

Esperance Lakes Nature Reserves

Draft Management Plan

1997



Department of Conservation
and Land Management



National Parks and Nature
Conservation Authority

DRAFT MANAGEMENT PLAN

Esperance Lakes Nature Reserves

A32257 Lake Warden

A15231 Woody Lake

A23825 Mullet Lake

A31197 Shark Lake

C24511 Pink Lake

WHAT DO YOU THINK ?

We want to know what you think of the proposals in this draft management plan. Have you thought about writing a submission ?

WHY WRITE A SUBMISSION ?

It is an opportunity to provide information, express your opinion, suggest alternatives and have a say on how we are proposing to manage the Esperance Lakes Nature Reserves over the next 10 years.

If you prefer not to write your own submission you could make a joint submission with others.

WHAT MAKES AN EFFECTIVE SUBMISSION ?

To ensure your submission is as effective as possible:

- make it concise and clear.
- list your points according to the subject sections (and page numbers) in the plan.
- describe briefly each subject or issue you wish to discuss.
- say whether you agree or disagree with any or all of the objectives or recommendations within each subject or just those of specific interest to you; clearly state your reasons (particularly if you disagree) and give sources of information where possible.
- suggest alternatives to deal with any issue with which you may disagree.

It is important to indicate those strategies and recommendations you agree with as well as those with which you disagree.

Each submission is important in its own right but those that give reasons for concerns, give support where appropriate and offer information and constructive suggestions are most useful.

WHAT HAPPENS TO YOUR SUBMISSION ?

All submissions will be summarised according to the topics discussed. The draft management plan will then be reviewed in the light of submissions, according to established criteria (see over). An analysis of the submissions will be published, along with the final management plan, and this will include an indication of how the plan was or was not amended in response to the submissions. If a submission is marked 'CONFIDENTIAL' the author will remain anonymous.

WHAT CRITERIA WILL BE USED IN ASSESSING YOUR SUBMISSION ?

1. The draft management plan *will* be amended if a submission:
 - (a) provides additional resource information of direct relevance to management;
 - (b) provides additional information on affected user groups of direct relevance to management;
 - (c) indicates a change in (or clarifies) Government legislation, management commitment or management policy;
 - (d) proposes strategies that would better achieve management goals and objectives; or
 - (e) indicates omissions, inaccuracies or a lack of clarity.
2. The draft management plan *will not* be amended if a submission:
 - (a) clearly supports the draft proposals;
 - (b) offers a neutral statement or no change is sought;
 - (c) addresses issues beyond the scope of the plan;
 - (d) makes points which are already in the plan or were considered during plan preparation;
 - (e) is one amongst several widely divergent viewpoints received on the issue and the recommendation of the draft plan is still considered the best option; or
 - (f) contributes options which are not feasible (generally due to conflict with existing legislation, or Government or Departmental policy).

DEADLINE

Submissions are welcome for two months following the date of release of the plan. Please ring (09) 334 0563 or (090) 713 733 for enquiries.

WHERE DO YOU SEND YOUR SUBMISSION ?

Written submissions should be sent to:

Executive Director
Department of Conservation and Land Management
Locked Bag 104
Bentley Delivery Centre W.A. 6983

Attention: Plan Coordinator
Esperance Lakes Nature Reserves Management Plan

PREFACE

All national parks, conservation parks, marine parks, nature reserves and marine nature reserves in Western Australia are vested in the National Parks and Nature Conservation Authority (NPNCA), and managed on its behalf by the Department of Conservation and Land Management (CALM).

The NPNCA is responsible for the preparation of management plans for all lands and waters that are vested in it. CALM prepares the plans on a regional and area basis, and prepares plans for individual areas on a priority basis. The NPNCA issues draft plans for public comment and provides a final plan for approval by the Minister for the Environment.

According to the CALM Act (1984), management plans should contain:

- a statement of the policies or guidelines proposed to be followed; and
 - a summary of operations proposed to be undertaken,
- for a specified period not exceeding 10 years.

This management plan also contains relevant strategies from the regional management plan released in 1992 for CALM's South Coast Region.

In accordance with section 55 of the Act, the term of this plan will be for 10 years but a review may take place within the term of the plan.

ACKNOWLEDGEMENTS

Financial assistance for the preparation of this management plan was provided by the Wetlands Unit of the Australian Nature Conservation Agency (now part of Environment Australia). This assistance is gratefully acknowledged.

This plan was prepared by the Esperance Lakes planning team comprising:

- Jacqueline Pontré and Matt Cavana - Coordinators
- Klaus Tiedemann - District Manager
- Ian Herford - Regional Planning Officer
- Dr Stuart Halse - Principal Research Scientist
- Bernie Haberley - District Wildlife Officer

Many others have provided valuable assistance in preparing this plan, particularly:

- staff of the Department's South Coast Region and Esperance District;
- Rod Properjohn and Steve Jones of CALM's Information Management Branch;
- Allan Wicks formerly of CALM's Recreation Planning and Design section;

The Western Australian Museum is gratefully acknowledged for its information on vertebrate fauna.

NOMENCLATURE

Inclusion of a name in this publication does not imply its approval by the relevant nomenclature authority.

CONTENTS

	Page
PREFACE	iii
ACKNOWLEDGEMENTS	iv
NOMENCLATURE	iv
 INTRODUCTION	
1.0 Overview	1
1.1 Brief Description	1
1.2 Ramsar Listing	1
1.3 Public Participation	1
2.0 Management Goals and Objectives	3
2.1 Primary Objectives	3
2.2 NPNCA and CALM Management Policies	3
2.3 Management Goals	3
2.4 Key Issues for Future Management	3
 LAND USE MANAGEMENT	
3.0 Land Tenure	4
4.0 Management Zones	4
 MANAGEMENT FOR CONSERVATION	
5.0 Principal Conservation Directions	7
6.0 Management for Conservation of Resources	7
6.1 Ramsar Obligations	7
6.2 Geology, Landforms and Soils	7
6.3 Catchments and Hydrology	8
6.4 Vegetation and Flora	12
6.5 Fauna	14
6.6 Cultural Heritage	15
6.7 Landscape Management	16
6.8 Plant Diseases	17
6.9 Fire Management	19
6.10 Introduced Plants and Animals	23
6.11 Rehabilitation	24
 RECREATION AND TOURISM	
7.0 Principal Recreation Directions	26
8.0 Recreation Activities	26
8.1 Nature Appreciation	26
8.2 Bushwalking	26
8.3 Picnicking and Barbecuing	28
8.4 Water-based Recreation	28
8.5 Horse-riding	29
8.6 Off-Road Vehicles	29
9.0 Commercial Visitor Services	30

10.0	Visitor Safety	...	...	...	...	...	...	30
11.0	Domestic Animals	...	...	...	...	...	...	30

COMMERCIAL AND OTHER USES

12.0	Management of Commercial and Other Uses	...	...	...	...	...	...	32
12.1	Mining and Mineral Exploration	...	...	...	...	...	...	32
12.2	Basic Raw Material Extraction	...	...	...	...	...	...	32
12.3	Utilities and Services	...	...	...	...	...	...	33
12.4	Aquaculture	...	...	...	...	...	...	33
12.5	Other Commercial Uses	...	...	...	...	...	...	33

COMMUNITY RELATIONS

13.0	Information, Interpretation and Education	...	...	...	...	...	...	34
14.0	Interaction with the Community and other Authorities	34

RESEARCH AND MONITORING

15.0	Research and Monitoring	36
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IMPLEMENTATION

16.0	Resources	37
17.0	Priorities	37
18.0	Evaluation and Review	37

BIBLIOGRAPHY	41
---------------------	-----	-----	-----	-----	-----	-----	-----	----

APPENDICES

Appendix 1.	Guidelines for Implementation of the Wise Use Concept of the Ramsar Convention	...	...	...	...	...	...	43
Appendix 2.	Vertebrate Fauna (excluding birds) in the Esperance Area	...	...	...	...	...	...	53
Appendix 3.	Landscape Character Types	...	...	...	...	...	...	55

MAPS

Map 1.	Tenure	...	...	...	...	...	...	2
Map 2.	Management Zones	...	...	...	...	...	...	6
Map 3.	Topography and Catchments	...	...	...	...	...	...	10
Map 4.	Vegetation	...	...	...	...	...	...	13
Map 5.	Disease	...	...	...	...	...	...	18
Map 6.	Fire Management	...	...	...	...	...	...	21
Map 7.	Access and Recreation	...	...	...	...	...	...	27

TABLES

Table 1.	Tenure of Reserves in the Lake Warden System	...	...	...	...	...	...	5
Table 2.	Average Surface Water Salinity	...	...	...	...	...	...	9
Table 3.	Hydrogeological Properties of the Esperance Coastal Zone	...	...	...	...	...	...	9
Table 4.	Landscape Management Guidelines	...	...	...	...	...	...	17
Table 5.	Key Recommendations for Esperance Lakes Nature Reserves	...	...	...	...	...	...	38

INTRODUCTION

1.0 OVERVIEW

1.1 Brief Description

The Esperance Lakes Nature Reserves covered in this management plan are located near the coastal town of Esperance on the south coast of Western Australia (Map 1). They are:

- Lake Warden, Reserve No. A32257 (709.7 ha);
- Woody Lake, Reserve No. A15231 (565.0 ha);
- Mullet Lake, Reserve No. A23825 (1917.4 ha);
- Shark Lake, Reserve No. A31197 (16.1 ha); and
- Pink Lake, Reserve No. C24511 (175.9 ha).

The Reserves are part of CALM's Esperance District, which extends from the South Australian border in the east to approximately 150 km west of Esperance and north to the Johnston Lakes area.

The area experiences a Mediterranean climate of warm, dry summers and cool, wet winters with a moderately reliable rainfall. Most of the average annual 670 mm of rain falls between May and September. Average maximum temperatures range from 26 °C in January to 17 °C in July, with average minimum temperatures of 16 °C in February to 8 °C in July.

The Reserves provide important habitat for waterbirds such as the Hooded Plover (*Thinornis rubicollis*), Banded Stilt (*Cladorhynchus leucocephalus*), Australian Shelduck (*Tadorna tadornoides*) and Black Swan (*Cygnus atratus*). They are used by the declared rare Cape Barren Goose (*Cereopsis novaehollandiae grisea*) and Freckled Duck (*Stictonetta naevosa*), and support thousands of waterbirds.

Shark Lake Nature Reserve has important conservation values being one of the few permanent freshwater wetlands on the south coast. Shark Lake is also an important drought refuge site for waterbirds, with large numbers of birds being recorded at the Reserve during the summer.

The lakes are predominantly fed by drainage channels from the agricultural districts to the north. Increased runoff and rising watertables resulting from agricultural clearing have a direct impact on the water quality of the lakes. Salinity and waterlogging are removing land from agricultural production and impacting on coastal environments. Eutrophication and siltation are also threatening the integrity of the lakes' ecosystems.

Attractions in the Reserves include the wetlands and coastal scenery. Opportunities for sightseeing, bushwalking, picnicking, nature appreciation, waterskiing and birdwatching, all in close proximity to the Esperance townsite, have meant increases in

visitor activity. Areas of subdivided land for urban development have been pushed to the lakes' edge creating further pressures on the lake ecosystems.

A number of activities currently not permitted are taking place in the nature reserves. These include horse-riding, motorcycling and off-road driving which cause degradation of vegetation and subsequent erosion. Developments and associated activities adjoining the Reserves are also having impacts on the Reserves' values.

This management plan has been prepared to resolve present conflicts, to plan for future needs and to ensure the Reserves' values are protected and maintained.

1.2 Ramsar Listing

The Lake Warden System is one of nine wetland areas in Western Australia recognised as Wetlands of International Importance under the Ramsar Convention. The Ramsar Convention is an intergovernmental treaty which provides the framework for international cooperation for the conservation of wetland habitats. Under this Convention CALM has special obligations relating to the conservation of these wetlands (see 6.1 of this plan - Ramsar Obligations). The Ramsar wetland system comprises Lake Warden, Woody Lake and a portion of Mullet Lake Nature Reserves (see Map 1). Shark Lake, Pink Lake and the remainder of Mullet Lake Nature Reserves are not part of the Ramsar wetland system. The system is also listed on the National Estate Register¹ in recognition of its significance for waterbird conservation.

1.3 Public Participation

Community input to the draft management plan was sought via the following avenues:

Submissions and Initial Meetings

Leaflets, asking for submissions regarding any information, issues of concern and points of view on the Reserves, were sent to all households in Esperance. Advertisements and articles were placed in State and local newspapers, and radio interviews (local

¹ The National Estate Register is an inventory prepared by the Australian Heritage Commission of all places in Australia which have aesthetic, historic, scientific or social significance, or other special value, for present and future generations.

stations) were conducted asking for submissions. A number of meetings were also held with interested groups and individuals, including Esperance Shire Councillors, local community groups, Aboriginal people, and representatives from urban and rural fire brigades.

Community Workshop

A community workshop was held in Esperance in November 1994 to provide a forum for discussion of the plan, the planning process and issues of concern.

Community Survey

A community survey of households in Esperance and surrounding districts was conducted by the Department between November 1994 and January 1995 to obtain information and points of view from local residents and reserve users. The results verify the importance of the Lakes to people in Esperance.

2.0 MANAGEMENT GOALS AND OBJECTIVES

2.1 Primary Objectives

The statement of mission adopted in CALM's Strategic Plan is:

TO CONSERVE WESTERN AUSTRALIA'S WILDLIFE AND MANAGE LANDS AND WATERS ENTRUSTED TO THE DEPARTMENT FOR THE BENEFIT OF PRESENT AND FUTURE GENERATIONS.

CALM's primary objective in managing nature reserves, as defined in Section 56 of the CALM Act (1984), is to:

maintain and restore the natural environment, and to protect, care for, and promote the study of indigenous flora and fauna, and to preserve any feature of archaeological, historic or scientific interest.

Lake Warden, Woody Lake, Mullet Lake, Pink Lake and Shark Lake Nature Reserves will be managed with this primary objective. Other more specific objectives are detailed in individual sections of this plan.

2.2 NPNCA and CALM Management Policies

This draft management plan is based on National Parks and Nature Conservation Authority (NPNCA) and Department of Conservation and Land Management (CALM) policies. These policies are derived from legislation, principally the CALM Act (1984), the Wildlife Conservation Act (1950) and associated regulations. Policies are published and distributed throughout CALM as policy statements

and are available to the public on request.

2.3 Management Goals

Management goals and objectives for Lake Warden, Woody Lake, Mullet Lake, Pink Lake and Shark Lake Nature Reserves are:

Conservation

- Conserve biological, physical, cultural and landscape values with particular emphasis on those values which led to their listing as wetlands of international importance.

Recreation

- Manage passive nature-based recreation in a manner compatible with conservation and other goals.

Community Relations

- Promote informed appreciation of, and community support for, the Reserves' natural and cultural values, and facilitate liaison with the community about their management.

Commercial and Other Uses

- Ensure that commercial and other uses are managed in a manner that minimises impact on other values.

Knowledge

- Seek a better understanding of the natural and cultural environments, and the impacts of visitor use and management activities.

2.4 Key Issues for Future Management

All issues relevant to management of the Reserves are considered in this draft management plan, however, the following are considered to be key issues (not in order of priority):

- fulfilment of obligations under the Ramsar treaty,
- impacts of catchment management and adjacent land use on water quality,
- *Phytophthora* dieback and *Armillaria*,
- fire management,
- weeds, and
- increasing recreational pressures.

