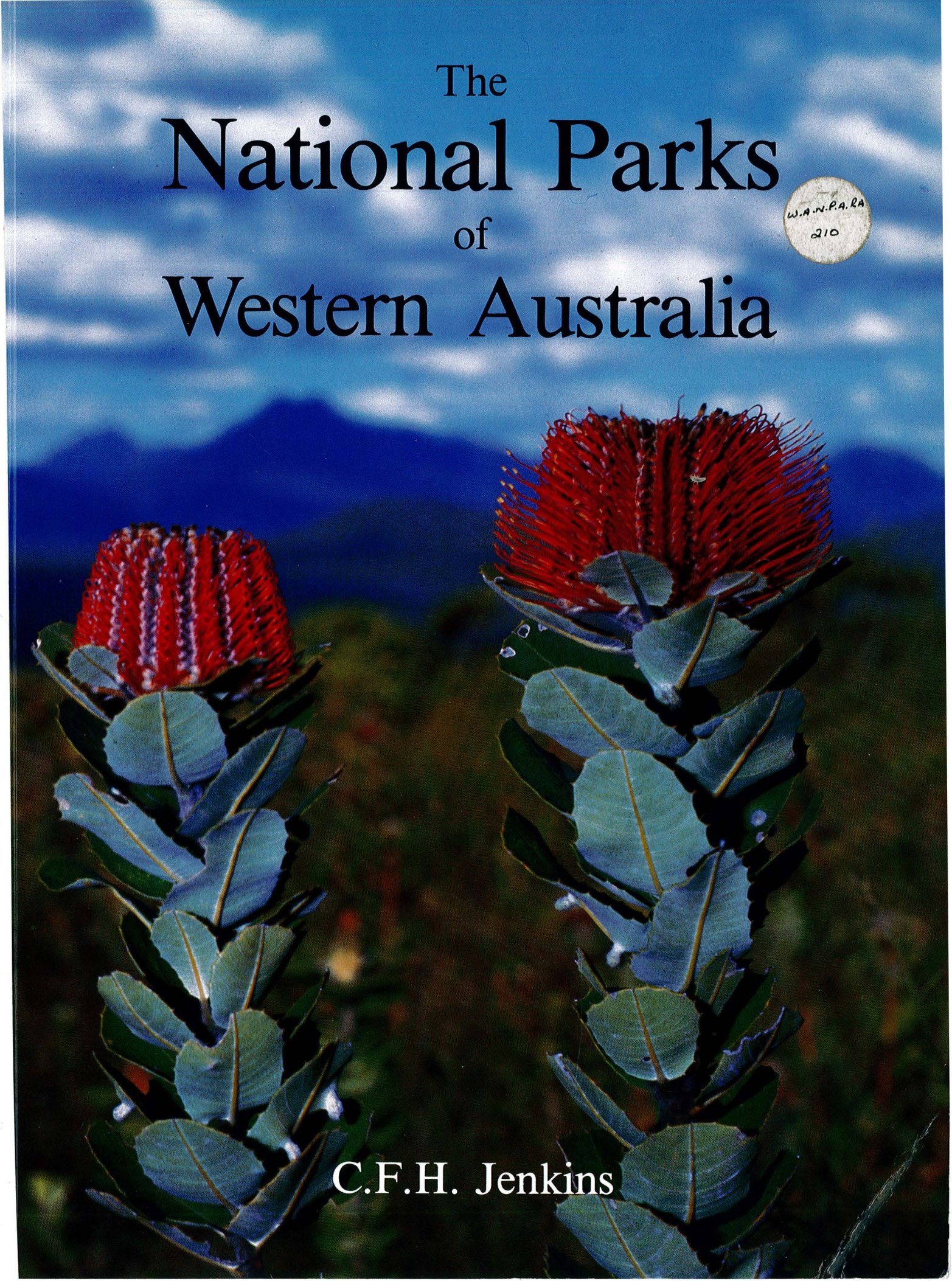
# The National Parks of Western Australia





C.F.H. Jenkins

# The National Parks of Western Australia



by
C.F.H. Jenkins

Published in 1980 by
The National Parks Authority of Western Australia

Corringendum over leaf

CORRIGENDUM

NATIONAL PARKS AUTHORITY OF WESTERN AUSTRALIA

"THE NATIONAL PARKS OF WESTERN AUSTRALIA"
By C.F.H. Jenkins

Page V111 Line 20 insert the word Zoological before Gardens.
Page 36 Line 36 *Gymnohina* to read *Gymnorhina*
Page 39 Line 44 *Anigosanthos* to read *Anigozanthos*
Page 44 Line 7 " " " "
Page 62 Line 18 *Anigosanthus* to read *Anigozanthos*
Page 39 Line 42 *Kennedya* to read *Kennedia*

The illustrations captioned hereunder which are located throughout the book should be credited with the following names:-

| | |
|---|---|
| Hanging Cone Flower | A.G. Wells |
| Downstream from the 'Z' Bend, Kalbarri | Dr. A.N. Start |
| Murchison River Gorge Kalbarri Nat. Park | R. Elston |
| Wattle Bird and Young | A. G. Wells |
| Australian Sea Lion | Dept. of Tourism |
| Mylies Beach and East Mt. Barren | Dr. F.G. Smith |
| Mandalay Beach, Walpole-Nornalup Nat.Park | Dr. F.G. Smith |
| Wolf Creek Crater | Kevrons Studio |
| Fitzgerald-River with exposed Coal Seam | Dr. A.N. Start |
| Pigmy Possum | A.G. Wells |
| View from John Rate Lookout Walpole-Nornalup National Park | Dr. F.G. Smith |
| Ocean Shoreline, Fitzgerald River Nat.Park | Dr. F.G. Smith |
| Scarlet Banksia | Dr. A.N. Start |
| Royal Hakea, Fitzgerald River Nat. Park | Dr. A.N. Start |
| Weathering on Spongolite Cliffs, Fitzgerald River National Park | J. Hill |
| Numbat | W.A. Forests Dept. |
| The Knoll, Walpole-Nornalup Nat. Park | Dr. F.G. Smith |
| Coastal Cliffs, Kalbarri National Park | Dr. F.G. Smith |

The illustration titled "Drysdale River National Park" should read Walpole-Nornalup National Park, photographed by Dr.A.N.Start.

The illustration titled "Honey Glider" should read Honey Possum.

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# Foreword

*BY THE PREMIER OF WESTERN AUSTRALIA*
*THE HON. SIR CHARLES COURT,*
*KCMG, OBE, MLA.*

When Mr C.F.H. Jenkins published his history of animal acclimatization and zoo-keeping in Australia ("The Noah's Ark Syndrome", 1977) his friends and colleagues felt it would be most appropriate if he went on to round off the conservation story by a similar historical treatment of the development of efforts in preserving the natural environment of Australia.

This he has now done in this book, "The National Parks of Western Australia", published by the National Parks Authority. It was based on his presidential address to the Royal Society of Western Australia in July 1979. The two volumes complement each other excellently.

I echo the words of my ministerial colleague, the Hon. June Craig, then Minister for Lands, in her foreword to Mr Jenkins's earlier book, by affirming how fortunate we are in having as an author one whose academic and professional attainments so well match his deep affection for the earth and its creatures.

His interest in the preservation of the flora and fauna, and the natural environment in which they have their being, began in his early years and was developed during his career at the Western Australian Museum and Department of Agriculture, where he became head of the Division of Biological Services. He retired from this post to become the first President of the National Parks Authority.

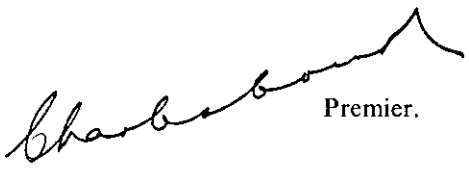
This book sets the history of the national parks movement in an Australian perspective, but the most detailed account is of the development of the concept in Western Australia itself. This had its beginnings soon after the foundation of the Swan River Settlement by Sir James Stirling, who early received instructions from the King 'to require and authorise the said Surveyor General to report . . . what particular land it may be proper to reserve in each County Hundred and Parish to be set apart for recreation and amusement of the inhabitants of any town or village for promoting the health of the inhabitants'.

Despite this mandate it was not until the passing of the Parks and Reserves Act of 1895 that the State's conservation areas received any degree of security, and even then the importance of these reserves was not fully appreciated because of the widely held belief that the 'vast interior' and land 'useless for agriculture' would provide all the parks and nature sanctuaries likely to be needed in the future.

As in the case of early legislative action for the preservation of our native fauna and flora, when attention was mainly directed to the preservation of game for hunting and fur-bearing animals for trade, natural scenery was first preserved solely for 'recreation and amusement of the inhabitants'.

It is only in comparatively recent times that 'habitat preservation' in the interests of the native flora and fauna has been added to these objectives as an equally desirable and perhaps more essential aim.

In recent years Western Australia has become a leader in nature conservation, and the details contained in this authoritative book show how the areas of national parks and wildlife sanctuaries have increased, how their management has been improved and how future planning should ensure the preservation of much of our natural heritage.



Premier.

# Contents

# Illustrations

**Colour Plates**
Between pages 38 and 39.



*Cover Illustration*
Scarlet Banksias, Stirling Range
(Photograph A.G. Wells)

# Introduction

The historical sections of this book on National Parks were prepared and delivered as the Presidential Address to the Royal Society of Western Australia for 1979.

Normally, such an address would have been published in the Journal of the Royal Society and would have been available to members of the Society and to institutions on the Society's exchange list.

But, because of the wide public interest in conservation and its relevance to the State's development and 150th celebrations it was decided to expand the paper by the addition of some general information on the flora and fauna likely to be found in our reserves and by particular reference to the more important National Parks and their salient features.

The author's background for preparing such information was more than fifty years interest and association with the State's wildlife and conservation movements, 40 years employment as a biologist by the State Government and more than 20 years membership of the Western Australian National Parks Authority and its predecessor the National Parks Board.

# Acknowledgements

The preparation of this book would not have been possible without the assistance of many people. Particular thanks are due to Mr P.C. Cornish, Acting Director, National Parks and Wildlife Service of SA, Mr T. Hare, Director, Territory Parks and Wildlife Commission, Mr D.A. Johnstone, Director, National Parks and Wildlife Service, NSW, Professor J.D. Ovington, Director Australian National Parks and Wildlife Service, Dr B.H. Pratt, Director, Conservation and Agriculture Branch, Department of Capital Territory, Mr P. Murrell, Director, National Parks and Wildlife Service of Tasmania, Mr D.S. Saunders, Director of National Parks, Victoria, and Dr G.W. Saunders, Director, National Parks and Wildlife Service, Queensland for the provision of helpful documents and information.

Thanks are due to Mr Colin Porter, Director, Western Australian Department of Conservation and Environment for permission to publish extracts from the "Green Book", the "Red Books" and other documents prepared under the direction of the Environmental Protection Authority. To Mr Bernard Bowen, Director of the Western Australian Department of Fisheries and Wildlife and to Mr Bruce Beggs, Western Australian Conservator of Forests for permission to use published information and illustrations. I also wish to thank the staff of the W.A. National Parks Authority, particularly Mr John Hunter who assembled many of the illustrations. Special thanks are due to Dr D.L. Serventy for reading the manuscript and checking the proofs.

Individual photographers are acknowledged adjacent to the appropriate illustrations.

# The Author

Clee Jenkins was born in South Australia and received his early education at St Peters College, Adelaide. He joined the staff of the W.A. Museum in 1929 and in 1939 he was appointed to the position of Government Entomologist in the Department of Agriculture. In the same year he received the degree of Master of Arts (specializing in Zoology) from the University of Western Australia.

During his 40 years in the Western Australian Public Service he was deeply involved, officially and unofficially, with biological studies and wildlife conservation.

For 20 years he was visiting lecturer in Entomology at the University of Western Australia and has been associated for many years with a wide range of scientific and natural history societies.

In 1966 he received the Medal of the Royal Society of W.A. for "distinguished work in science connected with W.A."

He served for 20 years on the Western Australian Gardens Board and retired after ten years as its President in 1979.

He has been a member of the National Parks Authority and its forerunner the National Parks Board for over 20 years and has occupied the position of President for the past 11 years.

He was awarded the M.B.E. in the 1977 New Years Honours List.

# The National Parks of Western Australia

*With notes on their History, Physical Features, Flora and Fauna*

by C.F.H. Jenkins

## National Parks — A World Movement

The term National Park means different things to different people, but the following definition from the *Encyclopaedia Britannica* reflects a widely accepted view point. 'National Parks are spacious land areas essentially of primitive or wilderness character, that contain scenery and natural wonder so outstanding in quality that their preservation intact for the benefit, enjoyment and inspiration of the people, is a national concern.'

Certainly in some states of Australia small reserves which do not conform to this definition are still called National Parks, but these anomalies result from administrative convenience or a carry over from the past rather than any conflict with the true concept of a National Park.

There are those who argue that a National Park must be controlled by the National Government, as in the United States of America and that reserves held by the State should be called State Parks, but as far as Australia is concerned if the park is of major significance it is usually called a National Park regardless of the controlling body.

In an effort to co-ordinate standards on a world basis, the International Union for the Conservation of Nature and Natural Resources (IUCN) laid down in 1963 minimum management requirements before any reserve would be recognised and as a result only five Western Australian parks out of 45 listed met the conditions required.

This does not mean that the unrecognised parks were of minor significance, but it does emphasize the importance of proper management and highlights the special problems which are associated with a large sparsely populated state such as Western Australia.

The definition of a National Park as laid down by the IUCN is as follows: ' . . . a relatively large area

1. Where one or more ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contains a natural landscape of great beauty; and
2. where the highest competent authority of the country has taken steps to prevent or to eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment; and
3. where visitors are allowed to enter, under special conditions, for inspirational, educative, cultural and recreative purposes.'

A definition of a National Park agreeable to all Australian States was accepted at the Fourth Ministerial Conference on National Parks in 1970 and read as follows: 'A National Park is a relatively large area set aside for its features of predominantly unspoiled natural landscape, flora and fauna, permanently dedicated for public enjoyment, education and inspiration and protected from all interference other than essential management practices, so that its natural attributes are preserved.'

The world's first major National Park was created in 1872 when the Yellowstone Park in the United States of America was set aside and closed to grazing. However, the ranchers of the region, in common with some present day stock owners in Australia, showed little sympathy for park protection and allowed their cattle to trespass on the reserve to such an extent that the United States Cavalry were deputed to protect the area up to 1917 when the soldiers were withdrawn, following American involvement in the Great War.

The honour of establishing the first National Park in Australia and the second in the world goes to New South Wales, for the National Park (now Royal National Park) at Sutherland was dedicated in 1879 (Goldstein 1979) to be followed by the Ku-ring-gai Chase National Park in 1894.

Many other nations followed the American example by establishing National Parks, but their significance varied greatly from country to country and in many instances they provided little protection for either the environment or the wildlife.

In many underdeveloped countries the parks have been designated more in the interests of tourism than of the flora and fauna and the wildlife is promoted more in the hope of ensuring a constant flow of wealthy visitors than the protection of a particular species.

Unfortunately, without proper management the success of such ventures must be short lived and there is little doubt that many parks in Africa and other third world countries are at risk, particularly when political turmoil, poaching and economic depression compound the already serious problems of ecology.

Since the second World War there has been a growing interest in wildlife conservation and the protection of the environment and this has been clearly demonstrated by the establishment of such bodies as the International Whaling Commission formed in 1946, the International Union for the Conservation of Nature and Natural Resources, founded in 1948, the World Wild Life Fund started in 1961 and the calling of the First World Conference on National Parks in 1962.

The fact that this meeting was convened under the patronage of the United Nations and that 65 countries were represented, marked a major step forward in the National Park movement throughout the world and one which has been reflected clearly in Australia.

In 1967 the first meeting of State and Commonwealth Ministers responsible for National Parks (with observers from New Zealand and Papua New Guinea) was convened in Sydney and annual meetings, rotating from State to State were arranged until 1974.

In that year the terms of reference were expanded to include Wildlife as well as National Park interests and as by then most governments had combined their National Park and Wildlife Services co-operation and co-ordination on a National and International basis were greatly facilitated.

The first Council of Nature Conservation Ministers (CONCOM) was convened in Melbourne in 1974 and meetings have been held annually on a rotational basis ever since.

In the meantime, the opportunity to cover South Pacific

interests was taken in 1972 when the NSW Government organised the first South Pacific Conference on National Parks to follow immediately after the Australian Conference which was being held in Sydney.

Although not held on an annual basis, further South Pacific Conferences have been organised and Australian support and co-operation have been offered to developing countries in the region.

## Great Britain

Before concentrating on the Australian and particularly the Western Australian National Parks systems it will be helpful to look briefly at conditions in Great Britain as British National Parks do not conform to the traditional definition and have been suggested as suitable models for 'integrated' parks in other parts of the world, including South-Western Australia.

Despite the proverbial beauty of the English countryside, and the immortal eulogies of Wordsworth, Shelley and Keats, little effort was made to protect the rural scenery of Britain until the middle of the present century.

Wordsworth suggested that the Lake District should be 'A sort of National Property in which every man has a right and interest who has an eye to perceive and a heart to enjoy' (Abrahams 1959). But no official action was taken until the formation of the Addison Committee (chaired by Lord Addison) in 1929. 20 years later the National Park and Access to the Countryside Act was passed and the Nature Conservancy was created to give scientific advice on the conservation and control of flora and fauna.

The first National Park was officially created in 1950.

Due to the almost complete lack of vacant Crown Land and a long history of settlement, few British parks could comply with the definition laid down by the IUCN.

Many such reserves combine farms, hills, lakes, woods and even villages, but developmental changes are closely watched and strict conditions are imposed in order to preserve the overall character of the area.

The fact that English type National Parks are accepted as filling an important need in Great Britain does not mean that the concept is equally valid in other countries, particularly Australia.

Many Australian conservationists regard as insidious an attempt by the Association for Regional Parks and Countryside Commissions of Australia Inc* (ARPCCA) to reintroduce sheep and cattle into Australian National Parks and particularly the Kosciusko Park, where some of the Commission's strongest supporters are said to have had land holdings. The argument that grazing animals and the fire stick will preserve the park-like environment, allegedly produced and 'managed' by the aborigines before the coming of the white man, has no scientific support and the fact that Professor Mellanby's Australian tour during 1977 was paid for by the ARPCCA has done nothing to strengthen the credibility of views advanced by either the Professor or the Association (Goldsmith 1978).

## The Era of Indifference and Exploitation

When the early explorers first arrived in Australia they found an inhospitable land sparsely stocked with primitive aborigines, but supporting a profusion of strange plants and animals. Some of the wildlife bore a superficial resemblance to familiar old world forms and in consequence the Australian fauna list soon contained such unimaginative and misleading names as native squirrel, native cat and native porcupine and our commonest black and white bird was dubbed a magpie.

However, more careful study soon showed that much of the flora and fauna in this vast land was completely new and sufficiently strange to strain the credibility of the world's leading scientists.

When Vlaming found black swans in Western Australia in 1697 he took live birds with him to Batavia as the only way of proving to the world that he had actually found the *rara avis* of the ancients.

The egg-laying platypus caused even greater consternation and was regarded by many scientists as a fake until Caldwell, a Cambridge zoologist, was sent to Australia in order to clear up the matter.

Despite this wealth of unique wildlife the homesick colonists showed little interest and applied their energies to improving the 'savage silence of the Australian bush' by introducing a wide range of songbirds and by supporting the acclimatization of pheasants, partridges, deer, rabbits, hares and trout or anything which would be a reminder of home or further the gentlemanly traditions of 'huntin', shootin' and fishin'.'

This attitude was strongly supported by such prominent citizens as the early state Governors, Professor Sir Frederick McCoy, Baron von Mueller and very importantly, Edward Wilson, the owner and editor of the influential Melbourne *Argus*.

The views of the day were summed up by Professor McCoy at the first Annual General Meeting of the Acclimatization Society of Victoria in 1862 in the following words: 'The aviaries established in the Botanic Gardens at this time were especially successful, and a very large number and variety, particularly of songbirds, have been kept and reared there up to the present time; and such large numbers, particularly of English thrushes, blackbirds, larks, starlings and canaries, have been liberated, that in the immediate neighbourhood at least they are quite acclimatized, and breed regularly without care of food from attendants. There could be no doubt that those delightful reminders of our early home, would even now have spread from that centre over a great part of the colony . . . were it not that . . . the catapult of the boys, and the fowling pieces of the young men have been more than a match for the legal engines which some legal members of the Society prepared and the Legislature passed last Session, for the preservation of imported creatures which we might set loose' (Jenkins 1977).

These opinions were also supported by G.W. Francis, Director of the Adelaide Botanic Gardens whose proposals sound more like a nightmare than the views of a professional scientist.

*Now known as The Association for the Protection of Rural Australia.

Francis suggested that even the 'central deserts' might be 'cropped' and that travellers and explorers 'might take the seeds of all kinds of melons, oranges, lemons, guavas . . . grain of many sorts . . . even slips of pineapple and banana might be carried three or four hundred miles — and the sugar cane too.'

So that the desert itself would be 'not withstanding its drought, teeming with animal and human food.'

As late as 1918 Sir Walter Kingsmill, President of the Western Australian Acclimatization Society commented enviously on the success of New Zealand's exotic fauna and referred to the Dominion 'as a sportsman's paradise, visited yearly by many thousands of people to enjoy the resources which have been created by acclimatization' (Kingsmill 1918).

But fortunately, the tide was already turning and many New Zealanders were soon to regret the hordes of deer, possums and foreign birds which had taken over so effectively from the unique native fauna.

For many years the Australian wildlife aroused little or no interest, unless it caused damage to crops and livestock, or presented an opportunity for direct exploitation and then, it was destroyed with such callousness and greed that many creatures were threatened with extinction.

The Australian fur seal, the koala and the platypus were massacred for their pelts and lyrebirds and egrets were slaughtered during the breeding season to supply the choicest plumes to the millinery houses of Paris and London (Marshall 1966).

A few protesting voices were raised from time to time but, despite the American evidence of the passenger pigeon and the bison*, the general view was that 'it can't happen here'.

The first conservation legislation introduced in Australia concerned the control of fisheries, the protection of acclimatized fauna and the taking of selected game species.

The emphasis was almost entirely on the issuing of licences and the control of marketing rather than the long term welfare of individual species and in consequence two million koala skins were offered for sale, mainly under the name of 'wombat', in 1924.

The effect was almost total disaster for the Queensland koala, but public reaction was swift and vocal and as a result, shooting and trapping were banned and the species made a slow but effective recovery.

In South Australia the koala was completely exterminated soon after the first World War but some Victorian animals have been successfully established in the Mt Lofty Ranges.

## From Destruction to Conservation

As Naturalists' Clubs and other conservation groups grew more influential and the concepts of ecology and habitat protection became better understood wildlife and flora protection laws were strengthened, particularly as regards direct exploitation, but the present concept of an integrated system of wildlife reserves and National Parks had to wait for several years.

## The Australian Academy of Science

A major stimulus to the Australian conservation programme was provided by the Australian Academy of Science whose status and expertise were sufficient to influence the Commonwealth and State Governments where other bodies had failed.

In 1958 the Academy appointed a Committee on National Parks and Nature Reserves and the Committee, in turn, established State Sub-Committees to review the past and make recommendations for the future.

In 1968 the Academy published a Report which listed the major reserves in the various States and Territories, drew attention to the absence of important ecosystems from existing reserves and stressed the insecurity of many others.

Eight recommendations resulted from this report (Anon. 1968) and they are reflected in all existing State and Commonwealth conservation programmes.

The Academy recommended:

'1. That the State and Commonwealth authorities assess (or arrange for appropriate bodies to assess) the land-types in their existing national parks and reserves in relation to all the land-types within their borders, with a view to ensuring that adequate representative areas of at least the most important environments and habitats are set aside permanently as national parks and reserves.

2. That a start be made on compiling an inventory of Australian fauna and flora to assist in assessing where national parks and reserves are needed.

3. That the early dedication of adequate national parks and reserves takes place in the following regions:
the eastern coastline
the arid zone, and
the marine environments

4. That all governments review their legislation covering national parks and reserves in the light of the principles given in Appendix 4.

5. That the universities and colleges of advanced education examine the adequacy of their facilities for training students in the science and profession of park management, and for training potential research workers in the biology and ecology of our native fauna and flora.

6. That the science and profession of park management be accorded greater recognition and status by the public service authorities and national park authorities in this country.

7. That, arising from the above recommendations, all governments in Australia endeavour to provide considerably increased finance for all aspects of national parks and reserves.

*In the middle of the 19th century passenger pigeon flocks often exceeded a million birds. The species became extinct in 1914 when the last individual died in the Cincinnatti Zoo.
It was estimated that less than 100 wild bison survived in the United States in 1889 following the slaughter of 3-5 million animals between 1872 and 1874.

8. That the Commonwealth Government consider the establishment of appropriate mechanism to enable it to participate in conservation in Australia.'

## Marine National Parks

The dedication of National Parks in 'marine environments' as recommended by the Australian Academy of Science has not progressed as rapidly as conservationists would have wished. Not because of any lack of interest in marine reserves or a shortage of suitable areas but because of certain legal difficulties.

Until final agreement has been reached between the Commonwealth and the Australian States and Territories as to who has jurisdiction over the coastal waters the declaration and management of Marine National Parks poses special problems.

The matter has been discussed at the national level for several years but without finality.

In the meantime the Council of Nature Conservation Ministers has accepted a report on Marine National Parks and Reserves from its Standing Committee which includes the following points.

**'The relevance of the concept of marine parks and reserves in the Australian context**

(Note: Throughout this report, the term 'State' includes the Northern Territory.)

The concept of marine parks or reserves is a logical development from the terrestrial national park movement. However, it is essential to understand the significant differences which occur between terrestrial and marine ecosystems as a result of the circulatory nature of the latter. The concept of marine parks has partly sprung from an awareness of the beauty and scientific interest of the world of nature beneath the sea, coupled with the interesting evidence of the vulnerability of this world to damage and alteration by man.

The coastline of mainland Australia and Tasmania is about 35,000 km in length and the vast majority of the population lives close to the sea. Australians have a strong interest in water-based recreation, many thousands spending much of their weekends and vacations either in, on or under the water.

There is great biological diversity in Australian waters giving them special scientific interest. They also represent a major resource for commercial fishing, which was worth more than $200 million in 1977.

Thus the concept of marine parks and reserves to protect areas for conservation, scientific, recreational and educational purposes is particularly relevant to Australia.

**Criteria and technique for the identification and classification of areas suitable for declaration as marine parks and reserves**

The scientific and aesthetic interest and value of Australian aquatic biota should be recognised, and this recognition should extend to an appreciation of the fact that in most cases the coastlines of the separate States comprise more than one biogeographic province. Any scheme for selecting suitable areas for preservation must take into account the current understanding of biogeography.

Within each of the main biogeographic provinces there is a need to set aside areas representative of each of the major marine and estuarine habitat types (for example, salt marshes, mangrove stands, seagrass meadows, mud flats, sand flats, rock platforms, rocky reefs, beaches, coastal lagoons, bays and offshore islands). The ecological importance of vertical zonation must be considered when defining the boundaries of an area to be set aside as a reserve.

It should also be recognised that in some very restricted areas a combination of physical and chemical factors may interact to produce unique biological communities, and therefore in addition to the larger areas reserved some much smaller and restricted areas are also worthy of protection.'

In Western Australia the Fisheries Act was amended in 1974 to allow for the declaration of aquatic reserves within Western Australian waters in much the same way as reserves are declared under the Land Act above low water mark, that is reserves may be vested Class A and be made for a variety of purposes and may be vested in a body corporate. As yet no reserves have been declared under this legislation, but areas considered very appropriate are the Ningaloo Reef, off North West Cape and adjacent to the Cape Range National Park and the waters of Shark Bay.

## New South Wales

As the first State in the Commonwealth to establish a major park, it was perhaps fitting that New South Wales should lead the way in the reorganization of its conservation legislation and establish a strong National Parks and Wildlife Service.

Prior to Federation in 1901 land in New South Wales was controlled under the Crown Land Consolidation Act and it was under this Act that the Royal and the Ku-ring-gai Chase National Parks were first established.

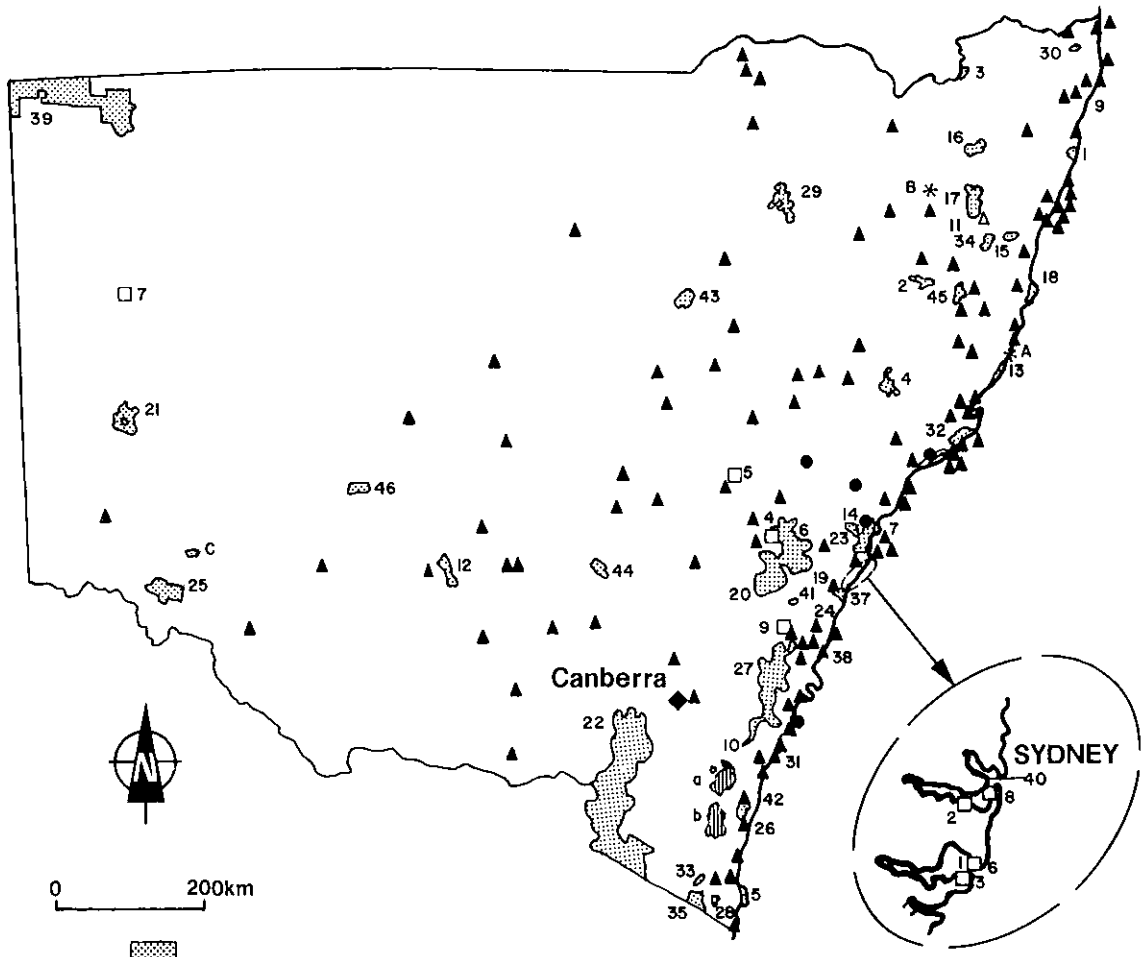
Following Federation, Crown Land remained the responsibility of the various State Governments and all passed some legislation for the protection of flora and fauna.

The New South Wales Wildflower and Native Plant Protection Act came into force in 1927 to be followed more than 20 years later by the Fauna Protection Act and the associated Fauna Protection Panel under the Chairmanship of Allen Strom.

In the early 1960's a major reshuffle of the State's conservation resources was considered advisable and at the instigation of the Minister of Lands, the Hon. Tom Lewis, an American wildlife administrator was appointed as Advisory Acting Director with instructions to organise the new National Parks and Wildlife Service and to run it for a period of twelve months.

At first the new appointee, Samuel Weems, operated under three Acts; the Wildflower and Native Plants Protection Act, 1927, the Fauna Protection Act, 1948 and the National Parks and Wildlife Act, 1967, but later these were consolidated into the National Parks and

# NATIONAL PARK AND NATURE RESERVES OF NEW SOUTH WALES




**National Park**

1. Angourie
2. Apsley Gorge
3. Bald Rock
4. Barrington Tops
5. Ben Boyd
6. Blue Mountains
7. Bouddi
8. Brisbane Water
9. Broadwater
10. Budawang
11. Cathedral Rock
12. Cocoparra
13. Crowdy Bay
14. Dharug
15. Dorrigo
16. Gibraltar Range
17. Guy Fawkes River
18. Hat Head
19. Heathcote
20. Kanangra-Boyd
21. Kinchega
22. Kosciusko
23. Ku-ring-gai Chase
24. Macquarie Pass
25. Mallee Cliffs
26. Mimosa Rocks
27. Morton
28. Mount Imlay
29. Mount Kaputar
30. Mount Warning
31. Murramarang
32. Myall Lakes
33. Nalbaugh
34. New England
35. Nungatta
36. Red Rock
37. Royal
38. Seven Mile Beach
39. Sturt
40. Sydney Harbour
41. Thirlmere Lakes
42. Wallaga Lake
43. Warrumbungle
44. Weddin Mountains
45. Werrikimbe
46. Willandra

**Historic Sites** □4

1. Bare Island
2. Cadman's Cottage
3. Captain Cook's Landing Place
4. Hartley
5. Hill End
6. La Perouse Monuments
7. Mootwingee
8. Vaucluse House
9. Throsby Park

**Aboriginal Areas** ●

**Nature Reserves** ▲3

**Game Reserves** *A

a. Lake Innes
b. Llangothlin

**New National Parks** a

a. Deua
b. Wadbilliga
c. Mungo

**Map 1**

Wildlife Act, 1974, which provided for the replacement of the old Trusts which had controlled many parks, by Advisory Committees and a much more vigorous and integrated management procedure for both National Parks and Wildlife reserves.

### Victoria

The earliest National Parks in Victoria, including Wilson's Promontory and Mt Buffalo, were created under the Victorian Land Act of 1898, but the actual control often rested in a local Committee of Management.

The National Park Act of 1956 created a central 11 man National Park Authority and this functioned, together with the individual Committees of Management, until the State Development Act 1970 took over 'to provide for balanced development in the fields of Tourism, Industrial Development, Immigration and National Parks.'

Under this act, the National Parks Authority was abolished and a National Parks Service was created with a Director as its administrative head.

However, in 1972, further changes came about when a special Act created the Victorian Ministry of Conservation, with power to co-ordinate the activities of several conservation agencies including:

The Environment Protection Authority
The Fisheries and Wildlife Division
The Land Conservation Council
The National Parks Service
The Port Phillip Bay Authority
The Soil Conservation Authority.

The Parks legislation was strengthened still further by the National Parks Act of 1975 which retained the traditional concept of a National Park but gave the National Parks Service responsibility for the management of recreation parks, education parks and other special reserves and replaced the Committees of Management with advisory committees responsible to the Director.

### Northern Territory

The need for the establishment of National Parks and other reserves in the Northern Territory was first recognised officially with the passing of the National Parks and Gardens Ordinance in 1955.

This authorised the formation of a five man Parks and Reserves Board (expanded to seven in 1959) which held its first meeting in Alice Springs, November 1956.

The Ayers Rock/Mt Olga National Park of 126,132 hectares was the Board's first and most important responsibility, but with the formation of the Australian National Parks and Wildlife Service the original dedication was revoked (Northern Territory Gazette of May 23rd 1977). The park was placed under the control of the Australian body and renamed Uluru (Ayers Rock — Mt Olga) National Park.

Further changes were involved with the passing of the Territory Parks and Wildlife Conservation Ordinance 1976, which came into force in January 1978. Under this Ordinance the staffs of the Reserves Board and the Wildlife unit of the Department of the Northern Territory were amalgamated and policy was in the hands of a five man Commission assisted by an Advisory Council of eight.

The Commission is an autonomous body responsible to an Executive Member of the Northern Territory Legislative Assembly. It operates its own bank account and derives its funds through the Assembly. However, the fact that much of this money comes from a Commonwealth Grant and that the recently formed Australian National Parks and Wildlife Service has assumed control of the Kakadu National Park as well as the Uluru Park has aroused criticism from the Territory Administration and disquiet in many of the States, despite a provision in the Act for the Territory Parks and Wildlife Commission to be involved in the development and management plans.

The Prime Minister Mr Fraser announced the creation of the 6,000 squ. km Kakadu National Park under the National Parks and Wildlife Conservation Act in April 1979. This was stated to be the first stage of major protective measures recommended by the Ranger Report and promised by the Commonwealth Government before any uranium mining would be permitted.

Preliminary surveys of the park have recorded more than 950 plant species, 50 native mammals, approximately 280 birds, 75 reptiles, 22 frogs and 43 fish.

In addition to the administrative and mining problems affecting the park it has a high population of feral pigs and water buffalo which have caused major changes to the environment and will demand serious attention in any management programme.

### Queensland

The first act 'to provide for the reservation, management and protection of State Forests and National Parks in Queensland' was assented to in December 1906, but the first reserve was not actually dedicated until March 1908 when the Witches Falls Park was set aside on the basis that 'it was unfit for other purposes' (W. Wilkes 1972).

Despite this negative approach popular support for National Parks continued to grow and in 1915 the magnificent Lamington National Park was created with the support of a door to door campaign and a petition containing 521 signatures.

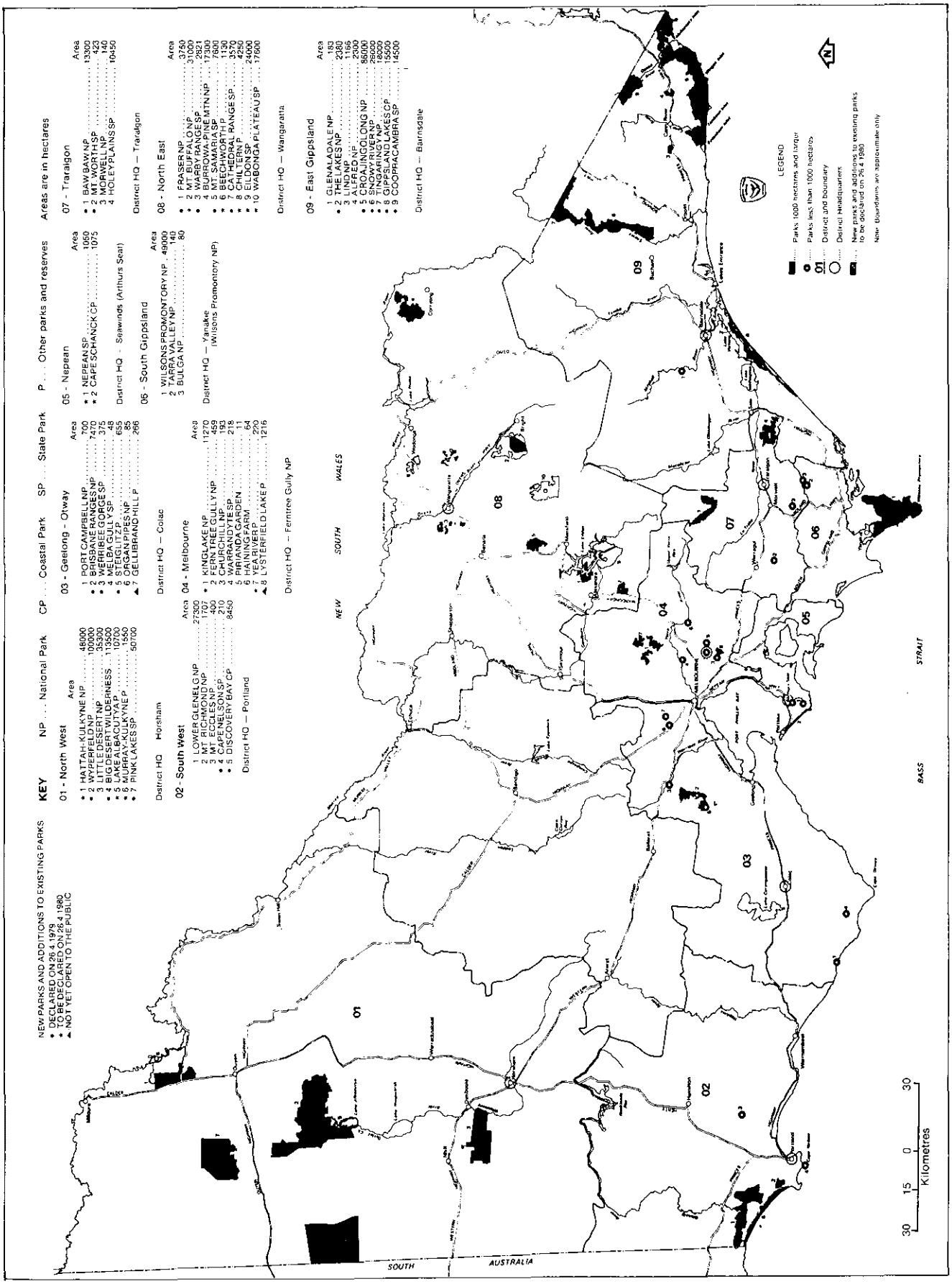
The present National Parks and Wildlife Service was established in May 1975 with the passing of the National Parks and Wildlife Act 1975.

The new body, which is responsible to the Minister for Lands and Forests, took over the staff of the Fauna Conservation Branch of the Department of Primary Industry (previously responsible for the 'Fauna Conservation Act 1974' and the 'Native Plant Protection Act 1930') and the 'National Parks Branch of the Forestry Department' (previously responsible for the appropriate provisions of the 'Forestry Act 1959-1975'). It also assumed responsibility for environmental parks, previously administered under the 'Land Act 1962-1975'.

### Australian Capital Territory and Jervis Bay

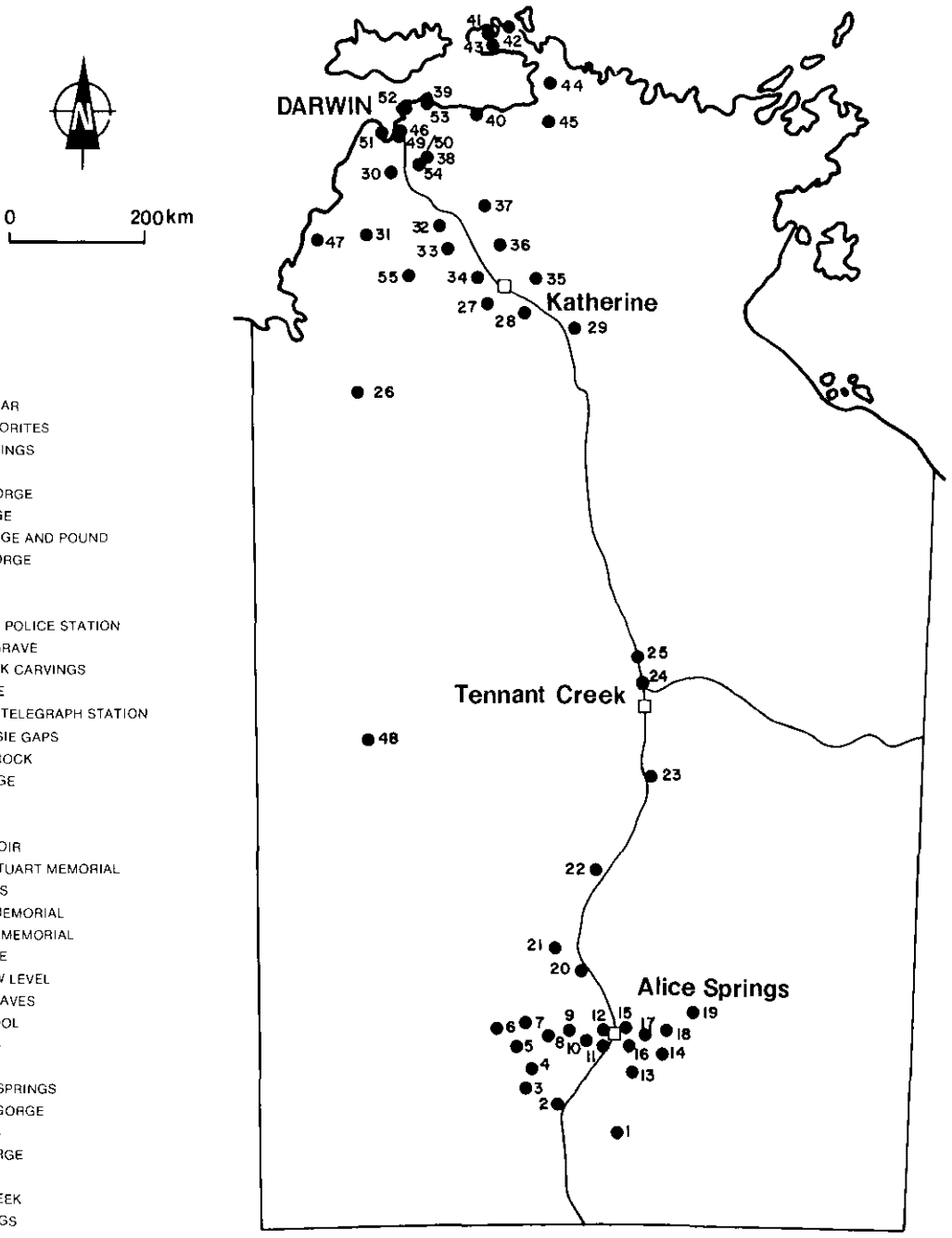
The importance of conservation was recognised very early in the history of Canberra when a very extensive

# NATIONAL PARKS AND RESERVES OF VICTORIA




Map 2

# NATIONAL PARKS, RESERVES AND SANCTUARIES CONTROLLED BY TERRITORY PARKS AND WILDLIFE COMMISSION

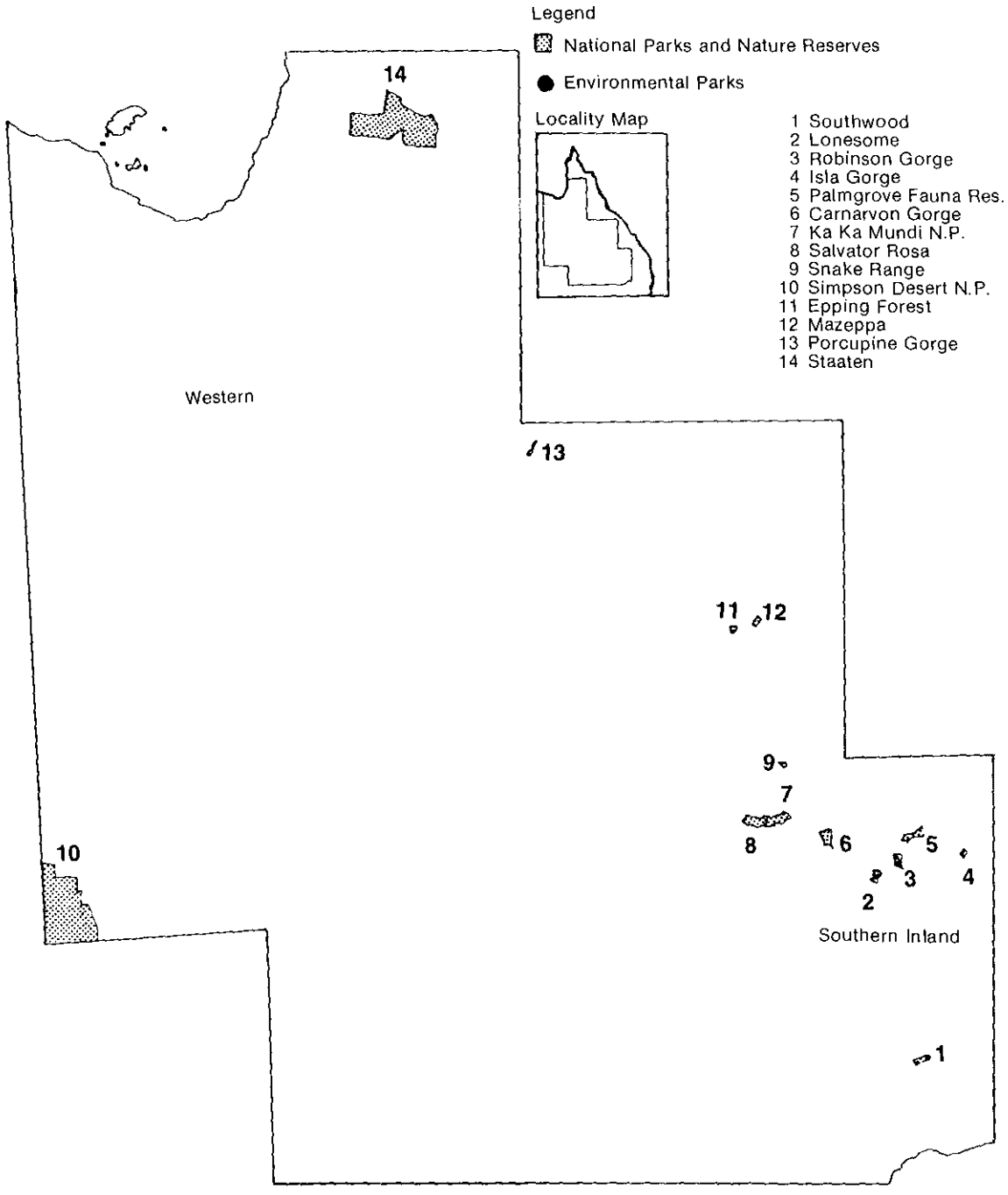



1. CHAMBERS PILLAR
2. HENBURY METEORITES
3. ILLAMURTA SPRINGS
4. FINKE GORGE
5. GLEN HELEN GORGE
6. REDBANK GORGE
7. ORMISTON GORGE AND POUND
8. SERPENTINE GORGE
9. ELLERY CREEK
10. SIMPSONS GAP
11. HEAVITREE GAP POLICE STATION
12. JOHN FLYNNS GRAVE
13. EWANINGA ROCK CARVINGS
14. N'DHALA GORGE
15. ALICE SPRINGS TELEGRAPH STATION
16. EMILY AND JESSIE GAPS
17. CORROBOREE ROCK
18. TREPHINA GORGE
19. ARLTUNGA
20. RYAN WELL
21. ANNAS RESERVOIR
22. CENTRAL MT. STUART MEMORIAL
23. DEVILS MARBLES
24. JOHN FLYNNS MEMORIAL
25. ATTACK CREEK MEMORIAL
26. GREGORYS TREE
27. KATHERINE LOW LEVEL
28. SIXTEEN MILE CAVES
29. MATARANKA POOL
30. BERRY SPRINGS
31. DALY RIVER
32. DOUGLAS HOT SPRINGS
33. UMBRAWARRA GORGE
34. KINTORE CAVES
35. KATHERINE GORGE
36. EDITH FALLS
37. WATERFALL CREEK
38. HOWARD SPRINGS
39. ESCAPE CLIFFS
40. STUARTS TREE
41. VICTORIA SETTLEMENT
42. FORT WELLINGTON
43. COBOURG PENINSULA
44. MURGENELLA SANCTUARY
45. ALLIGATOR RIVERS SANCTUARY
46. YARRAWONGA ZOO
47. DALY RIVER SANCTUARY
48. TANAMI DESERT
49. RADIO BLOCK
50. HOLMES JUNGLE
51. INDIAN ISLAND
52. GUNN POINT
53. CAPE HOTHAM
54. HOWARD SPRINGS
55. FISH RIVER

