dissemination of information, interpretive programs and an environmental education venue incorporating McNess House (see Section 14.4.3(b)). (Priority 1).**

3. **Appoint an interpretive officer/visitor facility manager to co-ordinate all aspects of the facility. (Priority 1).**

4. **Develop innovative information displays and packages that inform and inspire visitors to explore, experience and appreciate the natural environment. (Priority: Ongoing).**

5. **Develop a diverse interpretive and adventure program for the Park, offering a variety of activities to suit the range of visitors, which can link in with programs in the rest of CALM's Northern Forest and Metropolitan Regions. (Priority: Ongoing).**

6. **Use the interpretive programs for training of rangers. (Priority: Ongoing).**

7. **Investigate the establishment of a recruitment and training program for utilising expertise within the community to assist in running Park interpretation programs. (Priority: Ongoing).**

8. **Develop wildflower gardens representing different regions of the State (as discussed in Section 14.4.4(d)). (Priority 1).**

9. **Liaise with the Gloucester Lodge Museum Committee for cooperation with information and interpretive programs. (Priority: Ongoing).**

10. **Upgrade the sign system in the Park (as outlined in Section 14.6(f)). (Priority 1).**

11. **Establish regular patrols in the recreation area to facilitate contact between Park staff and visitors. (Priority: Ongoing).**

12. **Regularly update displays and information boards. (Priority: Ongoing).**

13. **Reassess the current location of the main information board in the Park, once the entrance area has been re-located. (Priority 1).**

14. **Provide a main information board and bay in the new entrance to the recreation area, so that visitors can easily orientate themselves on entering the Park (see Section 14.4.1(d) Entrance to the Recreation Area). (Priority 2).**

19.0 IMPLEMENTATION

This plan will be implemented according to the priorities assigned throughout. While every effort will be made to attract funds to implement this plan, including sponsorship and special grants, it is recognised that funds may not be available to implement all of the proposals. If this is the case, priorities between different projects will be determined according to the objectives of the Park and the recreation area.

20.0 TERM OF THIS PLAN

This plan establishes the groundwork for the next 20 years of development and management for Yanchep National Park. This plan will be for a term of 10 years. Regular review of the plan will be required within those 10 years, however, dealing with the degree to which objectives have been achieved, and updating and refinement of the information on which the planning analysis was based, using information gained through surveys, research and monitoring (for example visitor use patterns may change, or unforeseen changes or events may occur which will require a review of the plan).

If major changes in the direction of the plan are perceived to be necessary, the revised plan will be released for public comment again. However, review will take into account the objectives of the Park and the recreation area.

21.0 BIBLIOGRAPHY

Archer, M. (1972). *Phascolarctos* (*Marsuplialia Vombatoidea*) and an associated fossil fauna from Koala Cave near Yanchep, Western Australia. **Helictite, 10** (3), pp 49-57.

Arnold, J.M. (1983). Western Quoll (*Dasyurus geoffroi*) in **The Complete Book of Australian Mammals** by R. Strahan (ed) The Australian Museum.

Ayre et al (1977). **A Limnological Survey of Lakes Jandabup, Joondalup and Loch McNess.** Unpublished Honor's Thesis. UWA.

Bamford, M.J. (1985). The fire-related dynamics of small vertebrates in *Banksia* woodland: A summary of research in progress in **Fire Ecology and Management in Western Australian Ecosystems.** Proceedings of May 1985 Symposium WAIT Environmental Studies Group Report No. 14.

Bastian, L. (1964). Morphology & Development of Caves in the South West of Western Australia. **Helictite, 2**(4): 105-119.

Beard, J.S. (1979). The Vegetation of the Perth Area W.A. **Vegetation Survey of W.A.** Map and Explanatory Memoir 1:250,000 series. Vegmap Publications.

Beard, J.S. (1981). **Vegetation Survey of Western Australia - Swan** Explanatory notes to sheet 7. University of Western Australia Press.

Biggs, E.R., Leech, R.E.J. and Wilde, S.A. (1980). Geology, Mineral Resources and Hydrology of the Darling System, Western Australia, **Atlas of Natural Resources, Darling System, Western Australia,** Explanatory text, DCE, Perth.