The key recommendations in this management plan are tabled in section 17.0 Priorities.

LAND USE MANAGEMENT

3.0 LAND TENURE

The objective is to ensure that the gazetted purpose, vesting and tenure of the Reserves reflects their values and use.

Lake Warden Nature Reserve (A32257) was first gazetted in 1973 for the purpose of 'Recreation and Conservation of Flora and Fauna'. It became an 'A' class reserve in 1978. Adjoining Reserve 32259, comprising 7.3 ha (formerly a SECWA pole dump), had its purpose changed to 'Conservation of Flora and Fauna' in 1993.

Woody Lake Nature Reserve (A15231) was originally gazetted as an 'A' class nature reserve in 1970. Its purpose of 'Recreation and Conservation of Flora and Fauna' was gazetted in 1978 when a 300 m wide limited access area on the north-east side of Wheatfield Lake was gazetted for recreational use. Woody Lake Nature Reserve incorporates most of Windabout Lake, Woody Lake and Wheatfield Lake.

Mullet Lake Nature Reserve (A23825) was also originally gazetted in 1970. It became an 'A' class reserve for the 'Conservation of Flora and Fauna' in 1972. Mullet Lake Nature Reserve incorporates Station Lake, Mullet Lake and Ewans Lake and extends to High Water Mark on the coast (Department of Land Administration, Plan No. 3230 II).

Shark Lake Nature Reserve (A31197) was gazetted as an 'A' class reserve in 1972 for the purpose of 'Conservation of Flora and Fauna'.

Pink Lake Nature Reserve (C24511) was originally gazetted as a 'C' class reserve in 1956. Its purpose of 'Conservation of Flora and Fauna' was gazetted in 1993.

Issues of land tenure in CALM's South Coast Region are addressed in the South Coast Region Management Plan (1992). The tenures of reserves in the Lake Warden System (Map 1) and proposed tenure changes are summarised in Table 1. All reserves are vested in the NPNCA unless indicated.

RECOMMENDATIONS

1. **Seek to implement tenure changes as proposed in Table 1.**
2. **Encourage compatible management of adjacent Shire reserves with that of the nature reserves.**
3. **Encourage the Shire to adopt this**

management plan as part of the Esperance Town Planning Scheme.

4.0 MANAGEMENT ZONES

The objective is to assist in protecting conservation values and providing for appropriate recreation and other uses by means of zoning where appropriate.

The concept of zoning to manage conservation areas in general, and people in particular, is based on the principle that uses or activities that share similar or compatible environmental and cultural requirements can be allocated to designated areas or 'zones'. Allocating specific uses and activities to areas can be either spatial, temporal or both. Typically, such allocation is determined on the basis of environmental and cultural values, land use capabilities, visitor needs and management considerations. A clear zoning scheme also helps to communicate management intentions to the public.

The proposed zoning plan reflects knowledge of the conservation significance of the area, the vegetation and its associated dieback hazard rating, the intensity and types of recreation uses, and future requirements for fire management. The zoning scheme will be used as a guide for future management (Map 2).

The management zones identified in the Esperance Lakes reserves as shown on Map 2 are:

Special Conservation

These areas contain features that deserve special protection because they contain or support unique, vulnerable or threatened species, best examples of natural features, or best representatives of plant communities. Access within this zone will be strictly controlled, and will be restricted to foot access only except for essential management purposes. Visible evidence of management will be low. Shark Lake Nature Reserve, and parts of Lake Warden and Mullet Lake Nature Reserves are zoned special conservation.

Natural Environment

These areas will be maintained in their natural state and may sustain a selected range of low-key nature-based recreation activities that have minimum environmental impact. Conditional access by private vehicles may be permitted, and visible evidence of management will be minimised. Pink Lake Nature Reserve and most of Lake Warden and Mullet Lake Nature Reserves are zoned natural environment.

Table 1.
TENURE OF RESERVES IN THE LAKE WARDEN SYSTEM

Reserve No.	Name*	Area (ha)	Purpose	Proposed Actions
A32257	Lake Warden N.R.	709.7	Recreation and Cons. of Flora and Fauna	Amend purpose to 'Cons. of Flora and Fauna'.
A15231	Woody Lake N.R.	565.0	Recreation and Cons. of Flora and Fauna	-
A23825	Mullet Lake N.R.	1 917.4	Cons. of Flora and Fauna	-
A31197	Shark Lake N.R.	16.1	Cons. of Flora and Fauna	-
C24511	Pink Lake N.R.	175.9	Cons. of Flora and Fauna	-
C32259	-	7.3	Cons. of Flora and Fauna	-
Lot 108 (pt East Loc. 18)	-	7.75	Recreation (Shire of Esperance)	Add to A15231 Woody Lake Nature Reserve.
Lot 1 (pt Loc. 245) and Lot 3 (pt Loc. 242)	-	0.9	Recreation ⁺	Add to A32257 Lake Warden Nature Reserve.
Pt. Windabout Lake (East Loc. 10)	-	-	Recreation (Shire of Esperance)	Negotiate with Shire to seek addition to A15231 Woody Lake Nature Reserve.
Pt. C28170	-	1 988.4	Govt. Requirements (unvested)	Add to A23825 Mullet Lake Nature Reserve. [†]
C24284	-	2.7	Building Sand	Negotiate with Shire to seek addition to A32257 Lake Warden Nature Reserve.
C33660	-	10.2	Public Recreation	Negotiate with Shire to seek addition to A32257 Lake Warden Nature Reserve.
C4182	-	121.4	Water and Cons. of Flora and Fauna (Minister for Water Resources)	Vest in NPNCA as Nature Reserve. [†]

* Names are unofficial.

+ Reserved for recreation under section 20A of Town Planning and Development Act.

† Proposed in CALM (1992). South Coast Region Management Plan, 1992-2002.

Recreation

Both the Lake Warden and Woody Lake Nature Reserves have an additional purpose of 'recreation' in their reserve purpose. This has allowed recreation to be pursued as a management goal on both reserves but with the need for the recreation to be compatible with the purpose of 'conservation of flora and fauna'.

The remaining nature reserves which do not include recreation in their purpose can allow passive recreation which may assist the understanding and study of the reserves' indigenous flora and fauna. The provision of walk tracks, information shelters and picnic sites in the recreation management zones therefore represent viable uses.

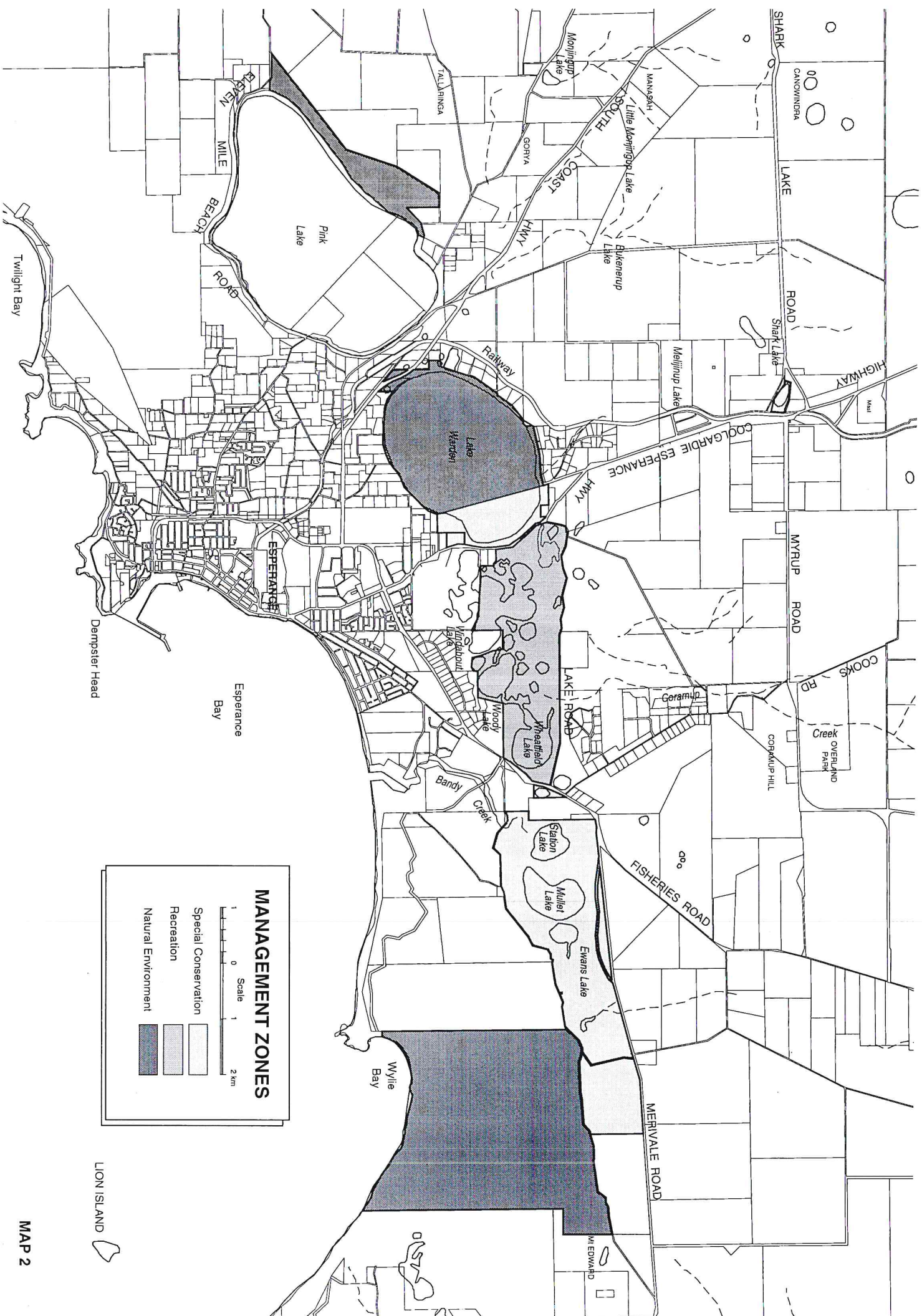
Woody Lake Nature Reserve is zoned for recreation and will be managed jointly for appropriate public recreation and for the conservation of native plants and animals. Facilities such as picnic sites, information shelters and walk tracks may be provided. Vehicle access will be separated from pedestrian access, and visible evidence of management may be moderate to high. The limited access area adjacent to Wheatfield

Lake will be superseded on gazettal of this management plan.

The Western Australian Government has accepted the need to include appropriate recreation in the purpose of nature reserves by way of an amendment to the CALM Act.

RECOMMENDATION

1. Base future management of the Reserves on the zoning scheme (Map 2).



MANAGEMENT ZONES

Scale 1 0 1 2 km

Special Conservation

Recreation

Natural Environment



MANAGEMENT FOR CONSERVATION

5.0 PRINCIPAL CONSERVATION DIRECTIONS

Conservation Goal

Conserve biological, physical, cultural and landscape values with particular emphasis on those values which led to their listing as wetlands of international importance.

CONSERVATION STRATEGY

The conservation strategy for the Esperance Lakes Nature Reserves will focus, where possible, on reducing external influences on the reserves to protect the diversity and abundance of flora and fauna species. Integrating management of the reserves with water catchments and encroaching urban development is essential in order to minimise degradation of ecosystems caused by activities outside the reserves. The impacts of reserve users will be monitored and controlled with regard to their potential for spreading *Phytophthora* dieback, introducing weeds, causing erosion and otherwise impacting on flora and fauna species.

6.0 MANAGEMENT FOR CONSERVATION OF RESOURCES

6.1 Ramsar Obligations

The objective is to ensure the character of the Reserves is maintained.

Wetlands are selected as Ramsar sites for Wetlands of International Importance on the basis of ecological, botanical, zoological, limnological or hydrological criteria. Criteria met by the Lake Warden system are that it is a particularly good example of a coastal dune wetland system in south-western Australia, that it regularly supports 20 000 waterbirds and that it supports over 10% of the Australian population of Hooded Plover.

CALM has special obligations relating to the conservation of Ramsar wetlands. These are based on the guidelines for the wise use of wetlands developed by the Ramsar Convention. The wise use concept is defined as 'the sustainable utilisation of wetlands for benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem'. Appendix 1 describes in detail the guidelines for implementation of the wise use concept. These guidelines promote increased knowledge of the wetlands and their values by

undertaking and encouraging appropriate research (see 15.0 Research and Monitoring).

RECOMMENDATION

1. **Ensure that the Esperance Lakes Nature Reserves are managed in accordance with the guidelines developed by the Ramsar Convention (Appendix 1).**

6.2 Geology, Landform and Soils

The objectives are to:

1. *Protect and conserve geological features, landforms and soils.*
2. *Minimise disturbance to the soil from any permitted activities.*

The Esperance district is characterised by Quaternary and Tertiary sediments which fill depressions in a rugged basement of Proterozoic granite and metamorphic rock (about 1 400 million years old) of the Albany-Fraser Province (Morgan and Peers, 1973). Projections of the granitic bedrock stand out as hills and islands while depressions have been progressively filled by Tertiary sediments of the Plantagenet Group during periods of sea level change. The Eocene sea (about 38 million years ago) reached 275 m above the present sea level (Jutson, 1950) when widespread sedimentation took place. Sandstone, siltstone, lignite and spongolite now form the flat plains behind the present coastline.

Changes in sea level appear to have had the greatest effect upon the development of the landforms. Dissection to produce an elevated plain occurred in stages during the Pleistocene (1.8 million years ago) with a lowering of the sea level. Pleistocene and recent (Holocene) deposits include the sand dunes on the coast, the coastal plain and sandplain, and alluvium of the river floodplains and terraces.

Overheu *et. al* (1993) identified two land systems over the Esperance lakes, namely the Tooregullup and Gore land systems. The Tooregullup land system represents the vast coastal dune fields laid down throughout the Holocene, and consists mainly of parabolic sand dunes and associated swales. The dunes run inland in a south-west to north-east direction. Soils are deep, calcareous, white sands with small areas of calcareous sandy loams in the swales. They are highly wind erodible as is evident by the numerous sand sheets and blowouts along the coast.

The Gore land system is a narrow, discontinuous coastal plain overlain in places by the Tooregullup sand dunes. It is a level to gently undulating plain that features large areas of wetlands and lakes where inland drainage lines flood out onto the plain. These include the Lake Warden system. The Gore land system is made up of Pleistocene alluvial and colluvial sediments, and complex aeolian sand dunes. The dunes are aligned in an east-west direction and are composed of deep siliceous sands. Sandy, yellow duplex soils occur on the level plain and saline, grey-blue duplex soils occur on the poorly drained winter-wet flats.

Shark Lake lies in a separate Esperance land system that represents the broader Esperance sandplain, a gently undulating plain with low rises and hills. Soils are mainly deep, sandy grey sands over yellow clay with grey-white loamy sand around the lake.

RECOMMENDATIONS

1. **Identify geomorphological units which are susceptible to damage.**
2. **Consider the vulnerability of geological features, landforms and soils in all management operations, such as access and firebreak maintenance and site developments.**

6.3 Catchments and Hydrology

The objective is to ensure that water quality and quantity are managed so as to maintain a healthy aquatic ecosystem.