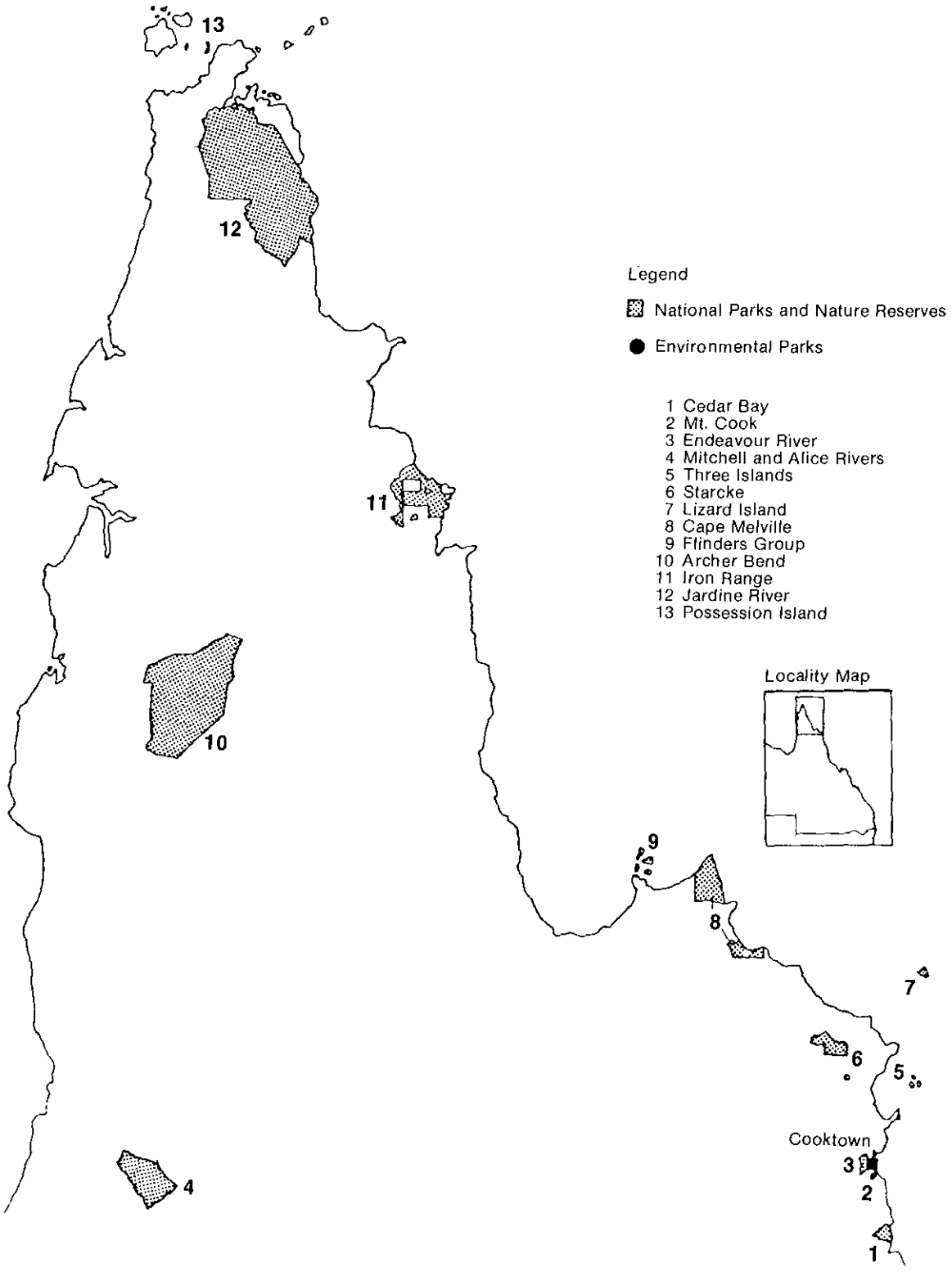


Map 3

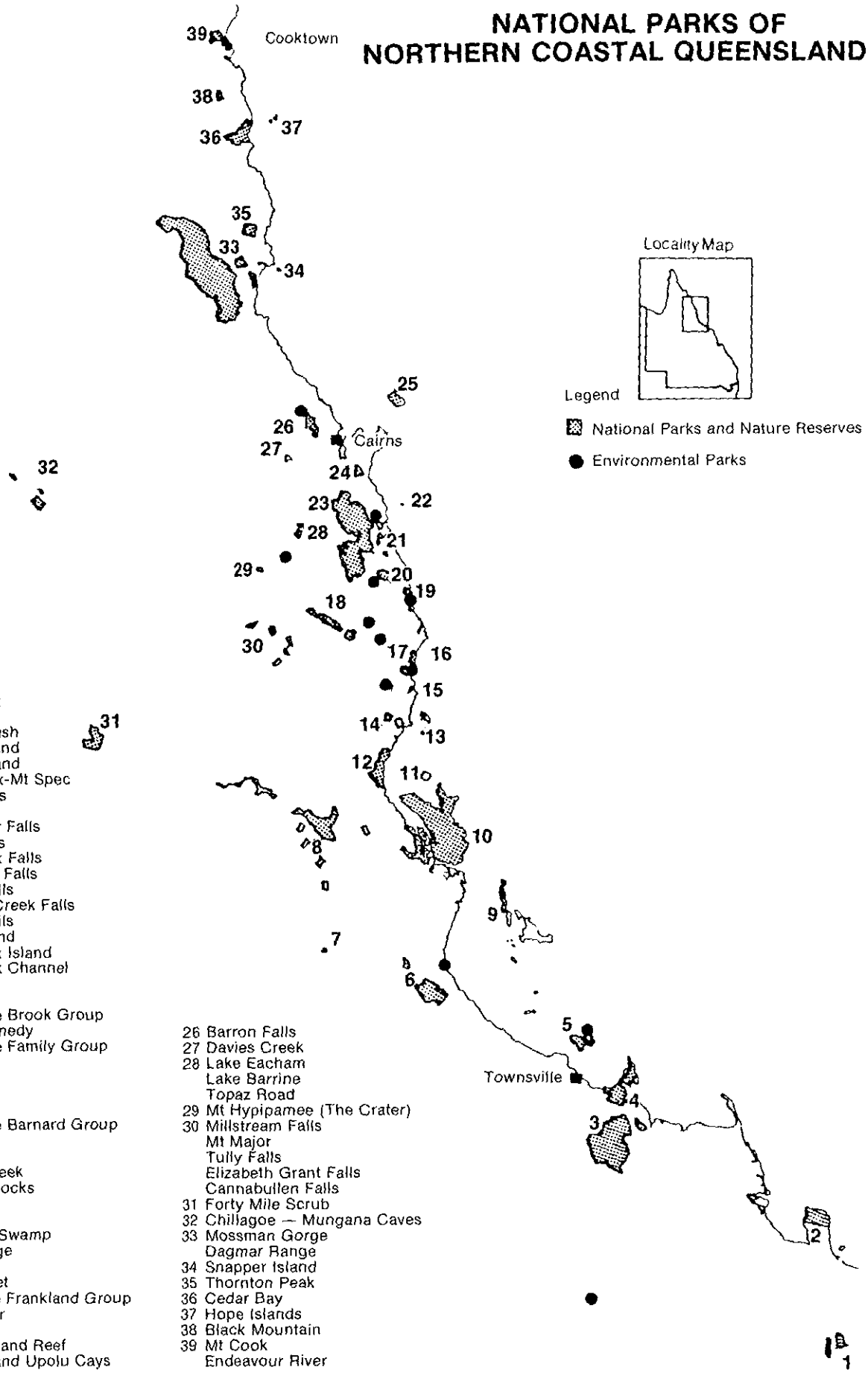
# NATIONAL PARKS OF SOUTHERN INLAND AND WESTERN QUEENSLAND



# NATIONAL PARKS OF CAPE YORK, QUEENSLAND



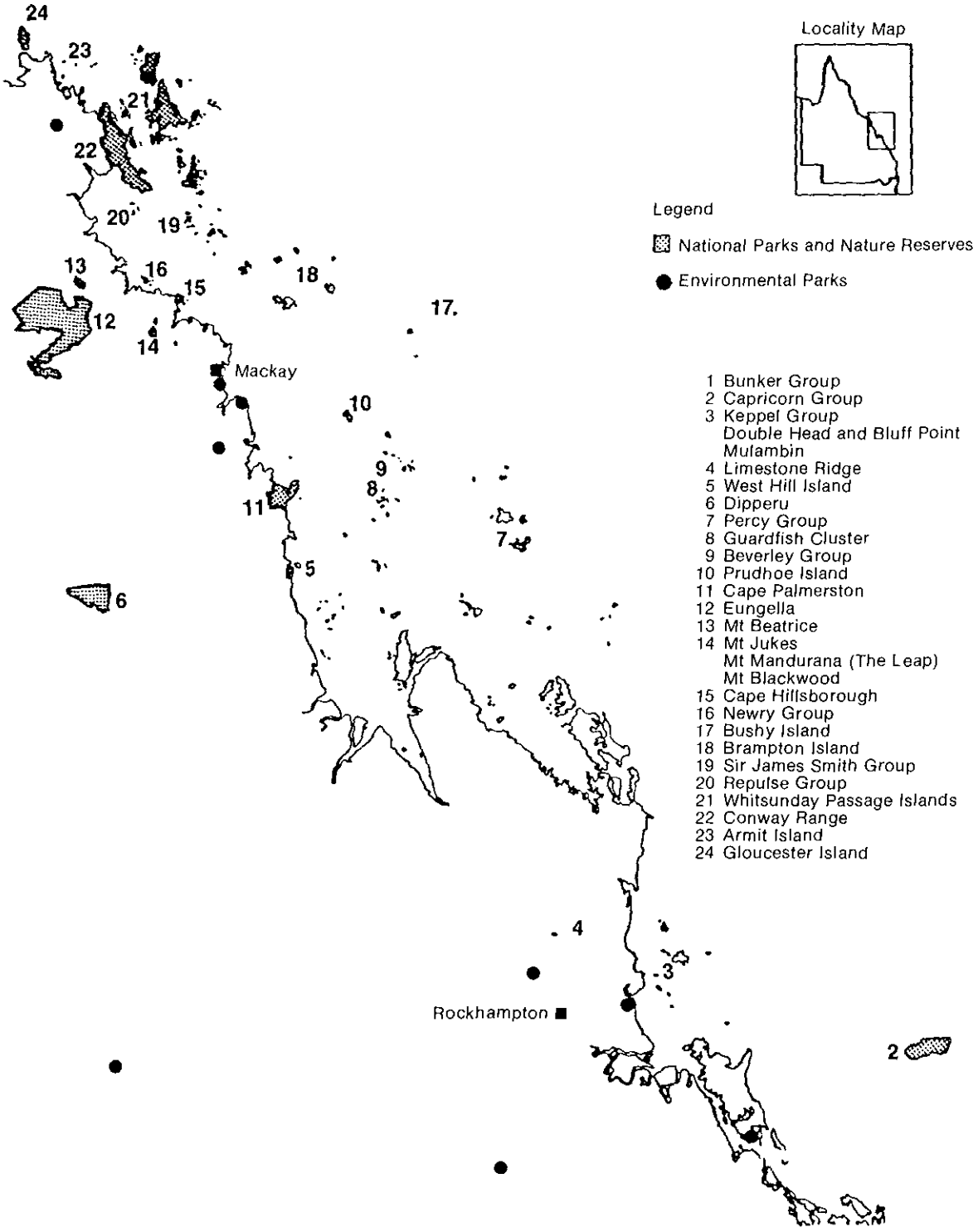
# NATIONAL PARKS OF NORTHERN COASTAL QUEENSLAND



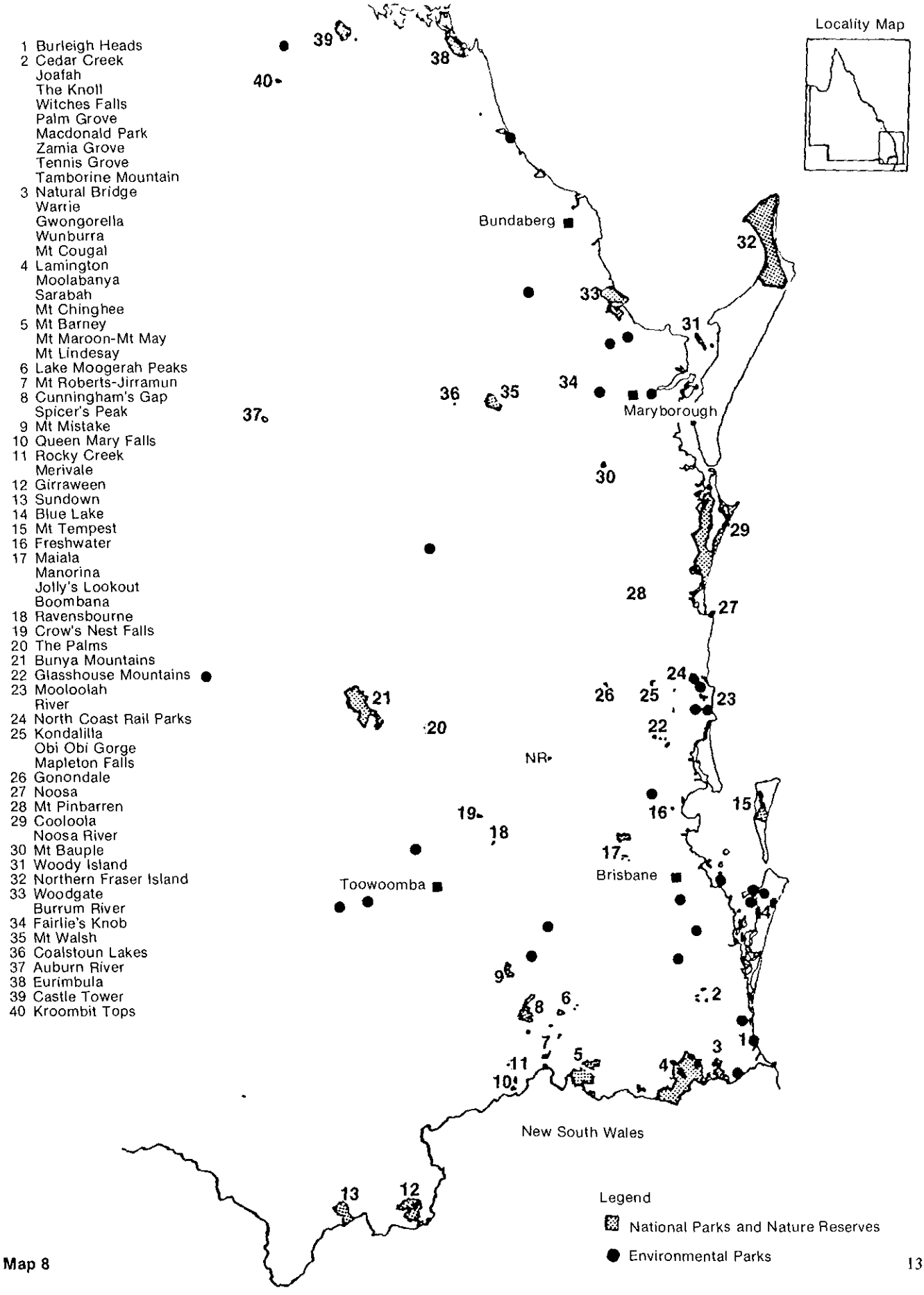

1 Mt Aberdeen
2 Cape Upstart
3 Mt Elliot
Mt Burrumbush
4 Cape Cleveland
5 Magnetic Island
6 Crystal Creek-Mt Spec
Jourama Falls
7 Mt Fox
8 Herbert River Falls
Yamanie Falls
Herkes Creek Falls
Sword Creek Falls
Garrawalt Falls
Broadwater Creek Falls
Wallaman Falls
9 Orpheus Island
10 Hinchinbrook Island
Hinchinbrook Channel
Nypa Palms
11 Goold Island
Islands of the Brook Group
12 Edmund Kennedy
13 Islands of the Family Group
Dunk Island
14 Hull River
15 Clump Point
Maria Creek
16 Islands of the Barnard Group
17 Kurrimine
18 Palmerston
McNamee Creek
Palmerston Rocks
19 Etty Bay
Mt Maria
20 Eubenangee Swamp
21 Graham Range
Russell River
Mutchero Inlet
22 Islands of the Frankland Group
23 Bellenden Ker
24 Grey Peaks
25 Green Island and Reef
Michaelmas and Upolu Cays

26 Barron Falls
27 Davies Creek
28 Lake Eacham
Lake Barrine
Topaz Road
29 Mt Hypipamee (The Crater)
30 Millstream Falls
Mt Major
Tully Falls
Elizabeth Grant Falls
Cannabullen Falls
31 Forty Mile Scrub
32 Chillagoe — Mungana Caves
33 Mossman Gorge
Dagmar Range
34 Snapper Island
35 Thornton Peak
36 Cedar Bay
37 Hope Islands
38 Black Mountain
39 Mt Cook
Endeavour River

# NATIONAL PARKS OF CENTRAL COASTAL QUEENSLAND



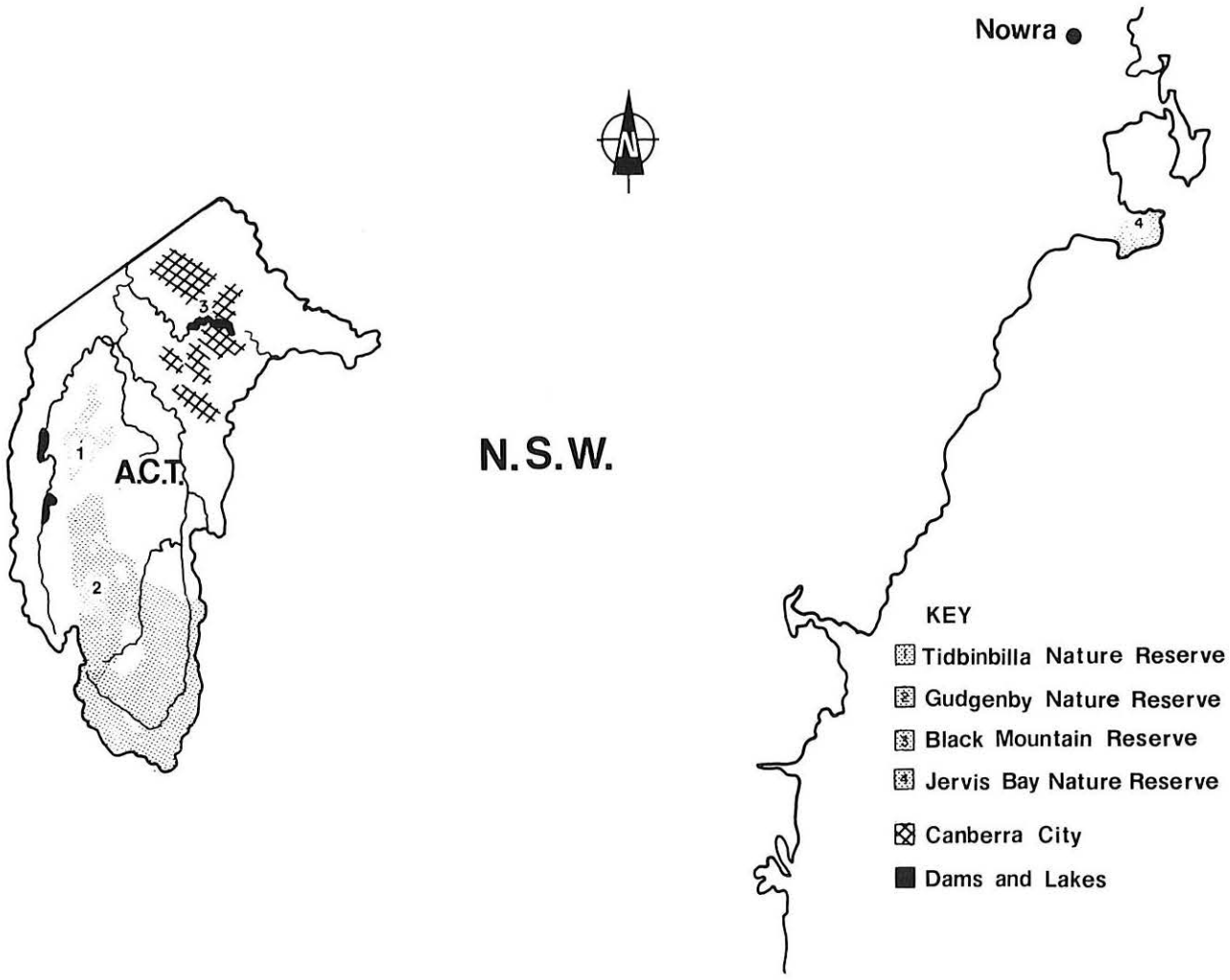
# NATIONAL PARKS OF SOUTHERN COASTAL QUEENSLAND




1 Burleigh Heads
2 Cedar Creek
Joafah
The Knoll
Witches Falls
Palm Grove
Macdonald Park
Zamia Grove
Tennis Grove
Tamborine Mountain
3 Natural Bridge
Warrie
Gwongorella
Wunburra
Mt Cougal
4 Lamington
Moolabanya
Sarabah
Mt Chinghee
5 Mt Barney
Mt Maroon-Mt May
Mt Lindesay
6 Lake Moogerah Peaks
7 Mt Roberts-Jirramun
8 Cunningham's Gap
Spicer's Peak
9 Mt Mistake
10 Queen Mary Falls
11 Rocky Creek
Merivale
12 Girraween
13 Sundown
14 Blue Lake
15 Mt Tempest
16 Freshwater
17 Maiala
Manorina
Jolly's Lookout
Boombana
18 Ravensbourne
19 Crow's Nest Falls
20 The Palms
21 Bunya Mountains
22 Glasshouse Mountains
23 Mooloolah River
24 North Coast Rail Parks
25 Kondalilla
Obi Obi Gorge
Mapleton Falls
26 Gonondale
27 Noosa
28 Mt Pinbarren
29 Cooloola
Noosa River
30 Mt Bauple
31 Woody Island
32 Northern Fraser Island
33 Woodgate
Burrum River
34 Fairlie's Knob
35 Mt Walsh
36 Coalstoun Lakes
37 Auburn River
38 Eurimbula
39 Castle Tower
40 Kroombit Tops

Map 8

# A.C.T. NATURE RESERVES






Map 9

area was made a sanctuary for plants and animals under Ordinance I in 1913.

For many years conservation was the responsibility of the Department of the Interior through its Agriculture and Stock Branch, but as interest in the environment increased, conservation was given greater prominence. 'The Agriculture and Stock' Branch became 'Conservation and Agriculture' under the Department of Capital Territory and a special Environment Conservation Section was formed in 1971 to manage both the ACT and Jervis Bay.

Tidbinbilla was established 'as a National Park and Nature Reserve' in 1936 and has been developed subsequently for the display of Australian fauna. It covers approximately five and a half thousand hectares of hilly terrain with waterfowl and marsupials including koalas, readily visible to visitors.

The Black Mountain Reserve gained wide publicity through the construction of the controversial office tower by *Australia Post.*

However, many environmental constraints were placed on the contractors during construction with the result that the Mountain still retains value as a bush area.

### Australian National Parks and Wildlife Service

The first call for an Australian National Parks and Wildlife Service was made by the Australian Academy of Science in 1968 and this was supported by the House of Representatives Select Committee on Wildlife Conservation in 1972.

The Bill to implement these recommendations was passed with the support of all parties on March 5th 1975 and the National Parks and Wildlife Conservation Act established the Australian National Parks and Wildlife Service within the Department of Environment and Conservation, later to be changed to the Department of Environment, Housing and Community Development. There was support for the new service on the basis that the distribution of plants and the movements of animals are not constrained by State, Territorial or national boundaries and that the Commonwealth Government was the appropriate body to undertake international negotiations and to co-ordinate activities between Commonwealth and State organisations.

However, the new service has aroused some concern amongst the States lest the Commonwealth uses its powers to acquire and manage parks and reserves within State boundaries and extends its off-shore powers to cover marine national parks which would otherwise be integrated into the appropriate State service.

### South Australia

Prior to the passing of the National Parks and Wildlife Act, 1972, National Parks management and Flora and Fauna conservation in South Australia were very fragmented. Most National Parks were under the control of a 15 member National Park Commission, which operated under the National Parks Act, 1966.

The Flora and Fauna Board, through the Fauna and Flora Reserve Act 1919-1940, controlled Flinders Chase reserve on Kangaroo Island. The Tourist Bureau, through the National Pleasure Resort Act, 1915-1960, controlled certain scenic areas, including Wilpena Pound in the Flinders Ranges and the Department of Fisheries and Fauna, under the Fauna Conservation Act 1964-65, with the assistance of a Fauna Advisory Committee, supervised fauna conservation, game permits and related services.

In 1972 the Department of Environment and Conservation was created to co-ordinate the activities of a number of Government Departments and statutory Boards and to bring South Australia's conservation policies more into line with those recently implemented in New South Wales and Tasmania.

The National Parks and Wildlife Service was established as a Division of the Department of Environment and Conservation by the passing of the National Parks and Wildlife Act 1972, and the transferring of staff from the various redundant organisations to the new service.

The Act also provided for the formation of a 17 member Advisory Council, representing a wide range of interests, to advise not only on conservation matters, but on the actual management of the National Parks and Wildlife Division.

At the present time, four types of reserves are recognised under the Act according to their major purpose. National Parks, such as Flinders Range and Mt Remarkable include tourist and conservation interests, Game Reserves relate mainly to fauna conservation and management, Recreation Parks, such as Belair are geared to extensive visitor use and Conservation Parks, such as the Simpson Desert Park and the Naracoorte Caves are concerned with the preservation of wildlife and scenic formations.

### Tasmania

Following a world wide increase in interest in environmental matters in the early 1960's Tasmania moved to strengthen its conservation laws by the introduction of the 1968 National Park and Conservation Bill.

The legislation was passed by the Lower House of the Tasmanian Parliament, but failed to reach the Statute Books owing to a change of government.

As a result of this delay, the legislation was again reviewed and brought into line with that recently enacted in New South Wales.

This resulted in the repeal of the Scenery Preservation Act 1915 and the Animals and the Birds Protection Act 1928 and the amalgamation of State Parks and Reserves management and Flora and Fauna Conservation into one new Department.

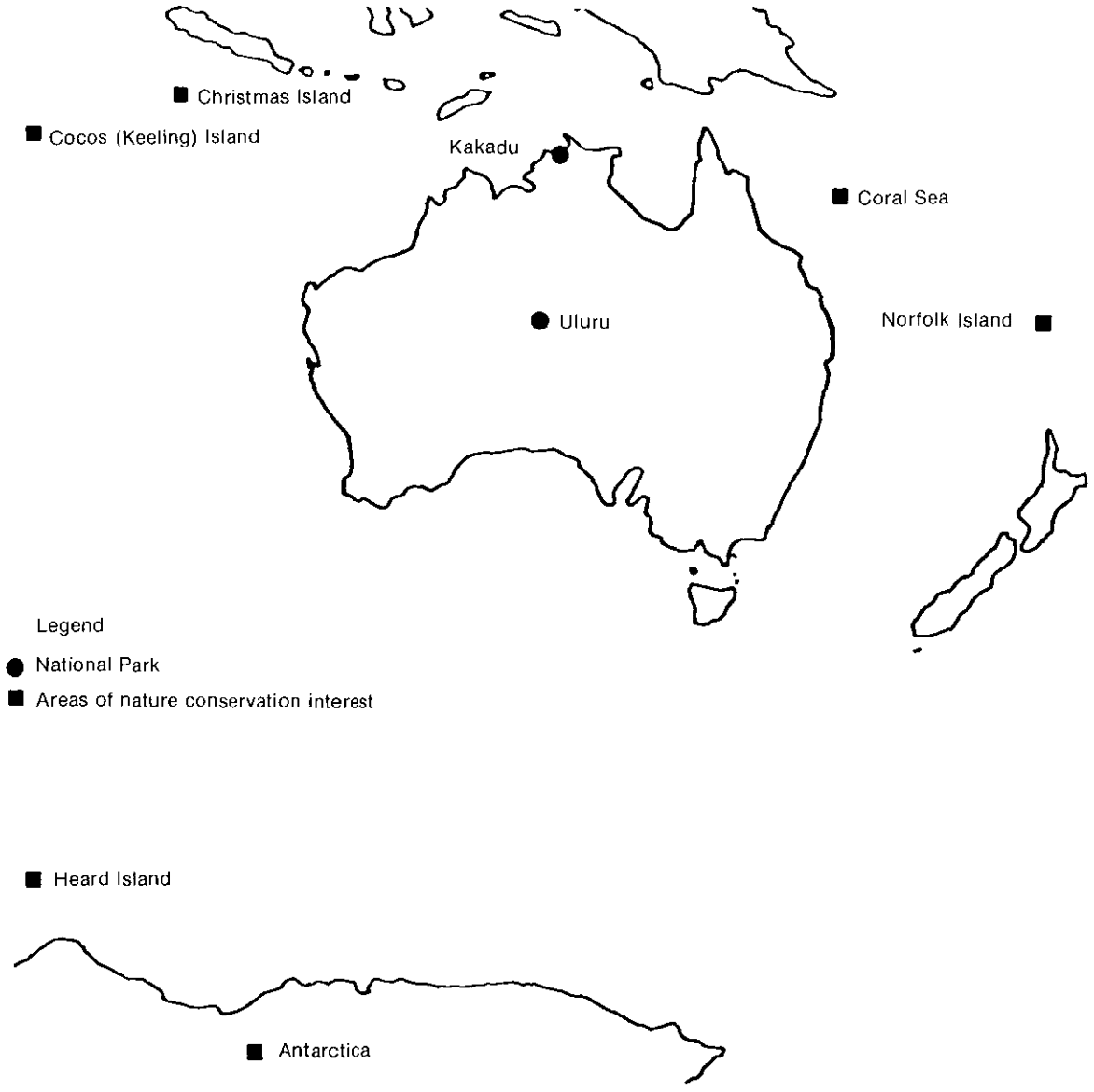
The National Parks and Wildlife Act was passed in 1970 and the National Parks and Wildlife Service commenced operations on November 1st, 1971.

The Act provided for the establishment of a 12 member Advisory Council representing a wide range of interests including professional biologists and lay members of the public.

### Western Australia

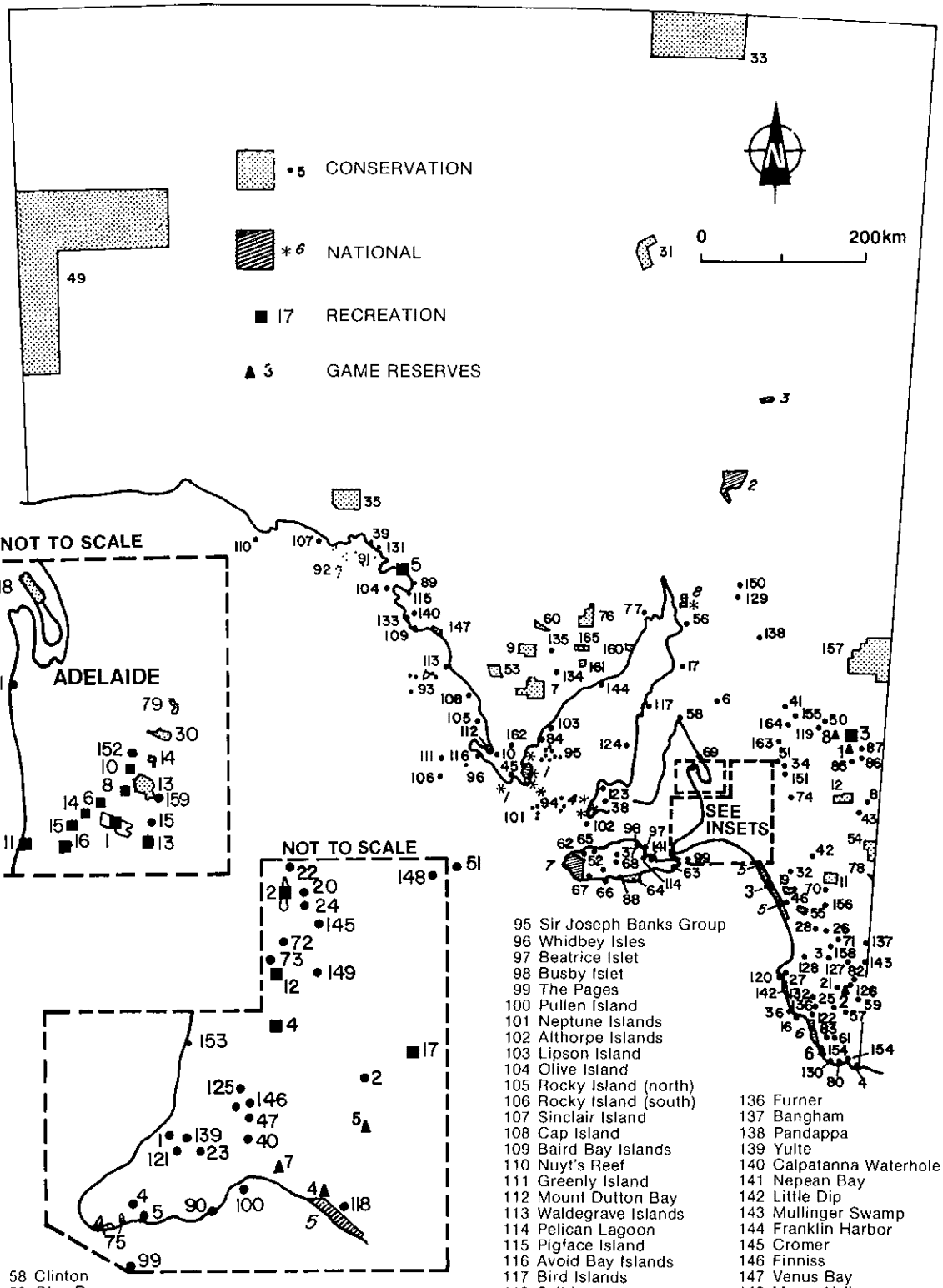
It is interesting to note that the 'Royal Instructions to Captain Stirling, Governor and Commander in Chief in

# AUSTRALIAN NATIONAL PARKS AND WILDLIFE SERVICE AREAS




Location of areas of nature conservation interest and the two national park areas that concern the Australian National Parks and Wildlife Service.

# NATIONAL PARKS AND WILDLIFE RESERVES OF SOUTH AUSTRALIA



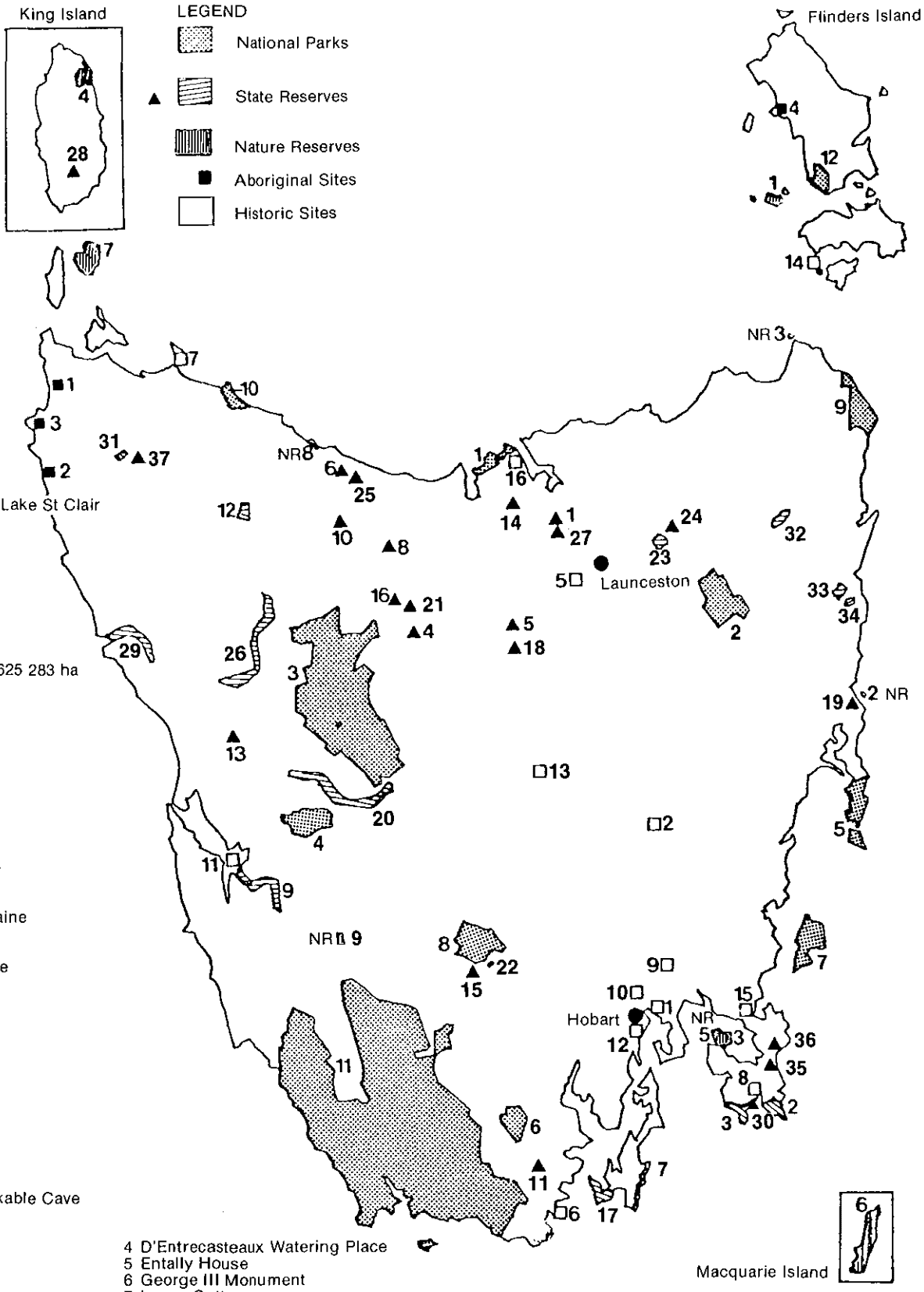

NATIONAL PARKS
1 Lincoln
2 Flinders Ranges
3 Gammon Ranges
4 Innes
5 Coorong
6 Canunda
7 Flinders Chase
8 Mount Remarkable

GAME RESERVES
1 Katarapko
2 Bool Lagoon
3 Coorong
4 Mud Islands
5 Tolderol
6 Bucks Lake
7 Currency Creek
8 Moorook

RECREATION PARKS
1 Belair
2 Para Wirra
3 Glossop
4 Totness
5 Caratoola
6 Brownhill Creek
7 *(Abolished)*
8 The Elbow
9 *(Abolished)*
10 Greenhill
11 Kingston Park
12 Lenswood
13 Loftia
14 Windy Point
15 Shepherds Hill
16 Sturt Gorge
17 Long Island

CONSERVATION PARKS
1 Nixon-Skinner
2 Ferries-McDonald
3 Fairview
4 Waitpinga
5 Eric Bonython
6 Spring Gully
7 Hincks
8 Peebinga
9 Hambidge
10 Kellidie Bay
11 Mount Rescue
12 Billiatt
13 Cleland
14 Horsnell Gully
15 The Knoll
16 Penguin Island
17 Mundoora
18 Torrens Island
19 Messent
20 Hale
21 Big Heath
22 Sandy Creek
23 Spring Mount
24 Warren
25 Calectasia
26 Desert Camp
27 Guichen Bay
28 Jip Jip
29 Mount Magnificent
30 Morialta
31 Elliot Price
32 Mount Boothby
33 Simpson Desert
34 Ridley
35 Yumbarra
36 Beachport
37 Parndana
38 Warrenben
39 Wittelbee
40 Scott
41 White's Dam
42 Carcuma
43 Karte
44 Piccaninnie Ponds
45 Sleaford Mere
46 Martins Washpool
47 Cox's Scrub
48 Dudley
49 Unnamed
50 Pooginook
51 Swan Reach
52 Mount Taylor
53 Bascombe Well
54 Scorpion Springs
55 Gum Lagoon
56 Telowie Gorge
57 Penola
58 Clinton
59 Glen Roy
60 Pinkawillinie
61 Gower
62 Cape Torrens
63 Cape Hart
64 Cape Gantheaume
65 Western River
66 Vivonne Bay
67 Kelly Hill
68 Seddon
69 Port Gawler
70 Kelvin Powrie
71 Padthaway
72 Cudlee Creek
73 Montacute
74 Lowan
75 Deep Creek
76 Lake Gilles
77 Whyalla
78 Mount Shaugh
79 Black Hill
80 Dingley Dell
81 Fort Glanville
82 Naracoorte Caves
83 Tantanoola Caves
84 Tumby Island
85 Kapunda Island
86 Media Island
87 Rilli Island
88 Seal Bay
89 Eba Island
90 West Island
91 Nuyt's Archipelago
92 Isles of St Francis
93 Investigator Group
94 Gambier Islands
95 Sir Joseph Banks Group
96 Whidbey Isles
97 Beatrice Islet
98 Busby Islet
99 The Pages
100 Pullen Island
101 Neptune Islands
102 Althorpe Islands
103 Lipson Island
104 Olive Island
105 Rocky Island (north)
106 Rocky Island (south)
107 Sinclair Island
108 Cap Island
109 Baird Bay Islands
110 Nuyt's Reef
111 Greenly Island
112 Mount Dutton Bay
113 Waldegrave Islands
114 Pelican Lagoon
115 Pigface Island
116 Avoid Bay Islands
117 Bird Islands
118 Salt Lagoon Islands
119 Maize Island Lagoon
120 Baudin Rocks
121 Myponga
122 Belt Hill
123 Carribie
124 Goose Island
125 Kyeema
126 Hacks Lagoon
127 Grass Tree
128 Mount Scott
129 Black Rock
130 Nene Valley
131 Laura Bay
132 Reedy Creek
133 Point Labatt
134 Rudall
135 Carappee Hill
136 Furner
137 Bangham
138 Pandappa
139 Yulte
140 Calpatanna Waterhole
141 Nepean Bay
142 Little Dip
143 Mullinger Swamp
144 Franklin Harbor
145 Cromer
146 Finniss
147 Venus Bay
148 Marne Valley
149 Charleston
150 Yalpara
141 Ngautngaut
152 Ferguson
153 Hallett Cove
154 Ewens Ponds
155 Morgan
156 Mount Monster
157 Danggali
158 Talapar
159 Euvilla
160 Munyaroo
161 Middlecamp Hills
162 Wanilla
163 Brookfield
164 Roonka
165 Sheoak Hill

# NATIONAL PARKS AND RESERVES OF TASMANIA




NATIONAL PARKS
1 Asbestos Range
2 Ben Lomond
3 Cradle Mountain - Lake St Clair
4 Frenchmans Cap
5 Freycinet
6 Hartz Mountains
7 Maria Island
8 Mt Field
9 Mt William
10 Rocky Cape
11 Southwest
12 Strzelecki
Total National Parks: 625 283 ha

STATE RESERVES
1 Bradys Lookout
2 Cape Pillar
3 Cape Raoul
4 Devils Gullet
5 Fairy Glade
6 Ferndene
7 Fluted Cape
8 Forth Falls
9 Gordon River
10 Gunns Plains Cave
11 Hastings Caves
12 Hellyer Gorge
13 Henty Glacial Moraine
14 Holwell Gorge
15 Junee Cave
16 King Solomon Cave
17 Labillardiere
18 Liffey Falls
19 Lookout Rock
20 Lyell Hwy
21 Marakoopa Cave
22 Marriotts Falls
23 Mt Barrow
24 Mt Barrow Falls
25 Mt Montgomery
26 Murchison hwy
27 Notley Gorge
28 Pegarah Forest
29 Pieman River
30 Brown Mtn-Remarkable Cave
31 Roger River
32 Steppes
33 St Columba Falls
34 St Marys Pass
35 St Patricks Head
36 Tasman Arch
37 Tessellated Pavement
38 Trowutta Caves
Total State Reserves: 27 765 ha

HISTORIC SITES
1 Bluff Battery
2 Callington Mill
3 Coal Mines
4 D'Entrecasteaux Watering Place
5 Entally House
6 George III Monument
7 Lyons Cottage
8 Port Arthur
9 Richmond Gaol
10 Risdon Cove
11 Sarah Island
12 Shot Tower
13 Sydney Cove
14 Tasman Monument
15 York Town
Total Historic Sites: 499 ha

ABORIGINAL SITES
1 Mount Cameron West
2 Sundown Point
3 West Point
Total Aboriginal Reserves: 1 242 ha

NATURE RESERVES
1 Chappell Island
2 Diamond Island
3 Foster Islands
4 Lavinia
5 Lime Bay
6 Macquarie Island
7 Three Hummock Island
8 Three Sisters-Goat Island
9 Truchanas
Total Nature Reserves: 28 114 ha

Western Australia' issued by HM William IV on March 5th 1831 directed Stirling '... to require and authorise the said Surveyor General further to report to you what particular lands may be proper to reserve in each County Hundred and Parish so to be surveyed by him as aforesaid for public roads ... or as places to be set apart for recreation and amusement of the inhabitants of any town or village or for promoting the health of the inhabitants.' It was not until 1872 that reserves comparable to present day National Parks and nature reserves were set aside and it was not until the passing of the Parks and Reserves Act of 1895, the Land Act of 1898 and the Permanent Reserves Act of 1899 that such reserves had an acceptable degree of security.

The Permanent Reserves Act made provision for three classes of reserves with varying degress of security.

The purpose of a *Class A Reserve* could not be changed except by Act of Parliament.

The purpose of a *Class B Reserve* could be changed by proclamation in the Western Australian Government Gazette. It was necessary for the Hon. Minister for Lands to give reasons for the cancellation of the Reserves to both Houses of Parliament.

The purpose of a *Class C Reserve* could be changed by the Governor after proclamation in the Western Australian Government Gazette.

Present day reserves are still classified in the above manner under Section 31 of the Land Act 1933-1967.

A major stimulus to nature conservation and the establishment of parks and reserves in Western Australia was the formation of two scientific societies — the Western Australian Natural History Society and the Australasian Association for the Advancement Science, now known as Australian and New Zealand Association for the Advancement of Science (ANZAAS).

The WA Natural History Society was formed in 1891 under the Presidency of Sir John (later Lord) Forrest and although it lapsed in 1896 (Jenkins 1965) it sponsored the formation of the North Dandalup-Pinjarra Reserve of 64,000 ha (Anon. 1962), and supported changes in the early game acts which had been designed primarily to control the taking of commercial or game species.

Although the purpose of the North Dandalup Reserve was changed in 1911 to 'Timber-Government Requirements' many of the early Lands Department Reserves remained unchanged and were available for vesting as National Parks and wildlife sanctuaries in later years. One reserve of particular interest which was declared Class A as early as 1910 is Barrow Island, which has remained a valuable wildlife sanctuary and study area despite the exploitation of oil on the island (Woodward 1907) and (Main 1971).

One of the most important influences on Conservation policy in Western Australia in the past two decades was a report entitled *'National Parks and Nature Reserves in Western Australia'* produced in 1962, by the Western Australian sub-committee of the Australian Academy of Science Committee on National Parks.

Despite its unattractive appearance the original cyclostyled edition of 30 copies was in great demand and an unsuccessful approach was made to the State Government for the report to be printed for sale to the public.

However, the Australian Academy of Science, the Western Australian National Parks Board and the Royal Society of Western Australia co-operated in the production of a slightly abridged (by the deletion of certain maps) but illustrated edition of 800 copies, which appeared in 1965 (Government Printer, Perth).

This sold readily, recouped all printing costs and served as a most valuable catalyst and guide to further conservation policies in Western Australia.

### Boards, Committees and Acts of Parliaments

Until the passing of the National Parks Authority Act 1976 most reserves in Western Australia were created and controlled under the appropriate sections of the Land Act 1898, the Land Act 1933 and the Parks and Reserves Act 1895-1955 and in the absence of any co-ordination mechanism there was a proliferation of independent Boards and some confusion as to their respective functions.

### Kings Park Board

The first and best known park to be created in WA was Perth Park (now Kings Park) of 193 ha which was set aside at the suggestion of His Excellency the Governor of Western Australia Sir Frederick Weld in 1872 for 'the purpose of public park and recreation'.

At the suggestion of Sir John Forrest a further 219 ha was added in 1890 and on March 23rd 1900 the entire area gained maximum security by being classified Class A under the Permanent Reserves Act, 1899 (Lovekin 1925) and (Anon. 1957).

### The Caves Board of WA

Because of their vulnerability and growing popularity, the limestone caves of the South-West from Yallingup to Margaret River were placed under the control of a specially appointed Caves Board on November 7th, 1902 and in August 1905 the Board's authority was extended to include the caves of the Yanchep area. During its eight year term the Board developed the caves as a tourist attraction and in 1910 relinquished control to the Hon. J.D. Conelly MLC, who supervised the reserves until they were passed to the Manager of the State Hotels Department in 1914.

With the disbanding of this Department in 1960 the caves reverted to the Lands Department with day to day supervision in the hands of various lessees.

### Rottnest Island Board

Largely as result of interest shown by the Colonial Secretary, Hon. J.D. Conelly the Rottnest Island Board was constituted under the Parks and Reserves Act, 1895 in May 1917 (Somerville 1949).

With minor changes of name and several alterations in the size of the reserve to include off shore islets and to permit land to be transferred to the Commonwealth Government for defence purposes, the Board has continued to control the island and arrange for its development as a tourist resort (Meadly *et al* 1977).

### Nornalup Reserves Board

The Nornalup Reserves Board was set up in December 1924 to control the National Park at Nornalup Inlet. Although by-laws were laid down for the control of the Park, little effort was made to enforce them and in August 1947 the Board was abolished and its lands were transferred to the State Gardens Board.

### The Abrolhos Islands Board

Following a request by the Geraldton Municipality the Abrolhos Islands were declared an A Class Reserve on November 1st 1929, placed under a Board of Control, consisting of Geraldton residents, in accordance with the vesting powers of the Parks and Reserves Act 1895 and promoted as a tourist resort. As no Government grant was paid to the Board and as it was not allowed to exploit the islands at will, little development occurred and on August 19th 1966 the vesting was transferred to the Minister for Fisheries and Wildlife.

As a result they have been protected from indiscriminate development and even access by fishermen and their families is subject to controls. A most important one is the total exclusion of domestic pets such as cats and dogs.

### Pemberton National Parks Board

In 1930 a scenic hillside on Big Brook on the outskirts of Pemberton was placed under the control of the newly constituted Pemberton National Parks Board and some years later its responsibilities were enlarged by the addition of the Warren National Park, Brockman Forest, Beedelup National Park and Vasse River Bridge. Together these reserves totalled 3,256 ha and after a period of minor progress and considerable financial difficulties the Board was disbanded and its reserves and assets, including a caravan park, were transferred to the National Parks Authority of WA in March 1977.

### National Parks Authority of WA

The first organisation to control Government parks and gardens was the State Gardens Board, created on December 8th, 1920 with Mr L.E. Shapcott, Secretary of the Premier's Department as its only member (Shapcott 1939).

A few days later the Under Secretary for Lands Mr C.G. Morris joined Mr Shapcott who was appointed Chairman and retained the position until his retirement from the Civil Service in 1942. The first lands vested in the Board were ten small reserves around the City of Perth and included East Perth Cemetery, Stirling Gardens and several other isolated areas, so small as to be of no value as parks, which were later transferred to other bodies.

At the outset the Board had no leasing or borrowing powers and the original grant of $6,688 for 1920-21 dropped to $2,560 in 1931. This may be compared with the funds available to the National Parks Authority for the year 1978-79 which were approximately $2 million. However, with the aid of the philanthropist Sir Charles McNess and a pool of sustenance labour the major buildings at Yanchep and John Forrest Parks were completed and various other important projects were commenced.

Shapcott was autocratic and often unorthodox in his methods, but he deserves full recognition for the drive and initiative which he brought to bear on any project under his direction.

Recognition of this fact by his contemporaries was shown by the action of Alex Clydesdale, President of the Acclimatization Society which controlled the Zoo, who in March 1932 wrote to the Premier the Hon. Sir James Mitchell requesting that 'you take the institution over as a Government and hand it to the State Gardens Board'.

This was agreed to and early in 1932 the almost bankrupt Zoo came under the control of the Gardens Board with the Acclimatization Committee 'to be advisory only, the chairman to have full powers of Director and to be permitted to carry out his policy without interferences' (Jenkins 1977).

On Shapcott's retirement on August 25th 1942, Mr G.L. Needham, Under Secretary for Lands was appointed Chairman of the Board and Messrs W.V. Fyfe, Surveyor General, H.W. Byfield, Assistant Under Treasurer and C.A. Gardner, Government Botanist, were appointed as members.

On April 13th 1956 the State Gardens Board, became the National Parks Board, a body corporate with perpetual succession and a common seal and was made responsible to the Minister for Lands. The membership of the new Board was broadened by the appointment of trained biologists (Jenkins 1961) and the conservation policy was strengthened by the cancellation of grazing leases and a general review of park management procedures.

The fact that for many years various independent boards and committees were established to administer separate and sometimes small reserves indicates that such appointments were made largely on an *ad hoc* basis and that little thought was given to co-ordinating the activities of the various conservation bodies.

In 1969 the State Government moved to improve the situation by appointing the Reserves Advisory Council under the chairmanship of the Under Secretary for Lands, Mr C.R.L. Gibson, with terms of reference to:

'1. consider ways and means of protecting natural scenery in Western Australia;
2. consider all matters relating to National Parks and relative reserves;
3. consider existing legislation in Australia for the protection of natural scenery; and
4. recommend appropriate action in relation to the foregoing and legislation, if necessary, to achieve desired objectives.'

This committee recommended the vesting of a number of important reserves including the Victoria Desert Wildlife Sanctuary and the Chichester Range National Park and recommended the allocation of various other reserves between the National Parks Board and Wildlife Authority.

However, it did not make formal recommendations concerning legislation. This was done later by the National Parks Review Committee, which was appointed in 1972 by the Hon. H.D. Evans, Minister for Lands and was comprised of the following members:

C.F.H. Jenkins
President National Parks Board (Chairman)
B.J. Beggs
Conservator of Forests
B.K. Bowen
Director, Department of Fisheries and Wildlife
F.W. Byfield
Under Secretary for Lands
R.H. Doig
Chairman, Public Service Board
J.F. Morgan
Surveyor General
Dr B.J. O'Brien
Director, Department of Environmental Protection.

The recommendations of this Committee included the following four points:

1. The appointment of a National Parks Authority responsible to a Minister.
2. The National Parks Authority to assume the functions and responsibilities of the National Parks Board.
3. The appointment of a professional Director responsible to the National Parks Authority.
4. The power to lease and power to permit development by private enterprise.