Blakers, M., Davies, S.J.J.F., and Reilly, P.N. (1984). **The Atlas of Australian Birds.** Royal Australasian Ornithologists Union. Melbourne University Press.

Bridge, PJ. (1971). Paleodistribution of *Macroderma gigas* in the south-west of Western Australia. **Helictite, 13**(35).

Bridgewater, P.B. and Backshall, D.J. (1981). Dynamics of some Western Australian ligneous formations with special reference to invasion of exotic species. **Vegetation, 46**: 141-148.

Burbidge, A.H., personal communication, CALM.

Burking, B., personal communication, Agriculture Department of W.A.

Burt, J.S. (1982). **Aquatic Cavernicoles of the Yanchep Caves.** Honours Thesis, Zoology Department, University of Western Australia. Unpublished.

Butcher, M., personal communication, W.A. Speleology Group.

Butcher, T.B. (1986). **Rainfall Distribution on the Northern Swan Coastal Plain.** Department of Conservation and Land Management W.A. Technical Report No. 13.

Christensen, P., Recher, H., Hoare, H. (1981). Responses of open forest to fire regimes in **Fire and the Australian Biota** by A.M. Gill, R.H. Groves and I.R. Noble (eds). Australian Academy of Science, Canberra.

Churchward, H.M. and McArthur, W.M. (1980). Landforms and Soils of the Darling System, Western Australia, in **Atlas of Natural Resources, Darling System, Western Australia, Explanatory Text,** DCE, Perth.

Colbung, K., personal communication, Nyungar Community, Gnangara.

Congreve, P. (1971). Freckled Duck at Yanchep **W.A. Naturalist 12** (2) 47.

Conservation and Land Management Department (1987). **Northern Forest Region Management Plan.**

Daniels, G. and Cockman, M. (1979). **The Story of Wanneroo,** Shire of Wanneroo.

Davidson, D.S. (1948). Disposal of the Dead in Western Australia **Proc.Amer. Phil. Soc., 93** (1) 76.

Davis, J., personal communication, School of Environmental and Life Sciences, Murdoch University.

Davis, R., personal communication, Yanchep National Park.

Department of Conservation and Environment (1978). **Caves in Western Australia** Bulletin No. 51.

Department of Conservation and Environment (1983) **System 6 - The Darling System Conservation Reserves for W.A.** Department of Conservation and Environment Report 13.

Dortch, G. (1986). **Devils' Lair, A Study in Prehistory** W.A. Museum, Western Australia.

Douglas, A.M. (1977). Some inimical effects of the domestic bee on the native fauna and flora **W.A. Naturalist, 14,** (1): 1-2.

Downey, J.H. (1958). **History of Yanchep**. Claremont Teachers' College.

Drescher, 0., personal communication, City of Wanneroo.

Environmental Protection Authority (1986). **Draft Guidelines for Wetland Conservation in the Perth Metropolitan Area.** Department of Conservation and Environment, W.A. Bulletin 227.

Environmental Protection Authority (1987). **Gnangara Mound Groundwater Resources** Water Authority of W.A. - Report and Recommendations Bulletin 295 Perth, Western Australia.

Environmental Protection Authority (in prep) **The Wetlands of the Perth Region, Part 1**. Bulletin 266.

Gordon, D.M., Finlayson M., & McComb, A.J., (1981). Nutrients and Phytoplankton in Three Shallow, Freshwater Lakes of Different Trophic Status in W.A. **Aust. J. Mar. Freshwater Res, 32,** 541-53.

Hallam, S.J. (1971). An archeological survey project, The Perth Area, Western Australia. **Report to the Australian Institute of Aboriginal Studies** Report No. 4.

Hallam, S.J. (1974). Excavations in the Orchestra Shell Cave, Wanneroo, Western Australia. Part 1. Ethnographic and Environmental Background Archeology and Physical Anthropology in **Oceania 9** pp 66-84.

Hallam, S.J. (1975). **Fire and Hearth, A Study of Aboriginal Usage and European Occupation in South-Western Australia** Australian Institute of Aboriginal Studies Canberra.