Catchments and Surface Drainage

The Esperance lakes are predominantly fed by drainage channels from the agricultural districts to the north although waterlogging occurs in some relatively flat areas where drainage is internal. These catchments include Neridup Creek, Bandy Creek, Coramup Creek, Melijinup Creek, Bukenerup Creek and Monjingup Creek (Map 3). Increased runoff and rising watertables resulting from agricultural clearing have a direct impact on the quality of the lakes. Salinity and waterlogging are removing land from agricultural production and impacting on coastal environments. Eutrophication and siltation are also threatening the integrity of the lakes' ecosystems.

Seasonal and annual rainfall determine the average maximum depths of the lakes which vary from being dry in the summer to about two metres in depth in winter. Pink Lake and Mullet Lake are generally less than one metre deep following winter rains while Lake Warden, Woody and Wheatfield Lakes are generally deeper than one metre. The smaller swamps vary in depth. Salinity is also influenced by seasonal and annual rainfall although the hydrology of coastal lakes such as these is affected by marine groundwater (see

Table 2). The relationship between the lakes and groundwater needs further investigation.

A catchment planning strategy has been developed for the Esperance Region by the Esperance Land Conservation District Committee (Platt, 1995). The strategy aims to facilitate the best use of water resources and to minimise land and water degradation due to imbalances in the hydrologic cycle. The development and implementation of 'sustainable' farming systems within the catchments is integral to the strategy. Catchment planning near Esperance also considers the impacts on town residents and other stakeholders, such as the Shire Council, CALM, Main Roads WA and users of the wetlands. Community groups should be encouraged to monitor wetlands in their catchments and alternative treatments for waterlogging should be investigated (Platt, 1995).

Draining of excess water into creeks and rivers appears unsustainable in the long term due to the effects of increased water volumes and decreased water quality on the wetlands. Proposals to alter drainage into nature reserves are evaluated under the NPNCA's drainage policy, however, both CALM and the NPNCA support and encourage the adoption of agricultural methods which increase *in situ* use of water and so minimise downstream loss of nutrients, silt, salt and water.

Table 3 summarises properties of the hydrogeological zone identified for the Esperance Lakes Nature Reserves excluding Shark Lake (Platt, 1995).

In 1994 the Science Department of the Esperance Senior High School in conjunction with CALM started a Ribbons of Blue Project. The aim of the project is to establish a system by which students can monitor the health of local wetlands. This monitoring provides an excellent hands-on educational experience for students, and provides accurate and useful information for CALM and other agencies such as the Water and Rivers Commission.

Groundwater

The Quaternary coastal sand and the Plantagenet Group formations contain the main aquifers (Morgan and Peers, 1973). The quality, salinity and reliability of groundwater supplies varies significantly throughout the Esperance area. Lenses of fresh water are often available near the coast at bore depths of less than six metres but supplies usually occur at depths near to or less than 25 m. Coastal aquifers are replenished by winter rains. The aquifer west of Esperance is used as a town water supply and has an average salinity of less than 1 ppt TDS (Chape and Sansom, 1983).

There is evidence that the saline groundwater table is steadily rising at less than 10 cm per annum on the coast (Short *et al*, 1995). Further inland over large areas of the sandplain the watertable is rising at rates of between 10-30 cm per annum (Short *et al*, 1995). Further increases of salt affected land in the area can be

Table 2.
AVERAGE SURFACE WATER SALINITY

Lake	Summer (ppt TDS)	Winter (ppt TDS)	Salinity [†]
Pink Lake	320	115	Hypersaline
Lake Warden *	120	87	Hypersaline
Windabout Lake	61	22	Saline
Wheatfield Lake	58	10	Saline
Mullet Lake	100	17	Saline
Station Lake *	39	22	Saline
Shark Lake *	1.7	1.7	Fresh

ppt TDS: parts per thousand total dissolved solids.

Sources: * CALM Wetland Sample Data, 1979-1993.
Handley, 1991.

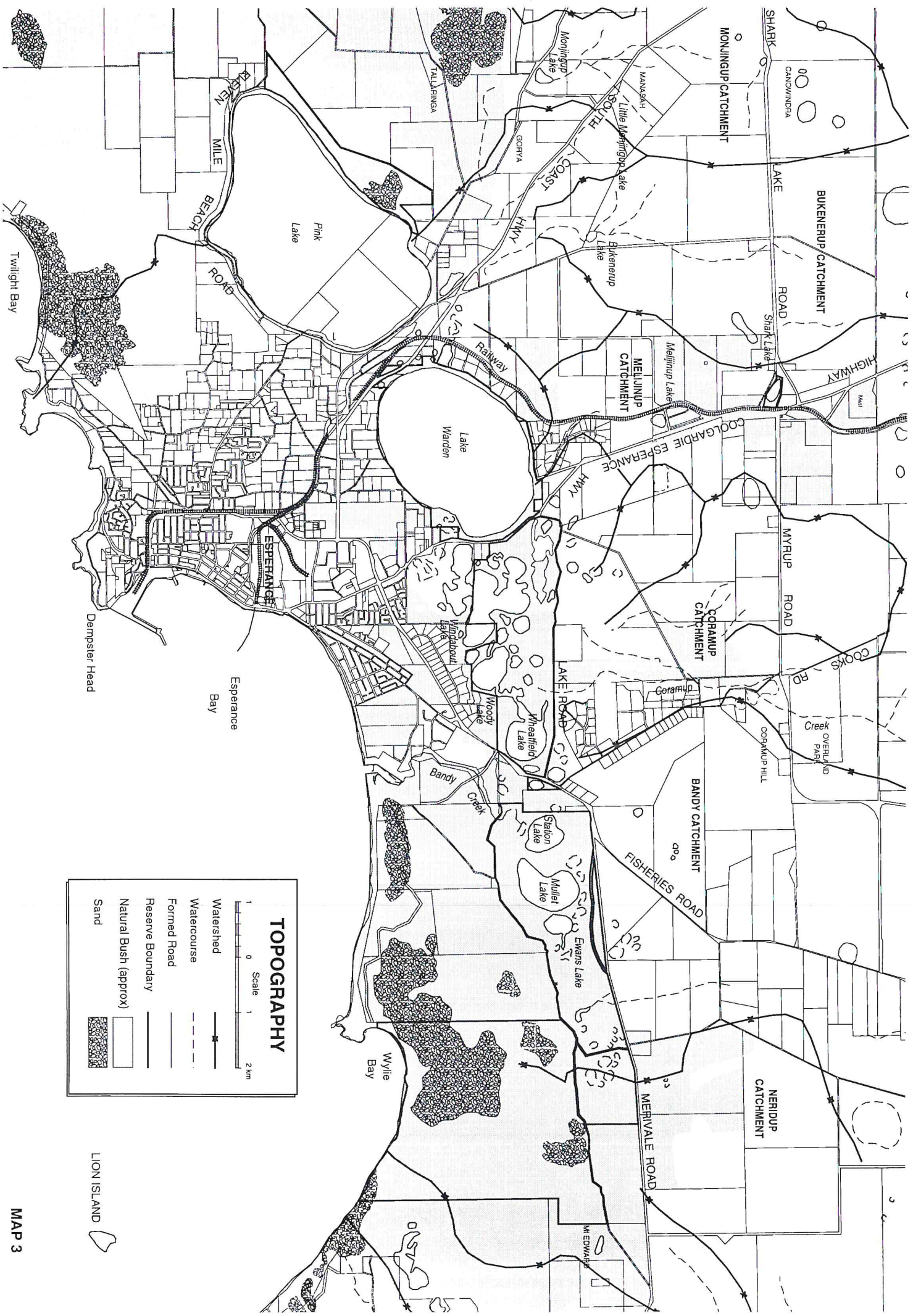
[†] Salinity (Halse *et al.*, 1993)

Fresh	< 3 ppt TDS all year	
Brackish	< 10 ppt TDS all year;	< 3 ppt TDS after inflow
Saline	< 50 ppt TDS all year;	< 10 ppt TDS after inflow
Hypersaline	often 100 ppt TDS;	> 25 ppt TDS after inflow

Table 3.
HYDROGEOLOGICAL PROPERTIES OF THE ESPERANCE COASTAL ZONE

Property		Comments
<u>Hydrogeological Attributes</u>		
Rainfall	> 550 mm	Waterlogging problem is so large it is expensive to treat.
Depth to watertable	< 10 m	
Water quality	Saline with fresh lenses.	Salinity is a moderate problem that needs attention.
Rate of rise	Unknown.	
Salt storage (0-6 m)	Unknown.	
Depth to basement	Shallow.	
Weathering profile to fresh basement	Shallow.	Soil structure decline is not considered a problem.
Drainage	Coastal lakes and poorly drained.	Water erosion is not considered a problem.
<u>Landform Attributes</u>		
Relief	< 9 m (mostly < 4 m).	
Model terrain slope	Level (< 1 %).	
Land system	Tooregullup, Gore.	
Landform pattern	Level plain.	
Channel development	Incipient, alluvial.	
Mode of geomorphological activities	Eroded and aggraded.	
Geomorphological agents	Wind, sheet flow, sheet wash, surface wash.	Wind erosion is a small problem at present but may increase in the medium term.
Status of geomorphological activities	Frequent.	
Component landform elements	Level plains, dunes, sand sheets, rock outcrops, lakes and swamps.	

Source: R. Short in Platt, 1995.



TOPOGRAPHY

1 0 1 2 km
Scale

Watershed ————
Watercourse ————
Formed Road ————
Reserve Boundary ————
Natural Bush (approx) [stippled pattern]
Sand [dotted pattern]



expected.

The groundwater resource should be protected through integrated management of the groundwater reserves west of Esperance and surface water catchments to the north. Shire planning controls over residential and tourist developments, including controls on the use of septic tanks and excessive fertilisers, should also minimise the impacts on groundwater. Ongoing monitoring of the watertable and groundwater quality is essential.

Future Outlook

There are five catchment-based groups established around the Esperance Lakes Reserves: Neridup Soil Conservation Group, Wittenoom Hills Catchment Group, West Bandy Creek Catchment Group, Coramup Creek Catchment Group, and the Lake Monjingup Development Community Group. These groups cover at least 60% of the total catchment area of the Reserves. The oldest group was formed in 1989.

The Lake Warden wetland system has already been identified as a high priority area under the Wetlands and Natural Diversity Recovery Program to be implemented as part of the State Government's Salinity Action Plan. As coordinating agency for this program, CALM will work with the existing catchment groups to coordinate action over their catchment areas (Government of Western Australia, 1996).

Many farmers within the catchments have been changing practises and implementing works on the ground to combat waterlogging, salinity and excess run-off. Much of this work has been done according to farm plans and with the catchment in mind. However, due to constraints of cost and time, most farmers have implemented only part of their proposed programs.

The outlook in the intermediate and long term is positive. Many farmers and research scientists are actively developing integrated farm planning and management systems that not only are economically attractive but also use more groundwater and reduce run-off. While implementation is continuing, it is important to commence proper monitoring of water flows into the lakes to provide feedback to farmers and the community on progress and likely trends for the future.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 10.5 Wetlands):

1. *As far as possible seek to prevent actions within the catchments of wetlands managed by CALM which will*

have an adverse effect on nature conservation values.

2. Foster the implementation of an integrated catchment management strategy for the Esperance Lakes Nature Reserves in consultation with the Water and Rivers Commission, the Department of Environmental Protection, Agriculture WA, Ministry for Planning and community groups.
3. Maintain support for the five catchment groups whose catchments directly feed the Reserves in the Esperance Land Conservation District in consultation with the Shire, Agriculture WA, the Water and Rivers Commission and the Department of Environmental Protection.
4. Liaise with the Shire and Ministry for Planning concerning the adoption of planning controls over future subdivision proposals to minimise the impacts of small subdivision catchments on the lakes.
5. Examine the impacts of the Bandy Creek boat harbour on the Mullet Lake complex.
6. Examine the impacts of Shire and Main Roads' drainage channels on ecosystem values and recommend any changes required.
7. *Monitor the condition of wetlands and the management of wetland catchments in conjunction with other key organisations.*
8. Support monitoring programs, including the 'Ribbons of Blue', to help ensure useful data are collected on salinity, nutrient levels, siltation and biota.
9. In consultation with the Water and Rivers Commission, further investigate the relationship between the lakes and groundwater supplies, and the impacts of groundwater use on the lakes. Encourage regular monitoring of groundwater quality, and maintain awareness of monitoring results.

6.4 Vegetation and Flora

The objective is to protect and conserve native plant species and communities.

The vegetation of the Esperance area has been described by Beard (1973). The reserves fall into the Fanny's Cove vegetation system of Quaternary sands, silts and clays with vegetated dunes of various ages. The coastal dunes comprise a low scrub of *Scaevola crassifolia* with scattered *Eucalyptus angulosa* occurring over a *Melaleuca pentagona* understorey. Immediately behind the coastal dunes are thickets of *Melaleuca* and *Acacia cyclops* or *Banksia speciosa*. A mixed Proteaceae-Myrtaceae scrub heath dominated by *B. speciosa* and *Melaleuca thymoides* occurs inland of the coastal dunes (Map 4).

The low-lying swamp areas around the lakes are dominated by *Melaleuca* spp. scrub or low trees. Other dominant species include *Calothamnus quadrifidus* and *Acacia cyclops*. Fringing vegetation of mixed low heaths occur on lake edges with species depending on lake salinity. Lake Warden is hypersaline (see 6.3 Catchments and Hydrology) and contains a belt of samphire, *Sarcocornia quinqueflora*, *Halosarcia pergranulata*, *H. lepidosperma* and sparse clumps of *Chenopodium glaucum* as a low succulent shrubland. Shark Lake is fresh water with dense sedge beds of *Baumea articulata*, *Isolepis nodosa*, *Juncus* sp., and *Schoenus brevifolius* (Halse *et. al*, 1993). Wetlands east of Mullet Lake are vegetated with samphire (*Halosarcia* spp.).

Although wetlands such as Station Lake are naturally saline, the increasing salinization of inland wetlands has a detrimental effect on their vegetation. A decline in species richness and composition may occur given that many species only occur within a restricted salinity range. Water-logging as a result of increased run-off after land clearing and urbanisation may also cause the death of plants (Froend *et. al*, 1987). This is particularly relevant to recent land subdivisions adjacent to the nature reserves.

At the present time (1996), almost all of the vegetation in the Reserves has been unburnt for at least 15 years. Some patches of *Banksia speciosa* within the reserves appear to be in a state of collapse and the general ecosystem exhibits a decline in vigor. Fire may be required to promote regeneration of these areas.

There have been no declared rare or endangered flora identified at present within the reserves. The presence of a relict population of a small mat plant, *Wilsonia rotundifolia*, is of interest.

Aquatic Flora

The lakes contain a characteristic aquatic flora dominated by diatoms and cyanobacteria. Some floristic elements, such as *Mastogloia halophila*, *M. reimeri* and *M. smithii*, indicate a degree of marine

influence.