These proposals were accepted by the Government and implemented by the passing of the National Parks Authority Act which came into force in August 1976. The Act provided for wide representation on the Authority with *ex officio* appointments from the Department of Lands, Fisheries and Wildlife, Forests and Tourism and special consideration for Primary Industry, Local Government and Conservation.

The inaugural Committee appointed by the Hon. Peter Jones MLA, Minister for Conservation and the Environment comprised the following members:

C.F.H. Jenkins (President)
B.J. Beggs (Conservator of Forests)
B.K. Bowen (Director of Fisheries and Wildlife)
N.J. Semmens (Director, Department of Tourism)
J.F. Morgan (Surveyor General)
Miss B.M.J. Hussey
D.W.G. Treloar
H.W. Sorensen
W.G. Young

In taking over from the National Parks Board the new Authority was fortunate to inherit the fine two storey Administration Building, standing on the Matilda Bay Reserve and constructed in 1975.

This brought to an end almost 20 years of uncertainty and improvisation for the National Parks Service and gave a clear indication of its changed status and the rapid growth to be expected in the future.

## Western Australian Wildlife Authority

Unlike the other Australian States the National Parks service in Western Australia is completely separate from the Wildlife service although the regulations relating to fauna and flora protection apply to all government lands as well as private property.

Early interest in fauna protection in Western Australia was focussed on laws relating to hunting. Thus they applied mainly to newly acclimatized creatures and to the taking of game and commercial species. Later however, the Game Act 1912-1913 covered many native species which were listed in various schedules and interest increased still further with the establishment of the Fauna Advisory Committee in 1944.

In 1950 the fauna legislation was completely reviewed with the passing of the Native Fauna Protection Act, the establishment of the Fauna Protection Advisory Committee and the repeal of the Game Act.

Further reviews led to the passing of the Wildlife Conservation Act 1950-1977 to provide for the conservation of both fauna and flora, the establishment of the Wildlife Authority (a statutory body of 12 members, responsible for the management of wildlife sanctuaries vested in it), the repeal of the Native Flora Protection Act, 1935-1938 and the transfer of flora protection responsibilities from the Forests Department to the Department of Fisheries and Wildlife.

Close liaison between the Western Australian Wildlife Authority and the National Parks Authority is ensured by the appointment of the Director of Fisheries and Wildlife as an *ex officio* member of both authorities.

## Department of Environmental Protection

The status of conservation in Western Australia received a great boost on 10th March, 1970 when the Premier, the Hon. Sir David Brand announced his intention to appoint a Ministry for Conservation and that the Public Service Commissioner, Mr Ralph Doig would be asked to report to Cabinet on 'the type of organisation which will be appropriate to our particular needs'.

As a result of Mr Doig's report the Environmental Protection Act 1971 established the Department of Environmental Protection with a three man* Environmental Protection Authority (EPA), a fourteen man Environmental Protection Council and far reaching powers to investigate and influence matters effecting the environment. However, the general administration of conservation matters still remained highly diverse.

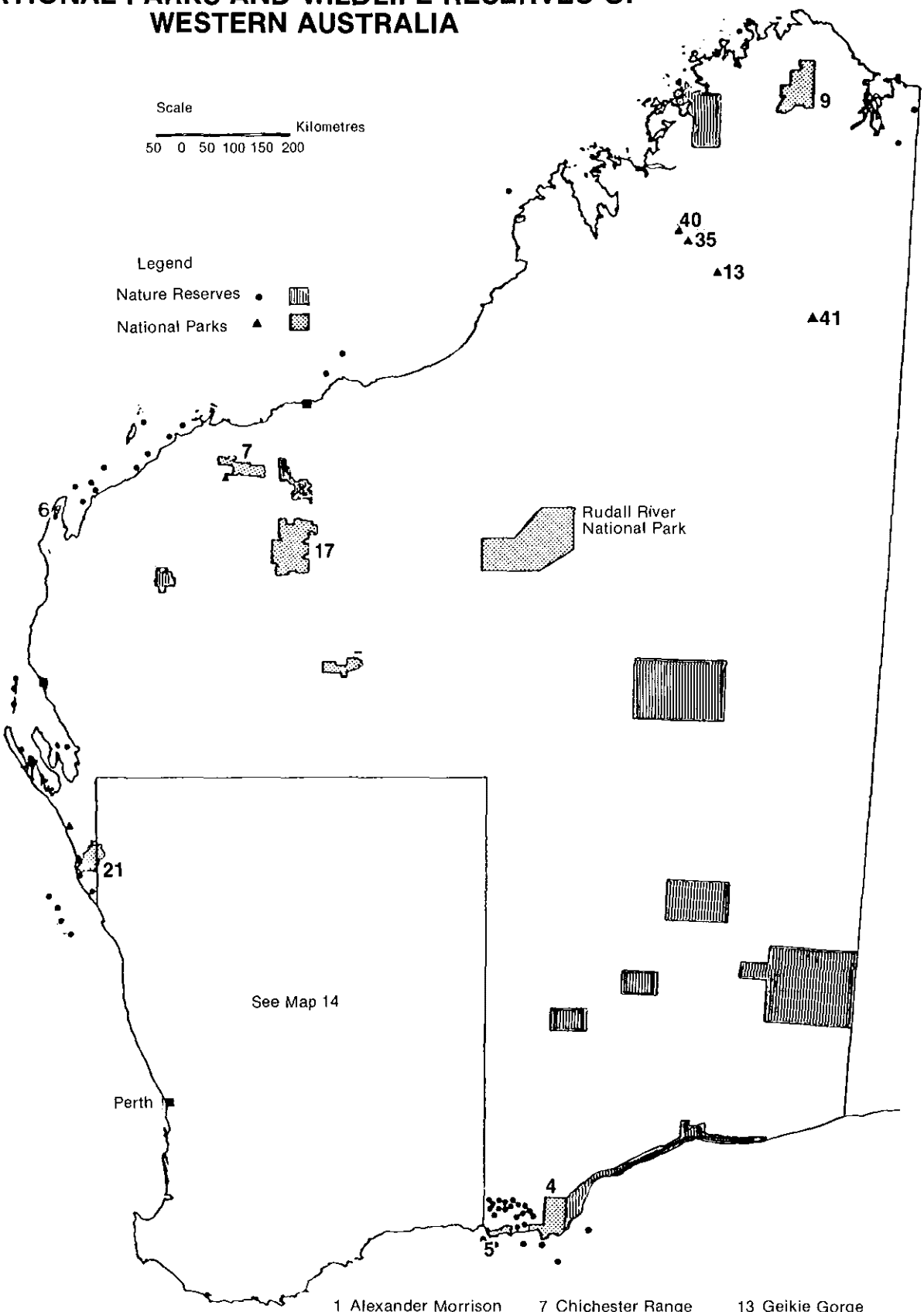
The Minister for Lands and Forests had responsibility for the Wildflower Protection Act through the Forests Department and for special reserves such as Rottnest Island and the State's National Parks through the Rottnest Island Board and National Parks Board.

The Minister for Fisheries and Fauna (later Wildlife) controlled fauna and flora reserves, through the Department of Fisheries and Wildlife and the Wildlife Authority. While the Minister for Conservation and the Environment had wide and sometimes overlapping responsibilities through the Department of Environmental Protection (changed in 1975 to the Department of Conservation and Environment).

Such an arrangement meant that three different State Ministers could be involved in closely related conservation issues including attendance at the same interstate

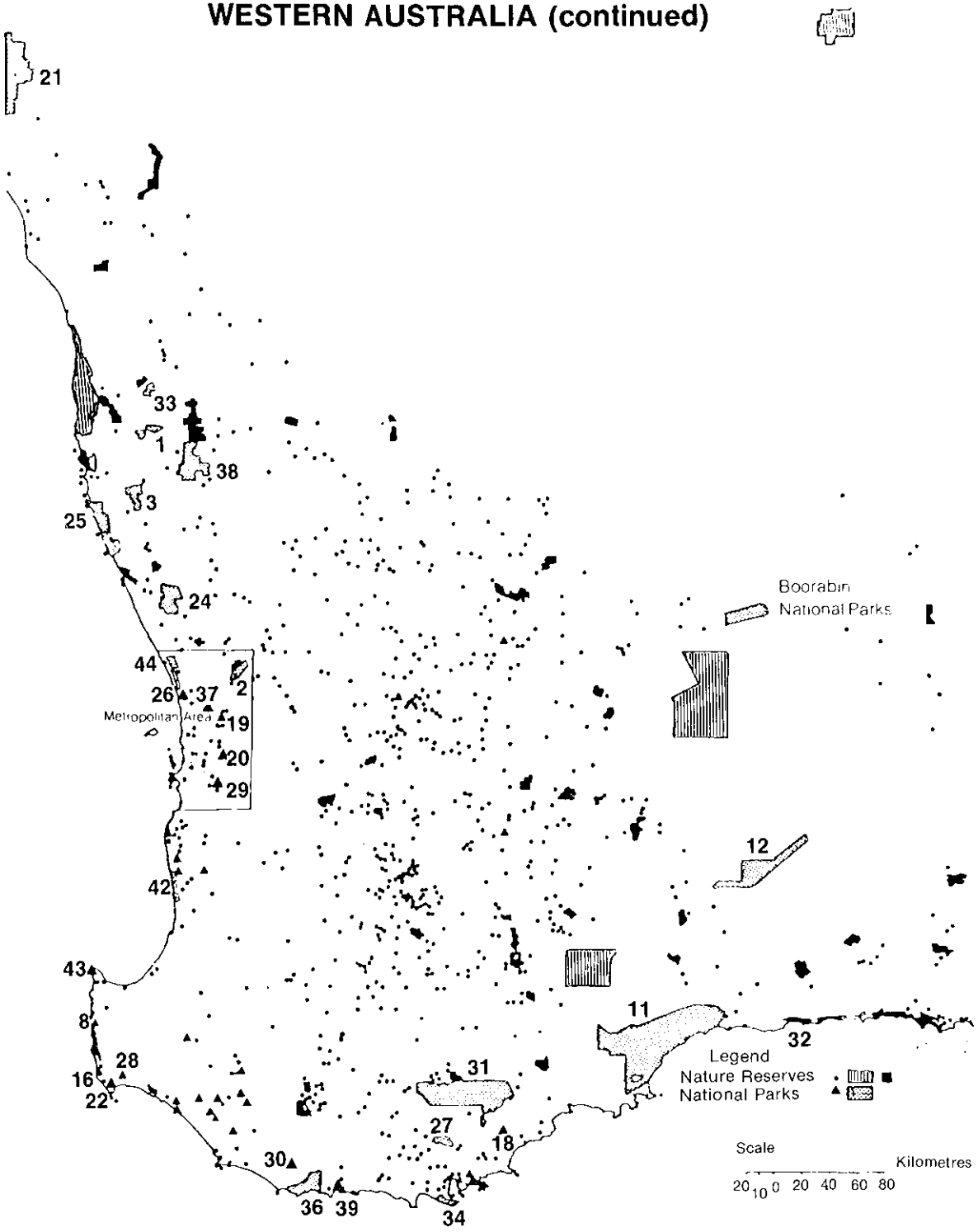
*Dr Brian O'Brien (Chairman)
Professor A.R. Main
Mr P. Adams QC

# NATIONAL PARKS AND WILDLIFE RESERVES OF WESTERN AUSTRALIA




1 Alexander Morrison
2 Avon Valley
3 Badgingarra
4 Cape Arid
5 Cape Le Grand
6 Cape Range
7 Chichester Range
8 Cowaramup
9 Drysdale River
10 Drovers Cave
11 Fitzgerald River
12 Frank Hann
13 Geikie Gorge
14 Gooseberry Hill*
15 Greenmount*
16 Hamelin Bay
17 Hamersley Range

# NATIONAL PARKS AND WILDLIFE RESERVES OF WESTERN AUSTRALIA (continued)




18 Hassell
19 John Forrest
20 Kalamunda
21 Kalbarri
22 Leeuwin
23 Lesmurdie Falls*
24 Moore River
25 Namburg
26 Neerabup
27 Porongurup
28 Scott
29 Serpentine
30 Sir James Mitchell
31 Stirling Range
32 Stokes
33 Tathra
34 Torndirrup
35 Tunnel Creek
36 Walpole-Nornalup
37 Walyunga
38 Watheroo
39 William Bay
40 Windjana Gorge
41 Wolf Creek Meteorite Crater
42 Yalgorup
43 Yallingup
44 Yanchep

**Map 14**

meeting, and that as a result decisions on important matters were sometimes confused and seriously delayed.

This problem was later solved by transferring the National Parks Board from the Department of Lands and Surveys to the Department of Environmental Protection and by giving the portfolio of Fisheries and Wildlife to the Minister for Conservation and the Environment.

An early and very important decision of the EPA was the appointment of the Conservation Through Reserves Committee (CTRC) in 1972 with the following terms of reference:

1. to review and update firm recommendations of the Western Australian Sub-Committee of the Australian Academy of Science Committee on National Parks in respect of National Parks and Nature Reserves;
2. to review National Parks and other significant reserves controlled by the National Parks Board of WA and the Pemberton National Parks Board, and large wildlife sanctuaries controlled by the WA Wildlife Authority;
3. to review areas recommended to the Minister for Lands by the Reserves Advisory Council;
4. to consider proposals for reserves submitted to it in writing by interested members of the public and organisations and by Local Authorities and State and Commonwealth Government instrumentalities.

The **"Green Book"** and the **"Red Book"**.

Because of the large area to be covered in the review and the great ecological diversity to be studied the State was divided into 12 Systems (See Map 15) and these were examined by groups of specialists and reported upon to the EPA (Anon., 1974).

After allowing for public comment the "Green Book", covering all Systems excepting System Seven (Kimberley) and System Six (Darling Range and Swan Coastal Plain) was amended by a 'Special Review Committee', revised further by the EPA and printed as two "Red Books" (Anon 1975 and 1976) and endorsed by Cabinet on February 9th 1976 and October 20th 1976, respectively. Some millions of hectares considered in the two "Red Books" and many more under review in the System Six and System Seven Reports remain to be allocated, either to the National Parks Authority or the Western Australian Wildlife Authority. However, at June 30th 1979 the National Parks Authority controlled more than 70 reserves, covering approximately four and a half million hectares and the Western Australian Wildlife Authority controlled several hundred reserves totalling more than seven million hectares.

Because of differing policies in the Australian States and Territories it is not appropriate to attempt any comparison based upon the land reserved for National Parks by each Administration. A more legitimate comparison can be drawn from the total area reserved for conservation purposes and the accompanying figure and table show that Western Australia has a greater area of conservation reserves than any other State and that on a percentage basis it is second only to Tasmania.

## NATIONAL PARKS/WILDLIFE RESERVES COMPARATIVE AREAS IN AUSTRALIA

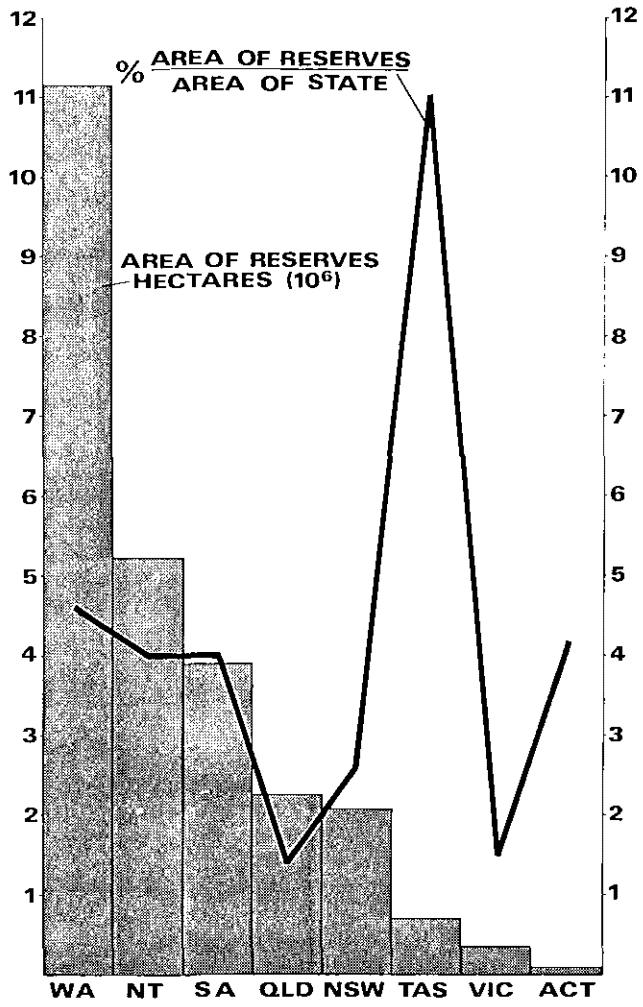


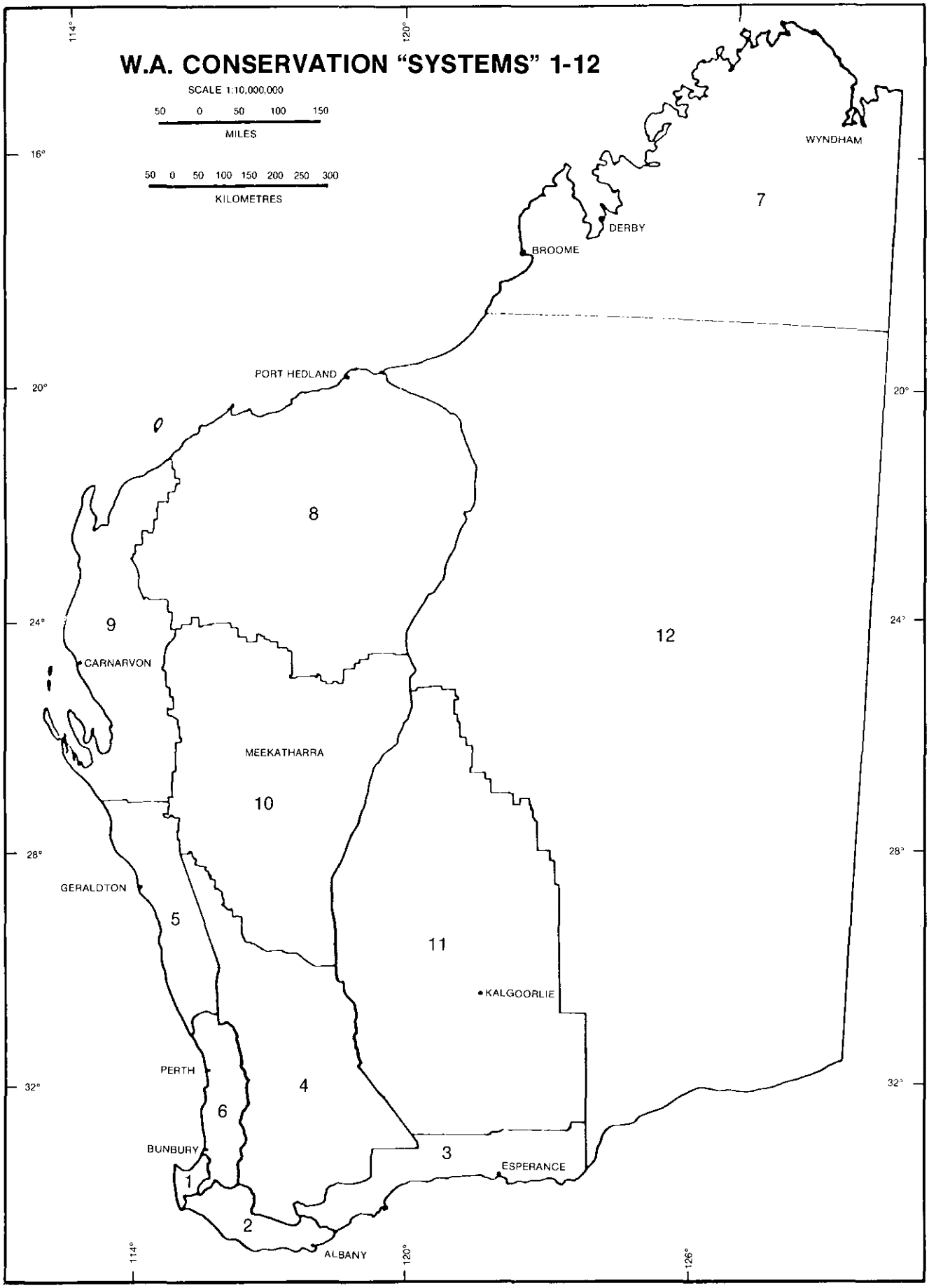

**Figure 1**

Western Australia is well above the average of 3.16% for all the mainland States and Territories.

However, many areas of land listed in the two "Red Books" and approved by Cabinet for conservation purposes have not yet been processed. When these areas have been vested and if the recommendations relating to System Six and System Seven are accepted Western Australia could have up to 20 million hectares of National Parks and Wildlife Reserves, covering almost 8% of the State.

It should be noted that none of the new proposals involve any resumption of private property and in the light of some of the uninformed criticism which resulted following the distribution of the "Green Book" the philosophy of the EPA with regard to land resumptions* and mining should be noted. 'Our attitude against any semblance of a

*Following the disbanding of the CTR Committee the EPA appointed the Parks and Reserves Committee in 1976 to advise it on the purchase of land for Parks and Wildlife Reserves. The committee comprises the Surveyor General (Chairman), the Conservator of Forests, the Director of Fisheries and Wildlife, the President of the National Parks Authority and the Valuer General.


W.A. CONSERVATION "SYSTEMS" 1-12
SCALE 1:10,000,000
50 0 50 100 150
MILES
50 0 50 100 150 200 250 300
KILOMETRES
114°
120°
126°
16°
20°
24°
28°
32°
WYNDHAM
DERBY
BROOME
PORT HEDLAND
CARNARVON
MEEKATHARRA
GERALDTON
KALGOORLIE
PERTH
BUNBURY
ESPERANCE
ALBANY
1
2
3
4
5
6
7
8
9
10
11
12

Map 15

'land grab' has been consistent: and our attitude towards criteria and management has been reinforced'.

In a similar vein the EPA believes that it must 'responsibly accept the present legal rights of individuals over areas of vacant Crown Land, the subject of deliberations. Therefore we consider that the rights of holders of mining tenements as at 9 July 1976, must be respected and that these areas be excised from the areas being subject of our recommendations which follow.'

**Table showing area of land reserved for National Parks and Wildlife Reserves in the various States of Australia as at 30th June 1978**

| State | Total Area of State Hectares | Area reserved Hectares | % of total area held as reserves |
|---|---|---|---|
| WA | 252,670,000 | 11,500,000 | 4.55 |
| Vic | 22,780,000 | 353,000 | 1.54 |
| NSW | 80,100,000 | 2,080,000 | 2.60 |
| Qld | 157,150,000 | 2,250,000 | 1.43 |
| SA | 98,380,000 | 3,900,000 | 3.96 |
| Tas | 6,290,000 | 700,000 | 11.13 |
| NT | 135,660,000 | 5,230,000 | 3.86 |
| ACT | 230,000 | 9,800 | 4.21 |

**RELATIONSHIP OF NUMBER OF RANGER STAFF TO AREAS OF NATIONAL PARKS VESTED IN THE AUTHORITY**

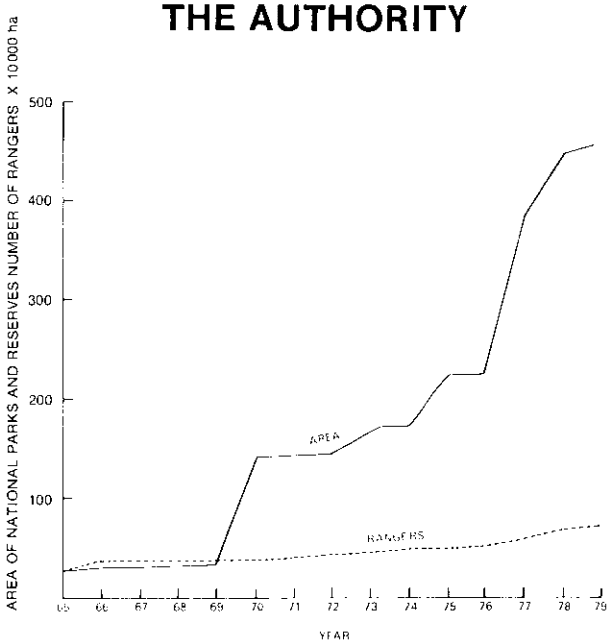



**Figure 2**

## The National Estate, and Australian Heritage Commission

In 1973 the Commonwealth Government appointed a Committee under the chairmanship of Mr Justice R.M. Hope, to inquire into the National Estate and as a result of the "Hope Report" the Australian Heritage Commission Act was passed in 1975 and its purpose was defined in Section 4. (1) of the Act as follows:

**"National Estate** (Definition)

4. (1) For the purposes of this Act, the national estate consists of those places, being components of the natural environment of Australia or the cultural environment of Australia, that have aesthetic, historic, scientific or social significance or other special value for future generations as well as for the present community."

However, before the formal establishment of the Commission the Commonwealth Government recognised the importance of preserving historic sites and natural features and made finance available to the States to assist in the renovation of historic buildings through the State branches of the National Trust and the purchase of land for vesting in the National Park and Wildlife organisations.

In February, 1975, a Committee under the chairmanship of Mr Ralph Doig presented a report to the Western Australian Government on a proposed Western Australian Heritage Commission to complement the Commonwealth Legislation.

However, before finalising this legislation the State Government appointed the Western Australian Heritage Committee to investigate the legislation further and to act as a clearing house for the various items proposed for inclusion in the Commonwealth Register of the National Estate.

Although the inclusion of a particular item on the Register has little legal significance it has considerable 'moral' influence particularly in the case of property controlled by either the Commonwealth or State Governments.

'The entry of a place on the Register has no direct effect on that place or on the obligations of private owners or occupiers of that place. There is no provision for the acquisition of listed places and the Act does not control the use, sale or transfer of such places . . . The Act does not require the continued or unaltered existence of a listed place as a pre-condition for the approval of a project.' (Report — House of Representative Standing Committee on Environment and Conservation, October 1979, p. 69).

## Environmental Management in a National Park

(see Appendix 1)

By definition a National Park is an area set aside 'for the conservation of the natural environment, the preservation and enhancement of natural beauty and the provision of access and facilities for public recreation' (Anon., 1976).

But, strictly speaking the two major provisions — conservation and public access are mutually exclusive and this can lead to conflict between those who see a National Park as a place for sporting and tourist activities in a rural setting and those who wish to preserve the entire park as a wilderness area. Although the requirements of both groups can never be met fully in the same area, increased public participation in conservation issues means a better understanding of the problems involved and a willingness to compromise.

There has been some support for the idea that development within a National Park should be restricted to a certain percentage of the total area (5%?), but this has many weaknesses and pays no regard to variations in size, wildlife content and ecological stability between parks.

A comparable argument applies to the suggestion that a minimum percentage of the total area of any country or state should be set aside for National Parks and nature reserves.

In the case of Australia, huge desert parks could result in a high percentage of reservation compared with total area, but smaller, more diverse and more carefully selected reserves could be of much greater importance in the overall preservation of a representative environment.

The main essentials in any viable National Park system are the creation of the necessary permanent reserves and an assurance that they will be protected from all kinds of destructive exploitation. This was clearly expressed by the Nature Conservancy of Britain (Anon., 1959) in the following terms: 'It is necessary to reconcile the use by the present generation of the national heritage with the need to safeguard its irreplaceable features for future generations . . . Use alone may be sufficient to threaten the scientific interest . . . to trample out of existence a rare plant, to drive away a rare bird or other animal, or destroy the character of a unique habitat . . . National bodies are being compelled to admit that their earlier policy of encouraging public access can turn out to be a Frankenstein Monster.'

The Australian Academy of Science shares the views of the Conservancy and made this clear in its review of the Mt Kosciusko National Park and the growing threat of tourism.

'But any national park, in addition to catering for the tourist and certain types of recreational sport, must also comprise areas in which conservation is the prime object. This is particularly important in Australia, a continent whose endemic flora and fauna attract world-wide attention. All local and visiting biologists are impressed by the fact that, after only a short period of settlement, very few virgin areas of native vegetation survive in Australia. Native plants, birds and animals are rapidly disappearing from the scene, even in districts in which there is not settlement as yet. A number of primitive areas will be essential if we wish to preserve for posterity characteristic examples of the Australian biota still existing in their natural environment, so that they can be studied by the scientist, and at the same time, provide a living museum for the naturalist and layman. Such primitive areas must be large enough to ensure that hydrological features, soil, and local climate are undisturbed by man's activities, large enough to ensure that the ecological balance of the plant and animal communities is maintained. It follows that grazing, forestry, roadmaking and all engineering activities are out of place in a primitive area' (Anon., 1961).

## Multiple Land Use

The views of the Nature Conservancy and the Australian Academy of Science do not support those who advocate multiple land use in national Parks. The argument that mining, logging and grazing can be tolerated without serious long term effects and that a damaged environment can be restored by reafforestation and other cosmetic procedures is not supported by scientific evidence.

Areas which have been subjected to extensive and drastic disturbances can be renovated, but a complex ecosystem once destroyed resembles Humpty Dumpty in that it cannot be "put together again".

For this reason it is appropriate to select and set aside national parks and nature reserves as soon as possible even though a complete biological survey may not have been made and funds may not be available for proper management of the reserve.

If changing circumstances require the alienation of such lands in the future, for agriculture, mining or any other purpose, this could be done by Act of Parliament. But no Act of Parliament could create a primitive or natural area out of a cleared farm. With sympathetic treatment such an area could be converted into a beauty spot, perhaps of considerable conservation value, but it would not reflect the original ecological features of the area or preserve the scientific "bench marks" which are so important to a true understanding of our environment.

## Mining

Mining, quarrying and major engineering activities have always been regarded as inappropriate in a National Park and such work would contravene the purpose of a National Park as specified in the preamble to the NPA Act 1976 in the following terms:

'. . . to provide for the vesting and management of certain areas as National Parks or Reserves, the conservation of the natural environment, preservation and enhancement of the natural beauty . . .'

Nevertheless, certain parks, such as the Hamersley Range National Park are associated with extensive mining because permission to mine was given under special legislation passed prior to the creation of the park.

Furthermore in its preamble to the 2nd "Red Book", p. 1 the EPA stated 'Therefore we consider that the rights of holders of mining and petroleum tenements as of the date of Cabinet approval of these recommendations, must be respected and that these areas be excised from the areas being subject of our recommendations which follow' (Anon., 1976).

Cabinet approved the 143 recommendations of the 1st "Red Book" on February 9th, 1976 and the recommendations of the 2nd "Red Book" on October 20th, 1976. Consequently the mining areas will be either excised from the reserves or incorporated in the park's management plan to be worked, where practicable, in such a way as to have minimum impact on the environment.

To many purists the presence of any mining activity within a National Park is totally unacceptable, but it is better to create a park and allow mining under supervision than to lose the entire reserve, which may be the only alternative. Furthermore despite the size of some mining tenements the final area to be worked may be relatively small.

A comparable argument for exclusion applies to water catchments and other public works and only under very special circumstances should major dams or other water installations be associated with parks and nature reserves.

## Size

One of the most important requirements of a true National Park is that it be sufficiently large to ensure the long term survival of the ecosystem which it represents.

Other things being equal the larger the reserve and the more compact its shape the less likely is it to be effected by outside influences such as weeds, domestic animals, wild fires or drifting chemicals. Nevertheless small reserves and connecting corridors, including roadside bush are of great importance in allowing species of many kinds to move from one area to another.

Research carried out by workers in the Zoology Department, University of Western Australia suggests that 'selected areas of more than 50,000 acres (20,250 ha) in extent are likely to retain fauna and flora representatives of that region provided the area contains a diversity of soils and topography characteristic of the region. Moreover, areas of this size are likely to retain the characteristic biotic diversity without intensive management.' (Main and Yadav, 1971).

## Fire

The development of a proper fire policy is one of the most important requirements for the management of any reserve.

Long before man reached Australia, wild fires caused by lightning had their effect upon the countryside and many of the early explorers, including Dampier in 1699, referred to the burning carried out by the aborigines (Merrillees, 1968).

Because of the devastation which can result from a major bushfire the popular belief is that fires are totally destructive and that they should be prevented or suppressed wherever possible, whereas properly used fire can be a most important factor in the survival of what we know as the 'normal' Australian environment (Christensen 1974).

Many native plants and animals are fire tolerant or even fire dependent and much research is now being carried out to see how controlled burning at different times of the year and at varying intensities can be used to manage commercial forests and National Parks and nature reserves according to their individual needs.

Generally speaking 'Much the safest method of control burning from the point of view of retaining the biotic elements of the community is the mosaic rotations system in which unit areas of appropriate size are in successive stages of recovery from the burn' (Key, 1978).

One of the highest priorities in National Park management is the location of firebreaks and buffers in such a way as to restrict the movement of fire either into or out of the park. The park itself can then be burned in such a way as to provide a wide diversity of habitats and to ensure suitable refuges from which flora and fauna can recolonise adjacent burnt out areas.

The response of the environment to fire will of course vary according to circumstances and authorities are by no means unanimous as to the best fire regime for a particular area. This will vary according to whether the reserve is intended to provide a showy display of wildflowers, protection for the short-necked tortoise or a refuge for kangaroos and wallabies.

What most authorities do agree upon is that bush fires are not as destructive to wildlife as it would first appear and that many types of fauna escape the fire either by fleeing before the advancing front or by sheltering in hollow trees, under logs and stones or in moist hollows by-passed by the flames (Disney, H.J. deS., 1968).

One amazing feature in the biology of the woyilie or rat kangaroo *(Bettongia penicillata)* is that these animals can avoid quite severe bushfires by moving from place to place and that even in the charred remains of the forest they are able to survive by feeding on subterranean fungi (truffles) until the vegetative cover is restored.

Unfortunately, many fire programmes can be seriously upset by unscheduled burns which may result from natural causes, carelessness or vandalism.

The park management plan must be devised to cope with such emergencies as far as possible and particularly to ensure that the reserve is not a threat to landholders in the vicinity.

## Off-Road Vehicles (ORVS)

The aeroplane, the helicopter and the 'four wheel drive' have revolutionised transport in Australia in recent years and have made it possible to visit previously inaccessible spots with a minimum of effort. These changes have been highly beneficial to the country's general development, but they could spell disaster to much of our wildlife and to some of the country's choicest scenery.

The more recently developed trail bikes, dune buggies and other ORVS present an even greater threat to the environment because they are readily available, relatively cheap to purchase and to operate and are a growing form of recreation for many members of the 'affluent society'.

These highly adaptable machines can negotiate almost any terrain and for some years their extreme mobility, lack of registration plates and helmeted drivers have made recognition, apprehension or control by a park ranger very difficult.

These problems have been discussed repeatedly by State and Commonwealth authorities and various means of control have been suggested.

Some States have introduced special legislation, but the difficulty of policing the law still remains.

In the long term public education offers the most promise, combined with the provision of special recreation areas to relieve the pressure on more useful and vulnerable sites.

The problem is still relatively minor in Western Australia, but already some coastal areas have been ravaged and several valuable parks are under threat.

Some idea of the problem in other countries can be judged from the fact that well over a million trail bikes and half a million dune buggies were roaring across Canada in 1974 and the popularity of this form of recreation is still growing.

The obvious effects of such heavy cross-country traffic include the destruction of vegetation, the disturbance of loose sand and the encouragement of soil erosion. However, there can be less obvious but equally serious affects upon the fauna.

The deafening roar of a racing motor will shatter not only the peace and quiet of the countryside, but it will alarm many bush creatures and drive them from the area.

Recent work in California has shown that even lizards can be affected. Heavily used sand dunes were almost devoid of reptiles and moderately used areas had only half the number to be found in the neighbouring undisturbed bush.

### Park Use by Visitors

Tourism is a fast growing industry and its effects upon the environment and the culture of an area can be blatant, insidious or neutral according to circumstances.

Ecological problems arising from tourist use of the Uluru (Ayers Rock-Mt Olga) National Park in the Northern Territory are typical of those prevailing in many National Parks not only in Australia but throughout the world.

The various impacts of tourism in the Park have been carefully investigated and one of the most disturbing findings was that 'Public enjoyment of the Park is being gained at the expense of some Park features and with the current level of management the environmental quality of the Park is being degraded progressively, perhaps irretrievably' (Ovington 1973).

Contrary to popular belief, the Ayers Rock environment is a fragile one, where ill directed roads have caused erosion and the death of many plants, following the diversion of water which once poured off the 'Rock' and supported a flora association unique to the area.

Fortunately, the problem may have been recognised in time to take corrective action, but not without the expenditure of several million dollars.

Many Western Australian parks are in imminent danger from over use and can be saved only by public co-operation and realistic management plans.

A good example is Yanchep National Park with its caves, lakes, wildflowers and giant tuart trees.

In the 1960's approximately 30,000 cars visited the park annually, but by the late 1970's the number had reached 100,000.

In the face of such pressure, parks must be protected by careful management plans and as far as possible by adherence to Recommendation 12 of the Second World Conference on National Parks, held in Yellowstone in September 1972 which reads as follows:

'1. that a System of zoning be introduced where necessary, designating sections of the national park for specific usage;
2. that measures be taken to limit the use within each zone to a level which will not adversely affect the conservation of those features for which the zone was established;
3. that where possible facilities for tourism be located outside the national park boundaries;
4. that wherever possible more imaginative systems of transportation be provided to and inside the park which will permit discouraging or banning of the use of automobiles;
5. that where roads and other access facilities are necessary, care be taken in their siting and planning; and
6. that every effort be made to reduce undue disturbance by visitors;

AND URGES governments to take action to set aside and develop suitable areas, to provide for public use and recreation and reduce visitor pressure on national parks.'

These recommendations show clearly that contrary to popular belief a National Park is not simply a recreation and picnic area located in a rural setting.

As far as the local scene is concerned the National Parks Authority Act requires the parks to be managed:

'for the conservation of the natural environment ... and the provisions of access and facilities for public recreation ... and other purposes.'

It is important to note that the first responsibility of the Authority is to protect the environment ... that is scenery and the flora and fauna and that the provision of recreation facilities comes later.

Indeed some types of recreation are quite unsuited to a National Park and should not be allowed under any circumstances.

For instance the establishment of golf courses and football grounds in natural bushland would require extensive clearing and certainly could not be regarded as protecting the environment. Also, the use of noisy trail bikes and dune buggies in National Parks could be highly disturbing to other visitors as well as to native wildlife and would certainly cause plant destruction and serious soil erosion.

Even on the beach itself vehicles can be a nuisance despite the fact that they may not be destroying vegetation or causing erosion.

The noise is very disturbing to people wishing to 'get away from it all' and also to birds such as dotterels and rock parrots which often nest on, or very near the beach and to shoreline feeders such as gulls, terns, oyster catchers and the plover-like waders which visit us every spring and summer from Russia and other countries in the Northern Hemisphere.

For these reasons vehicle access to beaches should be controlled in accordance with the particular requirements of the area.

Horse riding and boating are borderline cases. In some Parks horses could introduce harmful weeds or destroy vegetation, but in other areas they could be admitted along firebreaks as well as on the normal roads and tracks.

Powerboats are normally much too noisy and destructive for a National Park, but sailing and row boats may have a place where their use would not encourage visitors to trespass on wilderness areas so necessary for the protection of some rare plants and animals.

On the other hand bush walking, bird watching, photography and similar 'passive' forms of recreation are very

appropriate for National Parks and if properly conducted should have no detrimental effect upon either landscape or the flora and fauna.

One of the most difficult problems in National Parks management is the persuading of park users that the short term exploitation of the park must not be permitted at the expense of its long term preservation.

For instance, when a new coastal reserve is declared a National Park and traffic is directed along authorised roads to defined parking areas, visitors and particularly local residents, are apt to complain at having to walk longer distances or being excluded from their favourite fishing or picnic areas.

At first thought these restrictions may seem unreasonable but if the National Parks are to be protected properly such controls are absolutely necessary and in most instances require the services of at least one resident ranger.

This is supported by observations made in Europe by Liddle (1975) who states that 'The rapid deterioration and eventual erosion of rural areas used for informal recreation will continue, at least until the present Western European standard of living declines or the population is reduced below its current level. The fact that natural regeneration of the habitat has been estimated to take fifty or even a thousand years* is an imperative reason for maintaining the remaining resources.'

The duties of a ranger in National Parks are of course, to protect the area, particularly from bush fires and vandals, but equally important are his relations with the public. The Ranger should not be seen as a policeman, but rather as a friend who is knowledgeable about the park and its wildlife and who is anxious that all visitors should enjoy the many attractions of the area to the full. This can be done best by studying any leaflets which the Ranger may have available and by complying with park notices, for although these may appear to be over restrictive at times, they have been prepared in order to help visitors and to ensure long term protection for the park's scenery and wildlife.

Entrance fees to National Parks are charged in many parts of the world although there is some opposition to this practice.

Those opposed to a charge argue 'that fees tend to reduce the spontaneity of visits to the parks and restrict freedom of movement. Their collection detracts from the atmosphere associated with natural country (Anon., 1968).

In Western Australia fees apply only to vehicles entering a park and not to individual persons. They apply only to parks which contain certain amenities and a yearly ticket is available at a nominal charge so that district residents and others requiring repeated access to a park centre for shopping, postal or other facilities will not be seriously disadvantaged.

Contrary to expectation, park visitors in some States have reacted favourably to entrance fees on the grounds that the additional income would improve the general standard of the Park Service.

## Appendix

In order to achieve their major objectives most National Park services have clearly defined 'Management Policies' which take into account the past history of a particular park, its special attributes and the way in which it should be treated in the future.

The Western Australian 'Management Policies' published in 1977 are summarized as follows:

### Acquisition of Land

Most of the land now vested in the National Parks Authority had been reserved previously for conservation purposes or had been held as vacant Crown land. However, several private properties and pastoral lands have been purchased and despite the detrimental effects of grazing, these areas have added important recreational and conservation sites to the State's Parks System.

It should be noted that no parks have been created by the resumption of private land and that the normal method of acquiring land is 'purchase by a willing buyer from a willing seller'.

### Park Planning

Each park plan should include a general description of the area based upon geographical, geological and biological studies. It should contain details of past use or management and should consider the degree to which public access will be allowed and the effects which visitor pressure will have upon the ecology of the area.

### Land Classification

Four broad categories are commonly used to define special areas within a Park. These are:

**Natural Areas** — To be maintained predominantly in a natural or near natural state, but with appropriate roads and tracks to facilitate some public access.

**Wilderness Areas** — To be maintained in as natural a condition as possible, compatible with the long term survival of the environment.

**Special Areas** — For the protection of endemic plants or animals or for the preservation of other features of special interest.

**Facilities Areas** — To provide visitors with facilities which are compatible with good National Park management.

### Resource Management

#### Research

Effective management of a park must be based upon a detailed knowledge of the area and to this end a comprehensive research and monitoring programme is necessary.

Such information will help not only in the preservation of natural areas but also in the rehabilitation of those areas which may have been degraded by grazing, mining or other unnatural influences.

*Tyre tracks and even footprints can last in desert areas for decades.

**Fire**
Fire is a major influence in almost all National Parks and according to the timing and severity of each burn, it may be a valuable tool in the management of the ecology or a devastating and almost totally destructive influence on the landscape and the associated flora and fauna.

**Grazing**
Normally, exotic animals such as sheep and cattle are not permitted in a National Park, but in some areas and particularly those with a rough hilly terrain, feral goats are well established and defy all efforts at eradication.

**Native Fauna**
National Parks should be managed in such a manner as to maintain the natural ecosystem and to avoid violent and unnatural fluctuations in particular animal populations or plant communities.

**Fishing**
Fishing is permitted in tidal inlets and off the coasts of National Parks in accordance with the Fisheries Act. Normally, inland lakes and streams are closed to fishing, but in some areas, hand held rods and lines are permitted for the taking of fish for immediate personal consumption.

**Beekeeping**
Feral bees are widespread in many parks and often occupy hollow limbs and tree stumps, which would otherwise serve as nesting sites and shelters for kingfishers, tree martins and other native fauna.

It is possible also that they compete with and effect adversely various native creatures which act as plant pollinators and feed upon nectar and pollen.

For this reason apiarists are only allowed to place hives in a National Park under licence and in areas specially allocated.

**Collecting**
The collecting of biological and other specimens is not allowed except by special permit and in accordance with conditions specified by the Authority.

**Mining**
Mining is not regarded as an appropriate activity within a National Park, but where a lawful right exists to mine, the National Parks Authority encourages close liaison with the mining operator to ensure a minimum of damage to the environment and minimum inconvenience to park visitors.

**Exotic Plants and Animals**
Where possible, exotic plants and animals are excluded from all, but facilities areas in National Parks and where practicable populations already established are removed.

**Special Areas**
An area with biological, geological or other features of such significance as to require special protection. Access to such areas may be by permit only.

**Facilities Areas**
An area in which parking, camping and other services may be provided with minimum effect upon the environment.

As a general policy major facilities, including caravan parks and chalet type accommodation should be conducted by private enterprise adjacent to, but outside the boundary of the park.

Any facilities within the park should be controlled directly by the Authority.

**Boundary Zone**
Where possible, a boundary zone or buffer strip should be maintained to protect the natural areas of the park from outside influences. This applies particularly to the encroachment of weeds and straying stock and the spread of bushfires.

**Visitor Use**
Passive Recreation — Recognising that over use by visitors can be detrimental to any natural area, it is necessary for those managing a National Park to define the types of activity which can be allowed in a reserve and to allocate areas for certain activities.

Activities which have little impact on a National Park and a minimum effect on other park users include, walking, mountain climbing, bird watching, photography and sketching.

**Vehicles**
Vehicles should be restricted to authorised roads, tracks and parking areas. Off-road vehicles including beach buggies and trail bikes can cause serious damage to vegetation with resultant soil erosion. Vehicle noise can reduce the pleasure of other park visitors and seriously disturb many forms of wildlife.

**Boating**
Boating is permitted in tidal waters within or bordering a National Park in conformity with the Navigable Waters Regulations and the requirements of the Harbour and Lights Department.

Private boats are not allowed on inland lakes and streams excepting by special permission.

**Camping and Caravan Parks**
Where appropriate facilities are available, tents and caravans are permitted and back-pack camping is allowed in the larger parks.

**Horses and Pets**
Riding is permitted only on approved roads and tracks, not in areas where horses may cause erosion or facilitate the establishment of weeds.

Household pets, including cats and dogs, are not allowed in National Parks except where special areas have been allocated for the exercising of such animals.

**Fees**
It has long been customary to charge entry fees for vehicles where special park facilities and supervision have been arranged.

## The Development of Facilities

**Access Ways — Roads**
Where public roads pass through a National Park, they are the responsibility of the Main Roads Department or the local Council and will be constructed to an appropriate standard.

Where roads serve only as an access to a National Park they should be constructed and maintained in accordance with the requirements of the National Parks Authority and usually will be designed to fit the landscape and to accommodate relatively slow moving park traffic rather than high speed long distance travellers.

**Trails and Paths**

Bridle trails, nature trails and walking paths should be so designed as to have a minimum impact on the environment, but to give visitors access to scenic and interesting areas of the park.

**Information Services**

An important function of the National Parks Authority specified in Section 9(c) of the National Parks Authority Act is 'to provide information services and to educate the community to the use and enjoyment of the facilities available.'

Public participation in educational programmes can be by display centres, conducted tours, self guiding nature trails and by the provision of appropriate maps, brochures and other literature.

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# The National Parks of Western Australia

*It is not practicable to describe each National Park in detail nor to list all the flora and fauna which have been recorded within their boundaries. However, several major parks have been dealt with in some detail in order to show the diverse ecosystems which are covered by the Western Australian park system and comments have been included on some of the plants and animals which may be expected in the major regions of the State.*

## The National Parks of South Western Australia

### Birds

Anyone who has spent a few hours bird hunting in our south-west jarrah and karri areas will know that high, dense forests are not the best places to get a large tally of either bird species or individuals. In fact, many observers have commented upon the almost cathedral-like stillness which often pervades the densest forests. It is in the small clearings and along the forest streams that most of the birds will be found because of the varied habitat and food supply associated with the 'edge effect'.

At least four species of parrots are present in most areas of the south-west, and three are to be found nowhere else in Australia.

The western rosella *(Platycercus icterotis)* with its scarlet breast and yellow cheeks has close relatives in other States, but the red-capped parrot or Western Australian king parrot *(Purpureicephalus spurius)* is unique. The rich purple underparts and the red markings on the head and beneath the tail make it one of our most handsome species. This bird has evolved in association with the south-west marri forests for the beak has a particularly long upper mandible which easily extracts the seed from the large woody 'gum nuts'. Unfortunately, the western rosella and the king parrot have developed a taste for cultivated fruits and are regarded as pests by some orchardists.

The parrots are the noisiest birds in the forest, and by far the rowdiest of all are the white-tailed black cockatoos *(Calyptorhynchus baudinii).* They occur only in south-west Australia and are rather irregular in their movements, touring the country in large screeching parties which feed on gum blossoms, nuts and insects, as well as apples and pine cones. The powerful bill of the cockatoo is well adapted for tearing the bark from the forest trees and removing the various insect borers which sometimes cause considerable damage, particularly to eucalypts and wattles. But, unfortunately, the bill is equally useful for shredding up pine cones and seed production is sometimes seriously affected (Saunders 1974).

Another noisy and irregular visitor to the forests is the purple-crowned lorikeet *(Glossopsitta porphyrocephala).* The call of the lorikeet is always welcomed by the beekeeper as a sign that nectar-bearing flowers are about, and it is also probable that the birds help in the cross-pollination of the flowers as they move from one cluster of blooms to another.

The commonest parrot in Western Australia is the twenty-eight or Port Lincoln parrot *(Barnardius zonarius).* The birds vary considerably in size and colour, according to the locality, and the call note also varies.

The forest birds of the south-west are large and predominantly green in colour, with a yellow collar and some red feathers at the base of the bill. The call, since the days of the first colonists, has been syllabised as 'twenty-eight', hence its accepted vernacular.

The wheatbelt birds are smaller and show increasing yellow on the underparts as one goes north. The call bears little resemblance to the 'twentyeight' of the forest birds.

Amongst the smaller dwellers in the forest trees are the pardalotes or diamond birds, the western warblers, the thornbills or tits, and the sittellas or tree-runners. These are all insect eaters, but each species has its own particular method of seeking its prey.

The yellow-rumped thornbill or tomtit *(Acanthiza chrysorrhoa)* is easily recognised by the canary-yellow patch above the base of the tail. This bird often feeds in small parties both on the ground and in the lower branches of the trees. Its duller relative, the broadtailed thornbill *(A. apicalis),* has a striped breast, a cocked-up tail and a rather persistent chatter. It feeds mainly amongst the twigs and leaves, often well above the ground.

The tiny red-tipped pardalote or diamond bird *(Pardalotus substriatus)* is much more often heard than seen, for in the springtime it keeps up a continuous call of 'two two' as it climbs through the highest twigs, picking scale-like psyllids or lerps from the leaves.

Another tiny bird which is seldom seen, but whose activities affect many forest trees is the flower pecker or mistletoe bird *(Dicaeum hirundinaceum).* The male is one of the most brilliantly coloured species with its steely black upper parts and bright red throat, breast and rump. The birds feed mainly on mistletoe berries and are instrumental in spreading seeds of the parasite from tree to tree.

The white-tailed warbler or western warbler *(Gerygone fusca)* is a very small but active bird known to many children as the sleepy twit, because of its high-pitched, rather hesitant whistle. The warbler often flutters at the end of a bough picking insects from the outer leaves and showing a characteristic white band near the end of its tail.

The black-capped sittella or tree-runner *(Neositta pileata)* is a close relative of the European nuthatch. It is an attractively coloured bird with a black head and an orange wing patch. The most outstanding feature is the relatively long bill, which turns distinctly upwards. The sittellas often hunt in small noisy parties and run spirally down the tree trunk using the upturned bill to probe every crack and crevice for hidden insects.

The rufous tree-creeper *(Climacteris rufa)* is another inhabitant of the thick forest areas. It is reddish brown in colour, rather larger than the black-capped sittella and has a characteristic highpitched call. It also runs spirally around the tree trunks looking for insects, but whereas the sittellas usually work downwards, the tree-creepers usually work upwards, and so check cracks and hiding places which may have been missed on the downward run.

Amongst the most beautiful birds of the forest country are the robins and wrens. The scarlet robin *(Petroica multicolor)* with its brilliant red breast and white forehead is known to most people, but the more shy western yellow robin *(Eopsaltria griseogularis)* is often overlooked. The canary-yellow of the underparts makes the bird easy to identify and its habit of clinging to the side of a large tree trunk is also characteristic.

Two wrens of the south-west forests are the banded blue wren *(Malurus splendens)* and the red-winged wren

*(Malurus elegans).* Both like plenty of bushy cover and often nest in the tea-tree thickets which line the banks of forest streams.

Honeyeaters are amongst the most characteristic and specialised of Australian birds, and they are well represented in the forests. The long curved bill and brush tipped tongue are a special adaptation to assist birds in taking nectar and insects from native flowers. In some instances, the birds repay their hosts by carrying pollen from one bloom to another.

The largest and noisiest honeyeaters seen in the south-west are the wattle birds. The red wattle-bird *(Anthochaera carunculata),* so called because of the red fleshy wattle on the side of the head, is about the size of a small dove and has a hoarse coughing note. As in the case of the little wattle-bird *(A. chrysoptera)* it is a frequent visitor to flowering plants, particularly banksias.