Hallam, S.J. (1985). The History of Aboriginal Firing. In **Fire Ecology and Management in Western Australian Ecosystems** Proceedings of Symposium May 1985. WAIT Environmental Studies Group Report No. 14.

Havel, J.J. (1968). **The Potential of the Northern Swan Coastal Plain for *Pinus Pinaster* Plantations**. Forests Department W.A. Bulletin 76.

Healy, M., personal communication, W.A. Inbound Tour Operators Association.

Heddle, E.M., Loneragan, D.W. and Havel, J.J. (1980). Vegetation Complexes of the Darling System, Western Australia in **Atlas of Natural Resources Darling System Western Australia** Department of Conservation and Environment, Perth.

Hembree, D. and George, R.W. (1978). The Aquatic Invertebrate Fauna of the Northern Swan Coastal Plain in **Faunal Studies of the Northern Swan Coastal Plain.** W.A. Museum for Department of Conservation and Environment.

Hopkins, D., personal communication, Western Australian Water Authority.

Hopper, S.D., personal communication, Department of Conservation and Land Management.

Kile, G.A., (1981). *Armillaria luteobubalina*: A Primary Cause of Decline and Death of Trees in Mixed Species Eucalypt Forests in Central Victoria. **Aust. For. Res., 11**(63)77.

Kitchener, D.J., Chapman, A., Barron, G. (1978). Mammals of the Northern Swan Coastal Plain in **Faunal Studies of the Northern Swan Coastal Plain.** W.A. Museum for Department of Conservation and Environment.

Knott, B., personal communication, Zoology Department. University of W.A.

Knott, B., (1985). Australian Aquatic Cavernicolous Amphipods **Helictite 23**(2) 51.

Lamont, D., personal communication, Department of Conservation and Land Management.

McArthur, W.M. and Bettenay, E. (1960). **The Development and Distribution of the Soils of the Swan Coastal Plain, Western Australia**, Soil Publication No. 16, CSIRO, Melbourne.

McComb, A., personal communication, Botany Department, University of W.A.

McComb, J.A. and McComb, A.J. (1967). A preliminary account of the vegetation of Loch McNess, a swamp and open formation in W.A. **J. Roy. Soc. W.A , 50**: 10-12.

Marchant, N., personal communication, W.A. Herbarium.

Matthews, E. (1984). To Bee or Not...?! Bees in National Parks? **People Parks and Preservation**. Aust. Nat. Pks. Assoc. pp 9-14.

Mattiske, E.M. (1985). Effects of Gnangara Mound Groundwater Developments on Native Vegetation of the Northern Swan Coastal Plain in **Gnangara Mound Groundwater Resources Environmental Review and Management Programme** Water Authority of W.A. 1986.

Merrilees, D., Dix, W.C., Hallam, S.J., Douglas, W.H., Berndt, R.M. (1973). Aboriginal Man in South Western Australia **J. Roy. Soc. W.A.,56,**(1 & 2)

Muir, B.A., (1983). Koalas at Yanchep National Park Western Australia. **Australian Symposium of Vetinary Medicine.**

Muir, B.A. (1985) Observations of the Gilgie (Crustacea, Decapoda, *Cherax quinquercarinatus*) in caves at Yanchep, W.A. **The Western Caver, 22** (1&2):9-17.

McQuoid, N., personal communication, Yanchep National Park.

National Trust of W.A. (1987) **Trust News** 148th edition June.

O'Connor, R., Bodney, C., Little, L., (1985) **Preliminary Report on the Survey of Aboriginal Areas of Significance in the Perth Metropolitan and Murray River Regions** W.A. Museum, July, unpublished.

O'Leary, B., personal communication, Western Australian Water Authority.

Pearce, R.H. and Barbetti, M. (1981). A 38,000-year-old archeological site at Upper Swan, Western Australia **Archaeol. Oceania, 16**:173-178.

Playford, P.E., Cope, R.N., Cockbain, A.E., Low, G.H. and Lowry, D.C. (1975). Chapter 2, Phanerozoic **Geology of Western Australia**: West. Australia Geol. Survey, Mem. 2, pp 227-259.