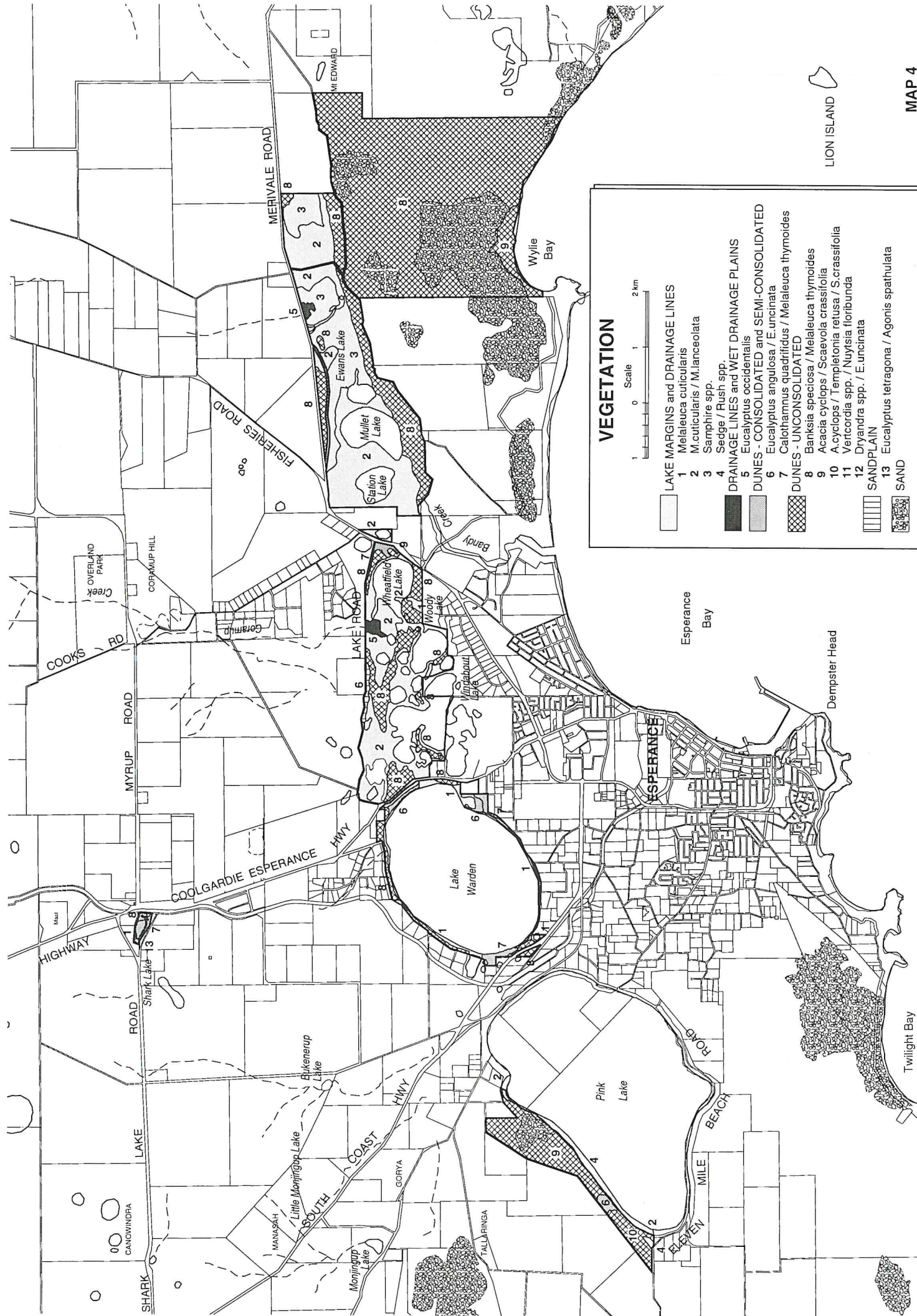
A study by Handley (1991) identified 100 taxa which belong to Bacillariophyta (54), Cyanophyta (32), Dinophyta (7), Chlorophyta (5) and Charophyta (2). The biodiversity of the lakes was found to be highest in winter, although not significantly different from summer. In winter, all of the lakes (excluding Pink Lake) contained similar numbers of species and supported a similar degree of biodiversity. Macrophyte flora such as *Ruppia polycarpa*, *Lepilaena preissii* and *Lamprothamnium papulosum*, which are widely distributed in the south-western Australia, show an extremely wide tolerance of fluctuations of salinity and can survive both submersion and dessication for extended periods (Brock and Lane, 1983). Pink Lake's hypersalinity greatly reduces the number of diatoms available leaving the more tolerant Cyanobacteria which forms rubbery, cohesive mats. The alga *Dunaliella salina*, which occurs in Pink Lake, accumulates carotenoids and appears red, giving the lake its pink colour (DCE, 1986a).

Macrophyte flora are primary producers that provide waterbird food either directly or indirectly, and require as little as three to four months to complete their life cycle (Brock and Lane, 1983).

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 11.1 Flora and Fauna):

1. *Manage the Reserves in a manner consistent with the maintenance of ecosystem processes and the current diversity of vegetation and flora.*
2. *Continue research to test hypotheses leading to an understanding of patterns and processes in the Reserves' ecosystems.*
3. *Continue surveys to record the distribution, abundance and other details of flora including species declared rare.*
4. *Seek to control weeds.*
5. *Assist in the development and implementation of strategies for any declared rare species to ensure continued survival and expansion of populations, and develop wildlife management programs when desirable.*
6. *Protect and monitor populations of any declared rare species of flora.*
7. *Monitor aquatic flora as part of monitoring programs designed to collect data on lake biota.*



6.5 Fauna

The objective is to protect and conserve indigenous fauna with emphasis on threatened and other priority species.

Waterbirds

The Esperance Lakes nature reserves are host to thousands of waterbirds, including two declared rare species - the Recherche Cape Barren Goose (*Cereopsis novaehollandiae grisea*), which comprises a rare subspecies of about 650 birds (Halse *et al*, 1995), and the Freckled Duck (*Stictonetta naevosa*). At least 59 species of waterbird have been recorded in the Lake Warden, Woody Lake and Mullet Lake Nature Reserves (Jaensch *et al*, 1988).

In terms of numbers of birds occurring, the wetlands are some of the most important in the south of Western Australia for Banded Stilts, Australian Shelducks, Black Swans, Chestnut Teals, Musk Ducks and Australasian Shovelers. They are also extremely important for the Hooded Plover (*Thinornis rubicollis*), an uncommon species restricted to southern Australia. Lake Warden, Woody Lake and Mullet Lake Nature Reserves support over 10% of the total population of this species. The entire Australian population of Hooded Plovers is estimated to be approximately 5 000 birds (RAOU, 1992).

Shark Lake is one of the few permanent freshwater wetlands on the south coast and is an important drought refuge site with comparatively large numbers of birds being recorded there in summer. A total of 40 species are known to visit the lake.

At least nine species of waterbird are known to breed in the reserves. These are Hooded Plovers and Red-capped Plovers at Station Lake and Ewans Lake; Pacific Black Ducks, White-faced Herons and Great Crested Grebes at Wheatfield Lake and Woody Lake; and Purple Swamphens, Clamorous Reed-Warblers, Spotless Crakes and Australian Crakes at Shark Lake. The fringing vegetation around Shark Lake may also be suitable for Pacific Black Ducks, Blue-billed Ducks and Musk Ducks. Cormorants are also known to breed around Wheatfield Lake (Jaensch *et al*, 1988).

The Hooded Plover in particular is threatened by vehicle movement along the dry margins and bed of Station Lake, and the dry bed of the north-east section of Lake Warden, which are used for nesting. The open water of Wheatfield Lake and Woody Lake, the latter being subject to waterskiing, is important for loafing by large numbers of other waterbirds (Jaensch *et al*, 1988).

Because of the conservation values of the reserves as habitats for waterbirds and as an example of saline coastal lakes on the south coast of Western Australia, Lake Warden, Woody Lake and Mullet Lake Nature Reserves are listed as wetlands of international importance under the Ramsar Convention and are

listed on the National Estate Register. They also protect at least 17 species of waterbird cited in the Japan - Australia Migratory Birds Agreement (JAMBA) and the China - Australia Migratory Birds Agreement (CAMBA).

Other Bird Species

Kitchener *et al* (1975) contains an annotated list of 121 bird species of Cape Le Grand National Park. Most of these species would occur in the nature reserves, including several ocean and island birds that would be found only occasionally. The area is a transitional zone from the mallee-sandplain to the coastal heath and consists of an intermingling of Bassian (south-west) and Eyrean (desert) species. Three species are gazetted as specially protected fauna: Carnaby's (White-tailed) Black Cockatoo, Peregrine Falcon, and the Red-eared Firetail. Suitable habitat for the Red-eared Firetail may be found in the reserves.

Other Terrestrial Fauna

The reserves also contain representative mammal, reptile and amphibian fauna of the south coast of Western Australia. No declared rare species are known to occur, however, a comprehensive biological survey of the reserves has not been conducted. Western Australian Museum records in addition to a survey of Cape Le Grand National Park by Kitchener *et al* (1975) indicate at least eight species of native mammal, 31 species of reptile, and six species of amphibian may occur in the reserves. The Southern Brown Bandicoot, which inhabits dense thickets of closed scrub around swampy depressions, is likely to occur in the reserves. It is gazetted as rare or likely to become extinct. The Carpet Python is gazetted as specially protected fauna and may also occur in the reserves.

Four species of introduced animal are known to occur in the area (see 6.10 Introduced Plants and Animals, and Appendix 2). Of these, the fox poses the greatest threat to native fauna.

Aquatic Fauna

Eighteen taxa of aquatic fauna were recorded in a study of the lakes by Handley (1991). These included eight protozoa, one nematode, three crustaceans, a gastropod, one foraminifera and four insects.

Protozoa are commonly found in hypersaline environments and survive by ingesting bacteria and algae. The crustaceans include one amphipod and two ostracods - small shellfish which can live in ephemeral waters because their eggs can withstand desiccation. The gastropod *Coxiella striata* is widely dispersed in Australia tolerating a broad range of salinities. The insects include two species of the order Diptera (midges, mosquitos) and two species of Coleoptera (beetles).

At least seven species of fish have been recorded from Bandy Creek (Hodgkin and Clark, 1989). These include hardyheads, gobies, black bream and mullet

(see Appendix 2). Western Australian Museum records also indicate the presence of two minnow species that occur in coastal streams and swamps in the area. Of these the Trout Minnow is considered to be Western Australia's rarest species of native minnow (Allen, 1982).

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 11.1 Flora and Fauna):

1. **Protect waterbirds, particularly breeding species, and their habitats from the impacts of reserve use and management.**
2. *Continue research to test hypotheses leading to an understanding of patterns and processes in the Reserves' ecosystems.*
3. *Continue surveys to record the distribution, abundance and other details of fauna including species declared rare or specially protected.*
4. *Seek to control feral animals.*
5. *Assist in the development and implementation of strategies for each declared rare species to ensure continued survival and expansion of populations, and develop wildlife management programs when desirable.*
6. *Protect and monitor populations of declared rare and specially protected species.*

6.6 Cultural Heritage

The objective is to protect and conserve the Reserves' cultural heritage and values.

It is known that Aboriginal people have an historical affinity with the lakes and Bandy Creek because of their food resources and camping opportunities. Four Aboriginal sites near the Reserves are registered with the Aboriginal Affairs Department - three ethnographic sites associated with water sources and one archeological site. Though they lie outside the reserve boundaries, these sites are indicative of the significance of water sources to Aboriginal culture and heritage. Surveys of the reserves may reveal other similar sites. All Aboriginal sites are protected by the Aboriginal Heritage Act (1972-80) regardless of whether they are known or not to the Aboriginal Affairs Department. Section 17 of this Act makes it an offence to alter an Aboriginal site in any way

without written permission from the Minister for Aboriginal Affairs.

Esperance Bay was named after the French ship *Esperance*, commanded by Huon de Kermadec, which took shelter there in December 1792. The town itself was not formally named until 1893, over a hundred years later. The *Esperance* and the *Recherche* were commanded by Admiral D'Entrecasteaux on his expedition to survey the south coast of western Australia. Early accounts of the area's history report that one of D'Entrecasteaux's landing parties discovered Spencer Lake (Pink Lake) and Lake Warden. After drawing maps of the lakes they noted that 'they contained no fish or living things'. They also came across Bandy Creek which they described as 'a sliver of a stream of fresh water that could not possibly replenish the ship supplies' (Marchant, 1982).

Prior to vesting of the reserves there was minimal use of the lakes. The vegetation and lakes remained relatively pristine. The lakes played an important geographical role in the growth of Esperance and its infrastructure. The Dempster brothers, who in the 1860s were the original European settlers of the region, ran sheep throughout much of the Esperance area. The remains of the Dempsters' woolshed are located within the Woody Lake Nature Reserve. The site is listed in the Esperance Shire Council Municipal Inventory of Heritage Places.

The section of the East-West Telegraph Line between Esperance and Israelite Bay was constructed in 1876. It followed an alignment through the wetlands now marked by Fisheries and Merivale Roads. The telegraph line was rerouted inland from Balladonia direct to Perth in 1929. The railway line from Coolgardie to Esperance was completed in 1927 passing between Pink Lake and Lake Warden (Rintoul, 1946).

Woody Lake and Mullet Lake Nature Reserves were game reserves where selective species of waterbirds were taken by licensed shooters during a declared open season on those species. The last declared open season was held in 1989-90 after which the reserves were listed as Ramsar wetlands. Lake Warden, Woody Lake and Mullet Lake Nature Reserves are also listed on the National Estate Register.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 12.1 Aboriginal Cultural Resources and 12.2 Historic Sites):

1. *Ensure that CALM's activities do not impact detrimentally upon known Aboriginal sites.*
2. *Train staff in liaison with the*

Aboriginal Affairs Department to recognise sites and report any new sites to them so that registers can be updated.

3. *Develop and implement management guidelines for Aboriginal sites in the Reserves in liaison with the WA Museum, tertiary institutions and Aboriginal organisations.*
4. *Liaise with Aboriginal groups concerning requests for access to the Reserves for cultural activities. Negotiate access in accordance with Departmental policies.*
5. *Collate existing information on historic sites located in the reserves and maintain an up-to-date register of sites in the Regional office and District office. Liaise closely with the National Trust and the Heritage Commission in the preparation and maintenance of registers and in the evaluation of potential additions.*
6. *In accordance with the Burra Charter², develop management guidelines for historic sites in the reserves in liaison with the WA Museum, National Trust, Heritage Commission, tertiary institutions and historical societies.*
7. **Where appropriate, incorporate material on the cultural heritage of the area in interpretive displays and community education programs.**

6.7 Landscape Management

The objective is to protect and restore the Reserves' landscape qualities.

The Esperance Lakes reserves lie within the broader Esperance Plains Landscape Character Sub-type of the Wheatbelt Plateau (CALM, 1994). Landscape character types are central to the methodology employed by CALM in assessing visual landscape values, which are determined by an area's geology, soils, landforms, vegetation, water features and land use history. Descriptive criteria termed 'frames of reference' have been established to help in assessing the scenic quality components of landscape character types. While all landscapes have some value, some are of greater scenic attraction and importance than

others. Three classes of relative scenic quality for various landscape components of the Esperance Plains - landform, vegetation and waterform - are described in Appendix 3. Most of the Esperance Lakes nature reserves have a high scenic quality.

In accordance with CALM's landscape management classification system, conservation reserves are managed with the objective of landscape preservation. This objective recommends that any landscape alteration should allow for little more than natural change or very low impact changes that are carefully planned to accommodate and/or enhance the Reserves' special visual qualities. The desired outcome is a positive response and sense of place for visitors and local residents. Landscape management ranges from broad scale to site specific analysis, and includes sensitive planning, design and construction.