The smaller honeyeaters include the brown honeyeater *(Lichmera indistincta),* which can be distinguished by its relatively long curved beak, small size, dull plumage and almost canary-like song. The singing honeyeater *(Meliphaga virescens)* which is rather larger, is greenish in colour, with a dark stripe through the eye. This species is common in Perth suburban gardens. The New Holland honeyeater *(Phylidonyris novaehollandiae)* frequents the flowering eucalypts and banksias. It is recognised by its black and white striped plumage, white face marks and yellow wing patches. A common species in the high tree tops, but one which is seldom seen at close quarters is the white-naped honeyeater *(Melithreptus lunatus).* It may be distinguished from other common species by its small size and the conspicuous white crescent on the back of the green neck.

Most of the honeyeaters mentioned may at times visit kangaroo paws and assist in their cross-pollination.

The western magpie *(Gymnohina dorsalis),* the squeaker *(Strepera versicolor)* and the grey butcher bird *(Cracticus torquatus)* are widespread in the south-west, although the magpie was scarce in the heavy forest regions prior to the general clearing for agriculture.

The squeaker or bell magpie is about the size of a crow, but dark grey in colour with a light mark on the wings, which is quite conspicuous as the bird flies. The loud ringing calls of the squeaker may be heard both in the forest and in more open country.

The grey butcher bird is one of Australia's finest songsters and, unlike many other local birds, it calls strongly both in the spring and the autumn.

The butcher bird feeds on insects, lizards and small birds and often wedges its food under loose bark or into the fork of a tree, for later attention.

A comparative newcomer to the south-west forest is the kookaburra *(Dacelo gigas).* Although most people regard the kookaburra as a native, it was introduced from the Eastern States about the turn of the century. Liberations from the Zoological Gardens were made over several years and the birds quickly colonised the southern portions of the state.

Two species of doves, the Senegal turtle dove *(Streptopelia senegalensis)* and the larger spotted turtle dove *(S. chinensis)* were also released about the same time as the kookaburra, but although they spread to many country towns, they have shown little inclination to penetrate the forests.

**Mammals**

Most of our native mammals are nocturnal and so the existence of many species in a particular district may be overlooked unless dead bodies are seen on the roadside or specimens are brought home by the family cat.

Australia is famous for containing the only two egg-laying mammals still surviving on the earth, and one of these is found in Western Australia. The platypus is confined to the rivers of eastern Australia, but the Australian spiny anteater or echidna *(Tachyglossus aculeatus)* is found all over the Commonwealth and is still moderately plentiful in the south-west of this State.

The western grey kangaroo *(Macropus fuliginosus),* recently shown to be a distinct species from the grey kangaroo of Victoria and New South Wales *(M. giganteus),* is still abundant in many areas of the south-west. The smaller brush wallaby *(M. irma)* is also widespread in the forest regions, but has disappeared from many of its former haunts.

The quokka *(Setonix brachyurus)* has suffered severely in recent years, and although it was hunted for sport in the 1930's along many of the river thickets of the south-west, it is now very rare on the mainland, with its main strongholds on Rottnest Island and Bald Island.

Two other wallabies, the woilie or brush-tailed rat-kangaroo *(Bettongia penicillata)* and the tammar *(Thylogale eugenii)* have also declined in numbers in recent years. They both figured in the skin and hide trade in the 1930's, but now they survive in scattered areas only. Fortunately, the wandoo (white gum) woodlands of the Great Southern still support a reasonable number.

The brush-tailed possum *(Trichosurus vulpecula)* is still plentiful in many areas, but the nest building western ring-tailed possum *(Pseudocheirus occidentalis)* with its white tipped tail, is less common.

Several species of bandicoots were once abundant in various parts of south-western Australia, but the dalgyte or rabbit-eared bandicoot *(Macrotis lagotis)* has disappeared and only the short-nosed bandicoot or quenda *(Isoodon obesulus)* is common. The presence of this nocturnal feeder may be deduced from the conical diggings which may appear in the bush and even in home gardens, as the animals search for insects. The dark brown fur is coarse and bristly, and was never exploited by the 'trade'.

One of our most interesting mammals is the so-called banded ant-eater or numbat *(Myrmecobius fasciatus).* It has reddish fur with several white bands across the back and rump. The name ant-eater refers to the fact that the creature feeds mainly upon termites or white ants which it unearths with its powerful claws. Although a true marsupial, the numbat lacks a well developed pouch, and the young are merely protected by tufts of long hairs as they cling to the mother. This animal is most commonly met with in wandoo country around Pingelly, Narrogin and Kojonup.

The chuditch or western native cat *(Dasyurus geoffroii)* was once very common throughout the south-west and still persists in many timbered areas. It feeds upon insects, birds and other small creatures and used to rob the henroosts of the early settlers. As in other members of the marsupial cat family, the pouch is represented by two flaps of skin which afford but scanty protection to the naked young.

The tree climbing wambengers or native squirrels are still present in many areas, but because of their nocturnal habits they are seldom seen.

The brush-tailed wambenger *(Phascogale tapoatafa)* feeds upon various small creatures including birds, and like the larger native cat, it once caused trouble by robbing farm henroosts.

The so-called marsupial mice include two charming species the pigmy possum *(Cercatetus concinnus)* which feeds mainly upon insects, and the honey mouse *(Tarsipes spenserae)* which takes insects and nectar from bush flowers. Both species are active mainly at night, but only too often they fall victim to the domestic cat.

A number of native rats and mice occur in Western Australia but the best known is probably the western water-rat *(Hydromys fuliginosus).* It is found in most of our south-west streams, but because of its retiring habits it is seldom seen.

It is a true rodent, but can be distinguished from the introduced rat, which may also frequent bush streams, by its much greater size, thick fur (once used commercially) and the fully furred white-tipped tail. In the early days the water-rat often used to rob the poultry yard, but its native food consists of gilgies and other water life.

**Insects**

Compared with most agricultural crops the forests of South Western Australia experience little damage from insect pests. A wide range of insects is associated with our native plants, but the relatively natural conditions under which the forests have been maintained have helped, no doubt, to stabilise changes in insect populations.

Many types of insects feed upon the leaves and buds of forest trees, but the one which causes the most conspicuous damage is the jarrah leaf miner *(Perthida glyphopa).*

This small native moth, belonging to the family Incurvariidae, causes widespread damage during the winter months, primarily to jarrah *(Eucalyptus marginata)* and flooded gum *(E. rudis),* although about ten other species of eucalypt may sometimes be affected.

The moth lays its eggs in the leaves and the larvae tunnel through the leaf tissue forming reddish-brown blotches. When the larvae emerge they cut typical oval-shaped holes in the leaf and these holes together with the larval mines produce an overall effect on the tree similar to leaf scorch due to fire. The foilage is replaced during spring and early summer and the tree appears to completely recover from the attack. However, successive infestations may adversely affect the vigour of the tree and impair its growth.

Some control of the population is exercised by parasitic wasps, predatory birds and ants while a proportion of the jarrah trees are resistant to attack. Systemic insecticides have proved effective for small scale control but are too costly for use on a large scale.

The gum leaf skeletonizer *(Roeselia lugens),* also known as the brown leaf moth is much less common than the jarrah leaf miner, but spasmodic outbreaks of the caterpillars sometimes cause extensive damage. The caterpillar is a woolly bear type, reddish brown in colour, with long grey hairs.

Caterpillars of the tussock moth, the bag-shelter moth and the case moth sometimes cause severe leaf damage. The tussock moth caterpillar *(Orgyia athlophora)* gets its name from the dense brush-like tufts of bristles which stand out from the main hairy covering of the body.

The bag-shelter caterpillar or processional caterpillar *(Ochrogaster contraria)* is well known to most country residents. The strings of trailing caterpillars never fail to arouse attention, and the large silken bags hanging from defoliated trees are a feature of many roadsides. The hairs of many insects are highly irritating to some people and bushmen usually treat the homes of the bag-shelter caterpillars with respect.

The outstanding feature of case moth caterpillars is that they build silken coverings within which they live — rather like a snail in a shell. The construction of the shelter varies according to the species and the material available. Some like the leaf case moth *(Hyalarcta huebneri)* cover the outside of the silken bag with bits of leaves, while others such as the lictor or faggot case moth *(Clania ignobilis)* use lengths of thin twigs. The larvae of the ribbed case moth *(H. nigrescens)* on the other hand, construct a greyish silken bag conspicuously ribbed but quite devoid of decoration or extra covering.

The case moths have a wide host range but damage is usually restricted, for, as in the tussock moth, the females of the case moth are wingless and after hatching, the tiny caterpillars lower themselves on silken threads from the parental shelter and may be scattered by the wind.

The caterpillar-like grubs of the steel-blue sawfly *(Perga* sp.), often known as 'Spitfires', may cause severe defoliation of individual trees or limbs but these insects are much less troublesome in Western Australia than in parts of the Eastern States. The eggs are laid in the tissues of a gum leaf and as the larvae grow they congregate on the twigs in clusters which may reach the size of a small football. The insects spread out to feed on the foliage during the night, but cluster again with the approach of daylight.

Many types of beetles feed on native plants, but the rounded leaf-cutting beetles or chrysomelids, and the snouted weevils or curculionids are amongst the commonest and most destructive.

The red-legged weevil *(Catasarcus rufipes)* feeds on a wide range of both native plants and cultivated shrubs.

Many species of sap sucking insects occur in the south-west forests, including the well known cicada and the smaller cicadellids or leaf hoppers, but these are not considered of major importance.

Native aphids are very poorly represented in Australia, the only one reported in Western Australia being

*Anomalaphis comperi.* The woolly pine aphis or pine adelgid *(Pineus pini)* is the only introduced species of importance. This insect with its white waxy covering is heavily attacked by ladybirds and other natural enemies.

Sap sucking coccids which include scale insects and mealy bugs are represented by some very interesting species. The genus *Apiomorpha* produces varius types of woody galls, some of which look very like the fruits of a eucalypt, while others may be almost circular and larger than a golf ball.

The lerp insects or psyllids are small sap sucking insects which attack a range of native trees and shrubs. Although some of them construct galls, and others are naked throughout life, most of them spend their immature stages under a waxy or sugary covering. One of the commonest types of lerp insect found in Western Australia, *Creiis periculosa,* is associated with Flooded Gum *(Eucalyptus rudis).* The mussel-shaped, flat scales may almost cover both sides of the leaves and the damage may produce heavy defoliation.

One of the most puzzling features about the psyllids is that attacks appear to be increasing in intensity and that more and more tree deaths can be attributed to this cause. The psyllids are of course native insects and their association with eucalypts has been of very long standing. It would seem, therefore, that some fundamental changes in the environment must have contributed to the lack of balance now existing between the tree and its parasite. Such a change could have been brought about by clearing and agricultural development, and in the irrigation areas the change of water table could have played a part. Many insectivorous birds such as pardalotes, thornbills, tree tits and even twentyeight parrots are known to feed on lerp insects and their sugary scales, and so a reduction in bird life could be yet another contributory factor.

One of the best known of our wood boring insects is the so-called bardee. This creamy white, apparently legless grub, is the immature stage of a long thin cerambycid or longicorn beetle. There are many different species, but all are characterised by the very long feelers or antennae.

The beetle lays its eggs on the bark and the tiny spindle-shaped grubs bore down to the sapwood. Here they feed and tunnel about in all directions producing a network of scroll-like markings packed tightly with a mass of sawdust-like frass. When fully fed the grubs bore several inches straight into the solid wood and pupate.

Although often found in dead or dying trees, bardees are not always the cause of death. Healthy trees are usually able to withstand an appreciable amount of insect attack, but sickly trees seem to be particularly attractive to wood borers. It follows then that in many cases, heavy borer infestation may be of secondary importance as far as tree decline is concerned.

One species, *Phoracantha impavida* attacks young tuart, sometimes in association with a cossid borer *Culama sp.* which also bores under the bark. The borers tend to ringbark the stem and this no doubt accounts for the unexpected death of some young trees and the dead upper branches of many older trees.

The tuart bud weevil *(Haplonyx tibialis):* is a native insect which, as its name implies, is associated almost entirely with tuart. Because of its small size and retiring habits the insect is rarely seen, but its presence can be easily detected by the carpet of twigs and buds around infested trees.

Two families of wood boring moths are common in the south west forests, the swift moths Hepialidae and goat moths Cossidae. These are small to very large moths whose larvae tunnel in the wood of various native trees, including the eucalypts and acacias. Many of these moths have a life cycle of more than 12 months and the larger species may produce extensive tunnels half an inch or more in diameter. The white fleshy caterpillars (witchetty grubs) which sometimes reach six inches in length, were prized as food by the aborigines.

Karri trees from pole size to maturity may suffer damage by cossid larvae of the genus *Xyleutes*; this can result in reduction of timber quality.

A wide range of mites, insects and other invertebrates contribute towards the breakdown of the ground litter which accumulates under forest trees. Amongst the most important destroyers of wood are the termites and, although serious pests in structural timber and sometimes in standing trees, they are important scavengers in the forest.

The most destructive local termite in buildings and fences is *Coptotermes acinaciformis* and this species is also common in the bush. In Eastern States forests it has been associated with considerable damage to standing trees, but causes less damage in Western Australian forests.

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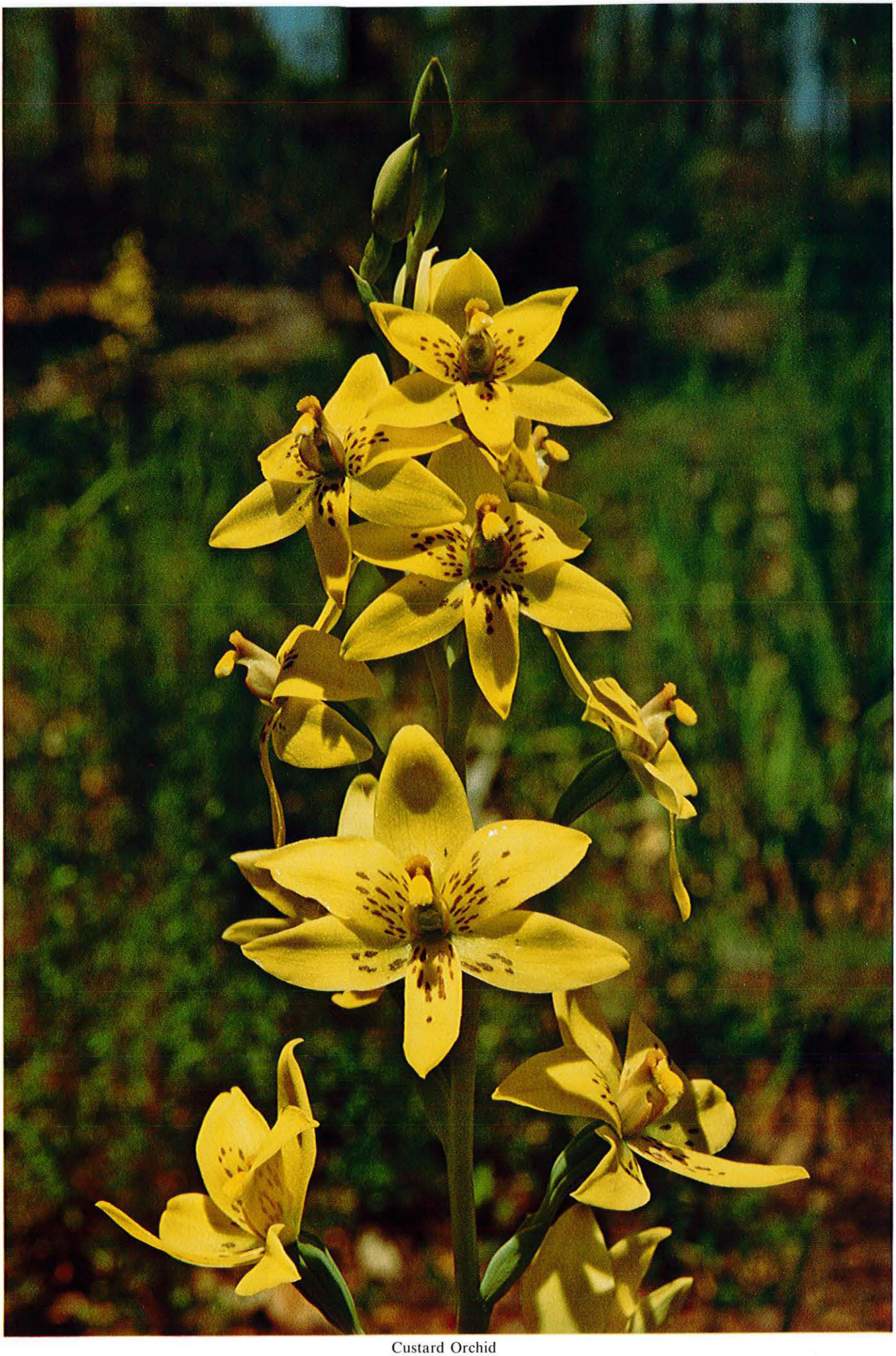
## Yanchep National Park

Yanchep National Park of 2800 hectares, lies 51 kilometres north of Perth and was gazetted as an A Class Reserve in 1905.

### Historical

The Yanchep caves were first discovered by Lt (later Sir) George Grey in 1838 and a bronze plaque commemorating this event was erected near Crystal Cave in 1949.

The name Yanchep is derived from the native name Yanget applied to bulrush *(Typha orientalis)* which grows prolifically in many South-West swamps and is abundant in Loch McNess.



W.A. FORESTS DEPARTMENT

Custard Orchid

Numbat

NATIONAL PARKS AUTHORITY

The Knoll, Walpole-Nornalup National Park

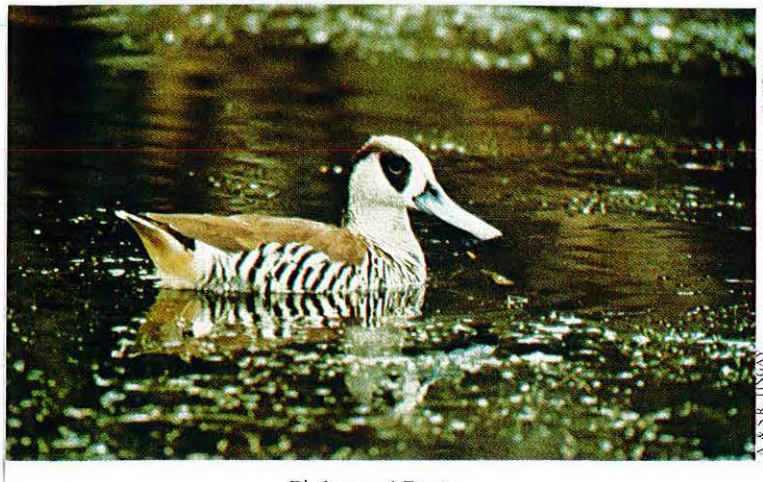
W.A. FORESTS DEPARTMENT

Wildflowers of the Karri Forrest

W.A. FORESTS DEPARTMENT

View from John Rate Lookout, Walpole-Nornalup National Park

NATIONAL PARKS AUTHORITY

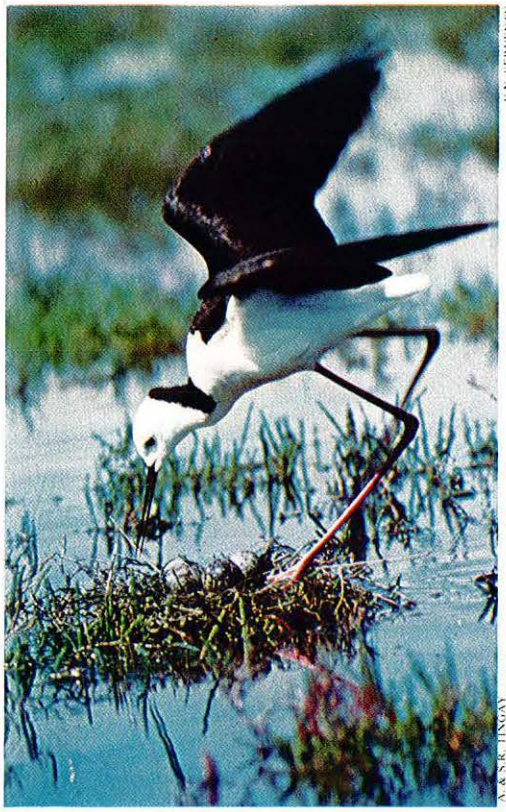



Pink-eared Duck


Spotted Crake

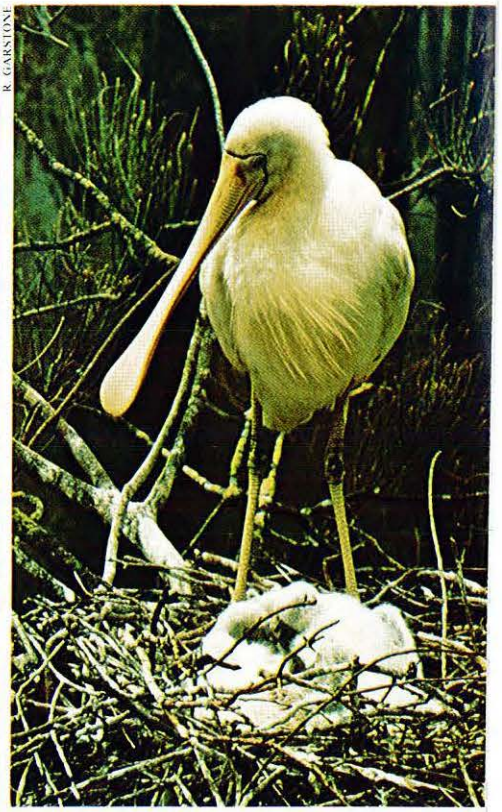

Bar-tailed Godwit


Swamphen




Pied Stilt

Pied Cormorant




Yellow-tailed Spoonbill

W.A. FORESTS DEPARTMENT

Red-capped Parrot

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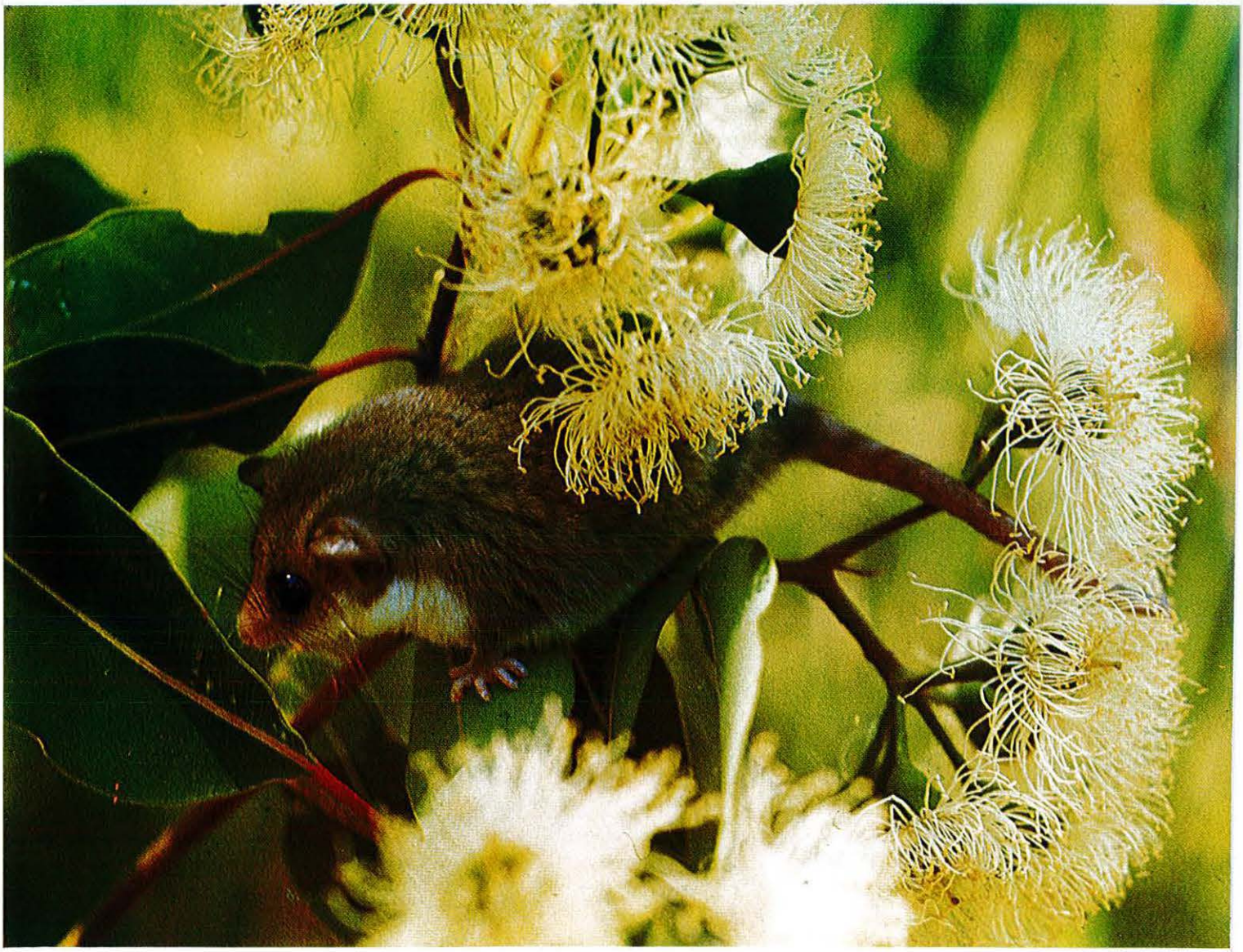
M.K. MORCOMBE

Western Chestnut Native Mouse

M.K. MORCOMBE

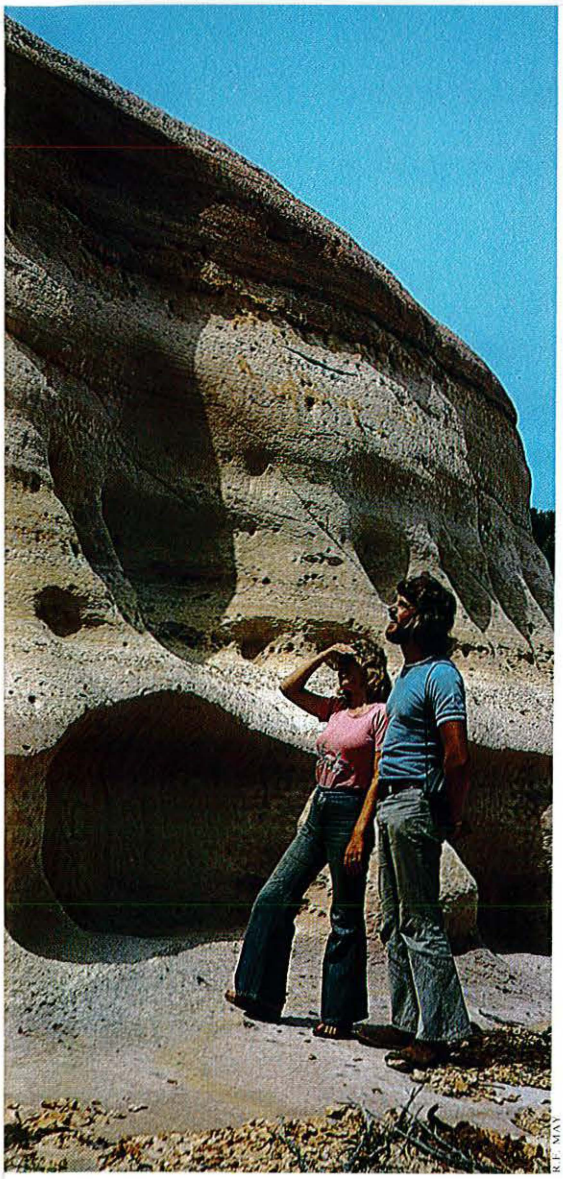
Sugar Glider

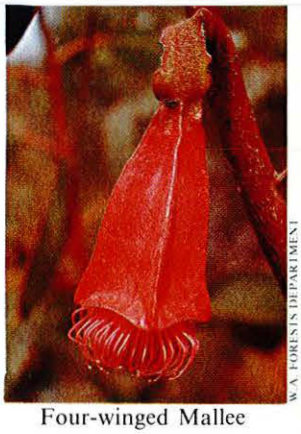
Honey Glider



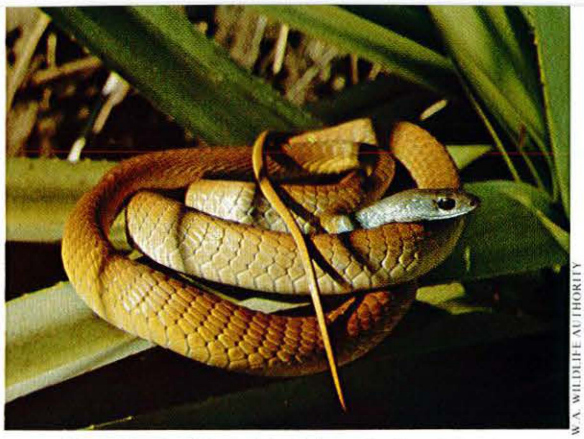
W.A. FORESTS DEPARTMENT

Pigmy Possum


R.F. MAY


W.A. FORESTS DEPARTMENT

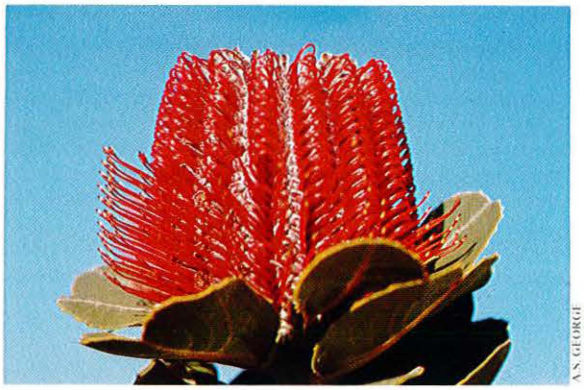
Four-winged Mallee


W.A. WILDLIFE AUTHORITY

Tree Snake, Drysdale River National Park


A.S. GEORGE

Royal Hakea, Fitzgerald River National Park


A.S. GEORGE


B. MUIR

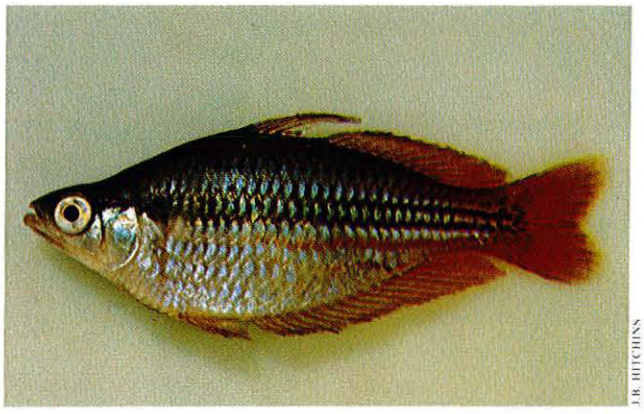
**Above**
Scarlet Banksia
**Left**
Barking Gecko
**Below**
Ocean Shoreline, Fitzgerald River National Park
**Far Left**
Weathering on Spongolite Cliffs, Fitzgerald River National Park


Woylie or Brush-tailed Rat Kangaroo


Yellow Robin


Day Flying Moth, Drysdale River National Park

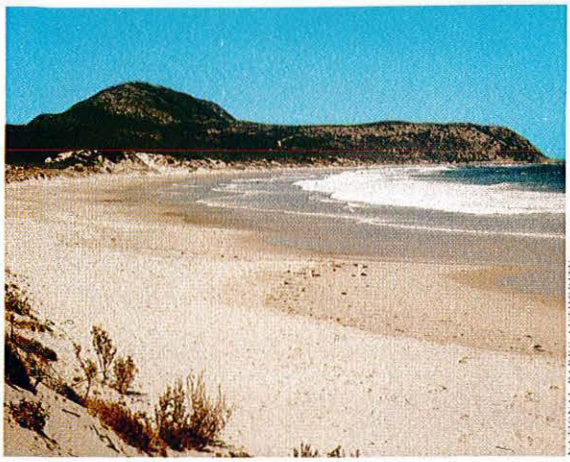

*Gossipium populifolium,* Kimberley




New Species of Fish (*Nematocentris* sp.) Drysdale River National Park

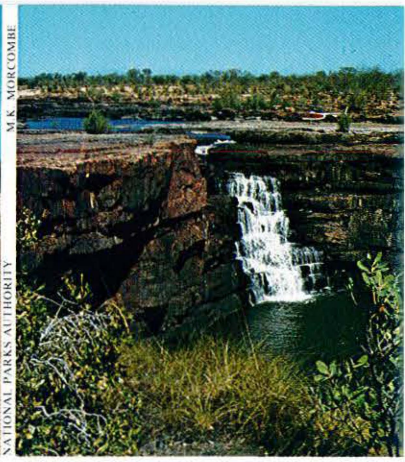
NATIONAL PARKS AUTHORITY

River Georges, Downstream from The Loop Lookout, Kalbarri National Park



NATIONAL PARKS AUTHORITY

Mylies Beach and East Mt. Barren



M.K. MORCOMBE

Solea Falls, Drysdale River National Park

NATIONAL PARKS AUTHORITY

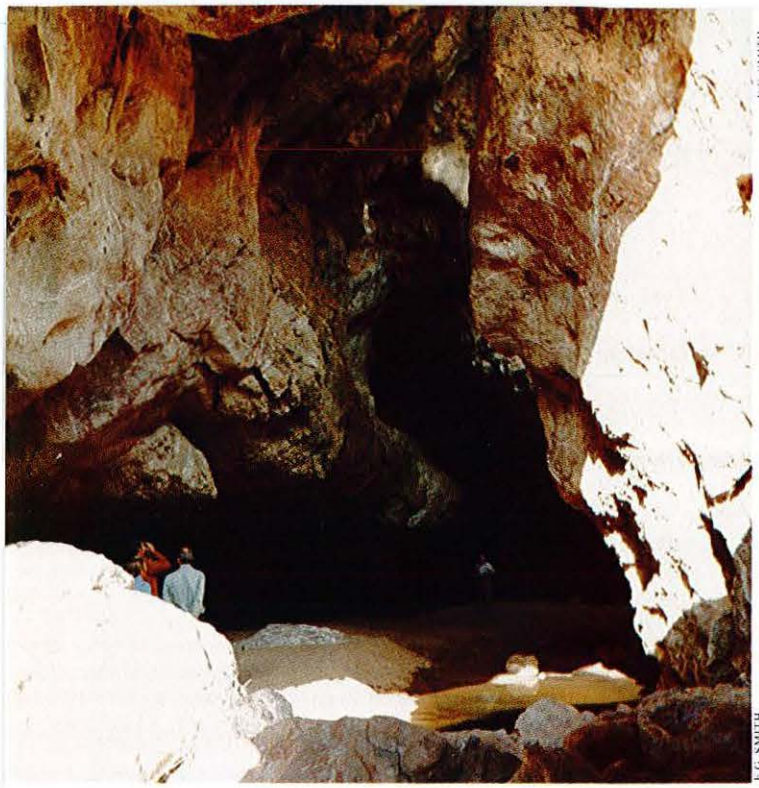
Murchison River Gorge, Kalbarri National Park

Wattle Bird and Young

W.A. FORESTS DEPARTMENT

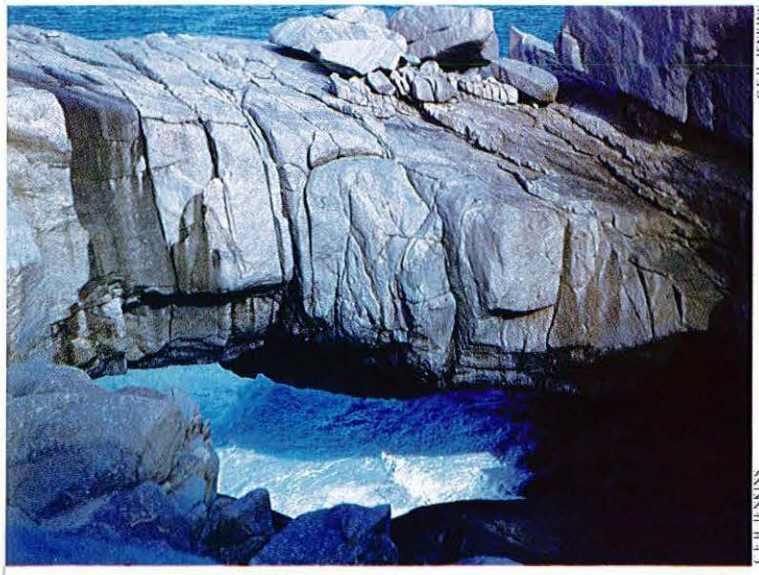
Australian Sea Lion

W.A. FORESTS DEPARTMENT

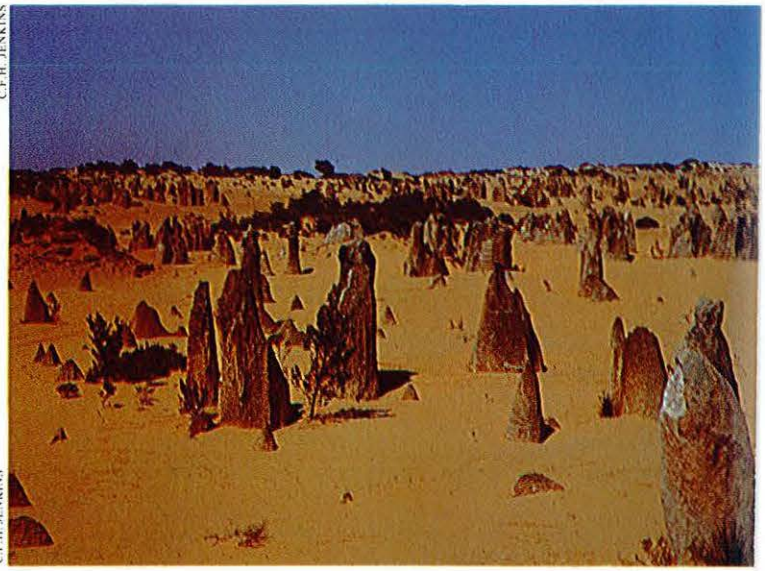



Tunnel Creek


Hamersley Gorge

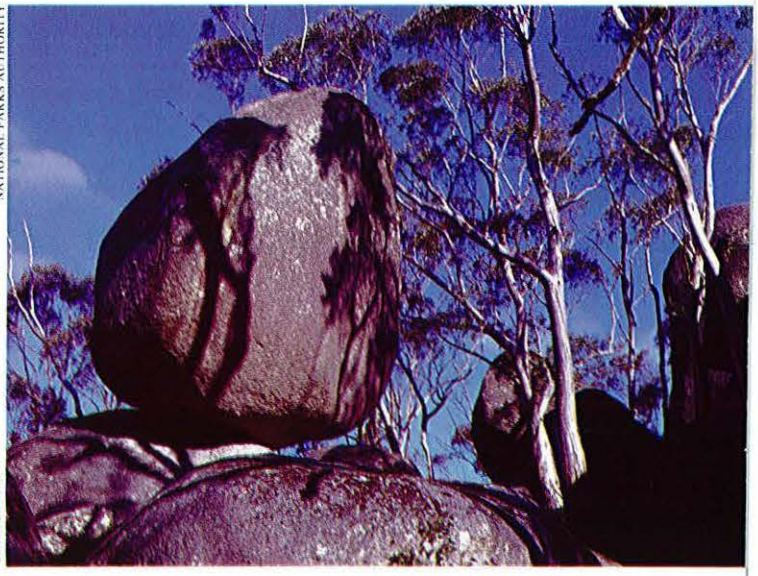



Natural Bridge, Torndirrup National Park




Pinnacles, Nambung National Park


Limestone formations, Nambung National Park




Balancing Rock, Porongorup National Park

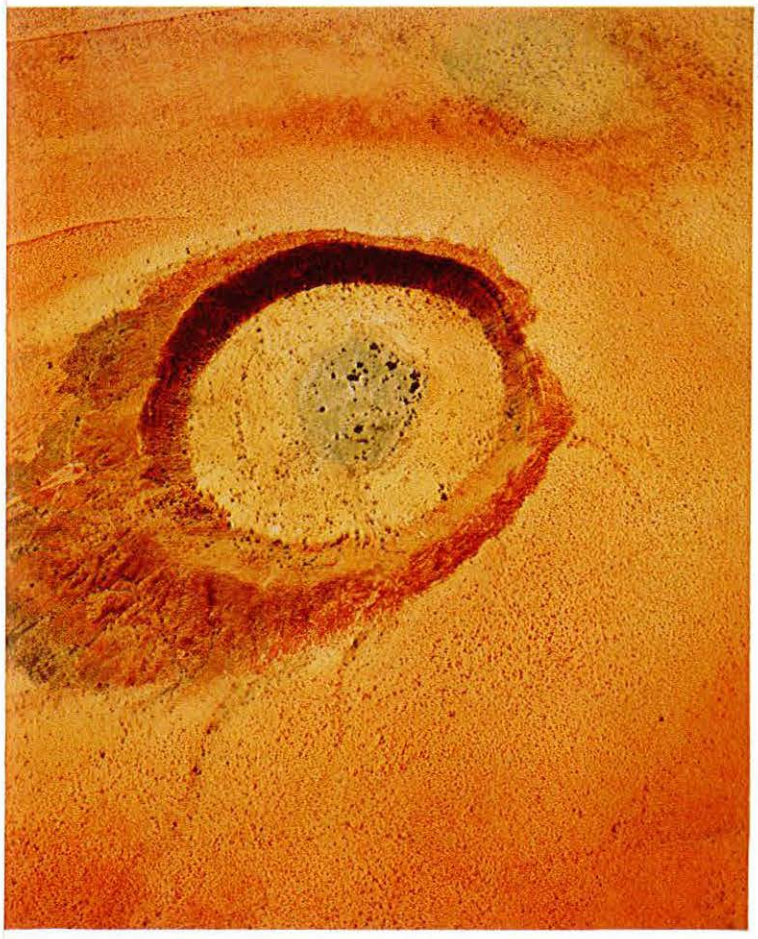
Fossil Tracks of Marine Scorpion (Eurypterid) Kalbarri National Park
*(see match box in foreground for scale)*

C.F.H. JENKINS

Murchison Gorge, Kalbarri National Park

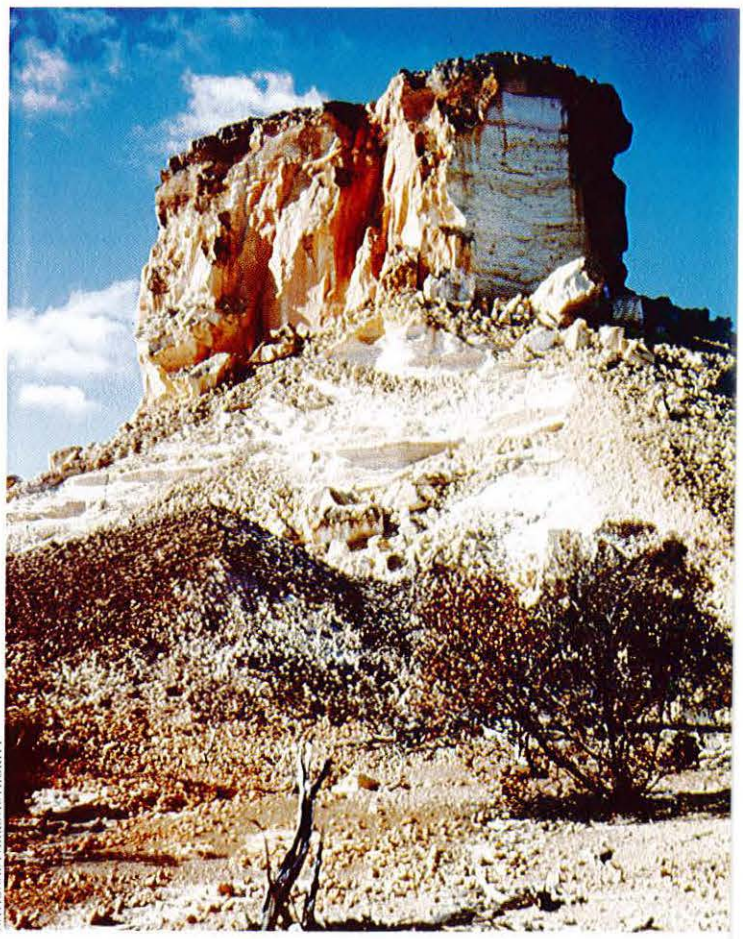
R.F. MAY

Yardie Creek, Cape Range National Park



A.S. GEORGE

Wolf Creek Crater



NATIONAL PARKS AUTHORITY

Roe's Rock, Fitzgerald River National Park

R.F. MAY

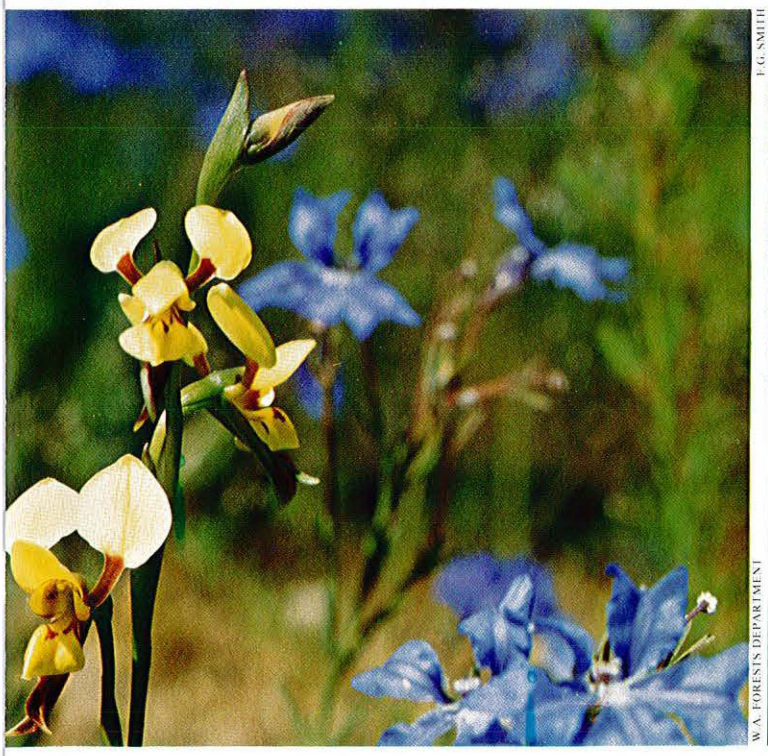
Waterfall, Quininup Brook, Leeuwin — Naturaliste Ridge National Park

F.G. SMITH

Paper barks, Millstream National Park

F.G. SMITH

Crossing Pool Millstream National Park



W.A. FORESTS DEPARTMENT

Donkey Orchid

F.G. SMITH

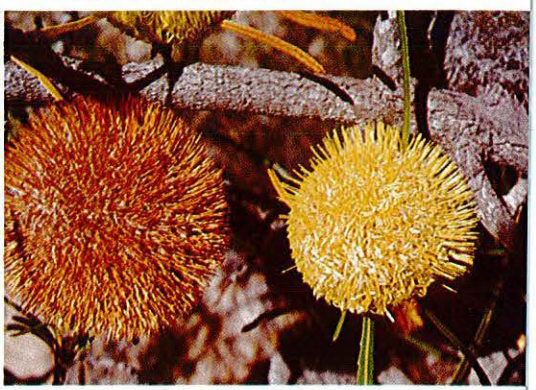
Crystal Pool Millstream

NATIONAL PARKS AUTHORITY

Hanging Cone Flower
(*Darwinia meeboldii*)

A.G. WELLS

Blue Leschenaultia



A.S. GEORGE

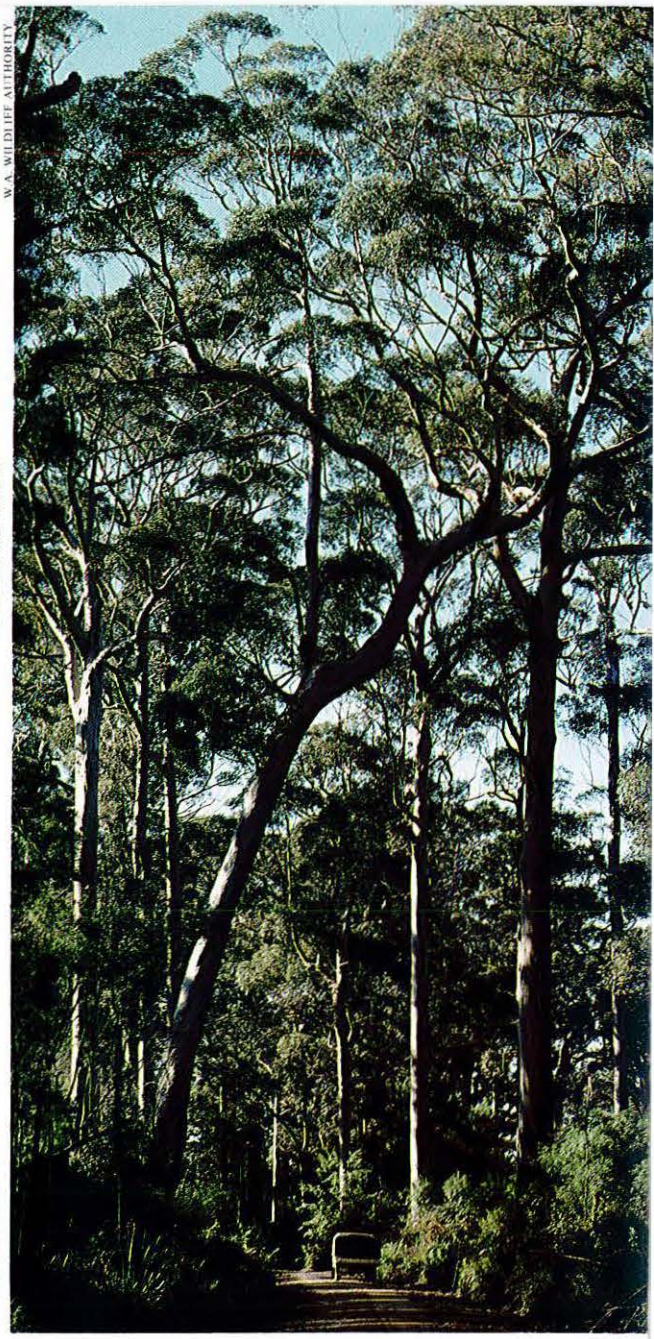
*Banksia laevigata laevigata*

W.A. FORESTS DEPARTMENT

Quokka

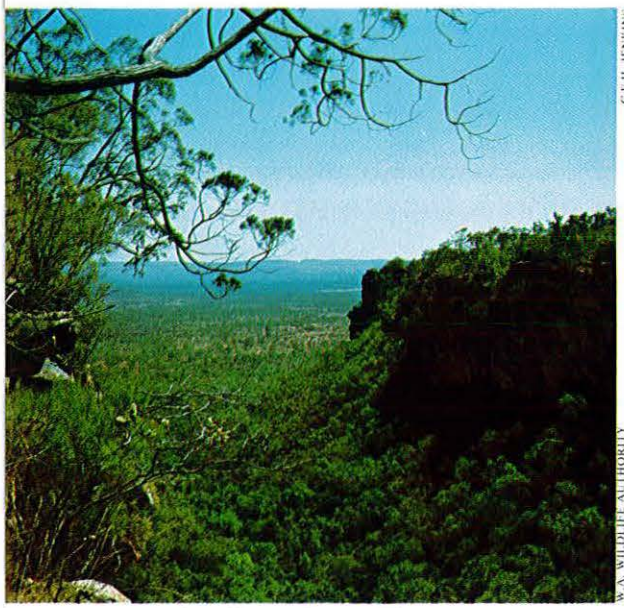
W.A. FORESTS DEPARTMENT

Echidna



W.A. WILDLIFE AUTHORITY

Drysdale River National Park



W.A. WILDLIFE AUTHORITY

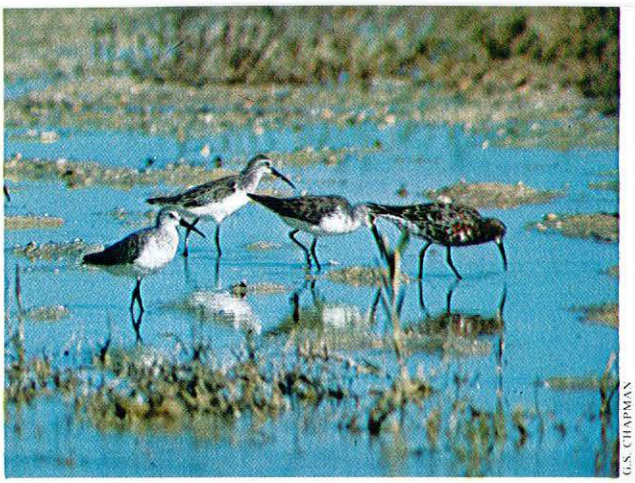
Glider Gorge, Carson River

C.F.H. JENKINS

Serpentine Falls in flood

R. GARSTONE

Black Swan



G.S. CHAPMAN

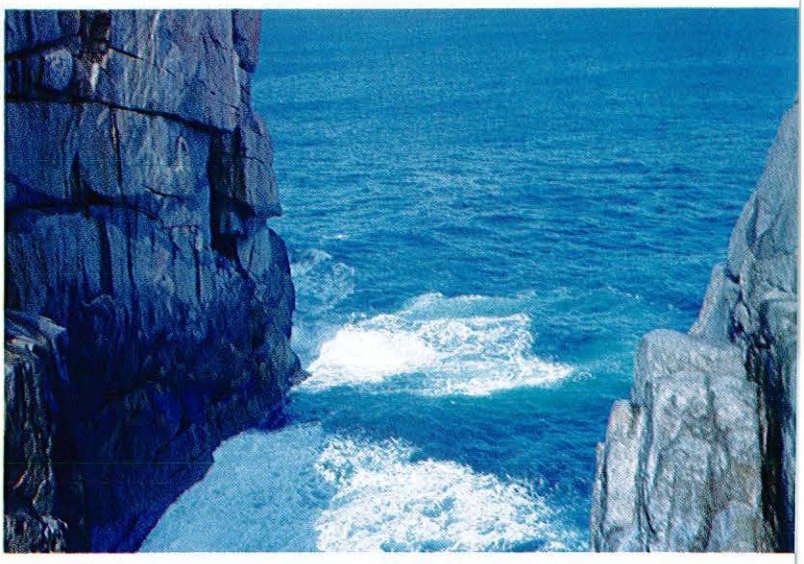
Curlew Sandpipers

R. GARSTONE

White-faced Heron

R. GARSTONE

Crested Grebe



C.F.H. JENKINS

The Gap, Torndirrup National Park

NATIONAL PARKS AUTHORITY

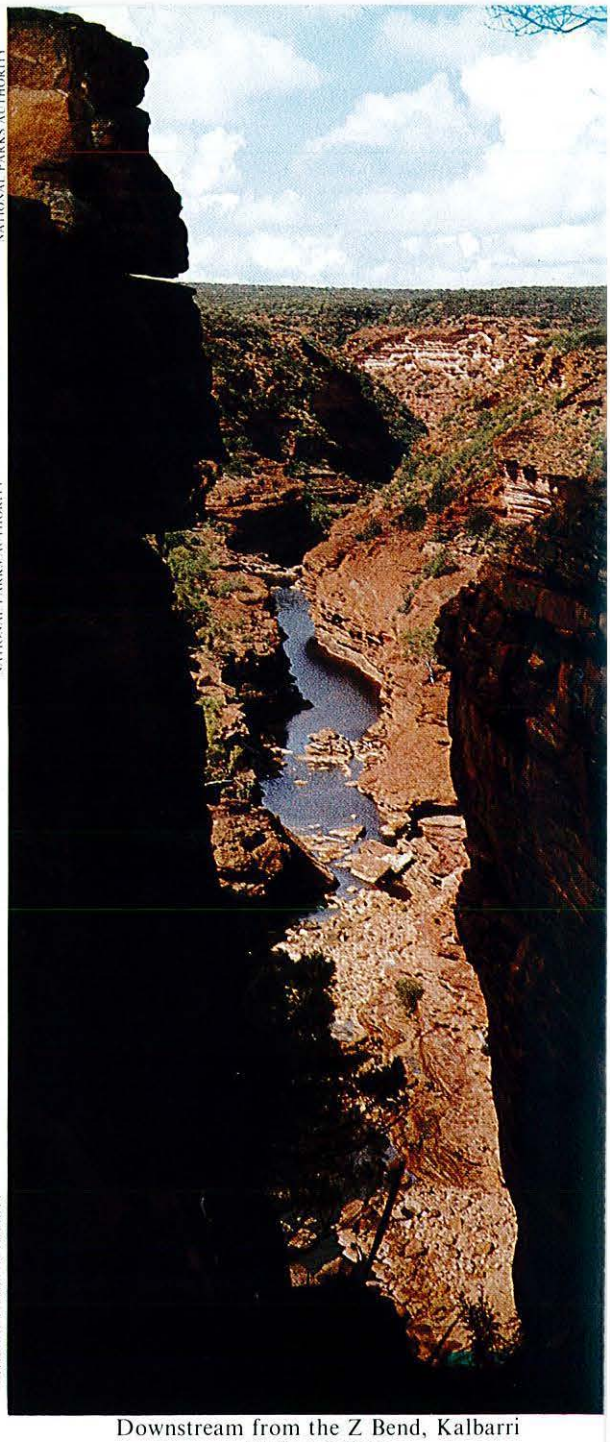
Mandalay Beach, Walpole-Nornalup National Park