Pyke, G. and Balzer, L. (1985). **Effects of the Introduced Honey-Bees on Australian Native Bees** National Parks and Wildlife Service of NSW Occasional Paper Number 7.

Recher, N.F. and Christensen, P.E. (1980). "Fire and the Evolution of the Australian Biota" in **Ecological Biogeography in Australia** Junk The Hague.

Renfree, M.B. and Wooller, R.D. (1983) Honey Possum (*Tarsipes rostratus*) in **The Complete Book of Australia Mammals** by R. Strahan (ed) The Australian Museum.

Richards, G.C. (1983). Goulds Long-Eared Bat (*Nyctophilus gouldi*) in **The Complete Book of Australian Mammals** by R. Strahan (ed) The Australian Museum.

Sarti, N.L. & Allen, G.R. (1978). "The Freshwater Fishes of the Northern Swan Coastal Plain" in **Faunal Studies of the Northern Swan Coastal Plain.** W.A. Museum for the Department of Conservation and Environment.

Schmidt, W., personal communication, Department of Conservation and Land Management.

Seddon, G. (1972). **Sense of Place**. UWA Press Nedlands.

Shannon, G., personal communication, Royal Australasian Ornithologists Union.

Singh, G., Kershaw, A.P. and Clark, R. (1981) Ouaternary Vegetation and fire history in Australia in Gill, A.M., Goves, R.H., and Noble, I.R., (eds) (1981) **Fire and the Australian Biota** Australian Academy of Sciences Canberra.

Smith, M.J. (1983). Western Pygmy Possum (*Cercartetus concinnis*) in **The Complete Book of Australian Mammals** by R. Strahan (ed) The Australian Museum.

Speck, N.H. (1952). **Plant Ecology of the Metropolitan Sector of the Swan Coastal Plain.** M.Sc. Thesis, 0A.

State Planning Commission (SPC) (1987). **Planning for the Future of the Perth Metropolitan Region** Report of the Review Group to the State Planning Commission of Western Australia.

Storr, G.M., Harold, G., Barron, G. (1978a). The Amphibians and Reptiles of the Northern Swan Coastal Plain in **Faunal Studies of the Northern Swan Coastal Plain.** W.A. Museum for the Department of Conservation and Environment.

Storr, G.M., Johnstone, R.E., Harold, G. (1978b). Birds of the Northern Swan Coastal Plain, Western Australia in **Faunal Studies of the Northern Swan Coastal Plain** W.A. Museum for the Department of Conservation and Environment.

Stukely, M. personal communication, Perth Electric Tramsways Society.

Swanson, S. (1987). **Lizards of Australia** (revised). Angus and Robertson.

The Metropolitan Region Planning Authority (1977), **Planning Structure for the North-west Corridor,** The Metropolitan Region Planning Authority, Perth.

Tyler, M.J., Smith, L.A., Johnstone, R.E. (1984). **Frogs of Western Australia**. W.A. Museum.

Water Authority of Western Australia (WAWA) (1986) **Gnangara Mound Groundwater Resources Environmental Review and Management Programme.**

Waterhouse, R., personal communication, Department of Conservation and Land Management.

Weaver, T. and Dale, D. (1978). Trampling effects of hiker, motorbikes and horses in meadows and forests **J. App. Ecol, 15:** 451-457.

Western Australian Museum (1978). **Faunal Studies of the Northern Swan Coastal Plain** for the Department of Conservation and Environment.

Western Australian Tourism Commission (WATC) (1987a) **W.A. Regional Tourism Research Monitor** July 1985 - June 1986.

Western Australian Tourism Commission (WATC) (1987b) **Western Australian Tourism Profile.**

Williamson, K. and Lance, K. (1979). The formation of limestone caves and speleotherms at Yanchep W.A. **The Western Caver, 18** (4) 77-82.

Wycherley, P. (1984). People Fire and Weeds: Can the vicious spiral be broken? **The Management of Small Bush Areas in the Perth Metropolitan Region.** Proceedings of a seminar held on 20 September 1983, by the Department of Fisheries and Wildlife, S.A. Moore (ed).