Table 4 sets out specific guidelines that should be implemented.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 10.1 Landscape):

1. *Identify and protect important landscapes in the Reserves.*
2. **Implement CALM's Policy No. 34 (Landscape Management on Lands and Waters managed by CALM) in all aspects of land management of the Reserves.**
3. **Take into consideration the landscape management guidelines set out in Table 4.**
4. *Provide advice to private landholders and other agencies on minimising the visual impact of operations, especially on lands adjacent to or within the viewshed of the Reserves.*
5. **Encourage the Shire, other Government agencies and private landholders in surrounding areas to recognise the importance of landscape management by the sensitive siting of facilities and signs, selection of site-compatible materials and colours, and careful planning and siting of utilities and roads.**
6. *Carry out research into landscape perceptions and preferences in the community.*

² The Australia International Council on Monuments and Sites (ICOMOS) Charter for the Conservation of Places of Cultural Significance (the Burra Charter) contains principles concerning the preservation of structures considered to have historical value.

Table 4.
LANDSCAPE MANAGEMENT GUIDELINES

Landscape Management Guidelines
<ul style="list-style-type: none"> • Alterations to the natural landscape should be subtle, remaining subordinate to natural elements by borrowing extensively from form, line, colour, texture and scale found commonly in the surrounding landscape; • A site development plan, at an appropriate scale, should be completed and approved before any development, maintenance or rehabilitation works are implemented; • Degraded landscapes, e.g. gravel pits and disused vehicular access tracks, should be rehabilitated after use; • Essential firebreaks should follow natural landform, vegetation or landuse patterns/breaks; • Prescribed burning, if required, should be done before periods of high vegetation growth (where possible) and incorporate minimal visual impact prescriptions and techniques; • Previously disturbed areas within areas of high scenic quality should be given the highest priority for rehabilitation until the desired standard of scenic quality is attained; and • Where environmental or visually incongruent facilities or activities are essential, the degree of resource value lost should be assessed, controlled by management and carefully monitored.

6.8 Plant Diseases

The objective is to prevent introducing plant diseases into disease-free areas and to minimise their spread where they are already present.

Phytophthora Dieback

Phytophthora cinnamomi (commonly referred to as dieback disease) has been identified on the track west of the Woody Lake carpark, and on Location 15 north of Lake Warden. Furthermore, there is a significant dieback risk in the Coramup Creek area at the east end of Lakes Road. *P.cinnamomi* has been identified in a quarry north of the Woody Lake Reserve from which the Coramup Creek flows (Map 5).

Phytophthora dieback is transported in infected soil and water as a result of human activities which move infected soil and root material. It is most commonly spread by the movement of infected soil during earthworks, in mud on the wheels and underbodies of vehicles and on walkers' boots. The impact of *P.cinnamomi* on the vegetation varies but the disease is known to attack over 900 plant species from many different families. Native fauna dependent on susceptible vegetation can also be severely affected.

Strict dieback disease hygiene measures, such as conducting management operations under dry conditions when soil does not adhere to vehicles, coupled with track closures or realignments is necessary to impede the transport of infected material. Recent research into the use of phosphonate suggests it may be possible to immunise some plants against the progress of small *P.cinnamomi* infections.

Intensive monitoring of known infections and further surveys are required to determine the extent of *Phytophthora* dieback in the Reserves. Management of the disease will be carried out according to CALM's Policy No. 3 (*Phytophthora* Dieback) and the South Coast Region Dieback Protection Plan, 1994-1998.

Armillaria luteobubalina

Armillaria is a native fungus which attacks the woody material of susceptible species and, like *P.cinnamomi*, can cause their death. An infection has been identified in the Woody Lake Nature Reserve at the junction of the Norseman Road and Lakes Road. It is not believed to be as much of a threat to native vegetation as *P.cinnamomi*. As the fungus is spread by root to root contact, in infected soil and by airborne spores, management strategies implemented for *P.cinnamomi* control, where soil movement is a feature of the operation, is also effective for control of *Armillaria*. However, no known strategies can be implemented to control the spread of airborne spores.

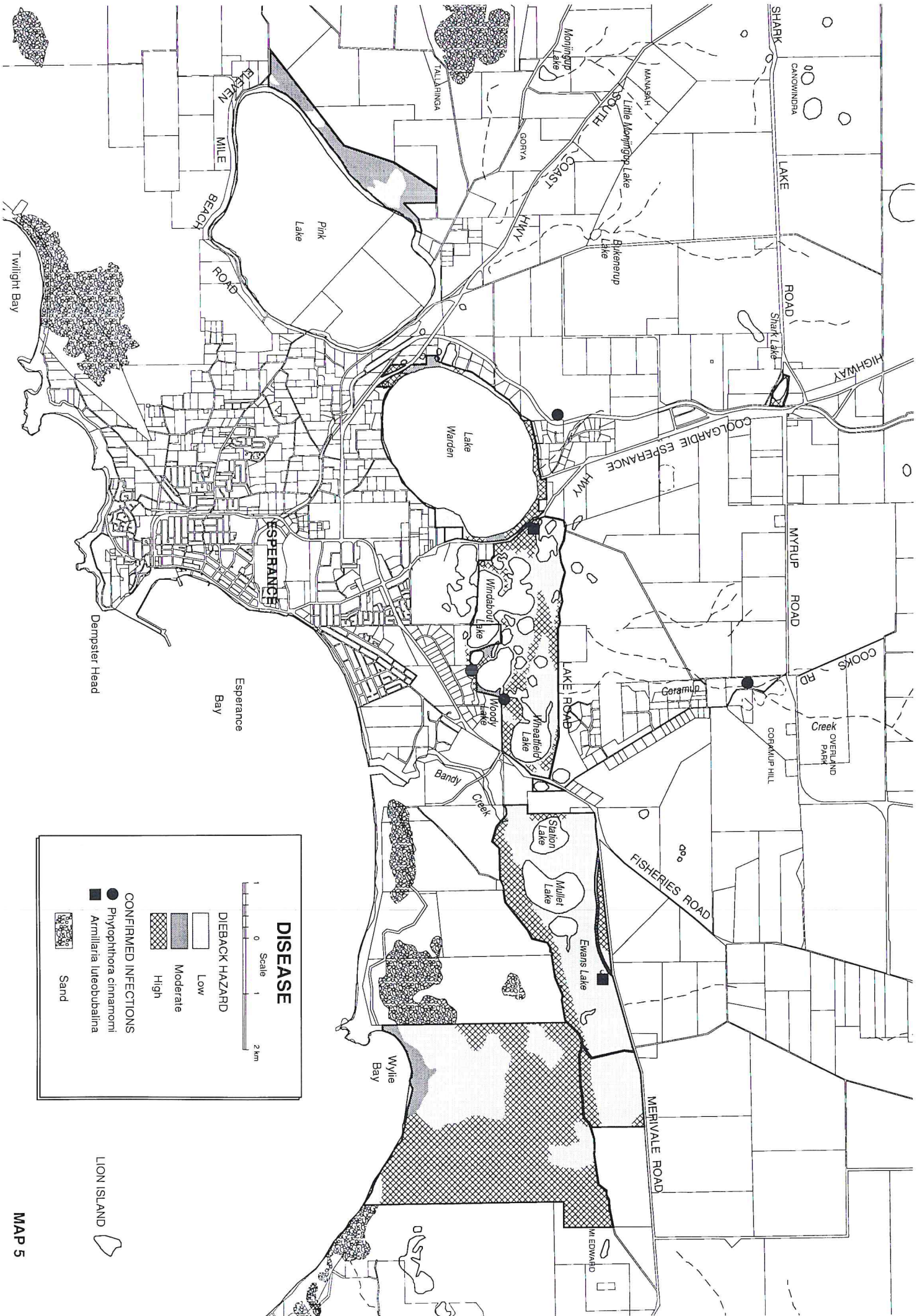
Canker

Canker fungi kill the aerial parts of plants as opposed to *Phytophthora* and *Armillaria* which kill plants from the roots up. Hosts affected by canker fungi occur mainly in the Proteaceae and Myrtaceae. The *Cryptodiaporthe* pathogen is a relatively new species which causes severe branch and stem cankering. It is known to cause high mortality of *Banksia coccinea* on the south coast (Shearer, 1994). The pathogen *Botryosphaeria ribis* is known to occur within the nature reserves, and is most prevalent within the *Banksia speciosa* woodlands.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 13.1 Plant Diseases):

1. **Reduce the risk of the establishment of dieback disease in new areas and minimise additional spread in areas where the disease already occurs by controlling access and operations in susceptible areas.**
2. **Continue to implement the South Coast Region Dieback Protection Plan, 1994-**



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1998, and CALM's Policy No. 3 (*Phytophthora Dieback*) in all management operations in the Reserves.

3. *Assess all operations and Reserve uses with an evaluation test for potential dieback disease impact and consequences.*
4. *Undertake all operations under hygienic conditions and monitor the effectiveness of such hygiene.*
5. *Identify priority areas within the Reserves for protection from dieback disease based on conservation values, risk of introduction and predicted impact.*
6. *Continue to monitor the *Phytophthora* and *Armillaria* infections, and dieback-susceptible vegetation in the Coramup Creek area, and take appropriate management action.*
7. *Develop and adopt appropriate strategies for other plant disease species including *Armillaria*, canker and other *Phytophthora* species.*
8. *Encourage the Shire of Esperance and other Government agencies to adopt similar dieback disease control strategies.*
9. *Undertake dieback disease mapping and assist with *Phytophthora* dieback research.*
10. *Improve understanding by the public and by CALM personnel of the dieback disease problem and protection measures in the Reserves.*

6.9 Fire Management

The objectives are to:

1. *Protect visitors, neighbours, fire fighters, staff and property from wildfires.*
2. *Protect plant communities, ecosystems and physical and landscape values from the effects of frequent uncontrolled fires and from inappropriate burning regimes and damaging suppression techniques.*
3. *Prevent large areas of the reserves from being burnt in any one wildfire, and enable the between-fire interval of most of the vegetation on the reserves to exceed 15 years.*
4. *Reduce the risk and frequency of unplanned fire starting near or within the reserves as a result of human activities.*

5. *Increase knowledge of the effects of fire on natural processes.*

Factors Affecting Fire Management

Values which are potentially threatened by fire on or near the reserves include the lives of reserve visitors, neighbours and firefighters, fauna habitat (particularly vegetation used by rare, restricted and breeding species), and adjacent residential and agricultural properties.

Protection of these values and assets must be considered in the development of fire prevention and management strategies.

Fire History

Prior to European settlement, there is recorded evidence that frequent burning of the bush occurred. Frequent burning of the country near Esperance by Aboriginal people was noted by nearly all early explorers and settlers. Burning not only flushed game out, but promoted growth which attracted game. Early observers also noted that very large fires were usually avoided by the successive burning of patches of land.

Only two major fires have been recorded within the reserves since 1979. The first was in 1979 and burnt an area along the Fisheries Road and into the lake system on a 6 km front. Over half the area of the reserves was burnt on that occasion. The other occurred in 1989 and was caused by an escape from an illegal campfire. It burnt an area of approximately 60 hectares between Woody and Windabout Lakes.

Unplanned fires have occurred in and around the townsite on a regular basis. Major fires have threatened the townsite or adjoining nature reserves in 1985, 1988, 1994 and 1997. Minor fires were recorded in 1988, 1989, 1994, 1995 and 1996. These fires, however, have burnt little of the Reserves which currently contain vegetation that has been largely unburnt for at least 15 years.

Although the major fires in the past have been caused by humans, lightning strikes are an ongoing threat.

Fire Behaviour

Fire behaviour is affected by the amount and type of fuel, air temperature, fuel dryness, wind speed and topography (Sneeuwjagt and Peet, 1985). Different vegetation types accumulate fuel at different rates and have different fire spread characteristics. The major fuel types in the Esperance Lakes are *Melaleuca* species around the lake margins, a low scrub of *Scaevola crassifolia* with scattered *Eucalyptus angulosa* in the sand dunes, and in the remainder a mixed Proteaceae-Myrtaceae scrub heath dominated by *Banksia speciosa* and *Melaleuca thymoides*.

These vegetation types in the main present continuous fuels that can be burned under relatively mild conditions. However, when conditions are suitable

fires can burn erratically with great intensity making control difficult.

From November until February, the advent of hot, dry northerly winds frequently results in severe fire weather conditions. Intense and fast moving fires are possible in all fuel types, with the exception of areas of vegetation where fuel is less than three years old. Direct suppression action on fires in older fuels is usually neither effective nor safe in these conditions.

Wind speed and direction are probably the major factors influencing the rate of spread of wildfires in the south coast area. A typical daily weather pattern during the fire season starts with moderate to strong offshore winds in the early morning with moderate to strong south to south-easterly breezes taking over in the late morning or early afternoon. The sea breeze is commonly over 30 km/h. This usually abates in the evening with winds returning to the east or north-east. The intensity of fire behaviour on the wind changes can increase dramatically and turn flank fires into large headfires.

The sand dunes in the reserves contain steep slopes and gullies that can promote erratic fire behaviour and make access difficult. Wildfires are difficult and dangerous to contain in these areas.

Fire Ecology

Plant species can be classified according to whether or not they are killed by fire, their mode and rate of regeneration, and whether they regrow from seeds or root stock. Although a considerable amount of research has been conducted in similar habitats elsewhere on the south coast, further work is required to confirm the classification and vulnerability of species within the lake system.

Appropriate fire-free intervals are still being refined. This is a complex issue as the rate of regeneration of vulnerable species varies greatly. Research to date has suggested that a fire-free interval of greater than 15 years is desirable in the area. At the present time, almost all of the vegetation in the Reserves has been unburnt for at least 15 years.

Some patches of *Banksia speciosa* within the reserves appear to be in a state of collapse and the general ecosystem exhibits a decline in vigor. Fire may be required to promote regeneration of these areas.

Perimeter areas adjacent to cleared land are vulnerable to weed invasion which can be exacerbated by fire.

Little information has been published about the influence of fire on the fauna within the lakes system. The recognised varied requirements of the different groups of fauna would be best served by much of the vegetation being retained unburnt, supplemented by areas with a range of fire ages. This has been inferred from observations in the kwongan of the Fitzgerald River area (Moore *et al*, 1991). Such diversity will be

hard to achieve in the sections of the reserves nearest the lakes because of the limited areas involved. However, small blocks can be identified which, when prescribed burnt, will provide protection from large fires and some age differentiation. The larger eastern area allows scope for a central core and variation in maturity to be established using patch burning.

Other Considerations

Preventing dieback disease from being introduced into the Reserves is of the greatest management concern. In the longer term, dieback disease has the potential to degrade the ecosystems of these areas far more than fire.

Because of the nature of the soils and their susceptibility to wind and vehicular erosion, the use of mineral earth firebreaks will be strictly limited. In their place wide, slashed, low fuel areas will be used. Tracks that were existing in the reserves have been rationalised and, where considered unnecessary, closed.

Due to landscape limitations, access and hygiene considerations, it is considered that the existing eastern boundary of Mullet Lake Nature Reserve is not a practical fire boundary. For similar reasons, the southern boundary of the Mullet Lake Nature Reserve precludes the establishment of an effective and trafficable strategic firebreak system.

Fire protection strategies are based on burnt patches to achieve low fuel areas which will be created without the need for additional firebreaks. Although this provides potential for fire escapes, it minimises the chances of introducing dieback disease.