A.S. GEORGE

East Mt. Barren from Culham Inlet

Crystal Cave, Yanchep National Park

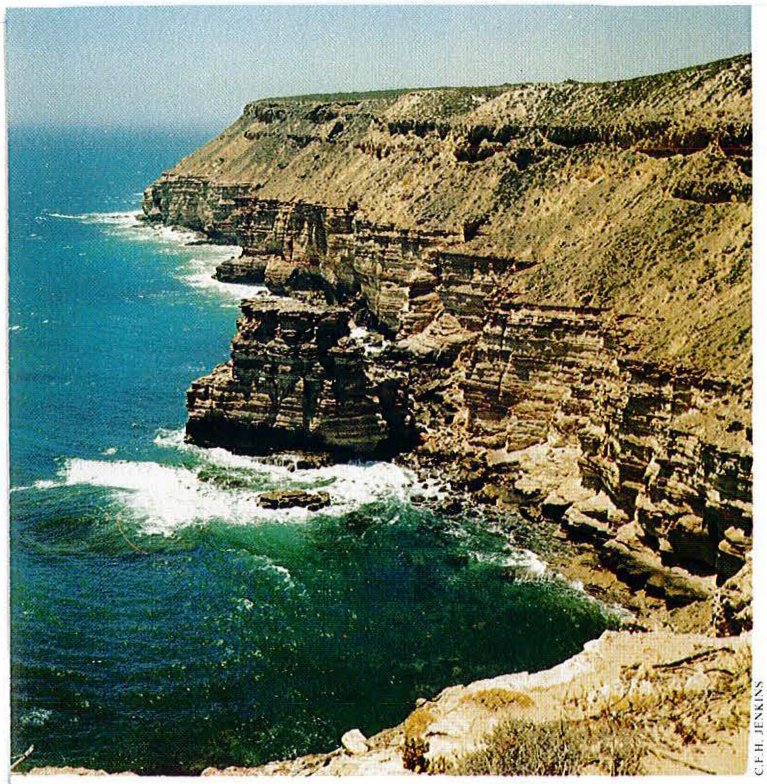
Elephant's Foot, Crystal Cave, Yanchep National Park



Downstream from the Z Bend, Kalbarri National Park

Thumb Peak from Middle Mt. Barren

View from Middle Mt. Barren, Fitzgerald River National Park



C.F.H. JENKINS

Coastal Cliffs, Kalbarri National Park

A.N. GEORGE

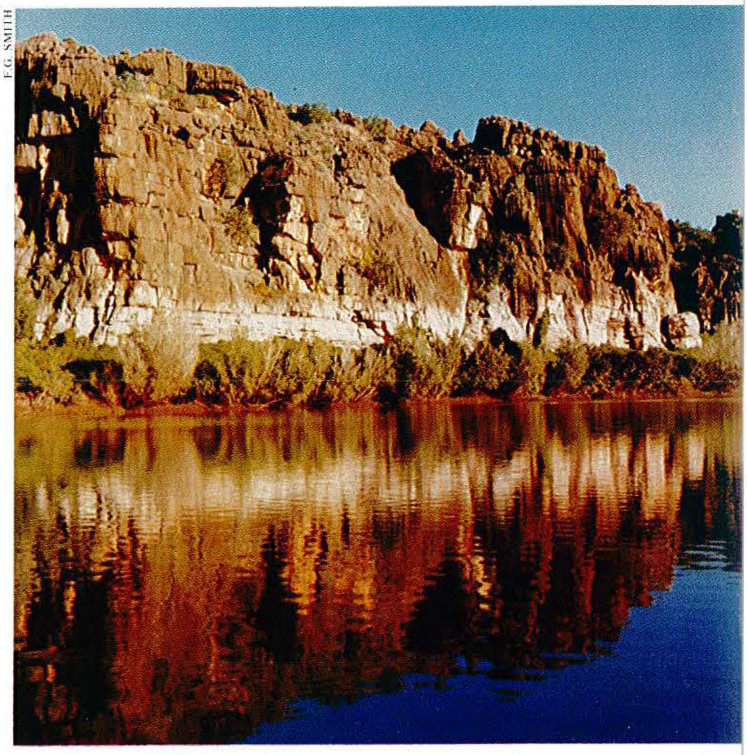
Coast East of Thumb Peak, Fitzgerald River National Park

C.F.H. JENKINS

Cape Range National Park

F.G. SMITH

Hamersley Range from the air

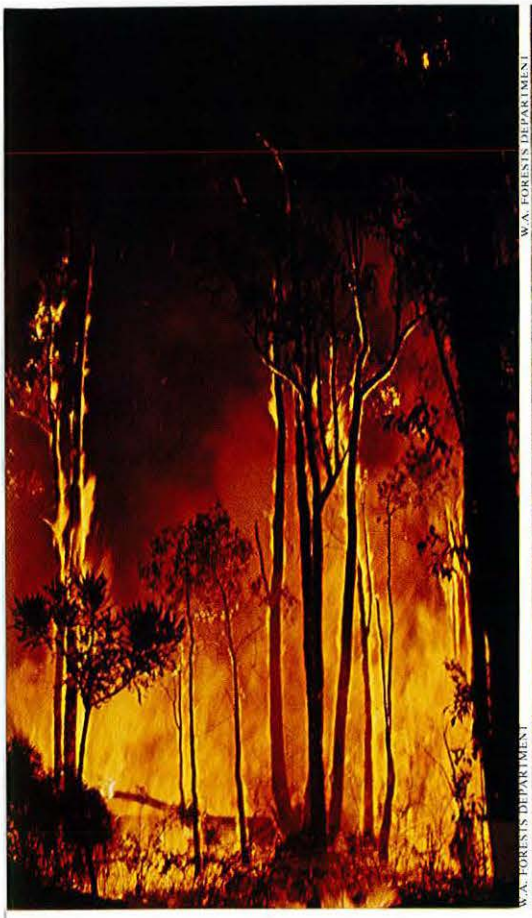


F.G. SMITH

Geikie Gorge, Fitzroy River

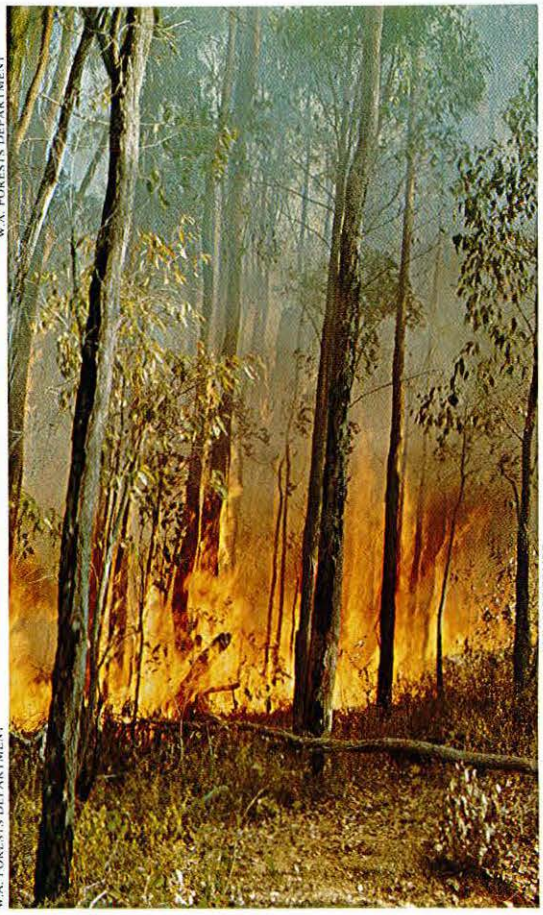
F.G. SMITH

Windjana Gorge



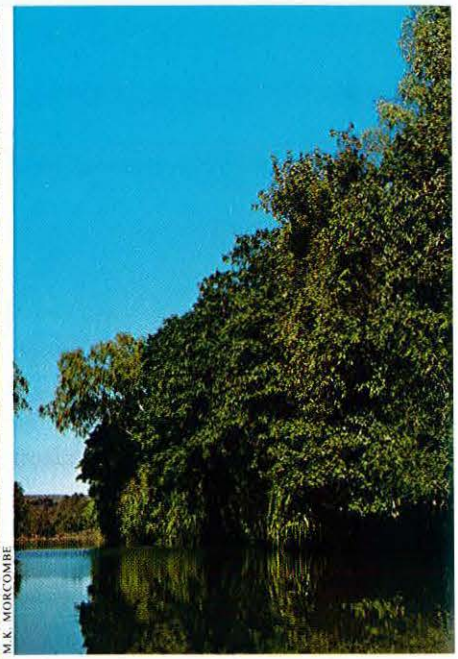
W.A. FORESTS DEPARTMENT

A "Hot" Bushfire can do serious damage



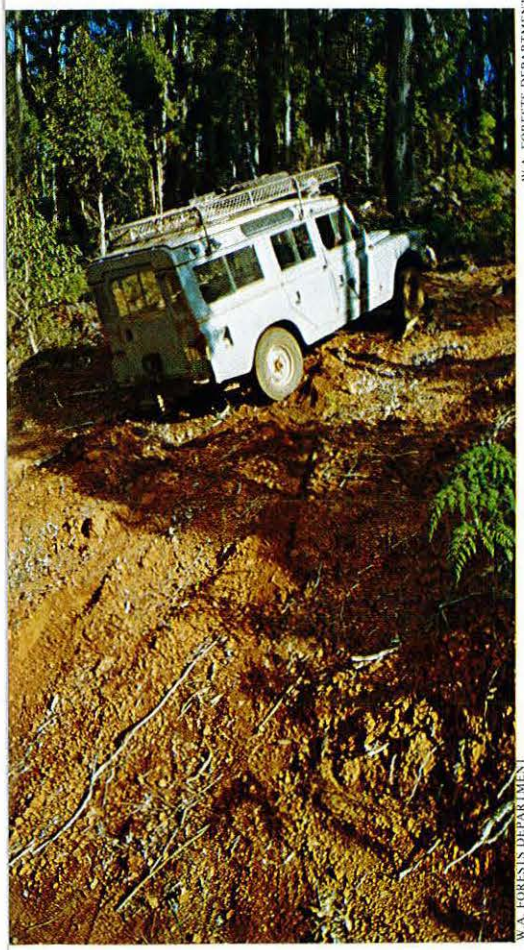
W.A. FORESTS DEPARTMENT

A "Cool" Fire can be used as a management tool



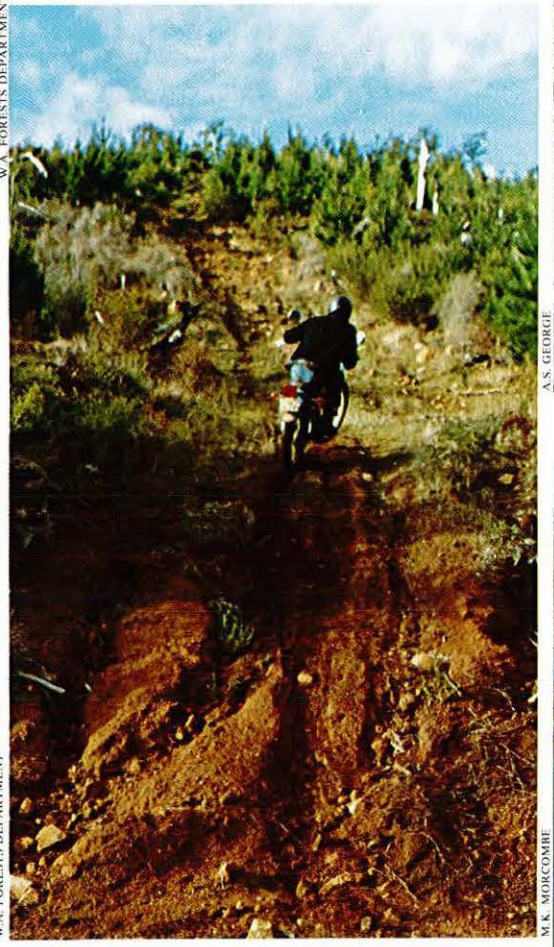
M.K. MORCOMBE

Fringing Jungle on the Carson River



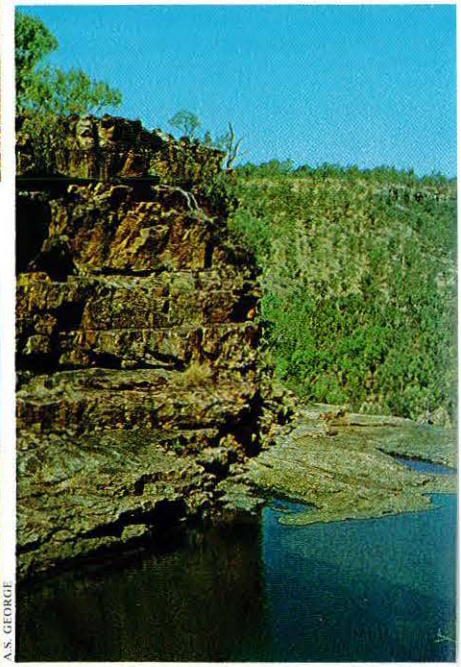
W.A. FORESTS DEPARTMENT

Off Road Vehicles can damage the environment



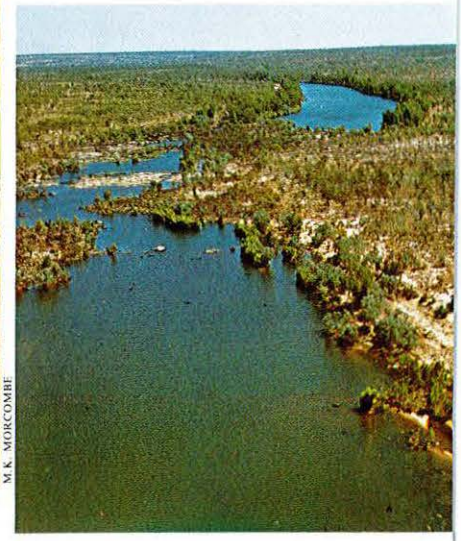
W.A. FORESTS DEPARTMENT

Trail Bikes can penetrate and damage "Wilderness" areas



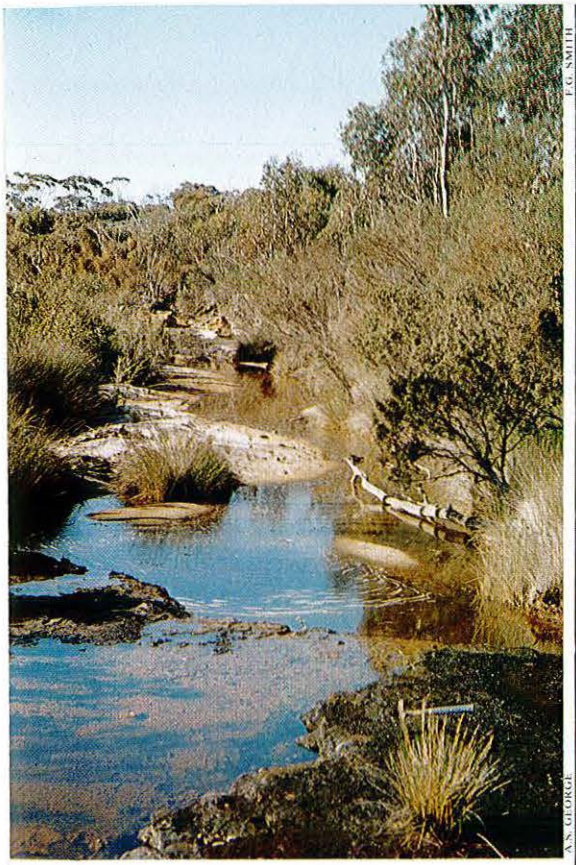
A.S. GEORGE

Looking East from Morgan Falls, Drysdale River National Park



M.K. MORCOMBE

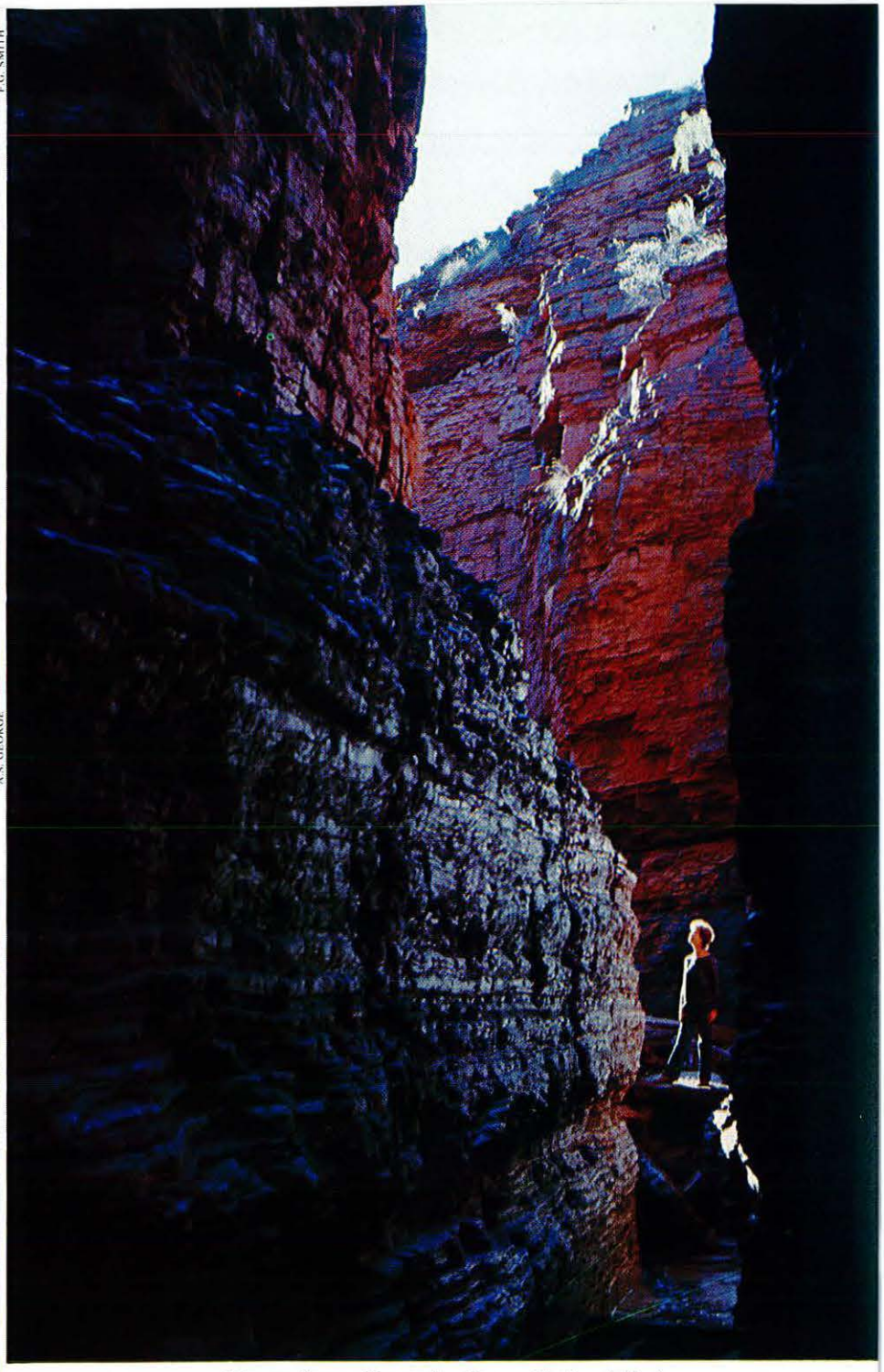
Aerial View, Drysdale River



P. G. SMITH

A.S. GEORGE

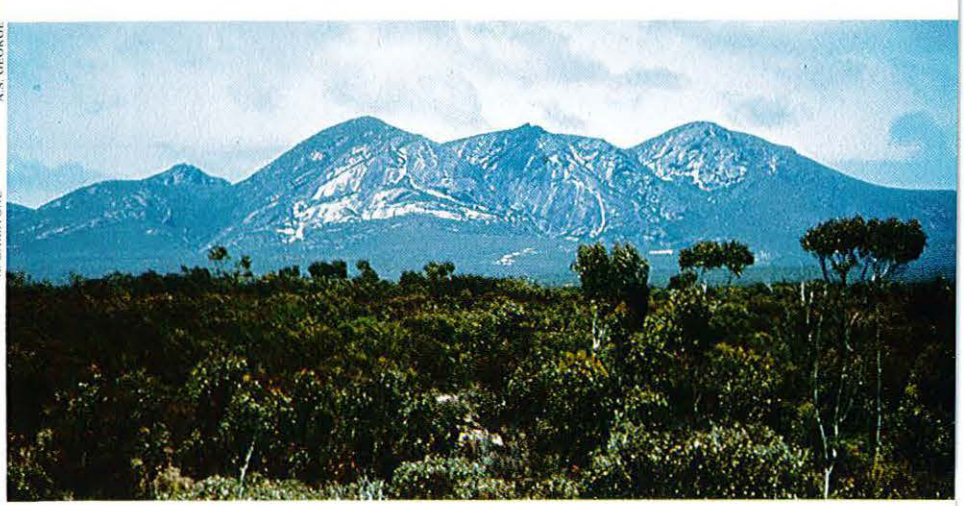
Fitzgerald River with exposed Coal Seam



Weano Gorge Hamersley Range National Park

R. GARSTONE

Nankeen Night Heron



A.S. GEORGE

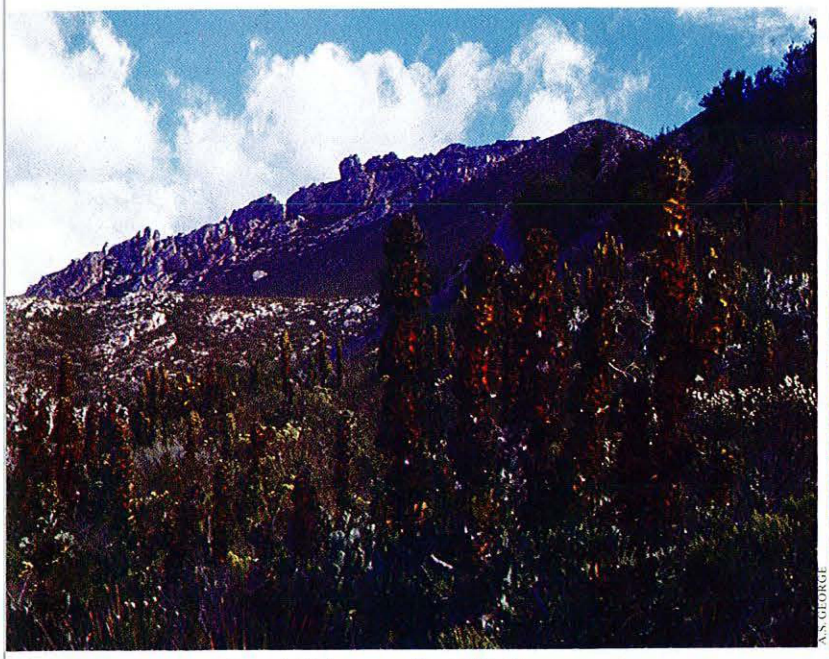
Whoogarup Range, Fitzgerald River National Park

C.F.H. JENKINS

Yellow Everlastings

W.A. WILDLIFE AUTHORITY

Tall Trees along Forest Creek, Drysdale River National Park



A.S. GLOAGUE

Royal Hakeas on East Mt. Barren

M.K. MORCOMBE

Aerial View along Carson Escarpment

A.G. WELLS

Pandanus Palms, Kimberley

M.K. MORCOMBE

Aerial View Petrogale Gorge, Drysdale River National Park

A.G. WELLS

Red-tailed Tropic Bird

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Purple-crowned Lorrikeet

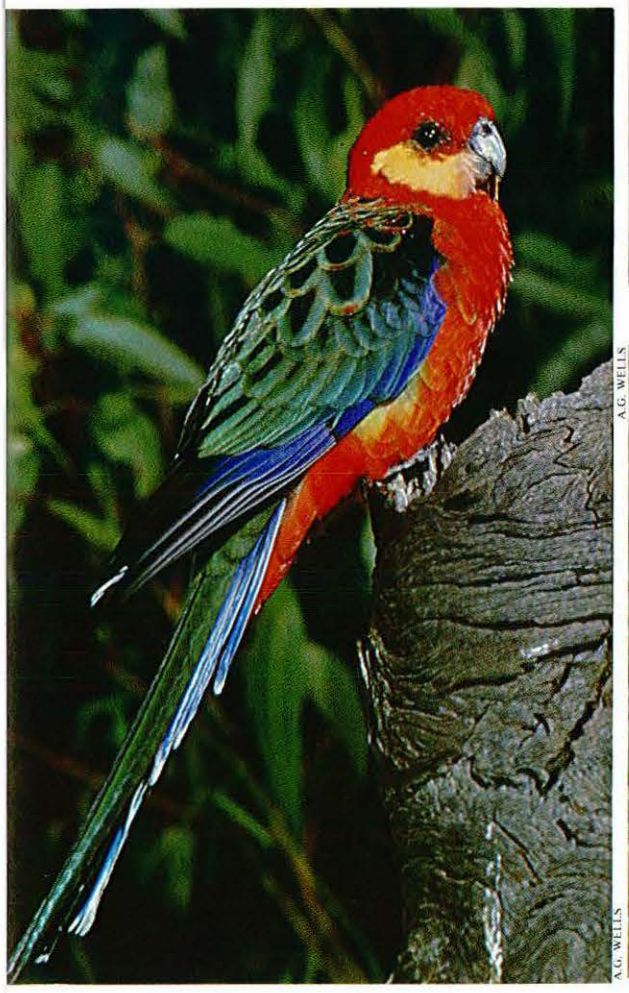

Red-winged Wren


New-Holland Honeyeater

Splendid Blue Wren

Spotted Bower Bird

Painted Finch



Western Rosella

Red-plumed Pigeon

Flower Spider on Eucalyptus Blossom

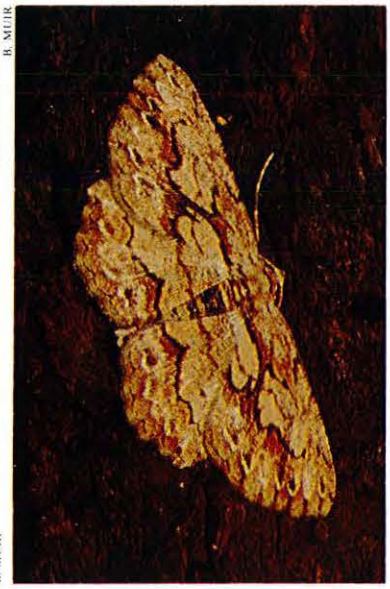

Paper Wasps at Nest


Grasshopper

Wood Gecko


Smooth Knob-tailed Gecko


Young Crusader Bugs hatching from string of eggs




A Geometrid Moth


Red-backed Spider (female)


A Looper or Geometrid Caterpillar

The first settler in the area seems to have been Mr H. White who took up grazing land in 1901 and erected a house on the site which is now occupied by the McNess Guest House.

The area was gazetted as a reserve for the protection of caves and flora and fauna and for a health and pleasure resort in 1905, but little development occurred for another 20 years. During the depression period of the 1930's sustenance workers were employed on road construction, the dredging of Lake Yanchep and the erection of residential facilities (McNess Guest House; Yanchep Inn and Gloucester Lodge). Much of the progress made during this time was due to the enterprise of Mr L.E. Shapcott (Secretary to the Premier's Department and Chairman of the State Gardens Board) and generous donations from philanthropist Sir Charles McNess, in whose honour Yanchep Lake was renamed.

**Loch McNess**

An important feature in the reserve is Loch McNess which runs almost due north and south for about five kilometres. It is one of a chain of fresh water lakes and swamps running roughly parallel to the coast and extending both north and south of Perth. Many of these areas are being encroached upon by agricultural development and some near the city are being filled, dredged or otherwise 'improved'. In consequence wildlife and particularly birds are being driven from their former haunts and the Yanchep lakes and swamps will assume greater importance as sanctuaries as time passes.

The southern end provides an expanse of open water suitable for boating and is attractive to various types of water fowl, including black swans, grey teal, black duck, white-eyed duck and the blue-billed duck.

Northwards the lake becomes gradually shallower and choked with reeds and bulrushes. These provide admirable nesting sites for such species as reed warblers, grassbirds, coots and moorhens. In late summer as the water subsides further, the shoals and mud flats provide feeding grounds for various migrants and waders, including the avocets with their long turned up bills, their long-legged relatives the white-headed stilts and the smaller stints and dotterels, known to many as 'snipe'.

**Native Animals**

Excluding the water birds, already mentioned under the heading 'Loch McNess' the most conspicuous birds at Yanchep are probably the ravens (usually known as crows) which come boldly to the picnic areas in search of food, and the white-tailed black cockatoos, which fly overhead in screeching mobs, or sit complaining to one another in the tops of the larger trees.

Honeyeaters of various types are plentiful, the largest and noisiest being the 'red wattler'. This bird has developed the unusual habit of stealing sugar from the outdoor tea tables. When flowering shrubs are scarce the birds are quite fearless so that sugar basins must be removed as soon as the guests depart. In common with the smaller honeyeaters the wattle bird tends the flowers of the various kangaroo paws and assists in cross-pollination.

Magpies, kookaburras and butcher birds are well established in the park and all compete with the ravens in scavenging for scraps of food. Unfortunately, however the kookaburras and butcher birds are partial to fledglings, captive canaries and budgerigars, and so terrorise many of the smaller birds both wild and captive.

Grey kangaroos *(Macropus fuliginosus)* are quite common at Yanchep and may be seen feeding on the ovals and golf links in the early morning or late evening.

Possums *(Trichosurus vulpecula)* are also present, but seldom seen because of their nocturnal habits.

Cave remains indicate that other mammals such as the chuditch or native cat *(Dasyurus geoffroii)*, the tammar *(Thylogale eugenii)* and the brush wallaby *(Macropus irma)* once ranged the area and it is probable that some of these still remain in the less frequented parts of the park.

No detailed survey of the lower animals has been attempted. The reptiles present include the brown snake or dugite *(Demansia nuchalis)* the bob-tailed lizard *(Trachysaurus rugosus)*, the ground goanna *(Varanus gouldii)* and the dark race-horse goanna *(Varanus tristis)* as well as various small lizards. The long-necked tortoise *(Chelodina oblonga)* is also present in the swamps.

Trout and marron *(Cherax tenuimanus)* were released in Loch McNess several years ago but it is doubtful whether any trout remain. The small gilgie *(C. quinquecarinatus)* is common.

**Timber and Wildflowers**

The main trees of the area are tuarts *(Eucalyptus gomphocephala)* (associated particularly with limestone and characterised by rough light coloured bark), marri or red gum *(E. calophylla)* — large seed capsules, dark flaky bark and red gum stains and jarrah *(E. marginata)* — small seed capsules and striated grey bark.

There are extensive areas of *Banksia* and scattered stands of sheoak *(Casuarina)*, blackboys or grass trees *(Xanthorrhoea)* and zamia palms *(Macrozamia riedlei)*. Some of the sand plains are covered with white flowered parrot bush *(Dryandra)* and much of the forest carries a floor covering of yellow flowered *Hibbertia* and prickly wattle *(Acacia)*. Profuse trails of purple sarsaparilla *(Hardenbergia)* and white clematis twine amongst the yellow wattles and provide a colourful display each spring. The purple *Hovea*, heliotrope and white *Hibiscus* and the red trailing *Kennedya* are additional species which never fail to arouse the admiration of the visitor.

The large red and green kangaroo paw *(Anigosanthos manglesii)* — the official floral emblem of the State — grows in profusion throughout the park in company with the smaller catspaw *(A. humilis)*.

The red pea-shaped flowers of the *Templetonia* are a spring attraction on coastal dunes and limestone ridges and provide nectar for various flower-hunting birds.

**Caves**

The coastal limestone which outcrops at Yanchep beach and is exposed in several areas within the park — particularly in Boomerang Gorge — has permitted the formation of an extensive cave system within the reserve.

Crystal Cave shows fine examples of active stalactites (hanging from ceiling) and stalagmites (rising from floor) and provides beautiful reflections in the main grotto where an underground stream occupies most of the floor.

Yonderup Cave presents an interesting contrast to the Crystal Cave for water action has ceased and the limestone formations lack the translucent lustre of the 'live' stone.

The Cabaret or Silver Stocking Cave is a very extensive grotto which formerly provided a unique setting for dances, music recitals and other social functions. However, it was closed following some earth movement. Many other caves occur in the area and two — Mambibby and Cauliflower — were once open to the public, but because of earth subsidence they were closed for safety reasons.

**Cave Fauna**

Pale coloured (but not blind) gilgies live in the underground waters of the caves and the bones of aborigines and native mammals have been found in several grottos. In addition to the remains of such animals as the grey kangaroo, the brush, the tammar, the dalgyte *(Macrotis lagotis),* the boodie *(Bettongia lesueuri)* and the chuditch, or native cat *(Dasyurus geoffroii),* the caves contained bones of the Tasmanian devil *(Sarcophilus harrisii)* and the ghost bat *(Macroderma gigas)* which now haunts the caves of the north and the dry interior. The Tasmanian devil is extinct on the Australian mainland but, like the koala *(Phascolarctos cinereus)* and the Tasmanian wolf *(Thylacinus cyanocephalus)* it was once a resident in our South-West.

## Display of Australian Wildlife

**Koalas**

Although koalas became extinct in Western Australia long before the coming of the white man a colony of the Eastern States populations has been kept at Yanchep since 1938. Breeding stock has been obtained from Queensland and Victoria on several occasions and thousands of selected eucalypt trees have been planted to provide suitable food.

The flooded gum *(Eucalyptus rudis)* forms the staple diet, but because of clearing in the district and spasmodic damage by lerp insects and leaf miners, foraging parties need to go many kilometres to keep up the food supply.

One koala usually eats more than half a kilogram of leaves each day, but as the animals are very discriminating feeders more than double this quantity, including a selection of species, must be offered to ensure that each animal can choose an adequate meal.

**Kangaroos**

Although common in the park, grey kangaroos are seldom seen by daytime visitors and for this reason several animals with related species are displayed in an almost natural setting near the wildflower beds.

Emus also survive in the back areas of the park, but most visitors are content to view the captive birds which occupy and breed in a compound near the kangaroos.

**Flight Cages**

Australian parrots are housed in several large aviaries which ensure the birds ample flight space and breeding facilities.

A parrot of particular interest is the western king parrot or red-capped parrot of the South-West. The long thin bill of this bird is especially adapted for extracting the seeds from the large woody capsules of the marri or red gum and although it eats other vegetable food, including fruit, its association with the marri probably explains the bird's restricted range.

**Wildflower Gardens**

Extensive wildflower plots comprising several hundred species are cultivated in the park both as an attraction for visitors and to conserve some of the rare species which are threatened by the spread of agriculture. The finest floral displays are of course to be seen in the spring but some species bloom at almost any month of the year and so the wildflower beds are a continual source of interest.

**Birds**

The first published account of the birds of Yanchep was from the pen of A.W. Milligan, honorary consulting ornithologist to the Western Australian Museum. He visited the area in 1903 and drew attention to the abundance of ducks, wild turkeys and emus. Water fowl of various types are still quite plentiful, but unfortunately the turkeys (bustards) and emus are now rarities.

The following list is by no means complete but indicates the variety of birds which may be seen at large either in the park, on the adjacent beach reserve and in many other parts of the South-West.

Emu: Wild emus *(Dromaius novaehollandiae)* may still be seen in the park but they are rare and quite shy.

Grebes: The little grebe *(Podiceps novaehollandiae),* often known as a dabchick or diver is the commonest species of this group in the park and can usually be seen on Loch McNess.

Pelicans: The Australian pelican *(Pelecanus conspicillatus)* is a frequent visitor to the Loch particularly during the summer months.

Cormorants: Several species of cormorants or shags may be seen both on the swamps and the rocky sea-shore.

Egrets and Herons: The only species of egret likely to occur in the park is the white egret *(Egretta alba)* which can often be seen perched in a dead tree or quietly fishing in the shallows. Its general habits are comparable with those of the white-fronted heron or blue crane *(Ardea novaehollandiae)* with which it is often associated.

The nankeen night-heron *(Nycticorax caledonicus)* has bright chestnut upper parts and is white beneath. In the breeding plumage the head carries three delicate white plumes. The birds are active mainly in the evening and spend the day in dense pine trees near the office. They also breed in these trees.

Swans: Black swans *(Cygnus atratus)* have been successfully tamed on Loch McNess where they breed and come readily to food.

Ducks: Several species of ducks visit the Loch including the black duck *(Anas superciliosa),* the grey teal *(A. gibberifrons),* the blue-winged shoveller *(A. rhynchotis),* and the blue-billed duck *(Oxyura australis).* This bird is an adept diver and is distinguished by its chestnut plumage and bright blue bill. The musk duck *(Biziura lobata)* is another common species. The male appears jet black and is larger than the female with a leathery pouch under the bill. When mating the drake paddles in circles

kicking up the water in spurts on either side of the body and uttering a high pitched 'plonk plonk'.

Hawks: Several species of hawks inhabit the park, including the kestrel *(Falco cenchroides)* the brown hawk *(F. berigora)* and the goshawk or chicken hawk *(Accipiter fasciatus)*. Most of our local hawks are useful vermin destroyers but the goshawk may rob chicken runs and pigeon lofts.

Rails and Waterhens: The swamps provide ample cover for several types of rails and waterhens but because of their retiring habits many are seldom seen by the casual visitor. The western swamphen *(Porphyrio bellus)* with its massive red bill and purple plumage is a handsome bird as it grazes on the margin of swamps. The dusky moorhen *(Gallinula tenebrosa)* with its reddish bill is distinguished from the equally common Australian coot *(Fulica atra)* as the latter has a conspicuous white shield on the bill.

Waders: Banded plovers may be seen on open ground in the park and the mud flats of the swamps attract such migrants as the little stint *(Erolia ruficollis)*, the wood sandpiper *(Tringa glareola)* and the greenshank *(Tringa nebularia)*. These all leave in the autumn to breed in the northern hemisphere. Interesting relatives which remain in Australia and are often present in the reserve are the white-headed stilt *(Himantopus himantopus)* with its black and white plumage and long pink legs and the avocet *(Recurvirostra novaehollandiae)* with its chestnut head and neck and long upturned bill.

Gulls and Terns: The silver gull *(Larus novaehollandiae)* is plentiful on the coast and associates with the equally common crested tern *(Sterna bergii)* distinguished by its black cap, forked tail and pointed wings. The larger caspian tern *(Hydroprogne caspia)* is easily identified by its bright red bill.

Parrots: The commonest parrots in the area include the twentyeight *(Barnardius zonarius)* and the red-capped parrot or king parrot *(Purpureicephalus spurius)*. Flocks of purple-crowned lorikeets *(Glossopsitta porphyrocephala)* screech in the tree tops when the eucalypts are in flower but are not permanent residents in the park. The noisiest birds in the park are the white-tailed black cockatoos *(Calyptorhynchus baudinii)* which are sometimes present in large flocks. Describing these birds at Yanchep in 1903 the late A.W. Milligan wrote, 'One flock of the latter I estimated at 2,000 birds. Their querulous voices became, after a time, most irritating.'

This species of cockatoo is found only in south-western Australia and is widely distributed throughout the forest areas. Its normal diet consists of wood boring insects and native seeds but unfortunately it has developed a liking for pine cones.

Cuckoos: Several species of these parasitic and migratory birds may be found at Yanchep. The notes of the pallid cuckoo *(Cuculus pallidus)* as it goes up the scale are a feature of the spring and the calls of the bronze cuckoo are also common.

Owls: Because of their nocturnal habits owls are seldom seen but the call of the boobook owl *(Ninox novaeseelandiae)* can be heard almost any night in the spring.

Frogmouths and Nightjars: The tawny frogmouth *(Podargus strigoides)* is popularly believed to make the call 'mopoke' from which its common name is derived. The 'mopoke' or 'boobook' call is however made by the boobook owl. The frogmouth produces a low 'oom oom' which may be imitated by blowing through a comb.

Kingfishers: The commonest member of this group is the kookaburra *(Dacelo gigas)*, which was introduced into Western Australia from the Eastern States about the turn of the century. The small sacred kingfisher *(Halcyon sanctus)* with its greenish back, pinkish underparts may often be seen near Loch McNess.

Bee-eater: The bee-eater, golden swallow or gold digger *(Merops ornatus)* is one of the most beautiful birds to visit and breed in the park. The eggs are laid at the end of a long tunnel drilled into a sandy slope. The birds feed upon a wide variety of insects including wasps and bees. When eating bees the birds take special care to avoid being stung.

Swallows and Martins: The welcome swallow *(Hirundo neoxena)* is common in the park, so also is the smaller tree martin *(Hylochelidon nigricans)* which can be distinguished from the swallow by its smaller size, white rump and less deeply forked tail. It nests in hollow tree spouts.

Richards (Australian) Pipit: The ground lark or pipit *(Anthus novaeseelandiae)* is common on open areas and although it spends much of its time on the ground and nests at the base of a tuft of grass it may often be seen perching high on a dead tree.

Black-faced Cuckoo Shrike: The cuckoo shrike or blue pigeon *(Coracina novaehollandiae)* is distinguished by its blue-grey plumage and black face. It is a useful bird feeding on various types of hairy caterpillars and sawfly grubs which are destructive to eucalypt foliage.

Warblers: The little grass bird *(Megalurus gramineus)* is seldom seen, but its mournful notes can sometimes be heard in the thick reedy growth of the swamps. The reed warbler *(Acrocephalus stentoreus)* is also seldom seen but its rich melodious song can often be heard coming from dense masses of reeds. It breeds in the swamps, attaching its nest to the upright stalks of several reeds.

The brown and rufous song larks *(Cinclorhamphus)* may be found in the open grassy areas of the park and in adjacent grazing country.

Wrens: The banded blue wren *(Malurus splendens)* is one of the most beautiful birds to be found in the Australian bush. Parties consisting of fully plumaged blue males and sombre females and young, can be seen in many parts of the park. The blue and white wren *(M. leuconotus)* may also occur in the low scrub plain near the coast.

The White-tailed or Western Warbler: This tiny bird *(Gerygone fusca)* may often be seen hovering amongst the foliage of the gum trees where it feeds upon numerous insects. It can be identified by the line of spots which show conspicuously as the tail is fanned in flight and also by its high pitched disjointed song, which has earned the bird the popular name of sleepy dick.

Thornbills or Tits: The broad-tailed thornbill *(Acanthiza*

*apicalis)* is one of the commonest of the small birds to be found in the bush, it is characterised by its striped chest, cocked up tail and harsh chattering call. The yellow-rumped thornbill *(A. chrysorrhoa)* is distinguished by the canary yellow rump and light spots on the forehead. The spotted scrub-wren *(Sericornis maculatas)* inhabits the denser thickets and can be identified by the white stripe over the eye, the dark stripes on the chest and its harsh scolding notes.

Robins: The commonest robin of the coastal plain is the scarlet robin *(Petroica multicolor).* The male has a brilliant red breast, the female a much paler one, both have a white mark on the forehead.

The white-breasted robin *(Eopsaltria georgiana)* has not been seen at Yanchep for many years, but it was recorded by Milligan in 1903. This robin is most commonly met with in the dense thickets of the lower south-west, but may still survive in some of the thick cover available near Yanchep.

Fantails: The willie wagtail *(Rhipidura leucophrys)* is common in the park so also is a lesser known relative the grey fantail *(R. flabellifera)* which is smaller and duller in colour. The nest of the grey fantail is a delicate cupshaped structure of grass and cobwebs with a prominent tail and so resembles somewhat a wine-glass with the base removed from the stem.

Whistlers and Shrike Thrushes: The commonest member of this group is the rufous whistler *(Pachycephala rufiventris)* whose reddish brown breast and white throat give the male bird a very attractive appearance. Its loud ringing notes of 'Joey Joey', often repeated, are characteristic of the spring.

The western shrike thrush *(Colluricincla rufiventris)* is a rather drab coloured bird about the size of a small dove, but the rich clear call makes the thrush one of our most accomplished song birds.

Flower Peckers and Diamond Birds: One of the smallest and most brilliantly coloured Australian birds is the mistletoe bird or flower pecker *(Dicaeum hirundinaceum).* The male has steely black upper parts and a brilliant red throat, breast and rump. It feeds upon mistletoe berries and is instrumental in spreading the parasite from tree to tree.

Two species of diamond birds may be seen, the spotted diamond bird *(Pardalotus punctatus)* and the red-tipped diamond bird *(P. substriatus).* Both are tiny species which frequent the leafy tops of the gum trees and keep constantly on the move in search of insects. Both are brightly coloured with scattered white spots, a yellow throat and red and brown markings. The spotted species tunnels into the side of a bank to construct its grass nest while the red-tipped species (so named from a red spot on the wing) uses a hollow tree spout.

Silvereyes: The common silvereye *(Zosterops gouldi)* is common throughout the park.

Honeyeaters: Honeyeaters are amongst the most characteristic and specialised of Australian birds. The long curved bill and brush-tipped tongue are a special adaptation to assist birds in taking nectar and insects from native flowers and in some instances the birds repay their hosts by carrying pollen from one bloom to another.

The largest and noisiest honeyeaters seen in the park are the wattle birds. The red wattle bird *(Anthochaera carunculata),* so called because of the red fleshy wattle on the side of the head, is about the size of a small dove and has a hoarse coughing note. In company with the little wattle bird *(A. chrysoptera)* it is a frequent visitor to flowering plants, particularly banksias.

The smaller honeyeaters are represented by the brown honeyeater *(Lichmera indistincta),* which can be distinguished by its relatively long curved beak, small size, dull plumage and almost canary-like song. The singing honeyeater *(Meliphaga virescens)* is rather larger, greenish in colour, with a dark stripe through the eye. This species is common in surburban gardens. The new holland honeyeater *(Phylidonyris novaehollandiae)* frequents the flowering eucalypts and banksias. It is easily recognised by its black plumage, white face marks and yellow wing patches. All the honeyeaters mentioned may at times visit kangaroo paws and assist in cross-pollination.

Magpie Larks: The magpie lark *(Grallina cyanoleuca)* is a rather long-legged black and white bird which is quite common in the park. With the exception of the swallow and fairy martin the magpie lark is the only mud builder found in Western Australia and the characteristic bowl-shaped nests may often be seen on a horizontal limb, near water.

Wood Swallows: The wood swallows are rather plump dark coloured birds with broad sail-like wings and squarish tails. The commonest species at Yanchep is the black-faced wood swallow *(Artamus cinereus).* Like the true swallows the wood swallows are insect eaters, but build cup-shaped nests of grass which may be placed on the stump of a broken off limb or even on the top of a stook of hay.

Magpies, Squeakers and Butcher Birds: The squeaker or bell magpie *(Strepera versicolor)* is not common at Yanchep but its loud clanging call can sometimes be heard. The bird is about the size of a crow, but dark grey in colour, with a white mark on the wing, which is quite conspicuous as the bird flies.

The grey butcher bird *(Cracticus torquatus)* is one of the finest songsters in the Australian bush, and unlike many local birds it calls strongly in the spring and autumn. The butcher bird feeds on lizards, insects and small birds and may impale food on sharp thorns or wedge it into bark or the fork of a tree for later attention. Unfortunately this bird will sometimes rob aviaries.

The western magpie *(Gymnorhina dorsalis)* is one of our commonest and best known birds, but few people realise that the Western Australian bird differs from the species found in eastern Australia. In eastern Australia two species occur — the white-backed magpie (male and female have white backs) and the black-backed magpie (both male and female have black backs).

In the western magpie the males have a white back and the females and immature birds have black or dark mottled backs.

Crows and Ravens: The so-called crow, which is a common scavenger at all the picnic spots at Yanchep, is really a raven *(Corvus coronoides).* The raven can be

distinguished from the true crow *(C. orru)*, which occurs further north, by the fact that the throat feathers or hackles are longer in the raven and that the bases of the body feathers are dusky in the raven and white in the crow.

Both the crow and the raven have a bad reputation with farmers and pastoralists as the birds have the cruel habit of picking the eyes from weakly lambs and sheep and also steal eggs. On the credit side however, it must be remembered that they are useful scavengers and that they destroy many harmful insects.

**Flora***

'The flora of Yanchep National Park is typical of large areas of coastal plain to the north of Perth, and it contains unspoilt examples of most of the vegetation types to be found along the west coast. It is an area in which the tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* are the principal tree species. Here they are associated with a characteristic set of smaller trees and shrubs, and together they occupy a large part of the western section of the park.

There is in addition a considerable extent of heath vegetation, mainly in the northern and eastern sections. Here the large eucalypts are missing, and they are replaced by the smaller gnarled coastal blackbutt *(Eucalyptus todtiana)* and by species of banksia. The lakes and swamps which stretch in a chain almost the whole length of the park, support a characteristic suite of plant species, while the coastal areas carry a heath vegetation which is different from that of the eastern portion of the park.

Tuart Association: The tuart areas in the Yanchep National Park are characteristic of the northernmost section of its distribution. Here the typical forest of the Busselton-Bunbury area has lost its true character, and the tuart itself ceases to be the principal species. Jarrah and marri are just as common and in certain areas form pure stands to the exclusion of tuart. In addition the shrub layer is much more dense than it is in the true forest areas to the south, and consists of a larger number of species.

From the southern boundary of the park, the tuart forms an almost continuous band on both sides of the main road, invariably coinciding with the occurrence of outcropping limestone. It is particularly prominent in the vicinity of the developed area to the south of Loch McNess, and continues northwards as patches on both sides of the series of lakes and swamps as far as the northern boundary.

In a few isolated localities particularly to the west of the chain of swamps it occurs in an almost pure stand and with very little undergrowth, but for the greater part it is associated with a large number of shrubs. Bull banksia *(Banksia grandis)* is common particularly near the swamps, while Menzies banksia *(Banksia menziesii)* and narrow-leaved banksia *(Banksia attenuata)* occur widely. Blackboys *(Xanthorrhoea preissii)* and stinkwood *(Jacksonia* spp.*)* are prominent in the area, while in spring several species of wattle and the native buttercup *(Hibbertia hypericoides)* provide a golden mantle to the bush. Native wistaria *(Hardenbergia comptoniana)* with its masses of blue flowers, and the low bushy *Grevillea thelemanniana* with red flowers, add vivid splashes of colour, while the many smaller shrubs in season brighten the landscape with a multitude of different hues.

Jarrah-Marri Association: The jarrah occurs principally in the western half of the park, and is scattered amongst the tuart areas. It is usually associated with marri, and the two trees together form the characteristic tree layer of this association.

The smaller trees which are most numerous in the jarrah country are the three species of banksia, bull banksia, Menzies banksia and the narrow-leaved banksia. A few sheoaks *(Casuarina* spp.*)* are to be seen in isolated areas, while black wattle *(Acacia cyanophylla)* and stinkwood are locally abundant.

Zamia palm *(Macrozamia riedlei)* is characteristic of the area, and a number of rather large specimens are to be found in the northern portions of the reserve. Blackboys, native buttercup, cottonheads *(Conostylis candicans)*, candle spike hakea *(Hakea ruscifolia)*, pixie mops *(Petrophila linearis)*, and blue boy *(Stirlingia latifolia)*, occur throughout the jarrah belt, and are but a few of the numerous smaller shrubs. Native wistaria is common as a creeper covering tall shrubs, while scarlet runner *(Kennedya prostrata)*, couch dryandra *(Dryandra nivea)*, and grannies bonnets *(Isotropis cuneifolia)* are prominent among the ground flora.

Banksia Association: The banksia-scrub is in all respects intermediate in character between the scrub heath and the jarrah-marri areas. It occurs in both the stony limestone soils and in the sands, and is interspersed among the jarrah and tuart areas, extending eastwards to merge into the treeless scrub formation.

The Menzies and narrow-leaved banksias are the most abundant of the tree species in these areas, but there are also occasional specimens of Christmas tree *(Nuytsia floribunda)*, coastal blackbutt, a gnarled straggling eucalypt with a short trunk and dense drooping crown, sheoak and corkwood *(Gyrostemon ramulosus)*, a thick-barked tree with narrow bright green foliage, and pale coloured branches and branchlets.

The smaller shrubs are essentially those of the true scrub association, and like it, the banksia areas provide a wealth of flowers during the spring months.

Scrub Association: In the northern and eastern sections of the park are extensive areas of scrub on which there are no trees. The principal shrub is parrot bush *(Dryandra sessilis)*, a prickly leaved relative of the banksia, which bears yellowish or creamy coloured flowers clustered into heads among the leaves at the ends of the branchlets. Blackboy and the wattle commonly referred to as prickly moses *(Acacia pulchella)* occur in great abundance, while the yellow flowered native buttercup and the honey bush *(Hakea lissocarpha)* with its masses of sweetly scented white or pinkish flowers and prickly divided leaves, are also common.

The scrub association is particularly rich in species, and it is in these areas that the greatest variety of wildflowers is to be seen. This applies particularly to the sandy soils of

*Contribution by R.D. Royce to 'Yanchep National Park' (Jenkins 1971)

the valleys where the species are abundant. On the other hand, the limestone ridges carry mainly parrot bush with relatively few other species.

Occasionally the one-sided bottlebrush *(Calothamnus quadrifidus),* or the grey-leaved cottonhead with its masses of small yellow flowers in dense heads or its relative the kangaroo paw *(Anigosanthos manglesii),* become abundant in small areas. In other localities species of sedges, a dense spreading wattle *(Acacia rostellifera),* or a yellow flowered species of tea tree *(Melaleuca acerosa),* dominate the landscape.

*Conospermum stoechadis,* or smoke bush, with its masses of feathery flowers resembling smoke as they wave in the breeze, is particularly abundant in some areas, and never fails to attract attention. Orchids occur throughout the area, while the many pea-flowered species such as bacon and eggs *(Oxylobium capitatum),* grannies bonnets and others without any recognised popular name, are common in both limestone and sand. The colour so typical of the spring is continued into the early summer months by the purple and white flowering spikes of the scale-leaved bottlebrush *(Melaleuca huegelii),* the purple of the fringed lilies *(Thysanotus* spp.*)* and the reds and yellows of feather flowers *(Verticordia* spp.*)* and many other plants of the myrtle family.

Swamp Association: A considerable area of the park is taken up by swamps and lakes, and these have their own characteristic set of plants. The principal trees in these areas are the needle-leaved paperbark *(Melaleuca rhaphiophylla),* swamp banksia *(Banksia littoralis)* and flooded gum *(Eucalyptus rudis).*

Growing amongst these as a second storey are several species of wattle, particularly the black wattle, together with native hazel *(Trymalium spathulatum),* a tall plant with oval leaves, hairy on the under-surface, and small white flowers, and the stinkwoods, two pea-flowered plants with more or less spiny branchlets and without leaves *Viminaria denudata,* the so-called swishbush, a tall leafless shrub with drooping branchlets and masses of yellow pea flowers, as well as *Templetonia retusa,* the cockies tongues, a compact shrub with masses of large red pea flowers, also occur in the under-storey.

Beneath these plants is a ground cover of several other shrubs and herbs, particularly the yellow-flowered native buttercup, native pelargonium *(Pelargonium capitatum),* and occasional specimens of bracken fern *(Pteridium equilinum)* and blackboy. Native wistaria with its masses of blue flowers is a frequent climber over other shrubs. At the edge of the water and sometimes extending across the swamp are the cultivation rush *(Juncus pallidus)* and its many related species with round pithy stems and leaves, together with the flat rigid-leaved *Lepidosperma gladiatum,* the sword rush, and yanget *(Typha orientalis).*'

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## John Forrest National Park

The John Forrest National Park is an A Class Reserve of 1577 hectares situated in the Darling Range about 27 km from Perth.

The reserve was created on the recommendation of Surveyor General H.F. Johnston in 1898 and is the State's oldest National Park, followed by Yanchep (1905) and Walpole-Nornalup (1910).

The area was known firstly as the Greenmount National Park and was vested in the State Gardens Board in 1928, but to most of the public the reserve was known simply as 'The National Park'. The name was changed in 1947 to the John Forrest National Park and next to Yanchep it is the most heavily used park.

The flora is typical of the Darling Scarp with jarrah, marri and wandoo the dominant trees, interspersed with banksias, blackboys, dryandras and acacias.

Wildflowers are a major attraction in the late winter and early spring and leschenaultia, pink myrtle, red and green kangaroo paws and pimelias are conspicuous.

Native mammals still present in the park include grey kangaroos, brush-tailed possums and some of the small marsupial mice but, because of their nocturnal habits the daytime visitor will be lucky to see even a kangaroo.

The winding road through the park offers the motorists panoramic views of the city and the Swan Coastal Plain and some water scenes along Glen Brook and Mahogany Creek.

Short walking trails lead to several small waterfalls and quiet pools which are of course most attractive during the winter and spring.

The wooded hills and valley pools offer attractive conditions for birds and the most common include magpies, kookaburras, wattle birds, yellow-winged honeyeaters, 28 parrots and western king parrots. Wild ducks, grebes and kingfishers frequent the dams and various birds of prey including kestrels, whistling kites and even wedge-tailed eagles can be seen in the sky.

The bare granite outcrops and massive boulders which hang on some of the valley walls offer little attraction to the casual visitor, but they are of great interest to the naturalist.

In addition to supporting a sparse growth of mosses, lichens and other rock loving plants, the cracks and flat stones are a refuge for many insects, spiders and centipedes as well as a variety of lizards. Unfortunately, these rocky habitats have been seriously effected in recent years by the removal of boulders and stony shingles for use in suburban gardens. So popular has this type of landscaping become that the very existence of some of the dragon lizards has been threatened and the removal of any rock material from crown land in the region now requires a permit.

Because of its proximity to Perth and easy access from the Great Eastern Highway, the John Forrest Park is over-used in the 'season' and during the summer it suffers from frequent unscheduled fires.

Several requests to use the abandoned railway tunnel near the western edge of the Park for projects as diverse as wine storage and mushroom culture show the public education which is still necessary to encourage the correct use of our parks. However, an appropriate function for the tunnel has involved the installation of delicate scientific equipment by Telecom and the exclusion of the public, but free access to bats, swallows, spiders and insects, which find the cave-like entrances much to their liking, now that the threat of smoke and steam has been removed.

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## Yalgorup National Park*

The land portion of this A Class Reserve of 11,384 hectares was placed under the National Parks Board control in January 1968. The lakes were added to the park in September 1971.

The region consists of long low sand and limestone ridges running approximately north and south, interspersed with a chain of lakes and swamps. With the continued progress in the region and, particularly with the growing population of Pinjarra, Mandurah and Bunbury, the upgrading of the Old Coast Road and the consequent destruction of the verge flora, areas such as the Yalgorup National Park and the associated lakes will exist as 'islands' in a sea of alien development.

For many years agricultural expansion between Mandurah and Bunbury was retarded by minor element deficiencies in the coastal sands, but modern fertilisers have now remedied this with the result that grazing paddocks and irrigated lucerne plots are taking over from the native bush.

A pleasing feature of some pasture development in the area is the park-like effect resulting from the larger tuarts, marris and jarrahs having been left as shade trees. Unfortunately however, the stocking of such areas prevents most regeneration and although the 'park clearing' system is desirable in the short term, it is no substitute for fully protected reserves.

### Plants and Animals

The woodland vegetation consists of a mixture of tuart *(Eucalyptus gomphocephala),* jarrah *(E. marginata)* and marri *(E. calophylla)* trees with an understorey of banksia *(Banksia grandisand B. attenuata),* peppermint *(Agonis flexuosa)* and sheoak *(Casuarina fraserana).* Heath vegetation on the exposed hills includes *Dryandra, Hakea,* blackboys *(Xanthorrhoea preissii)* and several species of Acacia.

Grey kangaroos *(Macropus fuliginosus)* are very common and brush wallabies *(M. irma)* are widespread. Brush-tailed possums *(Trichosurus vulpecula)* echidnas *(Tachyglossus aculeatus)* and various smaller mammals occur in the area but they are seldom seen because of their nocturnal habits.

Rabbits, feral cats and pigs are also present in the park.

The great importance of the Peel Inlet and the adjacent lakes to Western Australia waterfowl, particularly during drought years has been demonstrated on many occasions (Riggert, 1966 and Anon., 1962).

Inspections carried out at Lake Clifton during the late summer of 1971 showed that a two mile stretch of lake carried more than 1000 coots *(Fulica atra)* and musk ducks *(Biziura lobata),* in excess of 500 black swans *(Cygnus atratus),* over 200 hoary-headed grebes *(Podiceps poliocephalus)* more than 100 black ducks *(Anas superciliosa)* and grey teals *(A. gibberifrons)* and over 50 mountain ducks *(Tadorna tadornoides)* (Jenkins, 1976) and crested grebes *(Podiceps cristatus)* (Jenkins, 1971).

Other birds of major interest associated with the lakes include many species of migrant waders or 'snipe' including greenshanks *(Tringa nebularia)* stints *(Calidris ruficollis)* and sandpipers *(Tringa hypoleucos).*

The waters also provide a valuable food source for the banded stilt *(Cladorhynchus leucocephalus)* the white-headed stilt *(Himantopus himantopus)* and the avocet *(Recurvirostra novaehollandiae).*

A detailed survey has not been carried out, but approximately 150 bird species have been listed including most of those described in more detail in the section dealing with the Yanchep National Park (p. ) (Serventy, 1930 and Jenkins, 1971).

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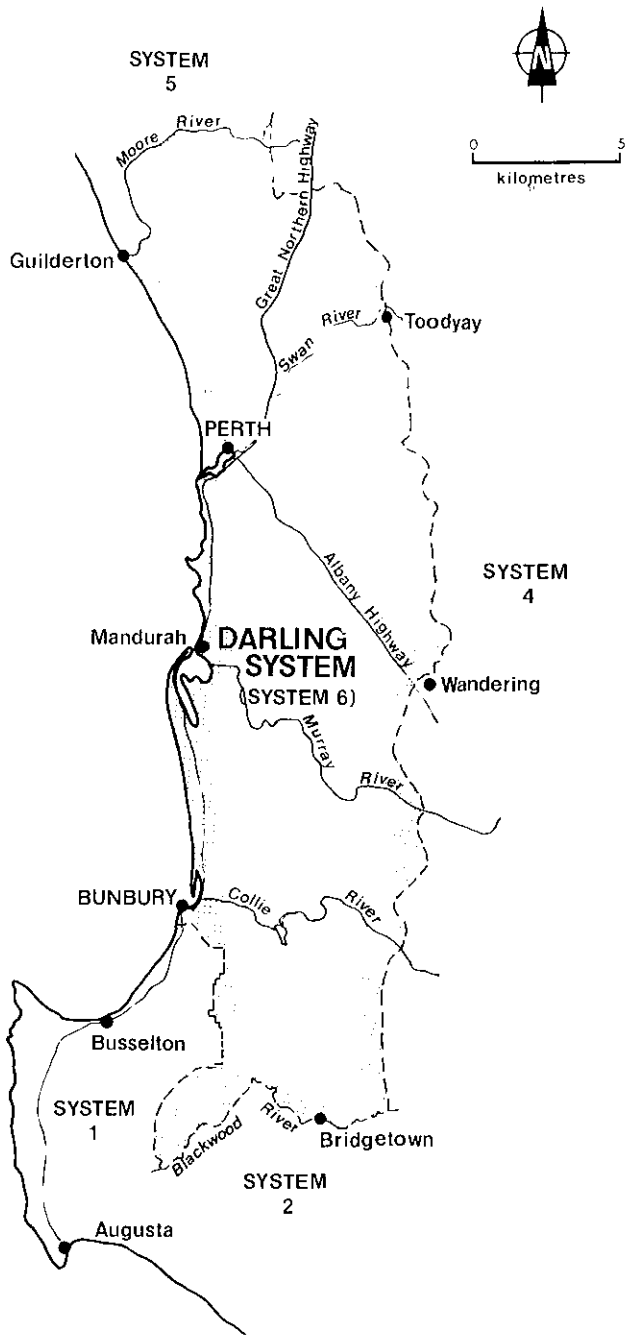
## System 6 (see Maps 15 and 16)

The parks just reviewed fall within the boundaries of System 6 and they, with other parks in the area, will be effected by the decisions which finally eminate from the System 6 Study. Some existing parks are likely to be enlarged by the addition of adjacent land and the creation of completely new reserves should help to relieve the

*The name is a coined Aboriginal word, a combination of 'Yalgor' meaning a swamp or lake with the widely used suffix 'up' meaning a place.

pressure on places such as Yanchep and John Forrest where visitor numbers are already excessive, particularly on holiday weekends.




Map 16

Because of the intensively competitive demand for land, water and other resources within the System 6 area the Environmental Protection Authority (EPA) arranged a special assessment procedure designed to give competitive land users an opportunity to present their case while at the same time recognising the major claims of conservation. To this end the EPA set up a system of committees with a wide range of expertise drawn from both government and private sources.

**ORGANISATION CHART**
**SYSTEM 6**

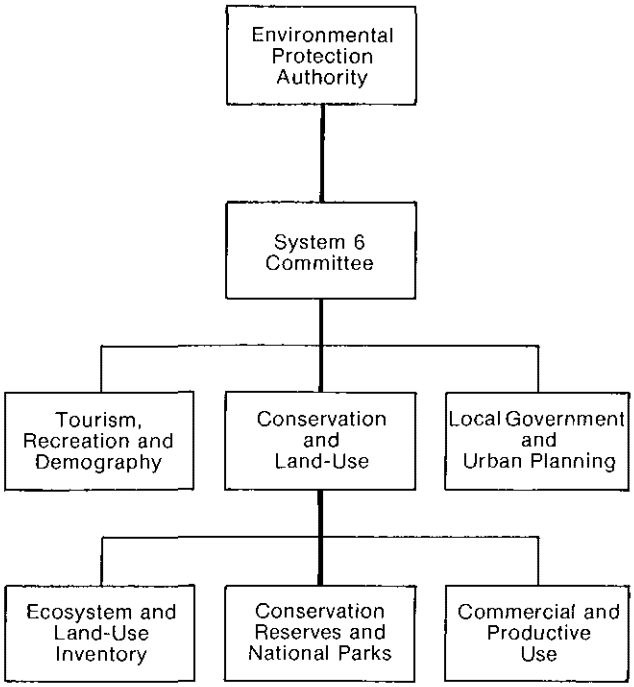



Figure 3

## System 6
## Terms of Reference for Committees

### 1. System 6 Committee

To receive technical reports from the lower committees and, having regard to present and likely future developments, to make recommendations to the Environmental Protection Authority on:—

(i) areas within System 6 desirable for national parks, nature reserves and major associated recreational resources;

(ii) related matters in and near the area delineated as System 6.

### 2.1 Conservation and Land-Use Committee

To develop for consideration by the System 6 Committee proposals for areas that should be set aside as national parks and nature reserves in System 6 taking account of:—

(i) the natural ecosystems themselves, their characteristics and management requirements;

(ii) the demands on the land for commercial and other production, development and public services where these interact or may interact with proposals for reservation.

### 2.1.1 Ecosystem and Land-Use Inventory Committee

To systematically assemble and report on information relevant to the identification of areas suitable for present or future reservation as national parks, nature reserves and associated recreational resource areas, taking cognisance of:—

(i) existing information on the nature and extent of the principal natural ecosystems, sub-systems and physiographic domains within the area known as System 6;

(ii) other relevant information such as shire and council administrative boundaries, existing patterns of land use, water supply catchment areas, State and private forests, mining leases and tenements, lines of communication, etc.

**2.1.2 Conservation Reserves and National Parks Committee**

To report to the Conservation and Land-Use Committee on existing and required conservation reserves and national parks generally, taking account of:—

(i) the EPA policies and philosophies expressed particularly in the Preamble to the two "red books";
(ii) public and other submissions received during the course of the System 6 Study;
(iii) information and comments derived from the Ecosystem and Land-Use Inventory Committee and the Commercial and Productive Use Committee.

**2.1.3 Commercial and Productive Use Committee**

To report to the Conservation and Land-Use Committee and to provide information for the Conservation Reserves and National Parks Committee which will:—

(i) ensure that land-use and potential land-use alternatives to reservation are considered at appropriate times;
(ii) attempt to evaluate the degree of compatibility between apparently conflicting land-uses;
(iii) ensure in their deliberations that the interests of State and Local Government instrumentalities, institutions and the private sector concerned with land-use are taken into account;
(iv) devise procedures which will ensure early planning for rehabilitation to be undertaken at the cessation of commercial exploitation, or following exploitation of short duration, where such rehabilitation is in the interests of conservation, national parks and associated recreational resources;
(v) arrange economic analyses of proposals referred to it for that purpose by the Conservation and Land-Use Committee.

**2.2 Tourism, Recreation and Demography Committee**

To develop for consideration by the System 6 Committee:—

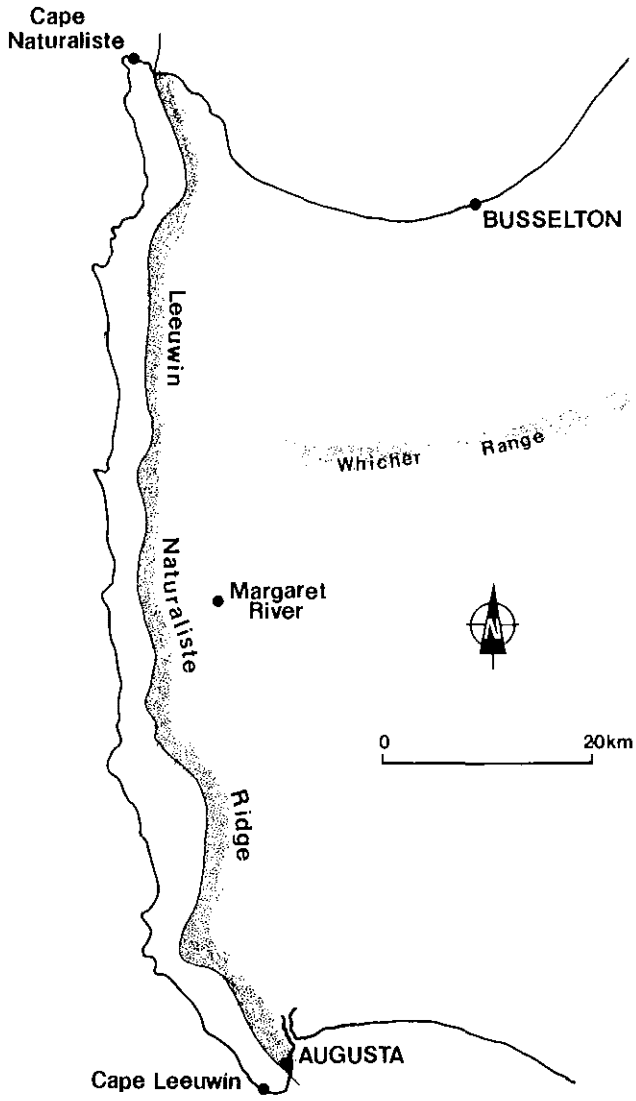
(i) an assessment of the present tourism and recreation facilities in System 6 and their utilisation, and likely additional needs, taking into account the requirements of residents and tourists;
(ii) forecasts through the year 2000 of the consequential demands for such facilities associated with tourism and recreation in all their forms taking into account envisaged changes of life-style such as the duration of the working week, the increased mobility of the population, the age of retirement and other facets of the quality of life.

**2.3 Local Government and Urban Planning Committee**

(1) To develop for consideration by the System 6 Committee:—

(i) an assessment of the present reserves set aside as regional or public open space, the extent and manner in which these are being presently used and make recommendations about modifications in use and developments thereof for the near future;
(ii) forecasts through the year 2000 of the consequential demands for facilities of this type, taking into account envisaged changes of life-style such as the duration of the working week, the increased mobility of the population, the age of retirement and other facets of the quality of life;
(iii) an assessment of the extent to which Local Government might play an active part in selection, management and maintenance of reserve areas including financial contributions in cash or in kind.

(2) To draw up for the System 6 Committee a plan for implementing the EPA recommendation to the Minister for Local Government, that "he considers ways and means by which Local Government authorities can appoint for liaison with the appropriate Government Departments professional reserve advisory officers in the same way as the Local Government authorities appoint, for example, health surveyors."




Map 17

A pleasing feature of these committees was the straightforward nature of the discussions, their ability to reach a compromise on some unexpected occasions and the improved long term communications which are likely to result between interested parties.

Another important outcome of the investigation is the valuable information which has been tabulated by the EPA and which will be used in the compilation of the final System 6 Report.

## The Leeuwin-Naturaliste Ridge

The western coastline between Cape Leeuwin and Cape Naturaliste is one of the most imposing in Western Australia and the varied vegetation systems ranging from dense karri forest to low coastal heath, underlain by extensive and picturesque cave formations, gives the region great value as a conservation area.

Because much of the land is still uncleared and because of a rapidly growing interest it was agreed that where practicable all available reserves should be consolidated into a National Park and that as it became available selected free hold land should be purchased for inclusion in the park.

One such property of great historical and scenic interest is "Ellensbrook", the birth place of Grace Bussell and the site where the ill fated *Georgette* drove ashore in 1876 (Terry 1978). This was purchased from Mr Jack Williams on the understanding that the restored homestead and immediate surroundings were offered to the National Trust.

In order to encourage local participation and multiple representation in the management of the "Ridge" reserve and the protection of caves, coastal dunes and other fragile features of the environment, it was agreed that an Advisory Committee should be formed to 'prepare Management plans for the proposed National Park to be submitted to the EPA for its approval before implementation'.

The Advisory Committee was established in 1977 with a member of the National Parks Authority as chairman and includes representatives of the Shires of Busselton and Augusta-Margaret River, the Forests Department, the W.A. Wildlife Authority and the Soil Conservation Service of the Department of Agriculture.

Important caves in the area include the Mammoth Cave and Devils Lair where important floor deposits contain fossil remains of extinct marsupials such as the giant echidna, the Tasmanian tiger, the Tasmanian devil and the koala. Associated with the fossil remains are human bone fragments and teeth of great antiquity.

Present day mammals to be found in the area include the western quoll or native cat, the western water rat, the brush-tailed and ring-tailed possum, the dunnart or pouched mouse, the wambenger or native squirrel and pigmy possum. The quokka was once common, but it has vanished from most of its former haunts.

Areas of outstanding historical interest include the early farms around Busselton and Margaret River, Cape Leeuwin, with its lighthouse and old water wheel; Hamelin Bay — pioneer timber port and many other sites associated with the early whaling and fishing industries.

Two birds of great significance recorded from the district and dependent upon dense, almost impenetrable thickets, are the noisy scrub bird and the rufous bristle bird.

The scrub bird was recorded near Wallcliffe in the late 1880's, but is now known only from Two People Bay east of Albany.

The rufous bristle bird was first discovered in 1901 at "Ellensbrook" and later near the lighthouse at Cape Naturaliste. Its present status in Western Australia is very doubtful, but of great interest, because of the fact that the nearest known survivors of this species are in South Australia and Western Victoria.

Two other birds worthy of mention are the osprey or fish hawk and the red-tailed tropic bird so named because of the red streamer-like feathers in the tail of the fully plumaged bird.

Tropic birds have nested on several occasions at Sugar Loaf Rock and this marks the most southerly breeding site for the species.

One of the earliest osprey nests in the area was discovered by A.J. Bussell of "Wallcliffe" who guided the pioneer ornithologist Archibald Campbell to the rough cart load of sticks perched on a rocky islet near the mouth of the Margaret River.

Bussell waded across the river mouth 'with his undergarments in one hand, his boots in his teeth and his unmentionables held high in the other hand'.

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## The Stirling Range National Park

The Stirling Range National Park of 115,671 hectares is an A Class Reserve named by surveyor John Septimus Roe in honour of Captain James Stirling the first Governor of Western Australia.

The park stretches approximately 55 kilometres east and west and rises abruptly from the plain some 80 kilometres north of Albany.

Geologically the range consists of Upper Proterozoic metasediments with quartzites and sandstones in the upper members and slates and shales below.

The material of the range was deposited below the sea more than 1000 million years ago, after which faulting, gradual uplifting and erosion produced the present outline.

Because of its elevation the range is often shrouded in mist and rain and the higher peaks may sometimes be capped with snow.

The rugged grandeur of the Park provides scenery unique in Western Australia and has created conditions highly conducive to the development of endemic flora.

Bluff Knoll (1073 metres) is the highest peak in the ranges, but four other mountains exceed a thousand metres and offer challenging climbs to the experienced bushwalker.

The area is mainly covered by dense scrub up to three metres in height, but many of the valleys support small forests of Jarrah *(E. marginata),* wandoo *(E. redunca)* marri *(E. calophylla),* yate *(E. cornuta)* and flat-topped yate *(E. occidentalis).*

Nearly 100 species of plants are peculiar to the area (endemic) and some like the mountain bells *(Darwinia* spp.) may be restricted to individual mountain tops.

The fauna is also interesting with a wide range of south-west mammals and birds and an unexpected occurrence of the small frog *Metracrinia nichollsi* found elsewhere only in the karri forests of the south coast and Pemberton.

The trapdoor spiders of the region deserve a mention, including as they do a species known elsewhere from the arid goldfields. Even the native land snails *(Bothriembryon* spp.) are worthy of further study for they show unusual biochemical diversity as well as interesting variations in shell colour.

Because of the diverse habitats contained in this large park and the extensive changes which have occurred outside the reserve, the Stirling Range is one of the most important conservation reserves in Western Australia.

Despite its large size, careful management is essential to ensure the long term survival of the park in its natural state. Calls for improved access, the use of horses, off road vehicles and even chair lifts on some of the steeper slopes show the misunderstandings which still exist concerning the proper uses of a National Park and emphasise the fact that sometimes over use by patrons can be just as destructive as deliberate vandalism.

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## Porongurup National Park

The Porongurup National Park of approximately 2400 hectares is an A Class Reserve between Albany and the Stirling Range. Despite its relatively small size the Park has many features of interest and differs markedly from the Stirlings in geological structure and vegetation.

The rounded hills rise to over 2000 metres in height with many bare rock slides and domes to tempt the climber.

The most characteristic vegetation of the range is the dense karri *(E. diversicolor)* which clothes the fertile slopes and valleys and survives as a remnant of a much more extensive forest which in earlier times extended well to the south and west.

Many of the wildflowers are also typical of the true karri forest and include tree hovea *(Hovea elliptica)* and hazel *(Trymalium spathulatum).* On the lower exposed slopes the karri is replaced by a mixture of marri *(E. calophylla)* and jarrah *(E. marginata)* and as in other parts of the State this laterite zone supports a wide variety of wildflowers.

Although grey kangaroos, brush wallabies, possums and small nocturnal marsupials are present in the park, it is the birds which are most obvious to the visitor. The high pitched call of the rufous tree-creeper *(Climacteris rufa)* is seldom absent and these reddish brown birds can often be seen fossicking near the barbecues or clinging to the trunk of a giant karri.

Two other very colourful species which enjoy the cool forest shade are the scarlet robin *(Petroica multicolor)* and the yellow robin *(Eopsaltria griseogularis)* characterised by its canary yellow underparts and the habit of clinging to the upright trunks of the forest trees.

Two of the noisiest species in the forest are the purple-crowned lorikeets and the white-tailed black cockatoos. The lorikeets hunt in screeching flocks for any flowering eucalypt, but are seldom visible as they climb amongst the leafy crowns of the karris.

The cockatoos flap lazily amongst the tree tops or perch on the lower shrubs in search of ripe seeds, but, sometimes, apple orchards in the neighbourhood tempt the birds from their natural food.

Other fauna of interest include a unique trapdoor spider, with relatives in the Stirlings and the Victorian Grampians, several species of frogs and a variety of reptiles and insects.

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## Walpole-Nornalup National Park*

The Walpole-Nornalup National Park of just under 18,000 hectares is located on the south coast of Western Australia, approximately 120 km west of Albany. Known originally as the Nornalup Park, the first portion of the reserve was established in 1910, but it was greatly enlarged in 1924 and placed under the control of the newly created Nornalup Reserves Board. The vesting was changed again in 1947 when the park passed to the State Gardens Board, which gave way to the National Parks Board in 1956 and the National Parks Authority in 1976.

The Park contains some fine stands of karri *(E. diversicolor)* some of which line the placid waters of the Frankland and Deep Rivers. The giant red tingle *(E. jacksonii)* and yellow tingle *(E. guilfoylei)* are another major attraction, 'karri wattle' forms an almost impenetrable understorey in many areas and thick groves of peppermint *(Agonis flexuosa)* thrive in sheltered spots.

Of particular interest is the red flowering gum *(E. ficifolia)* with its natural distribution confined to a limited area near the south coast.

*'Norne' is aboriginal for tiger snake and the widely used suffix 'up' means a place.

Wildflowers are present throughout the year ranging from hovea, crowea, hibbertia and clematis under the forest trees to a multi coloured carpet on the coastal dunes.

The peaty swamps are also of great interest for here may be found the scented boronia *(Boronia megastigma)* and the insect catching pitcher plant *(Cephalotus follicularis)*.

The fauna is typical of the south-west forest country but the coastal heaths support a variety of small birds including the red-eared finch *(Zonaeginthus oculatus)* several species of honeyeaters and the southern emu wren *(Stipiturus malachurus)*.

The coastal cliffs and beaches attract a wide range of sea birds including the osprey or fish hawk *(Pandion haliaetus)* and the white bellied sea eagle *(Haliaeetus leucogaster)*.

On a clear day the real ocean wanderers such as albatrosses and petrels may be seen well out to sea and occasionally the splash of a gannet as it plummets into the water in search of fish.

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## The Fitzgerald River National Park — A Biosphere Reserve

The Fitzgerald River National Park of approximately 243,000 hectares was declared an A Class Reserve and vested in the National Parks Board (now the National Parks Authority) on January 19th, 1973.

The area is of particular significance and therefore it is dealt with in rather more detail than the other parks.

Firstly, the reserve was under threat by mining interests and the brief summary of preceedings shows how a satisfactory compromise was achieved between the would be miners and the conservationists and secondly the reserve was the first Western Australian National Park to be declared a Biosphere Reserve.

Biosphere Reserves are special areas approved by UNESCO after ratification by its International Co-ordinating Council. The main criteria for the reserves are that they should be large natural or near natural areas, representing one or more ecosystems and managed in such a manner as to provide a 'bench mark' against which future changes in surrounding regions can be measured.

Although a complete physiographic and ecological survey of the areas has not yet been made the 'crash' programme organised to collect data for presentation to the Warden's Court provided much basic information and strongly supports the worth of the area as a Biosphere Reserve.

Many people and organisations were involved in collating this information which was presented to the Environmental Protection Authority and much of the information which follows comes from this report. I am indebted to the Director of the EPA, Mr Colin Porter for making this material available, and to the original contributors whose names are shown in Appendix VI.

Between the pegging of the coal mining leases by Jupiter Minerals at the junction of the Fitzgerald and Susetta Rivers and the Cabinet decision to declare a National Park, conservationists campaigned vigorously and submitted a petition bearing 800 signatures. This was countered promptly by another petition of more than 350 signatures requesting that the mining potential of the area be investigated because of the need for some economic stimulus in the region.

About this time the argument between conservationists and would be exploiters of the reserve was fueled further by the building of a road from near the Fitzgerald River township to Dempster Inlet.

The unauthorised track was bulldozed by Bell Bros Pty Ltd 'to transport equipment to mineral (manganese) leases' and the action was described by the presiding magistrate as 'a brazen and arrogant abuse of corporate authority' (Daily News, May 5, 1972).

The company was prosecuted under the Fauna Conservation Act and fined the maximum penalty of $200. However, the main argument was still centred around the extraction of montan wax and following further investigations and recommendations by the EPA, Cabinet approved a drilling programme to be carried out by the Geological Survey Branch of the Department of Mines to test the economic potential of the deposits under review.

This report, submitted in February 1973, stated that the coal ore body had been delineated and was estimated to contain 1.1 million tons of lignite (not 40 million tons as suggested in the company prospectus) averaging 2.3% montan wax and a total of 1500 tons of wax as compared with the original company estimate of 2.4 million tons of wax.

As a result of this report the Cabinet announced on April 2nd, 1973 that coal mining applications had been rejected.

## Historical Review of the Park and its Environs

### The Dutch

The first European to examine the southern coastline of Western Australia was Thyssen, who in 1627 in the Dutch ship *Gulden Zeepaerd* outward bound from Holland sailed about a thousand miles eastward from Cape Leeuwin. The most important passenger on board was Pieter Nuyts whose name was given to a stretch of coast along the Great Australian Bight, but whose more notable memorial is the colourful Christmas tree named after him as *Nuytsia floribunda*.

### The French

The French coasted along the area in 1792 when two vessels the *Recherche* and the *Esperance* under Admiral d'Entrecasteaux attempted to enter King George Sound in search of the lost explorer La Perouse. They were finally driven eastward by bad weather and sheltered in what is now Esperance Bay. Here the first kangaroo paw was collected by Labillardiere, who also collected the first specimen of Christmas tree.

**The British**

Matthew Flinders, accompanied by John Franklin (of Arctic fame) sailed into the area in 1801 in the *Investigator* and under orders from the Admiralty he charted the coast eastwards from Cape Leeuwin to Bass Strait.

**The Sealers and Whalers**

In the early years of the 19th century sealers moved into the area from sealing grounds in Bass Strait and Kangaroo Island. They worked westward to Doubtful Island Bay, but sometimes went as far as the settlement at King George Sound to purchase stores.

This settlement was established on the orders of Governor Darling of NSW who sent Major Edmund Lockyer from Sydney with a detachment of soldiers and a party of convicts. A landing was made on Christmas Day 1826 primarily to forstall the French, who it was thought might annex the area.

Whalers from the Eastern States and the USA also ranged the coast and together with the sealers had a serious effect upon many forms of wildlife, but particularly the fur seals.

## The Early Land Explorers (See Appendix 1)

**Edward John Eyre**

In 1841, Eyre and his aboriginal companion, Wylie, passed through the area on their way to Albany. On June 23rd they sighted East Mount Barren and on 26th camped in the country behind Culham Inlet and Mary Ann Harbour. On 27th they passed East Mount Barren. Eyre stated that he had travelled 'a wretched and arid looking country'. On June 28th they arrived at the Hamersley river and two days later they passed West Mount Barren and sighted the Fitzgerald River and later the Stirling Ranges.

**Lieutenant John Septimus Roe**

The first Surveyor-General of the Swan River Settlement — John Septimus Roe — explored our coasts with Captain Phillip Parker King (1819-20) in the vessels *Mermaid* and *Bathurst*. In 1848 he started on an important expedition to the south-east which is described by John Rintoul in *Esperance Yesterday and Today* p.23, as follows: 'His party reckoned Messrs H. Gregory and J.B. Ridley of the Surveyor-General's Department, Privates Lee and Buck of the 96th Regiment, and a native guide Bob. Lieutenant Roe was instructed to explore the country between Cape Riche and Russell Range (discovered and named by Eyre), east of Esperance Bay and to especially search for coal.

'On the journey to Russell Range he named Mount Madden (after the Colonial Secretary), Mount Short (after the Bishop of South Australia), and Bremer Range (after Sir Gordon Bremer, a naval officer). He called the highest peak in the range Mount Gordon. The Fitzgerald Peaks he named after the Governor and further named the peaks Mount Charles, Mount Eleanora (after his sister) and Mount Ridley. The country as viewed from the Fitzgerald Peaks at an altitude of 1000 feet consisted of dense scrub, dry watercourses and salt lakes, so Roe retreated towards the coast, and only stopped to halt at Russell Range after being deprived of water for three days and three nights. Russell Range was reached on November 23rd. Here the party found water and after rest and recuperation Roe decided to return rather than subject his party to further risks in the examination of what he described as fearful and impracticable country. They were fifteen miles from Point Malcolm when Roe recorded his impressions . . . "to the north an unbroken line of country stretching in the horizon, and in the opposite direction the mighty ocean, studded with the many islands of the Recherche Archipelago". He named Mount Howick, one of the granite hills common to this area, and also Mount Ney, after one of his horses.

'On December 7th the party was abreast of Esperance Bay and camp was made fifteen miles north of Cape Le Grand. On the return journey better country was traversed and tracts of country north of Esperance Bay, with others towards Cape Riche were found to be suitable for settlement. This was the longest and most celebrated of the journeys which have led to Roe being styled by some historians as "the father of Australian explorers". On this journey he named Mount Merivale, Mount Hawes, Gage River, Stokes Inlet and Lort River (note this is the Lort River, probably named after J. Lort Slotter*, RN of HMS Beagle, and not the Lart River as given by some Perth newspapers), Young River, Mount Desmond, Eyre Range, Phillips River, Culham Inlet, Mount Bland and Fitzgerald River. On Phillips River he discovered numerous evidence of coal and extensive beds of the same mineral on Fitzgerald River. It is interesting to note here that a report of 1850 states: "The coal deposits on the Phillips and Fitzgerald Rivers, near Esperance Bay, must go abegging because local people were not strong enough to work them. Yet all were sanguine that they would have great ultimate value.

'While Roe and his party were examining the country around the Fitzgerald River and were on a sandhill about 200 yards from the shore, they came across the skeleton remains of a man, which, the guide declared, belonged to one of three seamen who had quitted a Hobart Town Whaler from the vicinity of Middle Island, for the purpose of walking to Albany. Roe estimated the distance as 350 miles and was puzzled as to whether these men had been put ashore and attacked by natives or if they had left of their own free will. Roe collected the remains and buried them in a quiet hollow west of Cape Knob. A mound of limestone, with a wooden slab, was raised as a memorial. On reaching the Cheyne homestead Roe found the only survivor of the three seamen, employed by Mr George Cheyne. The survivor declared that they were landed of their own consent, supplied by the Captain of the whaler with such provisions as they chose to carry, and given a musket and ammunition. They became distressed for want of water and separated. The natives declared that two of them had died of actual starvation. Theirs was another dismal story consummated by the desolate parts of Australia.

Roe returned to Cape Riche and proceeded to Perth, visiting Bunbury on the route. Apart from Eyre's journey from Adelaide to Albany in 1841, Roe was the first white

*This is a misprint for Stokes.

man to have explored this area. In a large and freely illustrated history of Australia, published in 1886 by Picturesque Atlas Co London, most of the place names mentioned by Roe in his 1848 journey were indicated in a series of excellent maps and remain the same today.'

**Botanists**

The reserve is important as an area where major botanical collections have been made. The earliest collectors were W. Baxter (1828), J.S. Roe (1848), J. Drummond (1847, 1848) and G. Maxwell (1863). They collected several hundred plants in the area and many of the specimens, sent to botanists in Britain and Europe, were named as new species.

It is worth noting that when Sir W.J. Hooker, Director of Royal Botanic Gardens Kew, received Drummond's 1848 collection from the Mt Barrens, he wrote that he had 'rarely seen so great a number of fine and remarkable species arrive at one time from any country'.

Later visits of importance were made by C. Andrews (1903), H. Steedman (1930, 1932, 1938), W.E. Blackall and C.A. Gardner (1925, 1931 and 1948). More new species were described from these collections.

The late C.A. Gardner, former Government Botanist of Western Australia, recognised the importance of the area and was instrumental in having it gazetted as a reserve.

Over the past 20 years collecting has continued intermittently, and with every expedition further plants of interest have been found. So complex is the Reserve, especially in the river valleys and around the mountains, that thorough exploration will take some years to complete.

From 1957 to the present, more than 1000 specimens have been collected on seventeen trips to the reserve and the area has been the subject of a detailed vegetation survey.

Visits were made by an American botanist, S. Carlquist in 1967 and 1969 and these resulted in the discovery of a new species of *Stylidium* on East Mt Barren.

## Physical Environment

**Climate**

The climate of the Fitzgerald River National Park is mild with a summer drought. The average rainfall varies from approximately 500 mm (20 in) along the coast to 400 mm (16 in) in the north. Most of the rain falls between May and October with an average of 150 mm (6 in) falling between November and April.

The mean temperature along the coast varies from about 19°C in the summer to 12°C in the winter, but the inland figures show a slight rise in the summer and a drop in the winter.

Very hot days are rare with an average of three days a year exceeding 32°C (approximately 90° F) on the coast although the figure rises to about 15 days in the north.

**Soil Structure and Erosion Hazards**

With the exception of the river terrace alluviums the soils of the Fitzgerald River Reserve relate to the underlying parent material, consisting of the Pre-Cambrian granites to the north, the Plantagenet beds of spongolite and siltstones in the middle and the Pre-Cambrian quartzites and phyllites of the Mount Barren Beds in the south.

At various places along the coast, dunes occur both in stable and non-stable forms and the soils, according to Northcote's classification, are calcareous sands (Ucl.11) on the recent dunes and siliceous sands (Ucl.21) on the older dunes (Northcote 1971).

On the coastal side of the Reserve the Mount Barren Beds rise as a series of hills of varying height, with Mount Drummond and Mount Maxwell representing northern outliers of the same type on the other side of the Plantagenet Beds.

There are many areas of sheer rock and on the steeper slopes the soils are skeletal with a variable amount of rock fragments at the surface.

On the gentler inclines, especially where the northern hill slopes adjoin the spongolite plains, the soils are mostly coarse textured and sandy (Uc4.21) and often resemble the Willbay sands found to the south-east, nearer Albany and Denmark. Duplex soils such as Dy1.12 and Dy3.52 with sand overlying clay and lateritic gravel also occur.

Although the average annual rainfall for the area is low, severe storms may occur at almost any time of the year and cause quite serious erosion well away from the major streams. This is exemplified by the numerous deviations which have been made around bush tracks as they have been washed out, often to a depth of several feet.

Wind erosion is also of importance, particularly on the coastal dunes where vegetation has been destroyed either by fishermen's tracks or by natural causes.

The major rivers dissect the area in a general north-westerly to south-easterly direction and have developed a series of alluvial terraces.

The Fitzgerald River shows evidence of a great volume of water passing down it in full flood. The bed also shows large scour marks and debris carried down by past torrents is ample evidence of the river's ability to move a considerable load.

J. Frith quotes a figure of 30,000 cu-secs for full flood (about 1/6 the flow of the Ord River) above the junction of the Susetta with the Fitzgerald and such a strong current would have considerable scouring capacity particularly on any disturbed soil. Open cast mining would certainly break up the sorted structure of the river alluvium and result in much greater volumes of silt reaching the upper Inlet. This might be expected to have four effects:

1. The silting of the Inlet with consequent blocking of the passage to the sea;
2. A raising of the water table in the Inlet region sufficiently to kill a wide range of vegetation;
3. The smothering of plants growing in the river bed near the top of the Inlet; and
4. The fouling of water in the river pools.

## Physical Features and Geology

Most visitors to the Fitzgerald River National Park have commented upon its scenic grandeur, but perhaps the most expressive account of the area is that given by Dr

D.L. Serventy (personal comment) following a low level flight across the reserve in 1948.

'When one first looks at the Barrens one is arrested by the fact that they look quite different from the conventional mountains over most of southern Australia — which are more or less block mountains. The Barrens are like the Stirlings, with jagged outlines and sharp peaks. The profile or silhouette reminds one of the mountain shapes children draw. They are most exciting. The Barrens exceed the Stirlings in scenic interest in that river valleys are carved through them, by the Fitzgerald and the Hamersley. The Hamersley gorges and glens are magnificent. Wildly picturesque winding pools between slopes and cliffs, thickly wooded with Mort and other eucalypts, and among the striking plants which arrest the attention even of non-botanical laymen are the magnificent Royal Hakea *(Hakea victoriae)* and the Qualup Bell. On the pools one sees the handsome Mountain Teal, a duck not common further north, also flocks of Avocets. In the early mornings a delightful bird chorus, including the Purple-gaped Honeyeater.

The view of the Barrens as I saw them from the plane was the most dramatic view of natural scenery I can remember. The mountains extend right to the sea. Cliff sea-scapes we have in plenty, and the granite-bound coast between the Naturaliste and the Leeuwin, but these sharply tilted metamorphic rocks give us something quite different. When Mr Kailis* concedes that his mining operations "could alter the contour of the land" *(West Australian,* June 25, 1970) he sends a shiver down the spine of anyone who has fallen under the spell of the Barrens, at the thought that this remarkable scenery may be mutilated to provide materials for making polishes and abrasives.'

The geological origins of the rocks which underlie much of the western end of the reserve are largely responsible for the landforms today. The upper sedimentary rocks were laid down as flat beds in a shallow sea and have been lifted up above sea level without being tipped to any great degree.

Below these sediments are very old rocks (Precambrian, probably of the order of 1,000,000 years) which formed the shore rocks or the sea bed when first covered by the sea, at the beginning of the Tertiary (a mere 40 million years ago). Since a long period of erosion occurred between the deposition of the Precambrian rocks and the beginning of the deposition of the sedimentary rocks the junction of the two sets of rocks is known as a disconformity. The lower portion of the sediments is known as the Werillup Formation, and the upper portion as the Pallinup siltstones (Cockbain 1968). At the base of the Werillup Formation is a dark red-brown coarse sandstone which lies on the Precambrian and is only a few feet thick at most exposures. It probably represents the sea shores which occurred in the area as the sea moved in over the land. The rest of the Werillup Formation is a fairly coarse sandstone which is mostly light in colour and contains the lignite in lens shaped masses. These probably represent the organic material — plant remains, etc. — and mud which accumulated in the bottoms of swamps behind the sand dunes next to the sea. The Pallinup siltstone was formed in deeper seas than the Werillup sandstones, and the lower part of it is largely made up of pieces of sponges which lived on the sea bed. This spongolite is very soft and so erodes away very rapidly; it is this rock which forms the faces of the magnificent gorges which are so important a part of the scenery in the area. The upper part of the Pallinup siltstone is rather harder and much more resistant to weathering and so protects the softer spongolite below. Consequently the face of the spongolite moves back immediately beneath the edge of the harder upper siltstone. Because general erosion of the harder siltstone has occurred from above it varies in thickness down to a few feet at the tops of the cliffs.

All this results in the land having a generally level upper plain with only slight undulations. It then grades into gentle slopes with rock terraces where the harder siltstone has lost its soil cover near the cliff tops. Piles of loose rock fragments have accumulated at the base of the steep cliff faces which rise from the flat valley bottoms. In the upper reaches of the creek and river systems the vertical cliffs are largely absent and only gentle slopes are found on either side of the watercourses. This is probably because the water has not yet cut through the hard upper siltstones but is still running over them.

At the junction of the Fitzgerald and Susetta rivers the river beds have cut down through the whole section of the sediments and also some way into the Precambrian rocks below. However, because these Precambrian rocks had an uneven surface at the disconformity on which the Werillup formation was laid down, in some places the Werillup formation lies in part beneath the level of the water in the rivers. The Werillup and alluvium make undulating slopes leading gently up to the base of the soft Pallinup siltstones which have now drawn back a considerable distance from the centre of the valley, and stand up either as cliffs at the edge of the flat top country, or as isolated flat-topped hills, rather reminiscent of cakes. Roes Rock is one such isolate.

The lignites in which Jupiter Minerals were interested lie in lens shaped pockets within the Werillup formation and consequently outcrop at about water level near the junction of the Fitzgerald and Susetta Rivers. On either side of the rivers they are probably covered by greater depths of alluvium until they pass beneath the cliffs when they are covered by the full depth of the Pallinup siltstones as well. (Cockbain and van de Graaf 1972.)

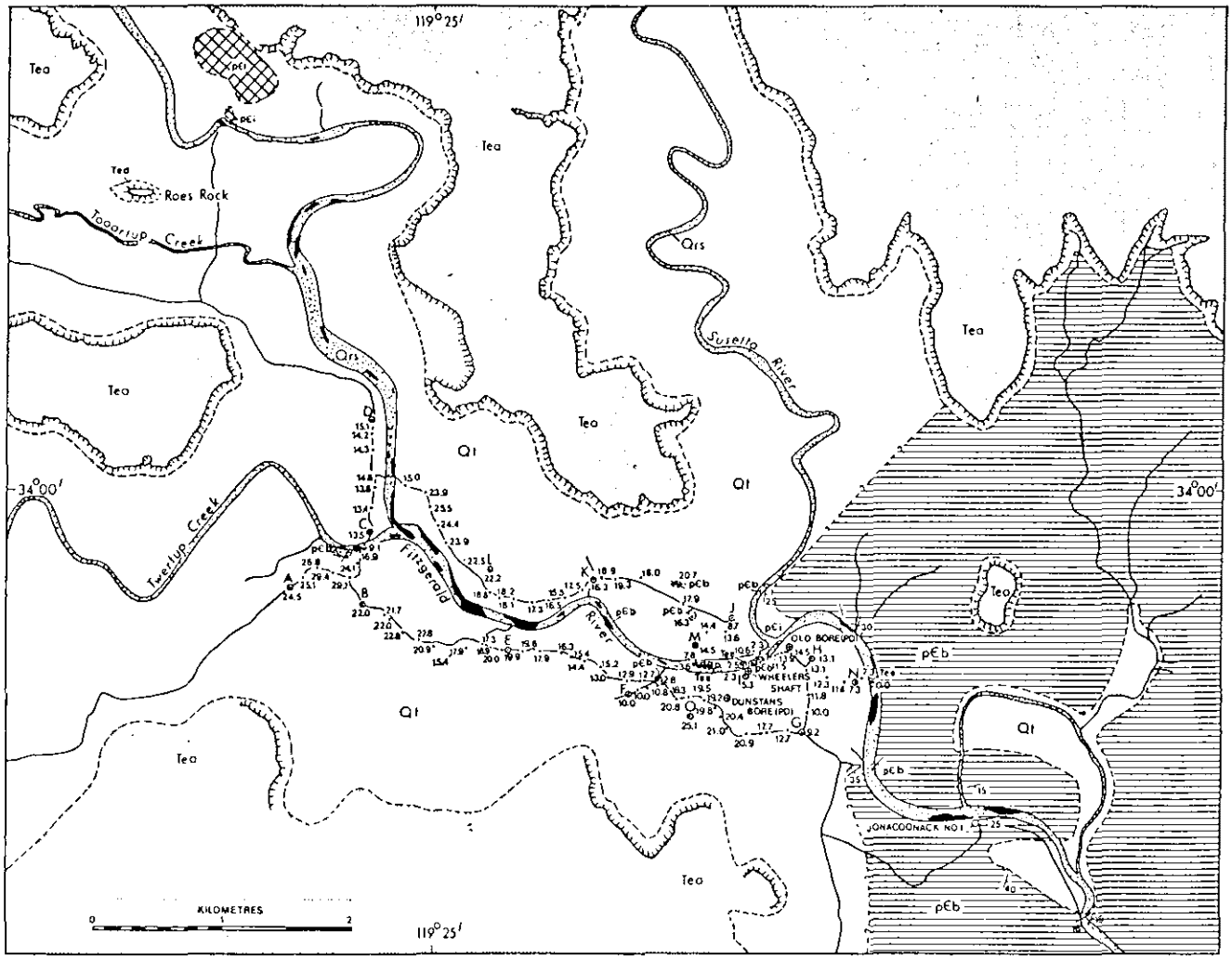
Salt water fills the whole width of the valley between the cliffs at the Inlet because wind blown sand dunes have built up across the mouth of the river and largely dammed up the flow of the water to the sea. Adjacent to the Inlet itself are extensive claypan areas with plants indicating very salty soil conditions just beneath the surface.