FIRE MANAGEMENT STRATEGY

General

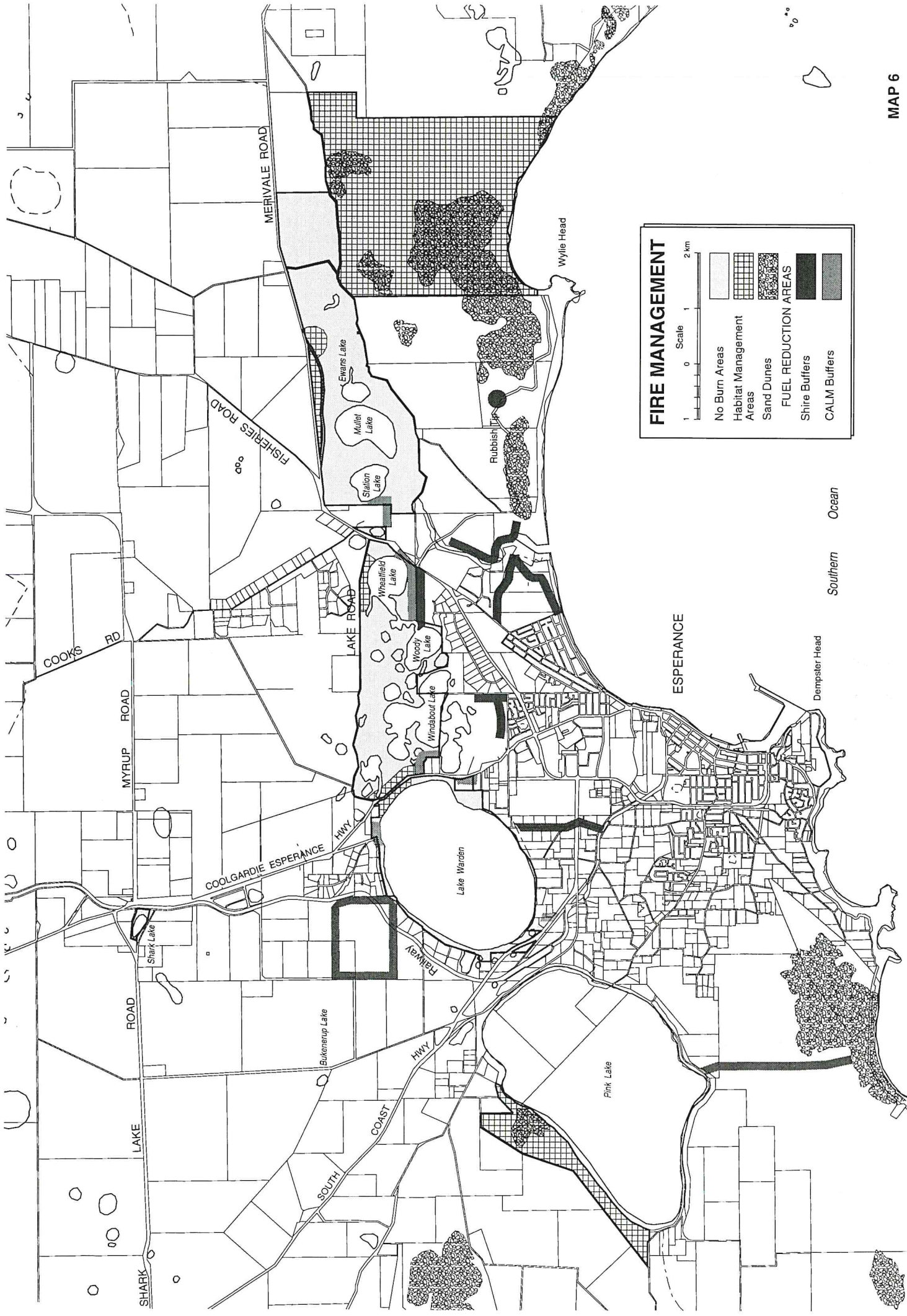
In accordance with the stated objectives, fire will be managed within the reserves using a combination of fuel reduction, habitat management and no planned burn areas (see Map 6).

The lighting of open fires is prohibited in the nature reserves. It appears likely that the 1979 and 1989 fires in the reserves were caused by illegal lighting of fires.

CALM staff will continue to use every opportunity to inform and educate the public about fire on the CALM-managed estate.

The spread of wildfires will be limited in two ways:

1. By creating fuel reduced areas created by slashing of vegetation or prescribed burning techniques in those areas identified in this plan; and
2. By suppressing all unplanned fires within the reserves.



FIRE MANAGEMENT

Scale 0 1 2 km

[Unshaded Box]	No Burn Areas
[Cross-hatched Box]	Habitat Management Areas
[Stippled Box]	Sand Dunes
[Solid Black Box]	FUEL REDUCTION AREAS
[Dark Grey Box]	Shire Buffers
[Light Grey Box]	CALM Buffers

No Planned Burn Regime

Sections of the reserves are to be designated as 'No Planned Burn' areas. These areas will not be burnt for the duration of this plan and may be retained for reference in the long term. Protection of these areas may entail fuel reduction of perimeter buffers and all practicable efforts to contain unplanned fires to the smallest area possible.

Habitat Management Regime

Areas will be burnt in order to regenerate vegetation and/or to provide diversity in vegetation ages in larger areas. This will involve the use of patches of fire to break up large expanses of even-aged vegetation.

Fuel Reduction Regime

Low-fuel areas will be maintained within the Reserves:

1. Wide slashed buffers will be maintained.
2. Some buffer areas will be prescribed burnt when fuels exceed predetermined levels.

Prescriptions

Prescriptions will be prepared for all proposed burns in accordance with CALM Policy No. 19 (Fire Management). This will also involve the completion of a pre-burn check list. All burns carried out by external agencies, i.e. local brigades, will be carried out according to CALM-prepared prescriptions. All details will be recorded to check that objectives are achieved and to increase the knowledge and experience available.

Multi-agency Fire Response Plan

The Esperance Lakes fall within an area that is covered by a fire protection and suppression plan - the Town and Urban/Rural Protection Plan. Under this plan, CALM, the West Australian Fire Brigades Board and the Bush Fire Brigades have an agreement to render mutual aid to one another. CALM will continue to support, encourage and strengthen this plan.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 13.2 Fire):

Prescribed Burning

1. Prepare and implement a Fire Master Plan from which annual fire management programs will be developed. Present annual fire management programs for endorsement at the relevant Shire Bush Fire Advisory Meetings.
2. *Reduce fuels by techniques such as prescribed burning and slashing in carefully selected strategic buffer areas either within the Reserves or, where possible, on adjacent lands.*

3. *Consistent with the requirement to protect life, property and nature conservation values, use prescribed burning to provide and maintain biological diversity.*

4. *Use fire to develop or favour habitat for specific flora and fauna species where appropriate.*

Pre-suppression

5. *Establish and maintain an efficient fire detection system and improve the effective fire fighting forces and equipment within the resources available.*

6. *Develop a fire emergency plan for the Reserves.*

7. *Establish and maintain a system of strategically located water points. Permit water extraction from Wheatfield Lake, Woody Lake and from the bore adjacent to Shark Lake for fire-fighting purposes.*

8. *Protect facilities from fire where possible, by careful site selection, design and management, fuel reduction and other methods.*

9. *Maintain firebreaks as 'management only' tracks, closed to public vehicles and subject to dieback disease hygiene requirements.*

10. *Close and rehabilitate all firebreaks and tracks which are not essential to the implementation of this plan.*

11. *In conjunction with adjoining land owners and local fire organisations, investigate the most suitable fire management boundaries of the Mullet Lake Nature Reserve taking into consideration the proposed additions to this section of the reserve.*

12. *Prohibit the lighting of wood fires in the Reserves.*

Suppression

13. *Endeavour to contain unplanned fires that enter the Reserves to the smallest area possible. Suppression may involve allowing the fire to burn out to low fuel areas, back burning from existing tracks or direct attack including the use of heavy equipment if essential. Choice of techniques will depend on values at risk, dieback disease risk, fire behaviour, resources*

available and presence of buffers and tracks.

14. Construct any emergency firebreaks subject to strict dieback disease hygiene principles using minimum impact techniques. Rehabilitate as soon as practicable after completion of fire suppression operations.

Liaison

15. Maintain close liaison with local Bush Fire Brigades, Reserve neighbours, the Shire of Esperance and other agencies and, through the mechanism of the Urban Rural Fire Protection Plan, establish mutual aid arrangements.
16. Develop neighbour and public knowledge about community fire protection needs and Departmental fire management objectives and response procedures.
17. Liaise with the owner of Location 814 so as to establish the most suitable and appropriate fire management strategy for this section of the reserve.
18. Liaise with the Esperance Shire and the Bush Fires Board to ensure maximum fire protection is established around the Shire rubbish tip.
19. Continue to liaise with the Esperance Shire and/or developers to ensure the provision of strategic fire protection with any further development of land south of the Mullet Lake system.

Research and Monitoring

20. Assist with research into fire behaviour and fire ecology.
21. Monitor the effectiveness and impacts of fire management measures and make any necessary changes to procedures in the light of research and experience.

6.10 Introduced Plants and Animals

The objective is to prevent the introduction of, and control the impact and spread of, declared and environmental weeds and feral animals.

Introduced Plants

Environmental or bushland weeds can be defined as unwanted plants or species growing in bushland. They can have a significant impact on conservation values by displacing native plants, altering fauna habitat and harbouring pests and diseases.

The Esperance Lakes Nature Reserves have several problem areas where weeds have established. One species of noxious weed declared under the Agriculture and Related Resources Protection Act (1976) occurs in the reserves. Patterson's Curse or Salvation Jane (*Echium plantagineum*) occurs on the access road to Woody Lake. The ARRPP Act (1976) provides appropriate policies and controls for declared species. Other environmental weeds established in the reserves include South African Boxthorn (*Lycium ferocissimum*) which occurs on the boundaries of Woody Lake and Mullet Lake Nature Reserves, and Victorian Tea-tree (*Leptospermum laevigatum*) which occurs alongside the Coolgardie-Esperance Highway, Lakes Road and Merivale Road. Bridal Creeper (*Myrsiphyllum asparagoides*) occurs around the northern perimeter of Lake Warden, and self-seeded Monterey Pine (*Pinus radiata*) and Victorian Tea-tree also occur on the reserve and around the periphery of Shark Lake Nature Reserve.

Weed invasion from neighbouring farmland is also prevalent. Blackberry vines (*Rubus fruticosus*) occur on private property and road reserve adjoining the Lake Warden and Woody Lake Nature Reserves.

Bushland weeds will be managed according to CALM Policy No. 14 (Weed Management) and other management strategies discussed in this plan. Noxious weeds will be managed according to the ARRPP Act (1976) and relevant CALM policies. Introduced trees will be considered for removal unless they are of historical or habitat significance.

Introduced Animals

There are no major feral animal problems in the reserves although foxes and rabbits occur in isolated populations. House mice are also common. Agriculture Protection Board (APB) rabbit baiting programs over the Esperance area are supported by CALM. Waterbirds are not threatened by baiting programs but a reduction in rabbit numbers may result in more foxes preying on waterbirds. Baiting for foxes may have logistic problems so close to the town and the impacts of such programs require investigation.

Domestic and feral cats pose a greater threat to waterbirds particularly as residential areas and subdivisions border the reserves.

The summer saltmarsh mosquito (*Aedes camptorhynchus*), which can be a carrier of Ross River virus, has been identified in the Woody Lake Nature Reserve. Ross River virus cases have been reported in Esperance, and are likely to occur more frequently during periods of warm, wet weather (T. Wright, pers. comm).

Midges have been the subject of local resident complaints for many years. Midges are the flying stage of the family Chironomidae which are best controlled by spraying during the larval stage. Their

importance in the food chain for waterbirds will be considered in any control program. Midges and mosquitos will be managed according to the NPNCA policy on mosquito control. The policy opposes mosquito control on Ramsar wetlands in principle.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 13.3 Weeds, Feral Animals and Pests):

1. **Implement control of weeds and pests according to the ARRP Act (1976), CALM Policy No. 14 (Weed Management) and the NPNCA policy on mosquito control.**
2. **Maintain liaison with the Esperance Shire Health Inspector with regard to monitoring the risk to public safety from the presence of mosquito and midge populations in the Reserves.**
3. *Maintain an inventory of weeds, feral animals and pests in the Reserves.*
4. *In conjunction with the Agriculture Protection Board and adjacent landholders, develop programs to control declared weeds and pests as resources allow.*
5. *Maintain liaison with neighbours to optimise control of boundary weed infestations.*
6. *Carry out monitoring and control programs on declared and non-declared weeds and pests as resources allow.*
7. **Seek special funding for weed control from external agencies.**
8. **Consider the removal of introduced trees unless they are shown to be of historical or habitat significance.**
9. *Assess the efficiency of control on target species and any effects on non-target species and make changes to procedures if required.*
10. *Provide information to the public on the impacts and control of weeds, feral animals and pests.*

6.11 Rehabilitation

The objective is to rehabilitate degraded areas to a stable condition resembling as closely as possible the natural environment.

There are several areas of man-made disturbance occurring in the Reserves. Most of these are the result of unmanaged or illegal activities, such as off-road vehicle use, camping, shooting, timber cutting and rubbish dumping. The most serious problem within the Reserves is the use of motorcycles and the subsequent problems with dieback, erosion and degradation of tracks and firebreaks. The extraction of soil and sand material for use on private property and for roadworks also occurs.

The combination of coastal dune sands and low heath vegetation may lead to serious erosion problems when disturbed by off-road vehicles. Access for vehicles, walkers and horses is discussed in other sections of this management plan. All access tracks not required for management or recreation access will be closed and rehabilitated. In some cases, simply removing the 'traffic' from degraded access routes may be sufficient as the native vegetation recolonises denuded areas. In other cases, more effective stabilising techniques may be required before rehabilitation is successful.

Disused and illegal sand pits on reserve boundaries also require rehabilitation. Appropriate opportunities for rehabilitation programs should be identified in consultation with the local authority, neighbours, volunteers and community groups.

Wherever possible, seed or cuttings from native species in the immediate locality should be used in rehabilitation operations. This ensures the greatest degree of success as well as enabling rehabilitated areas to resemble as closely as possible the natural vegetation.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 13.4 Rehabilitation):

1. *Survey lands in the Reserves and specify and prioritise the areas that require rehabilitation programs.*
2. **Rehabilitate degraded areas in accordance with CALM Policy No. 10 (Rehabilitation of Disturbed Land) and guidelines.**
3. **Prepare a detailed rehabilitation program and review the program on an annual basis.**
4. **Monitor the effectiveness of**

rehabilitation works on a regular basis.
Recommend changes to rehabilitation
strategies to effect improvement.

5. Provide opportunities for interested
individuals and groups to be involved in
rehabilitation projects.

RECREATION AND TOURISM

7.0 PRINCIPAL RECREATION DIRECTIONS

Recreation Goal

Manage passive nature-based recreation in a manner compatible with conservation and other goals.

RECREATION STRATEGY

The continued enjoyment by visitors to the Esperance Lakes Nature Reserves can only be assured while these areas are managed to protect their conservation values and to maintain the natural environment.

Lake Warden and Woody Lake Nature Reserves are currently reserved for 'Recreation and Conservation of Flora and Fauna' (see 3.0 Land Tenure). Windsurfing sometimes occurs on Lake Warden and sailing and sailboarding occurs on Windabout Lake. Water-skiing occurs on Woody Lake within a gazetted water-ski area vested in the Esperance Water Ski Club. A number of activities currently not permitted are taking place in the nature reserves. These include horse-riding, motorcycling and off-road driving. Pedestrian and vehicle access (horses are considered as vehicles) will be rationalised as part of the recreation strategy.