## Biology

A detailed biological survey has not yet been made of the Fitzgerald River National Park and conservationists were criticised for their lack of data when the Fitzgerald case came before the Mining Warden. This lack of

*Mr M.G. Kailis, Managing Director, Jupiter Minerals N.L.

## GEOLOGICAL MAP — FITZGERALD RIVER AREA




(Cockbain and van de Graaf)

### REFERENCE

**QUATERNARY**

- Qrs — RIVER CHANNEL SAND
- Qt — RIVER TERRACE ALLUVIUM

**EOCENE**

- Teo — PALLINUP SILTSTONE: siltstone and spongolite
- Tee — WERILLUP FORMATION: sand, silt, clay and lignite

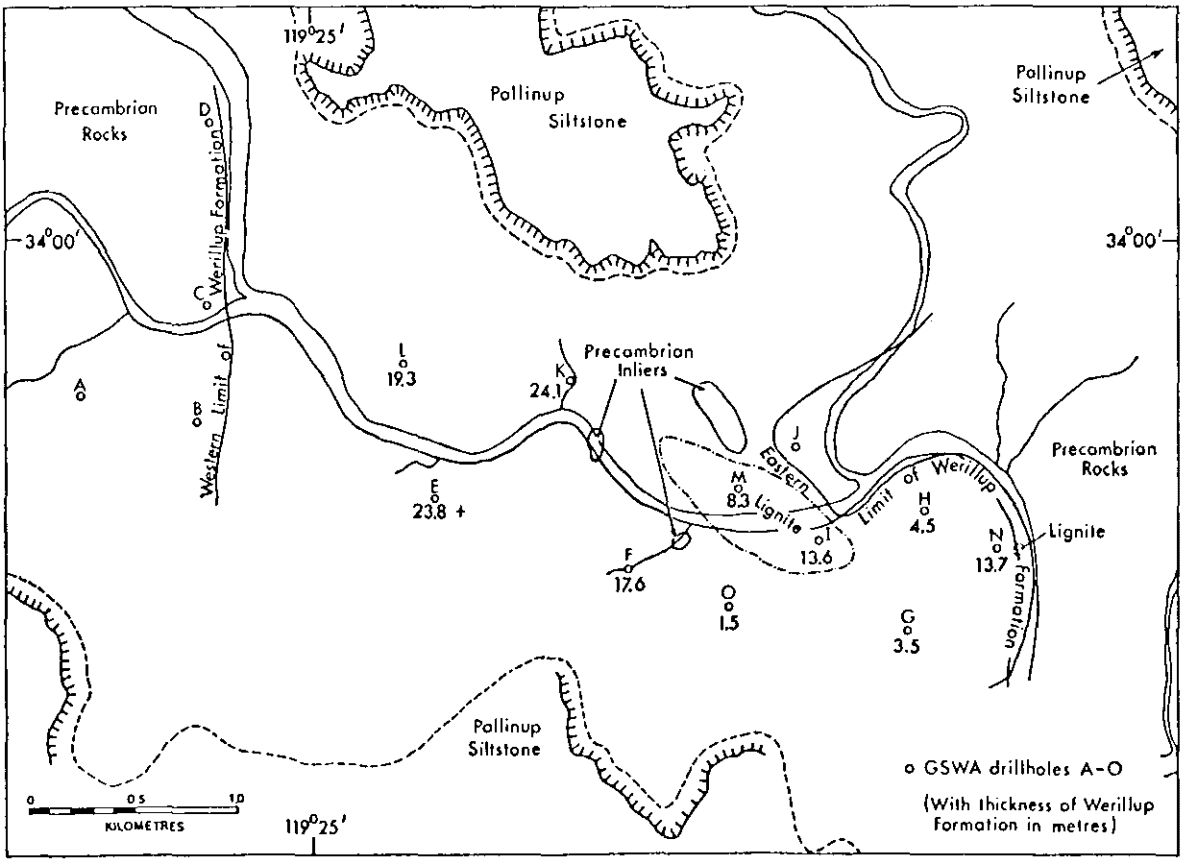
**PRECAMBRIAN**

- pEb — MT BARREN BEDS: quartzite and phyllite
- pEi — IGNEOUS ROCKS: granite and ? acid volcanics

### SYMBOLS

- Scarp
- Track
- River channel with permanent pool
- Geological boundary, approximate
- Geological boundary, inferred
- Dip and strike
- 2.5 — Spot height, elevation in metres. (Datum in bed of Fitzgerald River east of drillhole N)
- Oil exploration well, dry and abandoned
- Drillhole (P.D. — position doubtful)
- G.S.W.A. drillhole (A — O)

**AREAL EXTENT OF WERILLUP FORMATION BENEATH RIVER-TERRACE ALLUVIUM.**




(Cockbain and van de Graaf)

knowledge was not, as suggested, due to negligence or indifference on the part of biologists, but a direct result of a shortage of trained personnel for Government sponsored surveys and a belief that as parks and reserves should be relatively safe from exploitation, work should be concentrated on more vulnerable areas. Amateur naturalists were inhibited from visiting the area because of transport problems and high costs.

However, in the circumstances of an immediate threat, a crash programme was organised and the already extensive botanical investigations were expanded to provide the basis for a comprehensive ecological study.

The reserve deserves special attention because of its isolated populations of animals, many of which may have been cut off since the Tertiary. A study of these could well advance the understanding of evolutionary processes, population genetics and the recent history of the area. The hilltops are likely to provide populations of animals (such as land snails) which originated when the hills were offshore islands and there may be insects which warrant special attention because of their association with endemic plants. Long periods of isolation can also be postulated for many creatures associated with the river systems.

Additional studies which would be of great interest include those of animals living in heavily mineralised soil.

Plants are known to develop resistance to metal ions such as copper and nickel both in Britain and Australia, and it may well be that animals and especially phytophagous insects, may also do so. Resistant plants are being used in England to cover mine spoil heaps and may be used on derelict land; resistant insects may also be of value in building up a more complex ecology in similar areas. The copper bearing sections of the reserve have been sufficiently undisturbed for them to retain their original fauna and so they could prove to be most interesting.

The information so far available on the biology of the area is reviewed below.

## Zoology

**Mammals** (See Appendix III)

Only fourteen species of mammals have been recorded from the area including the introduced house mouse, the rabbit and the fox. Grey kangaroos are common in the reserve and brush possums, brown bandicoots and dingos are probably widespread.

As many of our small marsupials are nocturnal they would not be seen by most visitors and so the mammal list could be extended considerably when organised trapping has been undertaken.

A rare species which zoologists hope to find in the park is the Dibbler *(Antechinus apicalis)* rediscovered near Mt Many Peaks in 1967, after a gap of 84 years.

**Reptiles and Frogs** (See Appendix IV)

Tortoises: The only tortoise recorded from the area is the long-necked tortoise, common in the fresh water swamps of Swan Coastal Plain.

Lizards: Nineteen lizards have been recorded so far. The most obvious species are the sluggish bobtails and the fast moving Gould's goanna or bungarra. Several species of geckos can be found under stones and under the bark of trees and small skinks are widespread.

Snakes: Four species of snakes have been listed including the tiger snake and the dugite.

Frogs: Six species of frogs are known from the reserve and these include the banjo frog *(Limnodynastes dorsalis)*, the whoop frog *(Helioporus eyrei)* and the termite eating frog *(Myobatrachus gouldii).*

**Birds** (See Appendix II)
The bird list of 112 is not exhaustive, but includes such species as emus, penguins, mallee hens, ducks, egrets, hawks, eagles, parrots, sea gulls, dotterels, wrens, pardalotes, honeyeaters, magpies and ravens. This diversity of species reflects the range of habitats available and suggests that organised studies might well double the existing list.

Interesting forms which undoubtedly await listing include the white-bellied sea-eagle and the osprey, two magnificent raptores which range widely along our coasts, but which are disappearing from the more frequented areas.

The sea cliffs of the reserve should provide admirable nesting sites for both species.

Although the noisy scrub bird *Atrichornis clamosus* is currently known only from Two People Bay, the Fitzgerald River environment is another likely spot and it will be searched carefully by those optimists who believe that the scrub bird will yet be found outside its Mt Gardner sanctuary.

The parrots range from the huge black cockatoos to the tiny budgerigars and the tree loving twentyeights and king parrots to the shy rock parrots. Rock parrots, which were once common at Cottesloe, may be found searching for seeds right on the sea front and nesting under the shelter of overhanging rocks almost in reach of the ocean spray.

**Fish** (See Appendix V)
The fish fauna of the park itself has received no special study but professional fishermen using both nets and hand lines operate seasonally along the beach and from boats based at Albany some 225 km to the west. Four ocean fisheries are functioning at present and involve the following types:

1. salmon and sea herring;
2. sharks;
3. abalone
4. snapper, sampson fish etc (hand lining).

Net fishing for mullet and black bream also occurs in the river estuaries when conditions are favourable. The ocean based fisheries are restricted by the fact that no safe anchorage exists between the Doubtful Island area and Hopetoun and in consequence most professionals operate from trailer units which enable boats to be launched from the shore and recovered easily in the event of bad weather.

The salmon and herring run occurs in March/April and most fish are netted on the Fitzgerald River beach but some are also taken at Point Ann. Both species migrate along the coast from east to west and show considerable regularity in visiting certain beaches.

Shark fishermen work the area about every two months, visiting each beach in turn. Their method of capture — meshing (letting the shark swim into a net set in an area) is very effective and soon results in uneconomic catches if persisted with too long in one area.

Abalone divers work along the reefs and headlands but take only the larger shells as the smaller fish are left to prevent the over exploitation of the area.

After one or two heavy winters the river estuaries may be very productive, particularly as regards mullet and black bream, however in years of light rainfall sand bars close the river mouths and high salinity kills many fish as well as other forms of aquatic life.

## Invertebrates

### Non-Marine Molluscs

The colourful *Bothriembryon* snails are the largest group of native land snails in south-western Australia and at least five different species are known to inhabit the National Park. The largest of the entire group, *B. dux,* with a shell nearly six cm high, lives mainly along river valleys and on loamy soils with *Eucalyptus* trees; other species are restricted to coastal land or the higher parts of the Barren Range. Several are still awaiting scientific description as they were discovered only recently.

Two species of water snails, both of the family Hydrobiidae, are known from streams in the National Park. One, a tiny unidentified species, is common in some of the Fitzgerald River pools and the other, a salt lake snail *(Coxiella striatula)* is recorded from the Bremer River. It is likely that various other species will be found in the Park when more collecting has been possible.

### Arthropods

Although relatively little insect collecting has been done in the Fitzgerald River National Park the area shows considerable promise. A new species of weevil has been found already as well as many insect species poorly represented in existing collections. The mallee provides collecting sites of great interest particularly for those studying the showy jewel beetles (Buprestidae) which are sometimes present in large numbers.

The insect list of 122 species covers 10 orders, 62 families and 104 genera, but these numbers will be increased greatly when more detailed collecting has been organised.

Spiders are well represented throughout the park with orb-weavers and jewel spiders predominating. So far 18 species have been collected representing six families and eight genera.

Two genera of scorpions and one genus of centipede have also been taken in the area.

## Botany

The south coastal area of Western Australia, from Augusta to Israelite Bay, supports a wealth of wildflowers which have become world famous because of collections made in the latter half of the nineteenth century. The most outstanding area lies between Bremer

Bay and Hopetoun, and embraces the Fitzgerald River valley and the associated mountain peaks.

The known flora of the Park at present totals some 600 species, but when fully checked the number may be as much as 700. Approximately 10 per cent of the species are endemic, i.e. they occur nowhere outside the reserve and a number of others have their main distribution within the area.

Some idea of the richness of the flora can be gained from the following list of families and their representation within the park.

Family Proteaceae — 79 species in 13 genera, including 16 *Hakea* spp., *Dryandra* spp. and 14 *Banksia* spp.
Family Mimosaceae — 25 *Acacia* spp.
Family Myrtaceae — 41 species in 16 genera, including 25 *Eucalyptus* spp.
Family Epacridaceae — 30 species in 13 genera.
Family Papilionaceae — 35 species in 17 genera.
Family Orchidaceae — 23 species.
Family Stylidiaceae — 11 species of *Stylidium*.
Family Rutaceae — 21 species, including 12 *Boronia* species.

The unique character of the flora of the south coast was quickly recognised after the founding of the Swan River Colony, and a great deal of plant collecting was carried out between Albany and Israelite Bay. By 1878 when Bentham completed his 'Flora Australiensis' there were no less than 37 species recorded as being known only from the Fitzgerald River valley and the surrounding mountain peaks. Only 7 of these are now listed among the endemics, but since Bentham's time further collecting has greatly increased the actual number of endemics recorded in the area. Up to 1970 there were 63 described plants known only from the reserve, but many other species including the spectacular royal hakea *Hakea victoriae*, although not actually restricted to the park are threatened by agricultural development in most other portions of their range.

As an indication of the wealth of the flora of the area, it is pertinent to state that as a result of a seven day collecting trip in July 1970, when the blooming of the flora had barely commenced, and a total of less than 400 specimens were collected, there were discovered 10 species which were undoubtedly new to science, while a further 10 species were sufficiently distinct to make their naming uncertain. These latter plants may well be eventually described as new species or new varieties. These were collected in a short period of time over a very restricted area of the Park, and it is probable that many more scientific discoveries remain to be made.

Species variation within the Park itself is also of considerable scientific importance. The reserve is ideal as a unit of conservation because of the many different habitats which exist within its boundaries. These variants not only give rise to different species, but also to variations within species. As an example of this latter phenomenon, *Hibbertia mucronata* may be quoted. This is a species which is fairly widely distributed in the southern areas of the State, including the Fitzgerald River National Park. Within the reserve however, there are three well-defined variants of the typical form. These are not sufficiently distinct to be given formal names, yet they are of very great scientific interest.

Outstanding though this area is as a Park, it is also of great scientific value as one of a series of such reserves throughout the State. This area together with the Esperance sandplain, is comparable with the west coast sandplain which culminates in the Kalbarri National Park in the Murchison River area. Both of these areas are heavily influenced by the overlapping of the flora of the south-west and Eremean provinces, and this overlapping has produced a large number of unusual species over a broad band extending from Shark Bay to Israelite Bay. This 'endemism' as it is called has been demonstrated in many areas such as Kalbarri, Lake Barker, Lake Cronin, Comet Vale and the Fitzgerald-Esperance areas of the south coast.

The value of these areas as permanent reserves for study is immense. It enables a comprehensive study of the mechanics of species formation and provides a source of cross breeding material. From the scientific point of view the unique nature of these reserves is of great importance in experimental taxonomy, and is of international significance. Their individual preservation intact is therefore imperative scientifically.

From a study of the northern and southern coastal sandplains certain similarities are evident. In a number of instances closely related, but different species occur in the two areas, one in the north and one in the south. On the other hand two species, not necessarily closely related, can occur one to the south and the other in the north, each occupying a similar ecological niche. Examples occur in *Banksia, Eucalyptus, Adenanthos*, etc.

This parallel development is a most interesting aspect of evolution, and the presence of such species in reserves makes it possible to plan a continuing programme of study.

A study of the plants occurring in the northern coastal sandplains and the Fitzgerald-Esperance area has shown an interesting pattern. There are some 10-12 species including members of the genera *Eucalyptus* and *Hakea* which grow along the south coast and occur also in the northern sandplains. They are not found in the intervening areas.

The south coastal region is also of international significance to plant geographers. The area is remarkable for the fact that the overlapping south-west and Eremean vegetation has also been influenced by a southern element of the flora. It has been postulated that in early times the southern extremities of South Africa, South America and southern Australia were connected as a southern continent, and that there was free transfer of plant material between them. The effect of this continental connection can be seen today in the marked similarity in certain plant families occurring in South Africa, South America and southern Australia. The influence of this migrant element into the flora does not extend over the whole State, but it has had a profound effect on the Fitzgerald River area and surrounding districts in that it has increased the endemism of the area. Furthermore, it contains many of the plant species which demonstrate the affinities between the floras of South Africa, South America and southern Australia.

For this reason again, the area is of great international significance, and its preservation intact is important. It is of interest to note that the low-lying grassy flats of the Fitzgerald valley which were described in one report as being of 'little significance' in the reserve, are just the areas where the Restionaceae and Centrolepidaceae, which occur in the other two southern continents, would be most common.

The tourist potential of the reserve is great, both from the scenic and the botanical point of view. Already some of the most spectacular species are well known e.g. the Qualup Bell, *Pimelea physodes* Hook., the Barrens Regelia, *Regelia velutina* (Turcz.) C.A. Gardn. and the royal hakea, *Hakea victoriae* Drumm. The latter is unique among our wildflowers in that it is attractive throughout the year. It is one of those plants which, like the Sturt Pea, almost compels one to stop and admire it, no matter how many times one has already seen it. The unique weeping gum *Eucalyptus sepulcralis* F. Muell. is another plant of perennial interest, due mainly to its very slender, graceful habit. The scrub as a whole forms a green mantle over the ranges and gives them an aspect which is rarely seen elsewhere along the south coast. Rock outcrops projecting through this cover lend a rugged appearance to the mountains. The panoramic views across the ranges are sometimes compared with parts of Scotland.

It is extraordinary that in the park one can see a flora ranging from coastal species through species typical of southern sandheaths, montane scrub, mallee and woodland, to species which are normally typical of dry inland districts. The latter occur mainly in or alongside the Fitzgerald and Hamersley River valleys, which therefore must be preserved if an important part of the Reserve's flora is not to be lost.

The West Mount Barren — Mount Bland — Point Ann area of the reserve, shares much with the other ranges but also has its own characteristics. Being towards the western edge of the reserve it contains many species typical of areas further west. In fact there is a striking similarity between parts of the vegetation on the lower north slopes of West Mt Barren and parts of the Stirling Range below the north side of Bluff Knoll. This is not to say that the areas are identical, for each has many species not found in the other. Species which are restricted to West Mt Barren and Mt Bland include *Beyeria latifolia* Baill., *Acacia* sp. nov., *Agonis undulata* Benth, and *Monotoca* sp.nov. Another new species of *Acacia* is known only from Point Ann and an area of the plain between Mt Bland and West Mt Barren. In the latter area there are some magnificent populations of the royal hakea. Certain other species are known from only one or two peaks in the reserve besides these two. Such are *Calothamnus validus* S. Moore, *Melaleuca citrina* Turez., *Acacia cedroides* Benth. and a new species of *Lepidosperma.*

The reserve is extremely important as a general meeting place for plants which can be divided broadly into four categories:—

1. Those of the Albany-Stirling Range region which reach their eastern limit in the reserve;
2. those of the south coast east of Hopetoun which here are at or near the western limit;
3. those of the reserve area itself;
4. inland species which are able to utilise certain habitats in the reserve to extend their normal range further south and west.

A high proportion of the total flora of the south coastal regions from Albany to Israelite Bay is found here.

Such an area of overlap, provides great opportunities to study problems associated with speciation — why, for instance, are so many species restricted to this area, and how do 25 species of *Eucalyptus* exist in such close proximity? Such questions have evolutionary significance.

## Appendix I

### Place Names and their Origin in and near the Fitzgerald River Reserve

Boondalup River — This was named by H.S. Carey but the origin is not known.

Bremer Bay — Named after Captain Sir Gordon Bremer of HMS Alligator, 1849.

Culham Inlet (at the eastern end of the reserve): Named by Roe after 'Culham', the estate of Samuel Pole Phillips near Toodyay.

Dempsters Inlet — Named after the Dempster family.

Dillon Bay — Named after Captain P. Dillon, of HMS Research. He was responsible for finding the relics of the French Captain La Perouse in the New Hebrides in 1827. (There is also a Dillon Bay in the New Hebrides named after him.)

Elwes River — Named by J.S. Roe in the 1849 expedition after an English artist and naturalist. This name has been deleted from current maps as no exact interpretation of which river Roe was referring to can be made.

Eyre Range — Named by Roe after Edward John Eyre, who passed this way with Wylie in 1841.

Fitzgerald Inlet, Fitzgerald River — Both these were named after Governor Charles Fitzgerald R.N. (1848-55).

Gairdner River — Named after Captain Alan Gairdner, R.N. by Vancouver, 1791.

Hamersley River — Named after the Hamersley family.

Martins Creek — No information is available on the naming of this feature.

East Mount Barren, Mid Mount Barren, West Mount Barren — These were sighted and named by Matthew Flinders in the HMS Investigator, sailing along the coast in 1801.

Mount Bland — Resident Magistrate H. Bland, of Albany.

Mount Desmond — Named by Roe but origin unknown.

Mount Drummond — Named after botanist James Drummond, of Hawthornden, Toodyay.

Mount Maxwell — Named by H.S. Carey, Surveyor and explorer after Maxwell who reported the existence of coal beds on the East Fitzgerald River. Maxwell in 1849 also accompanied Lt Helpman on the schooner 'Champion' to examine these coal beds.

Peak Charles — Named by J.S. Roe in 1843 but origin unknown.

Phillips River — Named after S.P. Phillips. See under 'Culham'.

Point Ann — Named after Mary Ann Thomas, the eldest daughter of Captain J. Thomas, whaler and well known identity on the south coast.

Quoin Head — Possibly refers to the angular or wedge-shaped appearance of the headland. First appeared on Admiralty Charts, but who named the feature is not known.

Susetta River — This was named by J.S. Roe in his 1849 exploration, but the exact origin is unknown.

Thumb Peak — No information is available on the naming of this feature.

Twertup Creek — Alexander Forrest is credited with naming this creek, but he made no reference to the origin of the name. The only clue is that 'twertup' is a native name meaning 'a place of wild dogs'.

Note: There is a strong association between this area and that of Toodyay, because of Roe's connections. For example, Phillips Inlet was named after Roe's son-in-law; (S.P. Phillips married Sophie Roe, his eldest daughter). Culham was where Roe's daughter resided after her marriage. Drummond was in the area *before* Roe's exploration (see earlier notes) and Roe actually discovered Drummond's campsites on his own journey home. (For example, east of the Pallinup River.) Hamersley was Phillips' partner, hence Hamersley River and Inlet.

## Appendix II
## List of Birds from the Fitzgerald River National Park

(Based on surveys, July 1970; D.L. Serventy, February 1946; G.M. Storr, March 1958; J.R. Ford, May 1962; J. Stuart, January 1970; W.H. Butler, August 1970.) — Compiled by G.M. Storr and includes Mrs J. Falconer's list (resident of Bremer Bay).

Emu *Dromaius novaehollandiae.*
Little Penguin *Eudyptula minor.*
Little Grebe *Podiceps novaehollandiae.*
Hoary-headed Grebe *P. poliocephalus.*
Little Pied Cormorant *Phalacrocorax melanoleucos.*
Australian Darter *Anhinga rufa.*
White Egret *Egretta alba.*
White-faced Heron *Ardea novaehollandiae.*
White-necked Heron *A. pacifica.*
Black Swan *Cygnus atratus.*
Mountain Duck *Tadorna tadornoides.*
Black Duck *Anas superciliosa.*
Grey Teal *A. gibberifrons.*
Chestnut Teal *A. castanea.*
Wood Duck *Chenonetta jubata.*
Musk Duck *Biziura lobata.*
Wedgetailed Eagle *Aquila audax.*
Little Eagle *Hieraaetus morphnoides.*
Swamp Harrier *Circus assimilis.*
Brown Hawk *Falco berigora.*
Nankeen Kestrel *F. cenchroides.*
Mallee Hen *Leipoa ocellata.*
Painted Quail *Turnix varia.*
Coot *Fulica atra.*
Bustard *Eupodotis australis*
Pied Oystercatcher *Haematopus ostralegus.*
Banded Plover *Zonifer tricolor.*
Hooded Dotterel *Charadrius cucullatus.*
Red-capped Dotterel *Ch. ruficapillus.*
Greenshank *Tringa nebulairira.*
Common Sandpiper *T. hypoleucos.*
White-headed Stilt *Himantopus himantopus.*
Avocet *Recurvirostra novaehollandiae.*
Pacific Gull *Larus pacificus.*
Silver Gull *L. novaehollandiae.*
Crested Tern *Sterna bergii.*
Caspian Tern *Hydroprogne caspia.*
Common Bronzewing *Phaps chalcoptera.*
Brush Bronzewing *P. elegans.*
Purple-crowned Lorikeet *Glossopsitta porphyrocephala.*
White-tailed Black Cockatoo *Calyptorhynchus baudini.*
King Parrot *Purpureicephalus spurius.*
Smoker Parrot *Polytelis anthopeplus.*
Twenty-eight Parrot *Barnardius zonarius.*
Rock Parrot *Neophema petrophila.*
Budgerigar *Melopsittacus undulatus.*
Pallid Cuckoo *Cuculus pallidus.*
Fantailed Cuckoo *Cacomantis pyrrhophanus.*
Golden Bronze-Cuckoo *Chrysococcyx lucidus.*
Horsfield Bronze-Cuckoo *Ch. basalis.*
Barn Owl *Tyto alba.*
Boobook Owl *Ninox boobook.*
Tawny Frogmouth *Podargus strigoides.*
Owlet-Nightjar *Aegotheles cristatus.*
Spotted Nightjar *Eurostopodus guttatus.*
Laughing Kookaburra *Dacelo gigas.*
Australian Bee-eater *Merops ornatus.*
Welcome Swallow *Hirundo neoxena.*
Tree Martin *Petrochelidon nigricans.*
Australian Pipit *Anthus novaeseelandiae.*
Ground Cuckoo-Shrike *Pteropodocys maxima.*
Black-faced Cuckoo-Shrike *Coracina novaehollandiae.*
Southern Scrub Robin *Drymodes brunneopygia.*
White-browed Babbler *Pomatostomus superciliosus.*
Little Grassbird *Megalurus gramineus.*
Reed Warbler *Acrocephalus stentoreus.*
Splendid Blue Wren *Malurus splendens.*
Purple-breasted Wren *M. pulcherrimus.*
Southern Emu-Wren *Stipiturus malachurus.*
Western Warbler *Gerygone fusca.*
Broad-tailed Thornbill *Acanthiza apicalis.*
Yellow-rumped Thornbill *A. chrysorrhoa.*
Spotted Scrub Wren *Sericornis maculatus.*
Weebill *Smicrornis brevirostris.*
Shy Ground Wren *Hylacola cauta.*
Field Wren *Calamanthus fuliginosus.*
White-fronted Chat *Epthianura albifrons.*
Scarlet Robin *Petroica multicolor.*
Hooded Robin *P. cucullata.*
Western Yellow Robin *Eopsaltria griseogularis.*
Grey Fantail *Rhipidura fuliginosa.*
Willie Wagtail *Rh. leucophrys.*
Restless Flycatcher *Seisura inquieta.*
Golden Whistler *Pachycephala pectoralis.*
Rufous Whistler *P. rufiventris.*
Gilbert Whistler *P. inornata.*
Western Shrike-Thrush *Colluricincla rufiventris.*
Crested Bellbird *Oreoica gutturalis.*
Shriketit *Falcunculus frontatus.*
Spotted Pardalote *Pardalotus punctatus.*
Yellow-tailed Pardalote *P. xanthopygus.*
Silvereye *Zosterops gouldi.*
White-naped Honeyeater *Melithreptus lunatus.*
Brown-headed Honeyeater *M. brevirostris.*
Western Spinebill *Acanthorhynchus superciliosus.*
Brown Honeyeater *Lichmera indistincta.*
Tawny-crowned Honeyeater *Gliciphila melanops.*
White-fronted Honeyeater *Phylidonyris albifrons.*
New Holland Honeyeater *Ph. novaehollandiae.*
White-cheeked Honeyeater *Ph. niger.*
White-eared Honeyeater *Meliphaga leucotis.*
Singing Honeyeater *M. virescens.*
Yellow-plumed Honeyeater *M. ornata.*
Purple-gaped Honeyeater *M. cratitia.*

Yellow-throated Miner *Manorhina flavigula.*
Red Wattlebird *Anthochaera carunculata.*
Little Wattlebird *A. chrysoptera.*
Red-eared Firetail *Zonaeginthus oculatus.*
Dusky Wood-Swallow *Artamus cyanopterus.*
Grey Currawong (Squeaker) *Strepera versicolor.*
Grey Butcherbird *Cracticus torquatus.*
Western Magpie *Gymnorhina dorsalis.*
Raven *Corvus coronoides.*

## Appendix III
## List of Mammals from Fitzgerald River National Park

(A) collected and in Western Australian Museum (followed by catalogue number)

Common Dunnart *(Sminthopsis murina)* - M8170.
Brush Possum *(Trichosurus vulpecula)* - M8746-7.
Southern Bush Rat *(Rattus fuscipes)* — M8742-5 and M10046.
Gould's Wattled Bat *(Chalinolobus gouldii)* — M8748.
Feral Cat *(Felis cattus)* — M8376.
House Mouse *(Mus musculus)* — M10565-71, M8739-41.
Dingo *(Canis familiaris)* — M4580.
Fox *(Vulpes vulpes).*

(B) sighted only

Grey Kangaroo *(Macropus fuliginosus)* — common July 1970 (G.M. Storr).
Brush Kangaroo *(Macropus irma)* - - on Mt. Maxwell in July 1970 (A.M. Douglas).
Brown Bandicoot *(Isoodon obesulus)* — sign observed by W.H. Butler.
Rabbit *(Oryctolagus cuniculus).*
Western Water Rat *(Hydromys chrysogaster)* — footprints and scats.

## Appendix IV
## List of Reptiles and Frogs from the Fitzgerald River Reserve

(Based on surveys, July 1970 and March 1972; additional species recorded by J. Stuart in January 1970 in square brackets.) — Compiled by G.M. Storr.

**Tortoises**
*Chelodina oblonga* Longnecked tortoise.

**Lizards**
*Phyllurus milii.*
*Crenadactylus ocellatus.*
*Diplodactylus vittatus.*
*Phyllodactylus marmoratus.*
*Pygopus lepidopodus.*
*Delma* spp. (legless lizard).
*Amphibolurus minor.*
*Trachysaurus rugosus* (bobtailed lizard).
*Egernia nitida.*
*E. bos.*
*Ctenotus labillardierii.*
*C. impar.*
*Hemiergis initialis.*
*H. peronii.*
*Lerista distinguenda.*
*Cryptoblepharus virgatus.*
*Menetia greyi.*
*Morethia obscura.*
*Morethia lineoocellatus.*
*Varanus gouldii* (gould's goanna).
V. tristis.

**Snakes**
*Notechis scutatus* (tiger snake).
*Denisonia gouldii.*
*D. coronata.*
*Demansia nuchalis x affinis* (dugite).

**Frogs**
*Lymnodynastes dorsalis.*
*Heleioporus eyrei* (whoop frog).
*Myobatrachus gouldii.*
*Litoria cyclorhyncha.*
*(L. adelaidensis).*
*Crinia pseudinsignifera.*
*Heleioporus psammophilus.*

## Appendix V

List of fishes occurring in the ocean waters adjoining the Fitzgerald River National Park.

**Bony or Scale fish *(Teleosts)***
Yelloweye mullet *(Aldrichetta forsteri).*
Sea mullet *(Mugil cephalus).*
King George whiting *(Sillago punctata).*
School whiting *(Sillago bassensis).*
Cobbler *(Cnidoglanis macrocephalus).*
Herring *(Arripis georgianus).*
Australian salmon *(Arripis trutta esper.).*
Sea garfish *(Hemiramphus melanochir).*
Snapper *(Chrysophrys unicolor).*
Silver bream (Tarwhine) *(Rhabdosargus sarba).*
Sand flathead *(Platycephalus bassensis westralie).*
Rock flathead *(Platycephalus laevigatus).*
Trevally *(Usacaranx georgianus).*
Sampson fish *(Seriola hippos).*
Yellowtail kingfish *(Seriola grandis).*
Yellowtail *(Trachurus mccullochi).*
Small toothed flounder *(Pseudorhombus jenynsii).*
Tailor *(Pomatomus saltator).*
Barracouta *(Thyrsites atun).*
Long finned pike *(Dinolestes lewini).*
Queen snapper (Blue morwong) *(Nemadactylus carponotatus).*
Dusky morwong *(Psilocranium nigricans).*
Leatherjacket (a number of species) *(Navodon* spp.*)* most common genus.
Southern Bluefin tuna *(Thunnus thynnus maccoyii).*
Blue groper *(Achoerodus gouldii).*
Breaksea cod *(Epinephelides armatus).*
Wirrah *(Acanthistius serratus).*

**Sharks and rays *(Elasmobranchs)***
Wobbegong *(Orectolobus maculatus).*
Gummy Shark *(Mustelus antarcticus).*
Whiskery Shark *(Furgaleus ventralis).*
Grey Nurse *(Carcharius arenarius).*
School Shark (Western species) *(Notogaleus rhinophares).*
Whaler Shark (bronze, blue, etc.) *(Carcharhinus spp.).*
Stingarees *(Urolophus spp.).*
Smooth stingray *(Dasyatis brevicaudata).*
plus Skates and shovelnose rays and fiddlers (Fam. Rajidae and Rhinobatidae).

**Fishes occurring in the rivers and estuaries**
*(Galaxias hesperius truttaceus).*
*Atherinosoma* sp.
Mullet
Black bream.

## Appendix VI

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## Nambung National Park

The Nambung National Park of approximately 17,500 hectares is situated just over 200 kilometres north of Perth and was declared an A Class Reserve in August 1968.

Much of the area is covered by low sand plain heath which provides a wealth of colour during the late winter and spring, but the main attraction of the reserve is the Pinnacles Desert.

The limestone 'monuments' vary in size from five metres tall and two metres wide at the base to slender 'twigs' little more than ankle high and the thickness of a pencil.

The remarkable formations are attributed to the percolation of ground water heavily charged with lime and the redeposition of this lime as hard calcite along plant root systems, and other channels in the porous sand. Years of wind erosion has finally exposed the tapering monoliths which now stand like tombstones in a moon landscape.

Another feature of interest is the Nambung River which disappears into an underground cave system, but provides water holes which attract ducks and herons and support the growth of river gums and other aquatic vegetation.

Unfortunately, much of the pinnacles area is highly susceptible to vandalism. Once damaged the geological formations cannot be restored and for this reason strict vehicle control and public co-operation is essential.

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## Kalbarri National Park

The Kalbarri National Park is an A Class Reserve (declared in 1963) of approximately 187,000 hectares situated 644 km north of Perth at the mouth of the Murchison River.

The Murchison Gorge is one of the most impressive physiographic features of Western Australia and extends for about 125 km between Hardabut Pool and Bettie Crossing with precipitous, multi-coloured cliffs towering up to 150 metres.

In addition to its scenic and biological interests the park has important historical associations. Wittecarra Gully is probably the spot where two mutineers from the Batavia were marooned by Pelsart in 1629. The Dutchman Vlaming landed at Wittecarra Gully in 1696 for fresh water and later the explorer Grey was wrecked in this area in 1838 from where he and his party walked to Perth.

Although most of the scenic areas in the park are associated with the river gorges, the coastal cliffs are impressive and must have been a forbidding sight to the early navigators.

An interesting summary of the geographical features of the region was published by Clarke and Teichert (1948) who made one of the first detailed geological studies of the area.

### Vegetation

Although the main vegetation of the park is low sand-plain heath the river gorges, the estuary and the coastal cliffs and dunes provide a variety of habitats for both plants and animals.

To the tourist the park is most attractive in the late winter and early spring when most of the plants are in bloom, many birds are breeding and the river pools are favourable for both fish and waterfowl.

Grevilleas and banksias are prominent amongst the flowering shrubs with the white scented flowers of *Grevillea leucopteris* and *G. anulifera* borne on the ends of long leafless canes lining many of the roads and tracks.

The yellow flowered *Banksia sceptrum, B. lindleyana* and the orange *B. prionotes* flower in profusion and the massed reddish blooms of *Pileanthus* are conspicuous even from a speeding car.

Amongst the prominent features of the northern sand-plain are the beautiful feather flowers whose tight formations of white, red and yellow blooms would outclass most formal gardens.

The hibiscus family is prominent amongst the shrubs, and the two species, *Hibiscus drummondii* with deep blue

flowers and yellow centred blue flowered *Alyogyne hakeifolia,* occur throughout the area.

In favourable seasons the pink flowered mulla-mulla, *Ptilotus exaltatus* develops in great abundance, particularly along roadsides where it may reach a height of almost a metre. Other annual plants deserving mention include the flannel flower, *Actinotus leucocephalus,* and the aptly named native cornflower *Brunonia australis.*

Several species of eucalypts occur within the park, the commonest being the river gum *E. camaldulensis* which is found in the river gorge along with the coolabah, *E. microtheca.* In the sand-plain areas are the white-barked *E. drummondii,* the mallee white gum *E. redunca* and mallalie *E. eudesmoides.*

An interesting feature of the park is the fact that it contains the northern-most specimens of a number of typical south-western species including Mangles' kangaroo paw *(Anigosanthus manglesii)* Menzies' banksia *(B. menziesii)* and the pink flowered form of milkmaids, *(Burchardia umbellata).* It also supports a scattered population of the colourful Christmas tree, *Nuytsia floribunda.*

**Birds**

Most of the birds in the park are associated with the sand-plain where a variety of honeyeaters, wrens and thornbills are interspersed with such songsters as the rufous and golden whistlers, the southern scrub-robin, the grey and pied butcher birds and the characteristic, but less melodious bellbird.

The estuary mouth and the upstream pools harbour several species of ducks, shags and herons and the mudflats make attractive feeding grounds for seagulls, terns and a variety of migrant waders or 'snipe'.

The rugged overhanging cliffs of the gorge and the sea coast provide ideal caves and clefts for the breeding of kestrels, falcons, swallows and martins and provide an interesting diversion for any one with the time to watch these masters of the air as they ride the currents and eddies which bounce from the towering rock faces.

More than 130 species of birds have been recorded from the area and a detailed account is given by Sedgwick (1949).

**Mammals**

The commonest native mammal to be seen in the park is the western grey kangaroo *(Macropus fuliginosus)* but the euro *(M. robustus)* is also present and colonies of brush-tailed rock wallabies *(Petrogale penicillata)* are present in the river gorges.

Smaller nocturnal mammals were also recorded by a survey party from the Western Australian Museum in 1969 and included the fat-tailed dunnart *(Sminthopsis crassicaudata)* and the honey possum *(Tarsipes spencerae).*

Native rodents were represented by the ashy grey mouse *(Pseudomys albocinereus)* and the hopping mouse *(Notomys mitchelli).*

Unfortunately feral mammals are well established and widespread and include the rabbit, black rat, house mouse, fox, cat, pig, goat and sheep. Pigs and goats are particularly troublesome in the river gorges and should be reduced in number as much as possible.

**Fishes**

The estuary and coastal waters provide considerable scope for the angler, but the freshwater stretches of the river are of special interest to the naturalist. Whereas the flora of the region is mainly typical of the South-West the freshwater fish show relationships with the north.

Two species are of special interest, the hardyhead *(Craterocephalus cuneiceps)* which is restricted to the Murchison system and the golden gudgeon *(Eleotris aurea)* which is known elsewhere only from the Gascoyne River.

Other fish worthy of mention are the sea mullet *(Mugil cephalus)* which thrives well upstream, the black bream *(Mylio butcheri)* which reaches its northern limits in the Murchison River and the carp gudgeon *(Carassiops compressus)* which does not extend any further to the south.

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## Cape Range National Park

The Cape Range National Park was first established in 1965 but in 1974 it was extended to 50,581 hectares by the inclusion of a portion of former Yardie Creek Station (purchased by the Government) and gazetted an A Class Reserve.

Before the advent of oil drillers to the area in the 1950's and the establishment of the Naval Communications Base near Vlaming Head in the 1960's 'The Cape' was seldom visited by 'outsiders'. The mail came once a fortnight from Carnarvon, supplies for the lighthouse were landed on the beach twice a year from the lighthouse tender 'Cape Otway'. A reluctant horse dragged the cases up a primitive 'tramline' to the store room and then 'stood by' until the next job in six months time.

The establishment of the town of Exmouth and an influx of workers and tourists has changed all this and without the creation of the Cape Range National Park much of the area's natural beauty and interesting wildlife could have been destroyed.

Much of plain country is covered with spinifex but towards the centre the country rises to form a low rugged range cut by deep creeks and gorges. In a land of light rainfall it may seem strange to find such obvious evidence of intense water erosion. But semi-tropical downpours and willy-willies occasionally sweep across the Cape and the short creeks that run to the Indian Ocean on the west and into Exmouth Gulf in the east are for brief periods, raging torrents. Along their banks grow graceful river gums and kurrajongs with native figs on the rocky slopes and on the red clay soils trail the scarlet runners of the Sturt pea.

Yardie Creek on the west coast is a tidal stream of considerable scenic as well biological interest, which is often isolated from the sea by a sand bar.

Where the creek cuts it way through the hills half a kilometre or less from the shore it passes between sheer cliffs 30 to 40 metres in height, where little corellas assemble in flocks and where the osprey or fish hawk can nest in comparative safety.

The osprey with its white head and underparts is a fine looking bird somewhat larger than the whistling eagle with a wide distribution along the Australian coast. It builds a large stick nest which is often added to year after year until a great pile marks the nesting site.

Another bird of prey which patrols our northern coastline is the white-breasted sea eagle, resembling very much the white-headed or bald eagle of America. It is a truly picturesque bird with its snowy head, gleaming underparts and a wing-span of almost two metres. Its principal food is fish and other marine products, although some pastoralists shoot it on sight because of the occasional lamb it is said to steal.

Another bird of major interest is the spotted bower bird, which often builds its playground near a cluster of native fig trees, the fruits of which comprise the bird's staple diet.

Several creatures unique to the Cape and still needing much further study live in underground pools and shallow wells. These pale fish, eels and shrimps have one feature in common — blindness, because after generations of existence in subterranean darkness the power of sight has been lost. Despite this apparent handicap, all the creatures show a remarkable ability to regulate their movements to the time of day (Mees 1962).

A walk along the beach will disclose many beautiful shells seldom seen on southern strands including coweries, bailer shells and clams.*

Several turtles inhabit the warm waters of the Cape including the green turtle and the hawksbill, both of which were once commercially exploited, the first for its flesh and the second for its 'tortoise shell'.

Unlike the swamp tortoises of the South-West, the true turtles are entirely marine in their habits and only come ashore in the breeding season. The eggs are laid in an excavation on the sandy shore and are covered by a couple of feet of sand.

The dugong or sea cow also lives in the waters off Exmouth and but for the whale, is superior to any other mammal in its adaptation to an aquatic life. Hind limbs are absent and the fore limbs are represented by flippers. Although responsible for many mariners tales and fables about mermaids and sirens, the face of the dugong is not in the least prepossessing. The jaws are bent downwards to accommodate a pair of tusks which in the male have a sharp cutting edge and grow throughout life like those of the elephant.

Whales are common off North-West Cape, the principal species being the Humpback, which migrates from the Antarctic every winter to breed in the warm waters of the Indian Ocean. It was this fact that led to the establishment of a whaling station at Point Cloates, at the turn of the century but this was abandoned in 1928 and reduced to a heap of rubble by a severe cyclone in February 1945.

The effect of cyclones on the wildlife of the Cape is difficult to estimate, but when it is known that 8,000 sheep and six horses were drowned on one property during the 1945 blow and that the sea advanced inland 13 kilometres during the night the importance of the elements becomes apparent.

*The shallow off-shore waters of Ningaloo Reef also contain colourful coral formations reminiscent of the Great Barrier Reef.

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## The National Parks of the Pilbara

### Fauna

The Pilbara region of Western Australia, like the so-called 'Dead Heart' to the east, is a land of great contrasts. Areas which today are parched by heat and drought may in a few days be a sea of flood waters and in a few weeks a stretch of lush green vegetation. It is evident therefore that wild creatures living under such conditions must be so adapted that they can survive the long lean periods and make the most of any periods of plenty.

The wide variety of climatic conditions possible in the area may be illustrated by the following rainfall and temperature details for Roebourne and Marble Bar. The average annual rainfall for Roebourne is just over 300 mm, but the highest ever recorded in one year is 1050 mm, while the lightest annual recording is 3 mm. The heaviest downpour in a single day is just under 304 mm, that is about equal to the yearly average.

Although Wyndham is the most consistently hot place in Western Australia, Marble Bar shows great variations and can fluctuate between 50°C in mid-summer and 1.1°C in mid-winter. Furthermore, during one torrid spell commencing in October 1923, Marble Bar had the doubtful honour of having reached or exceeded the old time century on 160 days in succession.

Because many different types of fauna live in our hot arid regions it is popularly believed that such creatures are immune to high temperatures, but such is not the case.

Prolonged exposure to the hot sun would kill most of the reptiles, birds, mammals and insects and their ability to survive depends not on their resistance to high temperatures but on their ability to avoid them.

Water conservation is of course the prime consideration when faced with arid conditions, and to this end many animals are active mainly at night. This applies to only a few species of birds, but many creatures rest in shady situations during the heat of the day and do most of their foraging in the cool of the morning or evening. This habit means that exertion is largely avoided during the heat and that moisture loss, both by sweating and respiration, is reduced to a minimum.

When the body temperature approaches the lethal limit — about 42° C, many creatures dribble copiously, so as to wet the fur on the chin and throat and they may lick their forearms and paws. This is of course a very extravagant way of keeping cool, and is adopted only as a last resort. It has been calculated that some of the small kangaroo rats found in the desert, would use up to 20% of their body weight every hour if they depended upon water evaporation to keep them cool. They are left then with three alternatives. The first is to evaporate water and die from dehydration. The second is to abstain from evaporating moisture and die from heat stroke. The third, which is the one they try to follow, is to spend the day in cool surroundings, preferably underground, and to confine strenuous exercise to the hours of darkness.

In settled areas squatters, tanks and troughs have eased the lot of some inland fauna, but occasionally these watering points are the scene of mass drownings. During a severe heat wave in the north of South Australia temperatures reached the high 40's for several days and 60,000 budgerigars were drowned in one dam. On another property the owner filled a 40 gallon drum with parrots which had died on the homestead verandah during a few hours.

Such mass destruction would of course be disastrous to a species less adaptable than the budgerigar. But the bird is a real opportunist, and when conditions are favourable every tree with a hollow limb is home to a family of parrots.

Another small bird which may be even better adapted to the inland than the budgerigar, is the chestnut-eared finch or zebra finch. Like the budgerigar it is an opportunist and will nest at any time of the year if the weather is favourable.

What is equally important is the bird's ability to survive on drinking water which may be even more saline than the sea.

Important trees in the Pilbara are the mulga *(Acacia aneura),* the kurrajong *(Brachychiton gregorii)* and the river gum *(Eucalyptus camaldulensis)* which lines the water courses and is a favourite introduction around station homesteads. The white barked rather straggling coolabah *(E. microtheca)* is also present and many water-courses support good stands of paper barks or cadjeputs *(Melaleuca quinquinerva* and *M. leucadendron).*

At Millstream on the Fortescue River grows the graceful Millstream Palm *(Livistona alfredii)* which is found only in the Pilbara and contrasts with the exotic date and cotton palms introduced by early visitors, possibly camel drivers.

The most conspicuous of the ground plants are the tussocky porcupine grasses *(Triodia* spp. and *Plectrachne* spp.) which, after a fire, provide a green picking for sheep and kangaroos.

The spiny clumps also give shelter to many forms of wildlife. Although popularly called spinifex, the porcupine grasses should not be confused with the true *Spinifex,* which is found on sand dunes right along the West Coast and is a valuable aid in controlling erosion.

After good rains many areas may be carpeted with the brilliant red Sturt Pea *(Clianthus formosus)* and the pink, white or yellow flowers of the mulla mulla *(Ptilotus* spp.). Several species with succulent leaves and stems are also adapted to the area including the pink flowered parakeelya *(Calandrinia* sp.*)* bluebush *(Kochia)* samphire *(Arthrocnemum* sp.*)* and saltbush *(Atriplex* sp.*).*

Amongst the most successful insects living in the Pilbara are the termites. The large tombstone-like mounds of the spinifex-eating termite *(Nasutitermes triodiae)* are a feature of the landscape and unfortunately, the less obvious, but highly destructive giant termite *(Mastotermes darwiniensis)* is one of the most serious pests in the North.

Termites (commonly, but incorrectly, called white ants) always live in colonies which may be housed either in large conspicuous mounds or in subterranean tunnels with no obvious surface indications. In both instances however, the creatures live in dark insulated surroundings, which in some ways could be likened to a modern air-conditioned building. Even the foraging workers usually travel in covered galleries, although a few species don't mind exposing themselves, particularly during dull weather.

Termites are amongst the most successful of all the insect groups and reasons for this are not hard to find. Firstly, large colonies may contain several million workers, and secondly, the termite queen and her mate may live and continue to breed for 50 years or more — a much longer period than has been recorded for any other insect. One 60 year-old mound of the spinifex termite had its top knocked off in 1872, because being nearly five metres high it would have fouled the wires of the overland telegraph line. The mound was still active in 1935, 63 years later, but was found to be dead when checked again in 1970.

Although lacking the spectacular mounds of the spinifex termite, the giant termite is well-known because of its highly destructive habits. It has destroyed much structural timber throughout northern Australia, and has even been recorded damaging synthetic motor tyres, billiard balls, electrical insulation and asbestos lagging.

Although not closely related to the termites the true ants have a comparable social structure, which has proved helpful in overcoming many environmental problems. As with the termites, the worker ants go out to forage, but they are able to withstand considerable heat and exposure and so range far and wide in bright sunshine. Nevertheless, the underground nest still provides a cool 'airconditioned' retreat in times of stress and also protects

the queen and the developing brood from the vagaries of the weather. One of the most remarkable adaptations to arid conditions is found in the so-called 'honey pot' ants *(Melophorus* sp.) representatives of which occur in most of the drier parts of the world.

The food gathering workers collect a sugary liquid from aphids, scale insects and other sources and feed it to special workers known as 'repletes', who remain permanently in the nest. These repletes hang from the roof of underground chambers in the nest and become so engorged with 'honey' that they are almost incapable of movement and may swell to the size of a grape. When approached by other hungry ants in the colony, the 'honey pots' give out some of their sugary store and so serve as a living food reserve which can be tapped in times of want.

'Honey pot' ants were much prized by the Australian aborigines as a form of confectionery, and the gins often dug to a depth of several feet when a well-stocked nest was located.

Two common groups of insects which are well adapted to the so-called desert are the cockroaches and the grasshoppers. Unfortunately, the domestic cockroaches are well-established in northern towns and station homesteads, but the bush varieties do not come indoors. A brightly coloured species common in the area is *Polyzosteria mitchelli,* which is often found amongst the spinifex tussocks, where it shelters from the direct rays of the sun. It can run from cover to cover with considerable speed on its long powerful legs, which also keep the body well up off the ground, and so reduce the effect of radiation from the hot sand.

Many types of grasshoppers occur in the Pilbara, but different species react in different ways to the arid surroundings. Many of the tree and shrub haunting forms, such as the ridge-backed and long-horned grasshoppers, are present in relatively small numbers and rely on the harsh foliage to provide them with both food and shelter. Some locust types on the other hand may appear in devastating swarms following a succession of good rains, only to disappear as the lush feed burns off in the next dry spell. The eggs of many grasshopper species are laid in the soil and here they can remain for long periods until development is stimulated by heavy rain, and this accounts for the spasmodic appearance of grasshopper swarms in accordance with seasonal conditions.

Of the various beetles to be found in the area, the most successful are the weevils (Curculionidae) and longicorns (Cerambycidae). Both may be associated with wattles and eucalypts and the wood-boring habits of many of the grubs or larvae ensure that as long as the host tree remains healthy, the insects are little affected by the weather.

Another tree-haunting species which enjoys similar immunity is the cicada, often incorrectly called a locust. The immature stages may develop for several years underground sucking sap from the roots of a wattle or gum tree, and then the winged adults appear and start their ear-splitting chorus in evident approval of the scorching heat.