8.0 RECREATION ACTIVITIES

8.1 Nature Appreciation

The objective is to enhance the experience and knowledge of visitors to the Reserves by providing opportunities to experience, learn about and appreciate their natural attributes.

Nature can be appreciated in many ways by experiencing the environment through recreation activities such as bushwalking, birdwatching, viewing scenery and wildflowers, and photography. These activities can be enjoyed in their own right or as an adjunct to other activities like picnicking or canoeing.

Birdwatching is one of the most popular activities in the Reserves (46% of surveyed visitors) and is the main reason many people visit the lakes. The international significance of the wetlands for waterbirds attracts visitors from all over the world, but the Reserves remain largely as local attractions for the people of Esperance. At present there are no facilities for birdwatching in the Reserves and very little information provided on the types of waterbird and habitats that occur. A lookout is located on the

Eleven Mile Beach Road in Pink Lake Nature Reserve. Several other vantage points occur around Lake Warden, and Wheatfield and Woody Lakes.

Other popular activities enjoyed by reserve users are appreciating the scenery (59% of surveyed visitors) and looking at wildflowers (52%). Photography is also popular with many people (30%). Improved access for these sorts of activities is proposed by means of a circuit walk around some of the lakes (see 8.2 Bushwalking).

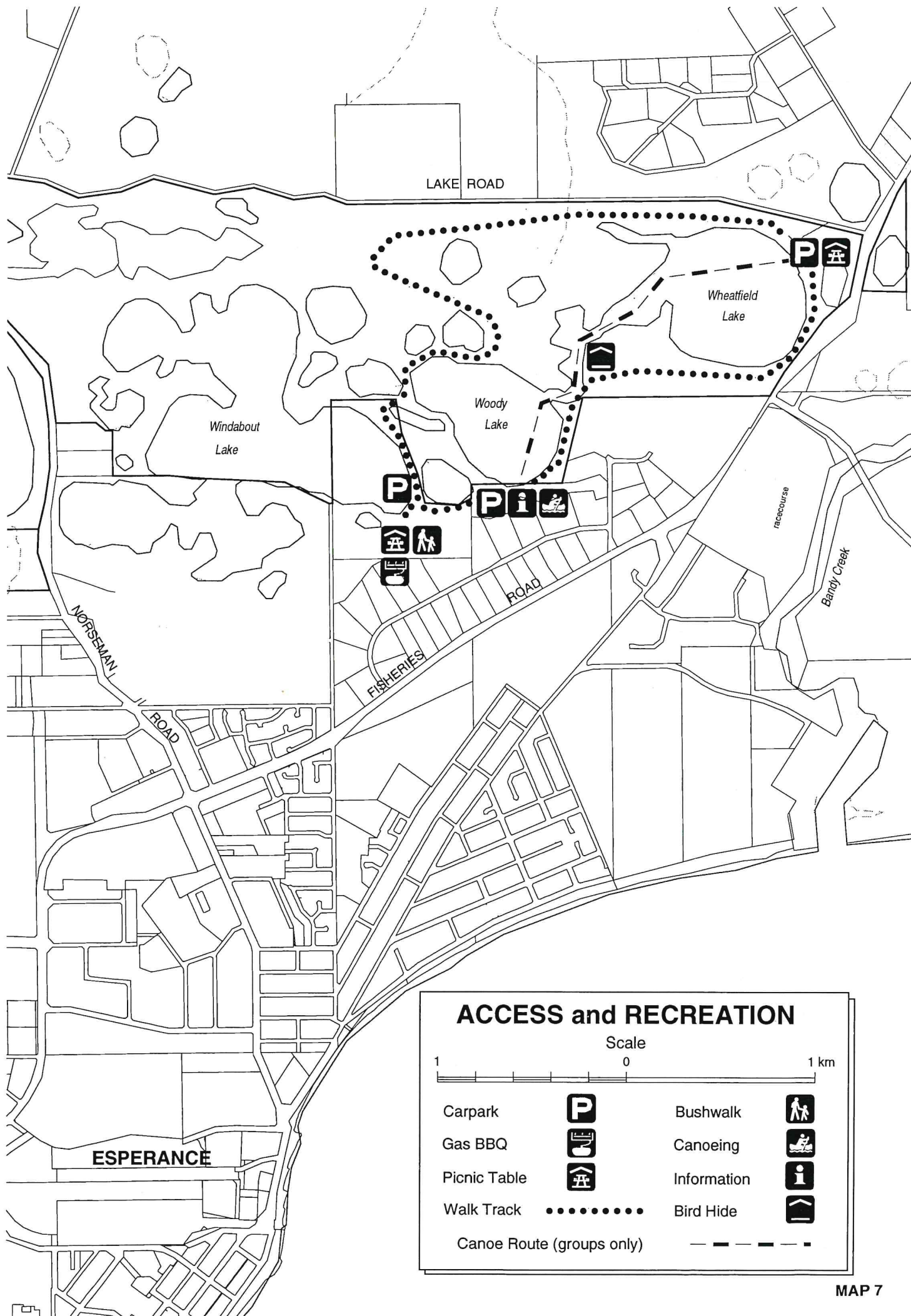
RECOMMENDATIONS

1. Provide information on waterbirds and their habitats, and the Ramsar status of the wetlands using appropriate media, e.g. display boards, pamphlets.
2. Provide information on other Reserve values, such as wildflowers, that will enhance visitors' appreciation and knowledge of nature.
3. Consider the construction of bird hides at quiet locations connected to the pedestrian access system (see 8.2 Bushwalking) where such facilities will not unduly impact on waterbirds and other fauna.
4. Develop vantage points from which to view scenic attractions including waterbirds and their habitats.

8.2 Bushwalking

The objective is to provide bushwalking opportunities from which the Reserves' natural attractions can be experienced and which do not adversely affect conservation and landscape values.

Bushwalking is a very popular activity in the Reserves (48% of surveyed visitors) and is enjoyed by people of all ages, interests and levels of fitness. It has traditionally been based on the 4WD tracks in the Reserves owing to the lack of specific pedestrian access. A walk track around Wheatfield and Woody Lakes based on existing tracks is proposed to be developed (see Map 7). Sections of the track will be suitable for use by disabled visitors and will be facilitated by carparks at Woody Lake and Wheatfield Lake. It may include a bird hide for observing waterbirds. The logical trail head for the walk should



ACCESS and RECREATION

Scale

1 0 1 km

Carpark



Gas BBQ



Picnic Table



Walk Track



Bushwalk



Canoeing



Information



Bird Hide



Canoe Route (groups only)



be Wheatfield Lake and at Lake Windabout in the Shire recreation reserve. Strict dieback hygiene measures will be implemented in construction of the walk due to the dieback risk in the Coramup Creek area (see 6.8 Plant Diseases).

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 14.8 Adventure Activities):

1. *Encourage 'low impact' bushwalking according to the zoning scheme.*
2. Ensure all pedestrian access complies with the South Coast Region Dieback Protection Plan, 1994-1998.
3. Develop a walk track as shown in Map 7.
4. Ensure that detrimental environmental impacts of construction, maintenance and use of the walk track, including disease spread, are minimised by the use of appropriate alignments, construction and surfacing techniques, and periodic maintenance as required.
5. Provide appropriate directional and interpretative signs on this and other bushwalking tracks within the Reserves.

8.3 Picnicking and Barbecuing

The objective is to provide facilities appropriate to the environmental setting that encourage visitor enjoyment and understanding of the Reserves' values.

The bush picnic or barbecue has become a tradition for many Australians and it often provides the central focus for other nature-based leisure activities such as sightseeing and bushwalking. Forty percent of surveyed visitors to the Esperance Lakes participate in picnicking, and nearly 80% believe picnic facilities should be provided.

Picnic facilities occur at Windabout Lake in the Shire recreation reserve. These facilities will be complemented by proposed development of the Woody Lake carpark area in conjunction with the circuit walk discussed previously. Facilities may include picnic tables and gas barbecues, and an information shelter. The proposed development will be subject to a site development plan which takes into account the dieback infection west of the carpark.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 14.2 Day Use):

1. Provide facilities at the Woody Lake carpark area and, in consultation with the Esperance Shire, seek the upgrading of facilities at the Lake Windabout carpark area subject to site development plans.
2. Ensure the site development plan takes into account the dieback infection on the carpark access road, and all works are subject to strict hygiene conditions.
3. *Provide access and facilities suitable for use by visitors with disabilities at appropriate locations.*
4. *Maintain recreation areas and facilities in a safe, clean and tidy condition.*

8.4 Water-based Recreation

The objective is to facilitate water-based recreation where this does not unduly impact on aquatic fauna, or lead to degradation of the environment or unacceptable levels of conflict with other user groups.

Water-skiing

Water-skiing occurs within a gazetted water ski area on Woody Lake. The gazetted area is controlled by the Esperance Water Ski Club which allows use by the general public subject to safety directions of the Club. A carpark and boat launching ramp facilitate access to the lake.

This activity has long been regarded as incompatible in the nature reserve. Public opinion against water-skiing (76% against or unsure) and the recent demise of the Water Ski Club indicate the activity should be phased out.

Canoeing

A limited amount of canoeing occurs in Lake Warden and Woody Lake Nature Reserves. This activity is a harmonious way of accessing the lakes for birdwatching and nature appreciation, and it is proposed to develop a canoe trail for organised groups in Woody Lake (see Map 7). This service may be subject to temporal constraints depending on factors such as water depth and bird breeding (see also 9.0 Commercial Visitor Services).

Windsurfing and Sailing

Windsurfing and sailing sometimes occur on Lake Warden and Windabout Lake. These activities have

minimal impact on the environment and on other Reserve users.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 14.7 Water-based Recreation):

1. *Involve recreation groups, interested community members and the Shire of Esperance in planning for water-based recreation activities and publicise information such as access routes.*
2. Develop a canoe trail for use by organised groups accompanied by a registered guide.
3. Seek to de-gazette the water-ski area from Woody Lake and phase out water-skiing in the Reserve.
4. Monitor water quality and restrict water-based activities if public health is jeopardized.
5. *Monitor the effects of water-based recreation on the environment in and around water bodies and modify plans as necessary.*

8.5 Horse Riding

The objective is to minimise the negative impacts of horse riding on the Reserves' environment and other visitors.

Current use of the Reserves for horse riding is limited to firebreaks and management tracks. This activity is considered incompatible within the Reserves and should be restricted to external tracks on private property. This is based on the premise that impacts of the activity can be minimised and controlled. CALM Policy Statement No. 18.2.8 (Equestrian Activities) prohibits horse riding in areas of special scientific value such as nature reserves. Horses can cause erosion problems and have the capacity to spread dieback disease by picking up infected soil in their hooves. Droppings and feed can introduce weeds into natural environments and, if not controlled, horses will trample and browse native vegetation and foul watercourses. Conflicts between horse riders and other visitors can also be a problem, particularly in these Reserves where most people seek peace and solitude in natural environments.

RECOMMENDATIONS

(Recommendations in italics are adapted

from the Regional Management Plan for the South Coast Region, 1992; section 14.5 Horse Riding):

1. Prohibit horse riding within the nature reserves.
2. *Provide information on trails available for horse riding as alternatives to the Esperance Lakes Nature Reserves.*

8.6 Off-Road Vehicles

The objective is to prohibit the use of vehicles off road in the Nature Reserves.

In the context of this management plan, off-road vehicles include four wheel drive or conventional vehicles, motorcycles, dune buggies and other motorised vehicles that are used off-road. Considerable off-road activity occurs in the nature reserves, particularly on bare coastal dunes and on coastal tracks in the Mullet Lake Nature Reserve, but also on dry lake beds and flats in the other reserves. Four wheel drive use of the beach to Wylie Head and beyond to Cape Le Grand occurs for fishing and beach recreation. The Wylie Bay foreshore within the Mullet Lake Nature Reserve should be managed cooperatively between CALM and the Esperance Shire for both nature conservation and recreation. The nature reserve extends to the high water mark.

This activity contravenes current Departmental policy which prohibits off-road vehicle use in nature reserves (Policy Statement No. 18.2.1 Vehicle Based Activities). Environmental damage by irresponsible use of off-road vehicles can be significant, and policing of the activity has not always been possible. Motorcycles and four wheel drive vehicles threaten Red-capped Plover breeding areas around Lake Warden and Hooded Plover breeding areas around Station Lake. The problem is exacerbated in the Mullet Lake Nature Reserve by the lack of any boundary demarcation which would advise off-road vehicle users if they were in the reserve.

An extensive Shire recreation reserve (No. 34777) to the west of Pink Lake is designated as an off-road vehicle area and is used by dune buggies and trail bikes. The boundaries of this reserve are also unmarked.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 14.3 Motorised Recreation):

1. Prohibit the use of vehicles off road in the nature reserves.

- 2. Enforce regulations relating to off-road vehicle use in the nature reserves.**
- 3. *Provide information on alternative off-road vehicle opportunities and responsible use of vehicles in natural environments.***

9.0 COMMERCIAL VISITOR SERVICES

The objective is to enhance the experience of visitors by facilitating commercial visitor services in a manner consistent with conservation and other goals.

Proposals for commercial concessions in the Reserves are carefully considered and require the approval of the NPNCA and the Minister for the Environment. Concessions must be consistent with the purpose of the Reserve and must protect its values. Appropriate concessions, such as guided canoe tours, can enhance visitor enjoyment and provide a return that assists in management and maintenance of the Reserves.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 16.10 Tourist Operations and Other Concessions):

- 1. Assess the potential impacts of proposed commercial concessions in and near the Reserves and, if and where appropriate, support those that are consistent with the purpose of the Reserve and its conservation values.**
- 2. *Identify the sustainable level of tourist operator use of the Reserve, monitor the impacts and regulate activities as required.***
- 3. *Ensure commercial operators maintain appropriate standards with respect to information and quality of service provided.***

10.0 VISITOR SAFETY

The objective is to take all reasonable and practicable steps to ensure the safety of visitors to the Reserves.

Visitors to the Reserves should be aware that there is always an element of risk in outdoor recreation activities and there are dangers inherent in any natural area. CALM has a duty of care to all Reserve visitors and encourages safe use of the area. Arrangements for cooperation between CALM, the Police and the State Emergency Service are to be prepared in case of

emergency situations. These arrangements are to be reviewed annually.

Management actions to reduce safety hazards will be planned in sympathy with the purpose of the Reserves, and in so far as possible, such actions will not be permitted to intrude unduly on the experience of visitors.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 14.10 Visitor Safety):

- 1. *In liaison with the Police Department, prepare plans for dealing with accidents and search and rescue operations.***
- 2. *Provide basic rescue equipment and staff training so as to be able to assist the Police in emergency situations.***
- 3. Upgrade and maintain signposting on public roads and tracks to enable safe evacuation in case of wildfire emergency.**
- 4. Locate and design recreation facilities to minimise the potential risks to visitors and the impact of safety measures on Reserve values.**
- 5. *Regularly inspect roads and recreation areas to ensure that potential hazards are identified and either removed or avoided by relocation of the facility.***
- 6. *Provide information for visitors which highlights potentially hazardous areas and activities, and how to avoid such dangers.***
- 7. *Ensure that permits (where used) are strictly adhered to. Otherwise encourage voluntary registration before participants embark upon adventure activities in areas away from roads or other facilities.***

11.0 DOMESTIC ANIMALS

The objective is to protect the Reserves from the negative impacts of domestic animals.