Although fresh water is limited for many months and perhaps even for years, seasonal floods may sometimes cover hundreds of square miles and water-loving insects such as mosquitoes, midges and dragonflies are quick to exploit every situation. Some species have special drought resistant eggs or larvae, but others maintain low populations around rock holes, permanent river pools and station dams from which the flooded areas can be quickly colonised.

Salt water is, of course, abundant on the coast and although very few insects are adapted to truly marine conditions, the shallow mangrove flats breed hordes of bloodsucking mosquitoes and sand flies *(Culicoides* sp.). Some mosquitoes not only breed in sea water, but also in rock holes and pools left by the tide, where evaporation may have raised the salt content to saturation point. One such species is common on metropolitan beaches and also at Rottnest Island.

Although the bush flies *(Musca vetustissima)* do not suck blood like the mosquitoes and sand flies, they are amongst the most troublesome insects in the region and drew critical comments from the early explorers. After his first meeting with the aborigines in 1688, William Dampier wrote in his log as follows: 'Their eyelids are always half closed to keep the flies out of their eyes, they being so troublesome here that no fanning will keep them from coming to one's face, and without the assistance of both hands to keep them off, they creep into one's nostrils and mouth if the lips are not closed very close'.

After more than 200 years the bush flies are still very troublesome, but there is some hope of relief. The flies breed mainly in cattle dung and other animal droppings and so dung-feeding beetles from Africa are being tested to see whether the rapid removal of dung will reduce the amount of fly breeding. Similar tests for the control of the buffalo fly in North Queensland and the Kimberley region of Western Australia, have shown considerable promise. However, a different species of beetle will be necessary to thrive in the drier areas of the Pilbara, and cooler regions of the south west.

Unlike the more tropical areas of north and north-eastern Australia, the Pilbara is poorly supplied with showy butterflies. Moths may be numerous after a good season and one of the most colourful and interesting species is the fruit-sucking moth *(Othreis materna)* which ranges from the Kimberley to Carnarvon. In almost all cases where moths and butterflies are regarded as pests, it is only the caterpillar which is destructive. However, the fruit-sucking moth has a rasp-like proboscis capable of piercing the skin of citrus and various other fruits and of sucking up the juice.

The moth measures over 76 millimetres across the expanded wings, which are greenish-grey patterned with olive, purple, brown and white. The rather stout caterpillars may reach a length of 50-60 millimetres and like the moths, are strikingly marked. The general colour is velvety-brown or black, with white and blue spots and a pair of large black and white eyespots on each side of the body. The caterpillars feed upon various native vines and the adults may fly long distances to attack cultivated fruits around station homesteads.

Much more is known about the mineral wealth of the Pilbara than about its insect fauna, and further study will undoubtedly disclose more new species and unusual adaptations. From what little we do know however, it is obvious that the area holds much of interest to naturalists, scientists and tourists and that, despite first impressions, inland Australia is not a 'Dead Heart'.

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## The Hamersley Range National Park

The Hamersley Range National Park of just over 590,000 hectares was declared an A Class Reserve and National Park in 1969 and is the second largest National Park in Western Australia, being exceeded only by the Rudall River National Park of approximately 1½ million hectares, several hundred kilometres to the east.

The rugged grandeur of the Hamersley region, combining as it does towering cliffs over 300 metres in height and scenic gorges, quiet permanent pools, spectacular water falls and raging torrents is a major attraction to tourists and a diversion to the residents of the Pilbara mining towns.

Features of special interest include Fortescue Falls, Circular Pool, Dales Gorge, Joffre Falls, Red Gorge and Yampire Gorge.

Mount Bruce (1238 metres), once regarded as the highest mountain in Western Australia, is included in the park, but the more recently surveyed and slightly higher Mount Meharry lies just outside it.

The fact that major mining enterprises are active within the boundaries of the National Park has provoked widespread criticism from those who believe that such activities should not be allowed in any National Park.

However, mining has been a very important industry in Western Australia and any attempt to exclude all prospecting and mineral exploitation from National Parks and other conservation reserves, while theoretically most desirable, would almost inevitably reduce the number and size of such reserves to be set aside in the future and thus be counterproductive to the cause of conservation.

In the case of the Hamersley Range area the mining operations had been ratified by a special Act of Parliament well before the National Park was declared. But despite this the mining companies have shown a willingness to co-operate with the National Parks Authority in the management of the park and where practicable to conduct operations and to site roads and other facilities in such a manner as to have minimum impact on the environment.

An example of conditions which can be imposed on mining interests is exemplified by those applying to the Rudall River National Park and published in the 'West Australian' newspaper November 8, 1978.

'The conditions on exploration companies are that: No base or semi-permanent camp is allowed within 300 metres of any river or rock hole. Casual camping (up to two nights) is prohibited within 100 m of any surface water. Soap, detergent or other foaming agents are banned in any river or rock hole and rubbish or other pollutants must not be deposited in these places.

Interfering with vegetation along the margins of rivers or rock pools is forbidden. Survey lines requiring the removal of vegetation must be done by lopping branches with no disturbance to the root system of plants. Access tracks should be kept to a minimum. All exploration sites must be left clean and tidy and garbage buried, but not in stream beds. Firearms are forbidden, except in an emergency, and domestic animals are not allowed on the reserve.

Strict fire control measures must be observed. Burning of standing vegetation is not to be done to provide access or for any other reason.

The Department of Conservation and the Environment must approve the building of airstrips which must be at least 500 metres from rivers or rock pools.

People operating in the reserve should be made aware of their responsibilities under the Aboriginal Heritage Act'.

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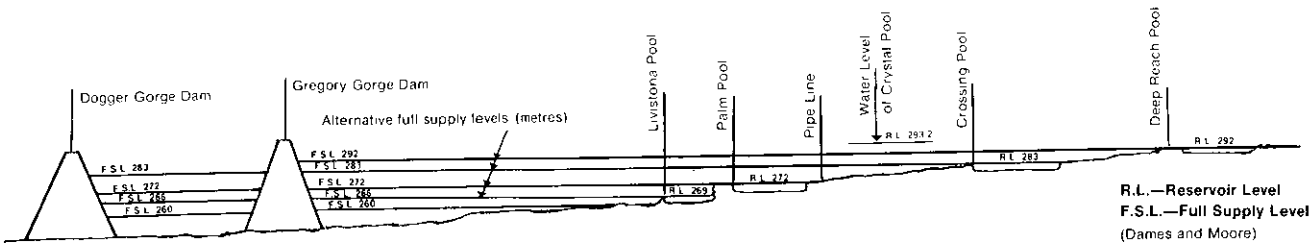
## Millstream

The 'staircase' series of pools in the Fortescue River at Millstream provide an oasis in one of the driest parts of Australia. For this reason the Environmental Protection Authority recommended that the major pools be included in an A Class reserve and that 'any proposed dam on the Fortescue River should ensure that there will be no flooding of the reserve nor should the extraction of water from the aquifer be to the detriment of the reserve' (Anon., 1974).

The final boundaries and size of the reserve are still under review, but in April 1977, 435 hectares, previously vested in the Fauna Protection Committee (now the Western Australian Wildlife Authority) in 1964, were vested in the National Parks Authority as an A Class Reserve with additional areas to be added after further negotiations with the Department of Public Works and the lessees of Millstream Station.

Prior to the working of the iron-ore deposits in the Pilbara, there was no major exploitation of the water or the scenic areas, but with the increase in population the




**LONGITUDINAL SECTION ALONG FORTESCUE RIVER SHOWING RESERVOIR ALTERNATIVES**

**Figure 4**

aquifer was tapped to supply neighbouring towns and the area was examined to select possible dam sites for above ground storage.

Because of the adverse ecological effects which could result from an excessive water draw on the aquifer, or the flooding of the permanent pools by a high level dam, the Public Works Department authorised an environmental investigation to report on the various options available for the harvesting of water at Millstream and the impact of the various methods on the environment (Dames and Moore 1975).

No finality has been reached on how water will be harvested or used, but the Western Australian Government has given an assurance, that the major pools will be preserved.

Because of its good water supply Millstream supports a wide range of animals and plants, including fringing paper barks or cadjeputs *(Melaleuca leucadendron)* and reeds *(Typha* sp.) the Millstream Palm *(Livistona alfredii)* and various eucalypts.

Several colonies of flying foxes and an assortment of water birds provide a diversion for visitors and naturalists are interested in the fauna list which shows several species of mammals, including euros *(Macropus robustus)* and red kangaroos *(Megaleia rufa),* nine species of fish, including the widespread spangled perch *(Therapon unicolour),* 109 species of birds and 32 species of dragon flies, several of which are restricted to the area.

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## National Parks of The Kimberley

### Fauna

Amongst the most publicised animals in the Kimberleys are the crocodiles, often quite incorrectly referred to as alligators.

Two species of crocodiles occur in Northern Australia. The large salt water or estuarine crocodile, which may exceed six metres in length, and the small fresh water or Johnston's crocodile, which seldom measures more than two metres from nose to tail. Apart from their difference in size, the smaller species can also be distinguished by the shape of the snout. Johnston's crocodile has a much more slender nose than its larger cousin, and shows a bigger display of teeth even when the jaws are closed.

The fresh water crocodile inhabits most of the Kimberley rivers and feeds mainly on fish, being too small to deal with most large game. The salt water species favours the ocean and tidal flats, but also goes up many of the rivers and will attack almost anything which it can drag into the water. Most of the river crocodiles are the smaller, and allegedly harmless variety, but it is surprising how their presence in a water hole reduces one's enthusiasm for a swim, even on a hot day.

Crocodiles and alligators are remarkably adapted for their aquatic life, being able to float for hours with just the nostrils, eyes and ear openings showing above the water. When lurking near a river bank, crocodiles may easily be mistaken for a log or stick and, of course, this camouflage helps considerably in the capturing of prey.

Crocodiles of both species have suffered heavily from the attentions of sportsmen and commercial hunters, and large specimens are now much less plentiful than in years gone by. For this reason both species have been placed on the protected list, although illicit shooting still occurs, and hides are smuggled to the Eastern States.

With the exception of crocodiles, probably no creatures in our north have received more publicity than the buffaloes. Unlike the crocodiles, however, buffaloes are not native animals, and the ancestors of the wild herds now ranging the Northern Territory were introduced from Sumatra. Most of the Kimberley beasts are credited with a somewhat later origin, however, from when the vessel *Florence Street,* shipping buffaloes from Malaya and Burma to the Sydney meat market, foundered in Cambridge Gulf, in 1857. Many of the beasts perished, but some survived and populated the lower reaches of the Ord River. The Kimberley buffaloes are not very plentiful at the present time, and most of the hunting is done along the larger rivers of the Northern Territory.

A disastrous side effect associated with the introduction of the buffalo was the establishment of the cattle tick and the buffalo fly. Both these blood sucking parasites are now serious cattle pests in Australia's tropical north, and cost the pastoral industry millions of dollars a year.

The commonest member of the kangaroo tribe in the far north is the sandy, jungle or agile wallaby. It is about the

size of the brush wallaby of the south-west, but much lighter in colour.

Three of the most unusual mammals to be found in the north are the scaly-tailed possum, the so-called flying squirrel and the marsupial mole. The scaly possum was once regarded as Western Australia's rarest mammal. The first specimen was collected near Turkey Creek, about 140 kilometres south of Wyndham, and sent to the Perth Zoo in 1919. The second came from Kunmunya Mission in 1942, and in 1954, Mr K. Buller, collecting for the Western Australian Museum, obtained a female and young. Fortunately, several specimens have been located since, and with proper protection the species should survive. This remarkable possum is somewhat like the ringtail possum in appearance, but the prehensile tail is hairless, and covered with well defined scales.

The so-called flying squirrels or flying possums have quite a wide range on the eastern side of the continent, but in W.A. they are represented only in the far north. They do not possess true powers of flight like the bats, but have broad flaps of skin connecting the front and hind limbs, which enable the animals to glide from the top of one tree to the lower branches of the next.

Although a true member of the Kimberley fauna, the marsupial mole prefers desert sands to tropical jungles, and has been reported chiefly near Wallal and Lagrange on the Eighty Mile Beach. The marsupial mole, known to scientists by the rather appropriate name of *Notoryctes* (meaning southern digger), is highly specialised for life underground, and bears a remarkable resemblance to the common European mole, and particularly to an African group known as golden moles. It should be noted, however, that the local mole is a true marsupial, and any resemblance to its overseas namesakes is purely superficial, and dependent upon adaptations for a similar way of life. In actual fact, the local animal is more perfectly adapted for a subterranean existence, than the true mole, and has become so specialised as to imperil its own survival.

Unlike the true mole, which has weak but functional eyes, the marsupial mole is completely blind. It also lacks all trace of external ears, and picks up sound waves by means of two tiny holes completely covered by fur. The creature measures about 15 centimetres in length, and is clothed in soft short fur of reddish or cinnamon colour, usually paler on the under surface. The legs are powerful, but so short, that the body rests on the ground as the animal drags itself along. Although the front feet have five digits, the claws on two of them have become so enormous as to resemble a small cloven hoof which, of course, functions as a very efficient shovel.

Little is known about the breeding habits of this interesting animal, but the pouch, like that of the bandicoots and other burrowers, opens backwards, presumably to prevent soil being gathered up during digging operations.

Excluding crocodiles, the reptiles which attract most interest in the north are the pythons and frilled lizards. Rock pythons are found along water courses, and in caves and stony outcrops. The textbooks give their length as up to two and a half metres and I have seen nothing larger but Dr D.L. Serventy (1952) has measured individuals of just over three and a half metres. Queensland pythons grow to six metres and it is possible that some of the monsters reported from the Kimberleys may be fairly genuine. Kimberley pythons, like the carpet snakes of the South-west are, of course, non-poisonous and so quite harmless.

The frilled lizard is not to be confused with the bearded lizard of the South-west which is sometimes called the frilled lizard. The northern reptile is a really picturesque creature, measuring a metre in length, and possessing a gaudy coloured frill, which may be extended, like an Elizabethan ruff, to show the orange and blue markings, or borne drooping over the shoulders like a cape. When disturbed, the lizard will open its mouth and extend the frill in the hope of terrifying its enemies. If this demonstration proves unsuccessful, however, it can run with considerable speed, and the fact that it often progresses in a semi-upright position on its hind legs is a further item of interest.

Besides the well-known crocodiles, the Kimberley rivers provide a home for some of the most remarkable fish to be found anywhere in the world. The little archer or rifle fish is famous for its peculiar method of catching prey. It takes up a position, near an overhanging leaf or limb, and may shoot an accurate jet of water to a distance of two or three feet to knock down flies, cockroaches and other small insects. Even when the jaws are closed, a small central opening or nozzle remains, which connects with a groove along the roof of the mouth, and when the fish compresses its gills, a jet of water may be propelled up to one and a half metres.

The so-called barramundi, more correctly referred to as the palmer or giant perch *(Lates calcarifer),* is perhaps the best known fish of the northern rivers, for it is prized as a game variety, and may reach a length of two metres and exceed 40 kilogrammes in weight.

The true barramundi *(Scleropages leichhardti)* also spelled burramundi, seldom exceeds a metre in length, is too bony to be prized by anglers, but is of great scientific interest. Like the world famous lung fish of North Queensland, it belongs to a very ancient group of fish and is often referred to as a 'living fossil'. The breeding habits are remarkable, for, as a protection, the male burramundi carries the eggs around in its mouth and takes no food, whatever, during the incubation period.

In the tidal estuaries may be found the tadpole-like mangrove fish or mud skippers. Using the front fins as legs, the fish drag themselves over the mud at low tide, and may climb into the mangroves. As long as the tail is kept moist, they can remain out of the water for quite a long time.

The tropical seas, which wash our northern shores, contain a number of creatures, either absent or very rare in the south. These include marine turtles, sea snakes and dugongs. The green turtle has long been famous as a source of soup and several attempts have been made to exploit the local population. The hawksbill is another turtle which once had commercial value, for its horny plates provided the so-called tortoise-shell. Synthetics have largely replaced the natural product however, and

whereas exports from Australia were worth thousands of dollars at the turn of the century, they are now negligible.

When the main Ord River dam (Lake Argyle) was filled in 1972 it inundated an area of over 520 square kilometres and produced an inland lake seven to nine times the size of Sydney Harbour. As a result of this flooding, many wild creatures perished but many were saved by 'Operation Noah's Ark'. This was a rescue plan organised by the Department of Fisheries and Wildlife which involved the transport of kangaroos, wallabies, cattle and even snakes and lizards from slowly disappearing islands to higher ground or to mainland.

Because of its enormous size, Lake Argyle could have far reaching effects upon the general ecology of the surrounding country, particularly as regards the increase of water birds and aquatic insects.

For this reason the public health potential of the changing mosquito and midge populations is being carefully studied as well as the habits of certain birds which are known to act as reservoirs for insect borne diseases.

**Bird Life**

The growing stream of tourists, which now traverse the North-west and Kimberley regions of Western Australia, are mainly attracted by Lake Argyle and the mining developments of the Pilbara, but many find an added interest in the varied flora and fauna of the region.

A fresh arrival in the Kimberley will find much that is new and strange, for not only will many of the birds and animals be different from those found in the south, but much of the flora also is quite characteristic. This is not surprising of course, when we recall that Wyndham is approximately 1000 kilometres north of the Tropic of Capricorn and dependent upon a summer, monsoonal rainfall.

It is true that eucalypts are the dominant trees of the area, but conspicuous strangers are the grotesque bottle trees or baobabs, known locally as boabs. These have such an enormous girth, that one hollowed out giant served for several years as a bush jail. The tidal flats are covered by an impenetrable tangle of mangroves, and big rivers like the Ord and the Fitzroy support a dense jungle of pandanus palms, Leichhardt pines and creepers, while the river flats may carry a lush growth of sugar cane grass, sometimes three metres in height.

The birds of the North-west and Kimberley are a mixture of old friends such as the crows, willie wagtails, magpie larks and galahs and a wide range of species unknown in the South-west. The dividing line, between the south and north for many species is the Eighty Mile Beach near Pardoo and Wallal, for here, save for a very narrow strip of grazing country fringing the beach, the red sand hills of the desert reach almost to the sea. The waterless expanse of bare red dunes, has effectively prevented the free passage of many creatures north and south and is an important feature in the distribution of many Western Australian plants and animals.

In order to see the northern birds at their best, it is necessary to be an early riser, for then they may be seen flocking to water holes and troughs. Amongst the first to appear are the crested pigeons. These slate-grey birds with their erect topknots, fly in low to the ground and run the last few yards to the water, to take the long deep draughts so characteristic of the pigeon family. Keen competitors with the pigeons are the galahs, which appear in large flocks and usually settle in any convenient dead trees, transforming the gaunt branches into animated flashes of bright pink, alternating with pale grey.

As the watcher lies concealed, a whirr of wings and a shrill tremulous call may be heard, heralding the arrival of a party of shell parrots or budgerigars. They wheel and circle over the water for some time, their green plumage flashing in the sunlight. Then, with one accord, they drop to the margin of the pool. Some alight actually on the water, and others on the shallow edges, but all are off again in an instant. These antics are repeated several times and contrast strongly with the almost horse-like method of drinking adopted by the pigeons.

Great activity in the bushes surrounding the billabong indicates that the finches are ready for their morning drink. Known to the bushman as Java sparrows, the finches of the north have earned a world-wide reputation. They are an adornment in any aviary, but must be seen in countless numbers, jostling around a watering place to be truly appreciated. The best known finch in this State is the so-called zebra finch, or chestnuteared finch. It may be found almost anywhere from Perth northwards, but is very drab compared with many Kimberley species. The Gouldian finch is one of the most striking of the group, with its purple and gold underparts, green back, and black, gold or red head. The so-called blood finch or crimson finch is also a beautiful bird, and on account of its comparative rarity, demands a high price from bird fanciers in many parts of the world. The extensive grassy plains of the Ord and Fitzroy valleys provide wonderful feeding grounds for seed-eating birds, and probably account for the fact that about a dozen different species of finches are found in the north of this State. Unfortunately, many of these finches find cultivated seed more to their liking than the wild crop, and have proved very destructive to the maturing rice and sorghum. In fact, the finches were so troublesome during the early rice experiments that many of the irrigation plots were completely enclosed with chicken wire, to ensure the harvesting of the grain. These giant cages had a special interest for the entomologist, as they trapped many large insects. Dragon flies, in particular, bred in the flooded rice bays and hundreds of these gauzy winged and often brilliantly coloured creatures fluttered ceaselessly against the walls of their wire prison.

No account of the Kimberley birds could omit mention of the brolgas, or native companions, as these stately birds may be seen patrolling the grassy flats or standing in the shallows of most billabongs. Next to the emu and its tropical relative, the cassowary, they are Australia's largest bird, and may stand up to one and half metres in height. They are of particular interest on account of the ceremonial dances which they perform — parties of birds bowing and turning, advancing and retreating and leaping into the air in a very graceful display. The brolga

is typically a northern bird in this State, but very occasionally individuals pay a visit to the South-west.

Unfortunately, many of the water birds in the north have proved troublesome to the rice grower. The ducks and geese found flooded seed beds almost ideal feeding grounds, and often assembled in large numbers. The brolgas were less malicious in their attacks, and merely used the flooded rice fields for ceremonial dancing grounds, but with results that can well be imagined.

The magpie goose, so prevalent on the Ord River and at Camballin does not occur in our South-west, but like the brolga, it once extended right down to Victoria on the eastern side of the Continent. It is a large black and white bird, considerably bigger than the mountain duck which is the giant of the duck tribe in the south. Not only do the geese feed on the young rice plants, but the more mature growth gives wonderful shelter for nesting purposes. As the nest is continued right down below the water, so as to rest on the underlying mud, a good bulk of greenstuff is needed for the foundations. When reeds and rushes are used for this purpose, nobody minds, but when high grade rice plants are ruthlessly pounded into the mud, the owner can hardly be blamed if he takes severe counter measures. However, an intensive study of the breeding habits of the geese has given fresh hope, for it has been shown that nesting only occurs in water of a particular depth. By a careful regulation of irrigation waters it may finally be possible to restrict the geese to their normal breeding grounds, and deter their visits to the rice fields.

The Kimberley jabiru, or Australian stork, with its conspicuous black and white plumage and massive bill, is a most impressive and interesting bird, for it stands almost one and a half metres high and is Australia's only representative of the stork family. The bird is so rare and little known however, that it has gathered none of the traditions common to its European relative.

The commonest hawk in the Kimberley is the black or forktailed kite. It can easily be recognised by the prominent V in the tail, and its habit of circling in large numbers around stock yards or dead carcases. Two much more attractive birds of prey which, although Australia-wide in their distribution, are commoner in the north than in the South-west, are the osprey or fish hawk and the sea eagle. The osprey with its white head and underparts, is a fine looking bird, somewhat larger than the whistling eagle. It builds a large stick nest which is often added to, year after year, until a great pile marks the nesting site.

The sea eagle is only slightly smaller than the wedgetail, but can easily be recongised by its snowy head and underparts. As may be expected, from its appearance, it is a close relative of the famous bald or whiteheaded eagle of America. The fully mature sea eagle is a magnificent looking bird, with a characteristic fluttering almost butterfly-like flight. Unfortunately, this eagle has been declared vermin in some northern districts because of alleged attacks on lambs.

The case against the sea eagle however, seems even more slender than that against the wedgetail, and an investigation on the America bald eagle, has led to it going on to the protected list.

Any visitor to Kununurra who has only a short time in which to see the country's bird life, should spend a few hours at the 'Lilly Pond', a backwater on the edge of the town. Feeding along the muddy edges of the pool will be seen groups of the noisy masked plover, a large relative of the banded plover of our wheat belt, and very similar to the spurwinged plover of the Eastern States.

Constantly calling from the central mudbanks can be heard parties of magpie geese, and screeching in the tree-tops will be bands of corellas, galahs, parrakeets and perhaps the odd redwinged parrot. Sacred kingfishers dive into the water to prey on tadpoles and small fish and the harsh call of the bluewinged kookaburra, is frequently added to the already discordant chorus.

The beautiful bee-eater or golden swallow is usually present in considerable numbers, and hunts wasps and bees as they come to the water. This bird is a regular visitor to the South-west, arriving about October and leaving again for the north about the end of March. It was once a common sight in King's Park and its long nesting tunnels could be found in the sandy banks, but with the rapid development of the Metropolitan area, this attractive bird is now seen mainly in the country.

Few Australian birds have a wider reputation than the bower birds, for their bowers and playgrounds have attracted the attention of scientists and settlers alike. The great bower bird is quite common in the Kimberleys and frequents station sheds and homesteads.

Different species of bower birds construct different types of bowers, and have their own ideas of ornamenting the playground. The great bower bird of the Kimberley likes bleached bones and shells, but it is also attracted by such glittering objects as nails, cartridge cases and tins.

One Ord River resident found that his missing spectacles had been stolen by a bower bird and another settler, mystified by the disappearance of his glass eye from a mug of water, finally found it keeping watch among a heap of shells and pebbles in a bower bird playground.

Fortunately, bower birds are most accommodating as far as tourists are concerned, for several playgrounds lined with white pebbles can usually be found within the boundary of the Kununurra townsite. On my last visit, a busload of tourists filed up to one playground and took photographs, while the perplexed owners watched cautiously from a neighbouring tree.

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## The Napier and Oscar Ranges

These ranges contain 'some of the most beautiful and striking scenery to be found in Western Australia' (Anon., 1962).

The parks so far established are small in size, but spectacular in appearance and of great interest to biologists, geologists and anthropologists.

• The Geikie Gorge National Park of 3136 hectares (declared an A Class Reserve in June 1967) lies about 20 kilometres up stream from Fitzroy Crossing where the Fitzroy River cuts a magnificent gorge through the Devonian limestone of the Oscar and Geikie Ranges and discharges a volume of water sufficient to fill Canning Dam in less than twenty minutes.

The deep river pools provide good sport for anglers, but they also provide a home for freshwater crocodiles, Leichhardt's sawfish and coach-whip stingray. The sawfish and stingrays are normally marine, but in some of the large northern rivers they have been isolated for a sufficiently long period of time to have become adapted to freshwater conditions.

The permanent waters of the Fitzroy and other northern rivers support a fringe of forest vegetation in strong contrast to the dry 'back country'. The 'jungle' plants include freshwater mangroves *(Barringtonia aculangula)* the Leichhardt tree *(Nauclea coadnata)* and the screw palm *(Pandanus aquaticus)* with tall grasses and sprawling creepers in between.

The gorge is only accessible to tourists in the winter because during the summer 'wet' the river may rise by more than sixteen metres, block access and cover the camping area with several metres of water.

• The Tunnel Creek National Park of only 92 hectares is 184 kilometres east of Derby and 29 kilometres south-east of Windjana Gorge. Tunnel Creek, so named because of the large 75 metre long tunnel it has cut through the limestone of the Napier Range is of great natural and historic interest.

Several requests have been made to 'improve' and illuminate the tunnel, but this would destroy much of its biological interest and probably drive away five or more species of bats, including flying foxes or fruit bats, and the highly specialised ghost bat *(Macroderma gigas)* which frequent the murky interior of the tunnel.

• Windjana Gorge National Park is an A Class Reserve of 2134 hectares containing a picturesque narrow canyon cut by the Lennard River and providing sheer cliffs of weathered limestone up to 100 metres in height.

The deep quiet pools harbour fish, a wide variety of water birds and the usual fringing vegetation, with native figs clinging to the rock faces.

Those who have read Ian Idriess' 'The Outlaw of the Leopolds' will know that Tunnel Creek and Windjana Gorge were 'Pigeon Country' where the aboriginal outlaw murdered constable Richardson in October, 1894 and with 'Captain' and other escaped aboriginal prisoners, eluded capture in the gorges and caves of the region for several years.

SELECTED LITERATURE

Anon., 1962, *National Parks and Nature Reserves in Western Australia* p. 208. [Report by W.A. Sub-Committee, Australia Academy of Science.]

## The Drysdale River National Park

The Drysdale River National Park of 435,590 hectares was gazetted a B Class Reserve and vested in the National Parks Board (now the National Parks Authority) in September, 1974.

'Scenically the park is diverse, gorges and cliffs contrasting with broad rivers and plains. Spectacular waterfalls are found on Palmoondoora Creek (Morgan Falls), on the Drysdale River (Solea Falls) and on Johnson Creek (Cracticus Falls) as well as on many of the smaller tributaries.

The Park encompasses a cross section of the main geological formations of the north Kimberley — only the laterites are poorly represented. This is in marked contrast to the Prince Regent River Nature Reserve (PRRNR) in which one rock type, the King Leopold Sandstone, predominates (Miles and Burbidge 1975).

Biologically the Park is intermediate between the subhumid north-west Kimberley (of which the PRRNR is representative) and the semi-arid east Kimberley. The vegetation is predominantly low open-forest, low woodland and low open-woodland but there are small areas of vine thickets and just outside the Park at present, a unique area of tall closed-forest. Fringing communities occur along creeks and rivers and around swamps. (Kabay and Burbidge 1977).

Because of its remote situation and rugged terrain little collecting had been done in the area prior to 1975, but the team led by Dr Burbidge collected 28 species of native mammals, nearly 2½ thousand species of insects, nearly 600 species of plants, 26 species of freshwater fishes, 13 frogs, 47 reptiles and 127 birds.

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# National Parks and Reserves

**(vested in the National Parks Authority)**

National Parks and other Reserves are listed hereunder in alphabetical order.

## National Parks

**Alexander Morrison National Park**
Class A Reserves of 8,501 hectares comprising Reserves A.29800, A.29803 and A.29804 located north-west of Jurien Bay and controlled by the Ranger-in-Charge of Nambung National Park.

**Avon Valley National Park**
An A Class Reserve of 4,377 hectares. It is the intention of the Authority to restrict access to this park until full-time supervision of the area can be provided.

**Badgingarra National Park**
Situated north-east of the Cervantes Townsite and Nambung National Park, this area of 13,121 hectares was reserved mainly for the preservation of Black Kangaroo Paws.

**Boorabbin National Park**
An A Class Reserve of 26,000 hectares on each side of the Great Eastern Highway west of Boorabbin. Typical heathland of the sand plains east of the wheatbelt.

**Cape Arid National Park**
An A Class Reserve of 259,808 hectares, having magnificent coastal scenery, popular for camping and fishing. A Ranger is resident in the park near the mouth of the Thomas River.

**Cape Le Grand National Park**
An A Class Reserve consisting of 31,390 hectares on the South Coast about 32 kilometres east of Esperance. It has magnificent coastal scenery with granite peaks and swamps rich in birdlife. The area is popular for summer camping and fishing holidays. The Ranger is resident in the park.

**Cape Range National Park**
The park was extended to include a part of former Yardie Creek Station and was classified an A Class Reserve in 1974. The park consists of 50,581 hectares situated on the North West Coast near Exmouth. It contains rugged mountain scenery with deeply eroded gorges and a coastline well patronised for camping and fishing during the winter months. The park is controlled by a Ranger located in Exmouth.

**Chichester Range National Park**
This A Class Reserve comprises 150,609 hectares of great scenic beauty, including the well known Python Pool. The area is located south of Roebourne and is serviced by a Ranger appointed to control the Hamersley Range National Park and by a Mobile Ranger based at Millstream during the winter months.

**Collier Range National Park**
A Class C Reserve of 555,714 hectares consisting of high ground between the upper reaches of the Ashburton and Gascoyne rivers.

**D'Entrecasteaux National Park**
Consisting of A Class Reserves extending along the west-south coast eastwards from Cape Beaufort to join up with the Walpole-Nornalup National Park. Contains extensive areas of sand dune, both primary and secondary. Extensive areas of heathland, scrubland and woodland, with smaller areas of Karri, Marri and Jarrah forest. At present consists of Class A Reserves at the mouth of the Donnelly River and at Lake Jasper, altogether 1,704 hectares.

**Drovers Cave National Park**
A Class A Reserve of 2,681 hectares located north of Jurien Bay, this area is under the supervision of the Ranger-in-Charge of Nambung National Park.

**Drysdale River National Park**
This reserve consists of 435,590 hectares of wooded country in the North Kimberley. The Drysdale River flows through the middle of the reserve which includes the Ashton Range and the Carson Escarpment. Owing to the lack of any roads and its isolation, the Authority does not intend to develop this area for the time being.

**Fitzgerald River National Park**
A major reserve of 242,727 hectares, situated on the South Coast between the Gairdner, Fitzgerald and Phillips River, west of Culham Inlet and Hopetoun townsite. Its most interesting features are the Fitzgerald and Hamersley River Gorges with spectacular cream coloured spongolite cliffs. It contains magnificent coastal and mountain scenery and unique flora and fauna. The area is serviced by a Ranger based in Jerramungup and an Assistant Ranger resident at Quaalup and one at East Mt Barren.

**Frank Hann National Park**
This area of 49,877 hectares comprises a strip of land approximately one and a half kilometres wide on each side of the Lake King-Norseman Road. It represents a cross section of the heath flora of the inland sand plain east of the wheatbelt.

**Geikie Gorge National Park**
This area of 3,136 hectares about 16 km from Fitzroy Crossing contains a beautiful gorge where the river cuts through an ancient limestone barrier reef. A campsite and river trips are operated by a Ranger during the dry season.

**Goongarrie National Park**
An A Class reserve of 49,878 hectares representing Mulga Country near to the Eucalypt Mulga Line.

**Gooseberry Hill National Park**
It is a scenic lookout of 33 hectares located on the western edge of the Darling Range escarpment a few kilometres from Kalamunda.

**Greenmount National Park**
An area of 56 hectares reserved for its panoramic views of the coastal plain, Swan River and Perth and its suburbs.

**Hamersley Range National Park**
This is the second largest single National Park under the Authority's control and comprises an area of 590,176 hectares. The area is one of spectacular mountains, gorges, water courses and plateaux. Points of special interest are Fortescue Falls, Circular Pool, Dales Gorge,

Joffre Falls and Red Gorge. The Ranger in charge of this National Park has his headquarters at Wittenoom. Camping is permitted in designated areas in this park.

**Hassell National Park**
This A Class Reserve of 1,279 hectares is situated along the main Albany-Bremer Bay road and is reserved for the protection of its flora and fauna.

**John Forrest National Park**
This National Park is an A Class Reserve of 1,577 hectares situated in the Darling Range about 27 km from Perth. It is the original National Park in Western Australia declared in 1895. It contains open forest and woodland and has outstanding displays of wildflowers during the spring. There is a natural swimming pool for the enjoyment of the public. It is serviced by a Ranger staff of 8.

**Kalamunda National Park**
An A Class Reserve of 375 hectares. This area is rich in wildflowers, particularly Blue Leschenaultia, and it has been the Authority's policy to leave it mainly undeveloped.

**Kalbarri National Park**
This A Class Reserve of 186,097 hectares is quickly becoming one of the State's most popular National Parks. Located some 644 km north of Perth near the mouth of the Murchison River, the park has outstanding gorge scenery along the river, and the limestone and sandstone cliffs provide magnificent coastal scenery. Good accommodation including hotel/motel, camping and caravan parks, swimming, surfing and fishing facilities are available at the townsite at Kalbarri.

**Leeuwin-Naturaliste National Park**
Consists of a series of Class A Reserves of 9,776 hectares, mainly on the ridge of granite gneiss and limestone which runs along the coast between Cape Naturaliste and Cape Leeuwin. Spectacular coastal scenery, heathland and forest with many caves in limestone.

**Lesmurdie Falls National Park**
A small A Class Reserve of 56 hectares which gives good views of the coastal plain. This area is a popular picnic spot situated 24 km from Perth.

**Millstream National Park**
Part of the area recommended by the Environmental Protection Authority to be a National Park at Millstream on the Fortescue River was vested in the National Parks Authority, *Government Gazette* April 1, 1977. This was Class A Reserve 24392, about 441 hectares, formerly vested in the Fauna Protection Advisory Committee.

**Moore River National Park**
This area of 17,543 hectares, located about 113 km north of Perth, is outstanding for its wildflowers. It is the Authority's intention to leave this area undeveloped.

**Nambung National Park**
A National Park of 17,332 hectares situated south of Jurien Bay, this area is becoming increasingly popular for its wildflowers and strange natural formations, the Pinnacles. A number of caves in the area are being kept sealed to protect them from vandalism. Two Rangers are resident in Cervantes townsite.

**Neerabup National Park**
Class A Reserve of 1,195 hectares. This area located on the Perth-Yanchep Road a few kilometres north of Wanneroo, is being maintained in its natural state.

**Peak Charles National Park**
An A Class Reserve of 39,959 ha. Centred on spectacular granite outcrops representing flora of the south-west portion of the goldfields.

**Pemberton National Parks**
Areas collectively known as the Pemberton National Parks, consisting of Class A Reserves 7691 (Warren National Park) 1,340 hectares, 7692 (Beedelup National Park) 1,200 hectares, 19424 (Brockman National Park) 48 hectares, 17519 (Miscellaneous reserves alongside alignment of Old Vasse Road) 204 hectares, and Class B Reserve 19857 at Pemberton 120 hectares. A delightful caravan park is situated in the Pemberton reserve. A ranger is based on the Old Vasse Road between the Warren and Beedelup National Parks.

**Porongurup National Park**
An A Class Reserve of 2,359 hectares between the Stirling Range National Park and Albany. It incorporates the granite peaks of the Porongurup Ranges, the slopes of which are heavily forested with Karri *Eucalyptus diversicolor*. Accommodation is available at the nearby Karribank Motel/Guest House. A ranger is stationed in the park.

**Rudall River**
Class A Reserve 34607, about 1,569,459 hectares around Rudall River, east from Roy Hill and Nullagine.

**Scott National Park**
An A Class Reserve of 3,273 hectares situated 6.4 km north-east of Augusta townsite originally created in 1959 to protect the waterways at the junction of the Scott and Blackwood Rivers and the Jarrah, Marri and Karri forests existing in the area. Named after Robert Scott who first selected land in the southern portion of the Reserve in 1871.

**Serpentine National Park**
A Class A Reserve of 635 hectares. This park is popular for picnicking and is noted for its waterfall. There is an area designated for camping and it has a resident Ranger.

**Sir James Mitchell National Park**
An A Class Reserve consisting of an area of 1,087 hectares stretching along the South West Highway, for a length of 64 km south of Pemberton. As its width is 100 metres on each side of the road it ensures that this stretch of road will remain a drive displaying natural flora.

**South Coast National Park**
A proposed National Park extending along the west-south coast eastwards from Cape Beaufort to join up with the Walpole-Nornalup National Park. Will contain extensive areas of sand dune, both primary and secondary. Extensive areas of heathland, scrubland and woodland, with smaller areas of Karri, Marri and Jarrah forest. At present consists of Class A Reserves at the mouth of the Donnelly River and at Lake Jasper, altogether 1,704 hectares.

**Stirling Range National Park**
An A Class Reserve of 115,671 hectares. This is a major National Park under the Authority's control and is situated 322 km south-east of Perth. This park is noted for its wildflowers and mountain peaks, the highest of which, Bluff Knoll, rises 1,073 metres above sea level. In order that the surrounding farmland be protected from bush fires escaping from this rugged park, an extensive system of fire breaks has had to be cut. There is a commercial caravan park on the northern boundary of the park opposite the Bluff Knoll turn-off, and overnight camping is permitted at Moingup Springs. Two Rangers are resident in the park.

**Stokes National Park**
An area of 10,667 hectares adjoining Stokes Inlet and Lake Cobinup reserve, to preserve the foreshores of these waterways. Maintained by a Mobile Ranger during the summer months.

**Tathra National Park**
An A Class Reserve of 4,323 hectares. The area is noted for its wildflowers and for the present is being maintained in its natural state.

**Torndirrup National Park**
This Reserve with an area of 9,313 hectares, is located south-west of the town of Albany. It is noted for its flora and fauna and rugged coastline, particular tourist attractions being known as The Gap and the Natural Bridge. The area is maintained by a Ranger situated in the Park.

**Tunnel Creek National Park**
This Reserve has an area of 92 hectares. Situated about 184 km east of Derby and 29 km south-east of Windjana Gorge National Park, Tunnel Creek is a stream which flows through the Napier Range and through a large natural tunnel eroded through the limestone by the creek itself.

**Walpole-Nornalup National Park**
This reserve of 18,063 hectares is located on the south coast of Western Australia some 418 km south-east of Perth. It is an area of great scenic beauty, noted for its flora, fauna, fine stands of Karri and Tingle forest, coastal views and enclosed inlets. The establishment of a camping and caravan park at Coalmine Beach, controlled by the Authority, has resulted in the area becoming a popular resort and noted for its swimming, fishing and yachting. There are three resident Rangers.

**Walyunga National Park**
The Walyunga National Park, consists of an area of 1,790 hectares, located approximately 37 km north-east of Perth. It is noted for its scenic views and flora and for the fact that it was a large camping area formerly used by Aborigines. The establishment of picnic facilities at Walyunga and Long Pools and the rapids that occur during the winter have resulted in its becoming one of the most popular picnic spots adjacent to Perth. There is a Ranger resident in the park.

**Watheroo National Park**
This A Class Reserve of 44,324 hectares is controlled by the Ranger stationed in Cervantes and is considered valuable for the preservation of native flora and fauna.

**William Bay National Park**
An A Class Reserve consisting of 1,879 hectares. This area is noted for its flora, fauna and coastal scenery.

**Windjana Gorge National Park**
This A Class Reserve of 2,134 hectares situated in the Kimberleys, contains a remarkable gorge where the Lennard River cuts through an ancient limestone reef. The gorge is 4 km long and has nearly vertical walls up to 76 metres high.

**Wolf Creek Crater National Park**
A Reserve of 1,460 hectares situated 104 km south of Halls Creek. Reserved for the protection of a meteorite crater. This crater is 800 metres wide, 49 metres deep, with an area of 1,296 hectares.

**Yalgorup National Park**
The land portion of this A Class Reserve of 11,545 hectares was placed under the National Parks Board's control in January, 1968. The lakes were added to the park in September, 1971. The park is located on the coastal plain south of Mandurah and contains a system of parallel lakes which are noted for their birdlife. It possesses delightful heath and woodland scenery, interesting geological features and also is noted for its flora and animal life. The Ranger resides in the park.

**Yanchep National Park**
This A Class Reserve of 2,799 hectares, located 51 km north of Perth, was established as a park in 1905. It is a noted tourist attraction containing caves, a swimming pool, golf course, boating, ovals and picnic grounds (barbecues, picnic tables provided, etc.) together with fauna exhibits of koalas, kangaroos, emus and bird aviaries. Accommodation is provided by the Yanchep Inn (licensed) and McNess Guest House.

Development around the entrance to this park may suggest that large areas have been given over to tourist facilities, but in fact 90 per cent of the Reserve is still maintained in its natural state. Loch McNess provides a haven for a large assortment of water fowl and other birdlife while the surrounding bushland is rich in native flora and fauna. This park with its many facilities for the public is maintained by 20 Ranger staff.

## Other Reserves

**Araluen-Canning Dam Reserve**
A small strip of land of 20 hectares, the area lies between the Canning River and McNess Drive and extends from the vicinity of Araluen to the boundary of Canning Dam Water Reserve.

**Badgingarra Ranger's Residential Reserve**
Reserved for the purpose of a Ranger's residential site in the townsite of Badgingarra.

**Cape Le Grand Ranger's Residential Reserve**
Reserved for the purpose of Ranger's residential site in Esperance.

**Charles Gardner Flora Reserve**
A Class A Reserve of 583 hectares. It is an area of outstanding botanical interest and is located south of Tammin.

**East Perth Cemetery Reserve**
A Class A Reserve of about 5 hectares. This area is situated on high ground at the eastern end of the City of Perth and is the last resting place of many of the State's early pioneers.

**Fitzgerald River Ranger's Residential Reserve**
Reserved for the purpose of Ranger's residential site in Jerramungup.

**Geekabee Hill Flora Reserve**
A small area of 4 hectares reserved for the protection of flora (Lambstails).

**Geikie Gorge Ranger's Residential Reserve**
Reserved for the purpose of Ranger's residential site in Fitzroy Crossing.

**Haddleton Flora Reserve**
An area comprising 713 hectares, reserved for protection of Boronia and other flora. It is located south of the Wellington Dam Catchment area in the south-west of the State.

**Kalbarri Rangers' Residential Reserves and Workshop Reserve**
Reserved for the purposes of housing and workshop sites at Kalbarri.

**Keane's Point Reserve**
A small Class A Reserve of about 2 hectares, leased to the Royal Freshwater Yacht Club Inc., which has established excellent aquatic facilities there.

**Matilda Bay Reserve (Pelican Point)**
Class A Reserve of about 23 hectares situated about 5 km from Perth. This Reserve now contains the Administrative Headquarters of the National Parks Authority. Improvements to access roads, parking area and public boat launching ramps in recent years have enhanced the appearance and utilisation of this Reserve by the public.

The Royal Perth Yacht Club Inc., Mounts Bay Sailing Club Inc., Perth Dinghy Sailing Club Inc., the Governors of Hale School and the 1st Pelican Point Sea Scouts Group lease sites on this Reserve whilst the University of Western Australia Rowing Club occupies a boatshed on the foreshore. These Clubs and the Sea Scouts are making worthwhile contributions towards providing facilities for the enjoyment of aquatic sports on the Swan River.

Pelican Point is an important sanctuary for water birds, including many species of migrant waders.

**Nambung Rangers' Residential Reserve**
Reserved for the purpose of Rangers' Headquarters in Cervantes.

**Nowergup Lake Fauna Sanctuary**
An A Class Reserve of 117 hectares reserved as a sanctuary for fauna.

**Old Mill Reserve, South Perth**
A small Reserve of about 0.2 hectares located at the South Perth end of the Narrows Bridge. The area is leased to the firm of H.L. Brisbane and Wunderlich Ltd., who arranged restoration of the Old Mill and cottage and established a historical museum on the site.

**Reserve East of Porongurup Ranges**
An A Class Reserve comprising 61 hectares located 40 km north of Albany. Reserved for flora protection.

**Penguin Island Reserve**
A Class A Reserve of 13 hectares which is situated about 48 km south of Perth and 1.6 km offshore near Safety Bay. It is a sanctuary for penguins and a portion of the Island is leased as a holiday centre.

**Walpole Golf Course Reserve**
A Reserve of about 14 hectares, this area was excised from the Walpole-Nornalup National Park in February, 1964 for a local golf course.

**Walpole Yacht Club Reserve**
An area of about 0.8 hectares excised from the Walpole-Nornalup National Park in February, 1964 for a Yacht Club Site. Leased to the Walpole Yacht Club.

**Yanchep Flora Reserve**
Comprises Class A Reserve of 113 hectares, situated 48 km north of Perth and reserved for the protection of flora and has been left in its natural state.

**Small Part of Reserve A.1720 King's Park**
An area of 0.4 hectares, this site is leased for the purpose of a refreshment kiosk, Bernies.

| National Parks Administered by the Authority 1979 | SCENIC ATTRACTIONS | | | | | | | VEGETATION FORMS | | | | | ACTIVITIES | | | | | | | | | NEARBY FACILITIES | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mountain | Coastal | River | Lake | Gorge | Moorland | Rock Forms | Forest | Woodland | Scrubland | Heath | Grassland | Hiking | Camping | Horse Riding | Mountain Climbing | Swimming | Boating | Fishing, inland | Fishing, ocean | Barbecue Sites | Hotel | Motel | Guest House | Chalets | Restaurant | Caravan Park | Coach Tours |
| Alexander Morrison | | | | | | ● | | | | | ● | | | | | | | | | | | | | | | | | |
| Avon Valley | | | ● | | | | ● | ● | ● | | | | ● | ● | | | | ● | | | | | | | | | | |
| Badgingarra | | | | | | ● | | | | | ● | | | | | | | | | | | | | | | | | |
| Boorabin | | | | | | | | | | | ● | | | | | | | | | | | | | | | | | |
| Cape Arid | ● | ● | | | | ● | ● | | | ● | ● | | ● | ● | | ● | ● | | | ● | | | | | | | | |
| Cape Le Grand | ● | ● | | | | ● | ● | | | ● | ● | | ● | ● | | ● | ● | | | ● | ● | ● | ● | | | | ● | |
| Cape Range | ● | ● | | | ● | | | | | ● | | ● | ● | ● | ● | ● | ● | | | ● | ● | ● | ● | | | | ● | |
| Chichester Range | ● | | | ● | ● | | ● | | | ● | | ● | ● | ● | | ● | | | | | ● | | | | | | | |
| Collier Range | ● | | | | | | ● | | | ● | | ● | | | | | | | | | | | | | | | | |
| Drysdale River | | | ● | | ● | | ● | | ● | | | | ● | ● | | | | | | | | | | | | | | |
| d'Entrecasteaux | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | ● | ● | ● | | | | | | | |
| Drovers Cave | | | | | | ● | ● | | | | ● | | ● | | | | | | | | | ● | ● | | | | ● | |
| Fitzgerald River | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | | ● | ● | | ● | ● | | | ● | ● | ● | ● | | | | ● | |
| Frank Hann | | | | | | ● | | | | ● | ● | | ● | ● | | | | | | | | | | | | | | |
| Geikie Gorge | | | ● | ● | ● | | ● | | ● | ● | | | | ● | | | | ● | | | ● | | | | | | ● | ● |
| Goongarrie | | | | | | | ● | | ● | ● | | | ● | | | | | | | | | | | | | | | |
| Gooseberry Hill | | | | | | | | ● | | | | | | | | | | | | | ● | | | | | | | |
| Greenmount | | | | | | | | ● | | | | | | | | | | | | | ● | | | | | | | |
| Hamersley Range | ● | | ● | | ● | ● | ● | | ● | ● | | ● | ● | ● | | | | | | | ● | ● | ● | | | | ● | ● |
| Hassell | | | | | | | | | | ● | ● | | | | | | | | | | | | | | | | | |
| John Forrest | | | ● | | | | | ● | ● | | | | ● | | ● | | ● | | | | ● | ● | | | | ● | | ● |
| Kalamunda | | | | | | | | ● | ● | | | | ● | | | | | | | | ● | | | | | | | |
| Kalbarri | | ● | ● | | ● | ● | ● | | | ● | ● | | ● | | | | ● | ● | | ● | ● | ● | ● | | | ● | ● | ● |
| Leeuwin-Naturaliste | | ● | | | | ● | ● | ● | ● | ● | ● | | ● | ● | | | ● | ● | | ● | ● | ● | ● | | ● | ● | ● | ● |
| Lesmurdie Falls | | | ● | | | | | | | ● | | | | | | | | | | | | | | | | | | |
| Millstream | | | ● | ● | ● | | | ● | ● | | | ● | ● | ● | | | ● | | ● | | ● | | | | | ● | | |
| Moore River | | | | | | ● | | | | ● | ● | | | | | | | | | | | | | | | | | |
| Nambung | | ● | | | | ● | ● | | ● | ● | ● | | ● | | | | ● | | | ● | ● | | | | | | ● | |
| Neerabup | | | | ● | | | | | ● | | | | ● | | | | | | | | ● | | | | | | | |
| Peak Charles | ● | | | ● | | | ● | | ● | ● | ● | | ● | ● | | ● | | | | | | | | | | | | |
| Pemberton | | | ● | | | | | ● | | | | | ● | ● | | | ● | | | | ● | ● | | ● | | | ● | ● |
| Porongurup | ● | | | | | | ● | ● | ● | | | | ● | | | ● | | | | | ● | | | ● | | | | ● |
| Rudall River | | | ● | | | | | | ● | ● | | | ● | ● | | | | | | | | | | | | | | |
| Scott | | | ● | | | | | ● | | | | | ● | ● | | | | ● | ● | | | | | | | | | |
| Serpentine | | | ● | | | | ● | ● | | | | | ● | ● | | | ● | | | | ● | | | | | | | |
| Sir James Mitchell | | | | | | | | ● | | | | | | | | | | | | | | | | | | | | |
| South Coast | | ● | ● | ● | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | | ● | ● | ● | ● | | | | | | | | |
| Stirling Range | ● | | | ● | | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | | | | | ● | | | | | | ● | |
| Stokes | | ● | | ● | | ● | | | | ● | ● | | ● | ● | | | | ● | | ● | | | | | | | | |
| Tathra | | | | | | ● | | | | ● | ● | | | | | | | | | | | | | | | | | |
| Torndirrup | | ● | | | | | ● | | | ● | ● | | ● | | ● | | | | | | ● | ● | ● | | | | ● | |
| Tunnel Creek | | | | | | | ● | | | ● | | | | ● | | | | | | | | | | | | | | |
| Walpole-Nornalup | ● | ● | ● | ● | | ● | ● | ● | ● | ● | ● | | ● | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Walyunga | | | ● | | | | ● | ● | ● | | | | ● | | | | | ● | | | ● | | | | | | | |
| Watheroo | | | | | | ● | | | | ● | ● | | | | | | | | | | | | | | | | | |
| William Bay | | ● | | | | ● | ● | | | ● | ● | | ● | | | | ● | | | ● | | | | | | | | |
| Windjana Gorge | | | ● | | ● | | ● | | ● | ● | | | ● | ● | | | | | | | | | | | | | | |
| Wolf Creek Meteorite Crater | | | | | | | ● | | | ● | | ● | | | | | | | | | | | | | | | | |
| Yalgorup | | ● | | ● | | ● | ● | | ● | ● | ● | | ● | | | | ● | | | ● | ● | ● | | | | ● | ● | |
| Yanchep | | | | ● | | | | | ● | ● | ● | | ● | | | | ● | ● | | | ● | ● | | ● | | ● | | ● |

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