Domestic animals such as dogs, cats and horses can create problems in conservation reserves by disturbing other users and wildlife. For example, the smell and general activity of dogs and cats disturb wildlife in areas which otherwise present ideal wildlife viewing

opportunities. There is also the potential for introducing or spreading disease and fouling of recreation sites.

The Esperance Lakes Nature Reserves are currently used by people walking their dogs or riding horses (see 8.5 Horse Riding). In the past dogs have been used to retrieve game during open duck-shooting seasons. CALM Policy No. 18.1.12 (Domestic Animals) prohibits dogs in nature reserves unless specified zones are established.

Guide dogs for the blind and tracker dogs for use in search and rescue operations are permitted in the Reserves.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 14.6 Pets):

1. Prohibit domestic animals in the Reserves except guide dogs for the blind and animals for use in search and rescue operations.
2. *Provide information explaining the Departmental policy on pets to the public and enforce it as necessary.*

COMMERCIAL AND OTHER USES

12.0 MANAGEMENT OF COMMERCIAL AND OTHER USES

Commercial and Other Uses Goal

Ensure that commercial and other uses are managed in a manner that minimises impact on other values.

of Minerals and Energy and the mining and petroleum industries over any proposals for mineral or petroleum resource development adjacent to the Reserves to ensure that the Reserves' values are protected.

12.1 Mining and Mineral Exploration

The objective is to minimise the impact of mining and mineral exploration on the Reserves.

No exploration licenses or mining leases currently exist over the Reserves (1996). A mining lease for the production of salt exists over the north-eastern section of Pink Lake outside the nature reserve and a small lease for building sand lies adjacent to the southern boundary of Lake Warden.

Government policy on mineral and petroleum exploration and mining in nature reserves stipulates that these be subject to the Mining, Petroleum and Wildlife Conservation Acts. They require that no tenements will be approved until the Minister for Minerals and Energy obtains the advice of the Minister for the Environment. The National Parks and Nature Conservation Authority provides advice to the Minister for the Environment. Proposals for exploration and mining may be referred to the Environmental Protection Authority for assessment. All exploration activities are subject to stringent environmental controls.

Mining will not be permitted in 'A' class nature reserves unless approved by both Houses of Parliament.

Any exploration and mining activity is likely to have a significant impact on the Reserves' values and, given their high conservation values, should be strongly opposed. If approved, exploration and mining should be subject to, and meet with, conditions that will ensure the impact on all conservation values are minimised.

RECOMMENDATIONS

1. Oppose exploration, mining and petroleum resource development that would have a deleterious impact on the Reserves' values.
2. Liaise with the Department of Environment Protection, the Department

12.2 Basic Raw Material Extraction

The objective is to minimise the impact of the extraction of basic raw materials on ecosystem and recreational values.

Soil and sand material for use on private property and for roadworks has been extracted from the reserves. Several quarries and reserves for building sand and other basic raw materials occur in the area. No gravel occurs in the Reserves.

Water from Shark Lake and Wheatfield Lake has previously been used in road construction and for fire-fighting purposes.

Proposals to extract basic raw materials from the Reserves are subject to the NPNCA policy on basic raw material extraction.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 16.5 Gravel and Industrial Minerals):

1. *Assess all requests for access to gravel and industrial minerals in the Reserves within the context of Departmental policy.*
2. **Follow the NPNCA's policy on basic raw materials in regard to proposals for extracting raw materials from the Reserves.**
3. **Wherever practicable, obtain supplies of basic raw materials from outside the Reserve boundaries.**
4. **Where this is not practicable, identify suitable sources of basic raw materials within the Reserves, develop an extraction/rehabilitation plan and minimise the impacts of extraction on the Reserves' physical, biological,**

cultural and visual resources.

5. *Ensure that correct rehabilitation procedures are undertaken at extraction sites at the expense of the extracting agency.*
6. Ensure basic raw materials used within the Reserves do not contribute to the spread of dieback disease.
7. Permit water extraction from Wheatfield Lake and Woody Lake for fire-fighting purposes and from the bore adjacent to Shark Lake for essential purposes.

12.3 Utilities and Services

The objective is to minimise the impact of utilities and services on ecosystem and recreational values.

The nature reserves are subject to impacts from several public utilities and services, particularly Lake Warden and Woody Lake Nature Reserves. These utilities and services are integral to the infrastructure of Esperance and include Western Power powerlines, Main Roads highways, Telstra cables, Water Corporation borefields and Shire drainage systems. The Coolgardie - Esperance railway also passes between Pink Lake and Lake Warden. Most of the utilities occur along or near reserve boundaries and their direct impacts are considered to be minor. However, one powerline traverses Woody Lake Nature Reserve. There is also concern over potential chemical spills or other accidents on the roads and railway that could contaminate the lakes.

Reserve No. 32259 adjacent to Lake Warden was formerly a State Energy Commission pole dump but was revested as a conservation reserve in 1993. Removal of the remaining poles from the reserve will be sought.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 17.1 Public Utilities):

1. *Liaise with officers in charge of key public utilities to ascertain whether any proposals are likely to affect the Reserves.*
2. *Negotiate to obtain relocation of infrastructure or rescheduling of operations where this is necessary to minimise impact on the Reserves.*
3. Negotiate conditions for access

maintenance of powerlines with Western Power.

4. Seek the removal of the poles from the former pole dump.
5. *Ensure that land disturbed by the installation and/or maintenance of public utilities is adequately rehabilitated at the expense of the responsible authority.*

12.4 Aquaculture

The objective is to protect the natural and cultural values of the Reserves from potential impacts of adjacent aquaculture developments.

The south coast region has potential for the development of certain forms of aquaculture. All aquaculture proposals are subject to review by the Inter Departmental Committee on Aquaculture (IDCA). This committee, comprising nine government agencies, considers applications for new ventures and seeks advice from the local shire, water authorities and affected industry and recreational groups, before making a recommendation to the Executive Director of Fisheries. Any proposals adjacent to the Reserves will be carefully considered to ensure that they do not impact adversely on the Reserves. Provision of access to shore-based facilities may be requested.

RECOMMENDATION

1. Review aquaculture proposals adjacent to the Reserves to ensure they do not unacceptably impact on their values.

12.5 Other Commercial Uses

The objective is to protect the natural and cultural values of the Reserves from degradation by any other commercial uses.

Although at present (1997) there are no proposals for further commercial use in the Reserves, it is possible that, during the life of this plan, new proposals will emerge.

RECOMMENDATIONS

1. Assess any proposal for further commercial use in the Reserves.
2. Apply stringent environmental controls to any such operations which may be approved within the Reserves.

COMMUNITY RELATIONS

Community Relations Goal

Promote informed appreciation of, and community support for, the Reserves' natural and cultural values, and facilitate liaison with the community about their management.

13.0 INFORMATION, INTERPRETATION AND EDUCATION

The objective is to increase awareness, appreciation and understanding of the values of the Esperance Lakes Reserves, and support for the strategies used to manage and conserve them.

An effective information, interpretation and education strategy is essential to achieve the goals and objectives of management of the Esperance Lakes Reserves. It informs the public of attractions, facilities and recreational opportunities available and provides an avenue to appreciate and better understand the natural environment. At the same time it fosters appropriate behaviour so that adverse impacts on the environment are minimised.

The information process has three parts:

- Information - provides details of facilities, activities and regulations;
- Interpretation - reveals cultural and natural values; and
- Education - provides detailed materials and programs designed to facilitate learning by target groups.

A range of information, interpretation and education programs will be developed for the Esperance Lakes Reserves. It is important that the information conveyed is integrated throughout the Reserves, the District and the Region (each site or area should provide a different thematic story). Interpretive stories should encourage exploration to enhance visitors' experiences and understanding of the Reserves' values.

Through innovative interpretation and education techniques, staff can also communicate information on how CALM manages its estate, not only in the Reserves but in all national parks, forests and natural areas.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 15.1 Community Education and Interpretation):

1. Develop and implement a communication plan for the Esperance Lakes Reserves.
2. Develop a range of interpretation and education programs and facilities that highlight the Reserves' natural features, cultural heritage and management issues.
3. *Liaise closely with other agencies, organisations and individuals (such as tourism agencies, tour operators, schools and museums) who have similar interests in the interpretation of the Reserves.*
4. Establish volunteer programs to use community expertise, knowledge and enthusiasm for interpretation and education purposes.
5. Provide opportunities for visitors to make contact with CALM staff.
6. Develop and implement projects within the Reserves that will foster positive visitor attitudes to environmental issues.
7. Monitor all programs regularly and revise as required.

14.0 INTERACTION WITH THE COMMUNITY AND OTHER AUTHORITIES

The objective is to develop, encourage and facilitate effective involvement of the community and other relevant authorities in management of the Reserves.

Effective communication and liaison with other authorities, such as the Shire, is an essential component of sound management. Sound management must provide a forum for the community to contribute to managing the Esperance Lakes Reserves as well as being informed about the area and management issues. Communication between neighbours and land managers also provides for integrated land management that is of particular importance when management issues go beyond the boundaries of the Reserves, such as in the case of fire protection, weeds and catchment management. Contingency plans in case of an emergency, such as rescue and evacuation in the event of fire, are also required.

Community Involvement

Community involvement is an integral part of CALM's operations. The principal benefits from community involvement are better informed decisions that will have greater public acceptance, better relationships between CALM and the public through development of an appreciation for the Department's role, responsibilities and actions, and the availability of traditional resources including information, labour and financial support.

Volunteer groups and individuals have been involved during the preparation of this management plan. Volunteers will continue to be sought and will be of considerable benefit in many aspects of management plan implementation.

Government Agency Liaison

Liaison with the Shire of Esperance is essential for:

- integrating fire and disease management
- integrating management of the Shire's reserves with the Esperance Lakes area, and
- maintaining a valuable recreation resource to the local community.

Ongoing liaison with Bush Fires Board, local Bush Fire Control Officers and volunteer brigades regarding fire protection of areas adjacent to the Reserves is also critical.

It is very important that all Government agencies whose role affects the Reserves recognise the values of the area, the main issues of concern, and the part they can play in protecting the environment of these areas. It is of particular importance to maintain liaison with agencies such as the Water and Rivers Commission, Western Power, Main Roads WA, Agriculture WA, the Department of Minerals and Energy, the Western Australian Museum and Telstra to ensure stringent disease hygiene is applied to all operations that are carried out within and near the Reserves.

RECOMMENDATIONS

(Recommendations in italics are adapted from the Regional Management Plan for the South Coast Region, 1992; section 15.2 Community Involvement):

1. Continue to liaise with the Esperance Shire and other Government agencies, and involve them in managing and protecting the Reserves.
2. *Continue existing involvement with local individuals and organisations with an interest in conservation and land management. Community groups will include recreational groups, conservation groups and Aboriginal interests.*
3. Involve individuals and organisations in helping to implement the management

plan.

4. Develop volunteer programs to implement the management plan where appropriate.
5. *Seek regular feed-back from the community on Departmental policies and management practices through both formal and informal contacts.*

RESEARCH AND MONITORING

Knowledge Goal

Seek a better understanding of the natural and cultural environments, and the impacts of visitor use and management activities.

15.0 RESEARCH AND MONITORING

The objective is to plan and implement an integrated program of research and monitoring of natural environments and visitor use.

Research and monitoring are essential components of effective management and provide a scientific basis for management.

Ongoing monitoring is important to evaluate the effectiveness of management practices. The gathering of new knowledge associated with research, both in the Reserves and elsewhere, also provides a scientific basis for improving management practices.

Monitoring projects should evaluate:

- the effectiveness of management practices;
- the social and environmental effects of management practices;
- the operation of management techniques.

Research and monitoring need to be orientated to both natural and social environments as illustrated in the guidelines for implementation of the wise use concept of the Ramsar Convention (Appendix 1).

Environmental research and monitoring projects should give priority to those values identified as being most at risk (sensitive to disturbance) and to activities that are most likely to have adverse ecological impacts.

Social research and monitoring projects should determine whether recreation, environmental education and interpretation activities and facilities are meeting visitor needs and CALM's management objectives.

Research projects and monitoring programs can benefit from involving volunteers, educational institutions and individual researchers as this can potentially reduce research and monitoring costs, and can help provide information to the broader community. CALM currently coordinates and promotes research undertaken within the Reserves.

Research has the potential to adversely impact on the Reserve's values. Proposals for research should be assessed as to their suitability and subject to appropriate conditions if considered acceptable.

RECOMMENDATIONS

1. **Implement a program of survey, research and monitoring, including social monitoring, as resources permit, based on the recommendations in the relevant sections of this plan.**
2. **Encourage volunteers, educational institutions and other organisations to participate in research projects.**
3. **Promote research programs and findings that address key issues.**
4. **Ensure that research activities do not detrimentally impact on the Reserves' values.**

IMPLEMENTATION

16.0 RESOURCES

The objective is to provide sufficient staff and funds to implement this plan.

Lake Warden, Woody Lake, Mullet Lake, Pink Lake and Shark Lake Nature Reserves are serviced by CALM officers from the Esperance District Office. Implementing the recommendations contained in the Esperance Lakes Management Plan over the next ten years may place considerable demands on existing staff. Volunteer assistance would enable more effective implementation of the plan.

CALM provides funds to manage the Reserves. External funding has also been provided for special research projects. Implementing this plan will require additional funding resources, particularly in planning, design, supervision and interpretation. Alternative means of funding will be investigated.

RECOMMENDATIONS

1. Seek sufficient trained staff to implement the recommendations contained in this plan.
2. Seek sufficient financial resources from both Government and private sources to implement this plan.
3. Investigate and implement revenue raising mechanisms to increase resources available for management.
4. Develop volunteer programs to assist in implementation of the plan.

17.0 PRIORITIES

The objective is to regularly review implementation of the plan according to priorities.

Many management strategies are recommended in this plan. While many are guidelines for management, others prescribe specific actions and developments. These prescriptions require resourcing and will be implemented on a priority basis by CALM's South Coast Region and Esperance District, subject to the availability of funds and staff. The key management recommendations in this plan are presented in Table 5.

Priorities will be reviewed on an annual basis or as circumstances change.

RECOMMENDATION

1. Assign priorities to the recommendations and review priorities at least annually or as circumstances change.

18.0 EVALUATION AND REVIEW

Section 61 of the CALM Act provides for the plan to be amended if required. If major changes to the plan are proposed, the revised plan will be released for public comment.

The NPNCA is responsible for monitoring the implementation of this management plan. To facilitate review of the plan and its implementation a team of CALM officers will be formed to report annually to the NPNCA.

The term of this plan is 10 years.

RECOMMENDATIONS

1. Review the implementation of the plan annually, prior to preparing the works program for the following year, or as circumstances change. The review should identify which recommendations have been achieved and to what degree, and any new factors that may affect management.
2. Review the plan within 10 years of its gazettal. This review should identify the extent to which the objectives have been achieved and recommendations implemented, the reasons for lack of achievement or implementation, and a summary of factors that may affect future management.

Table 5.
KEY RECOMMENDATIONS FOR THE ESPERANCE LAKES NATURE RESERVES

KEY RECOMMENDATIONS
<p>3.0 Land Tenure</p> <ol style="list-style-type: none"> 1. Seek to implement the tenure changes proposed in Table 1. 3. Encourage the Shire to adopt this plan as part of their Town Planning Scheme. <p>4.0 Management Zones</p> <ol style="list-style-type: none"> 1. Base future management of the Reserves on the zoning scheme (Map 2). <p>6.1 Ramsar Obligations</p> <ol style="list-style-type: none"> 1. Ensure that the Esperance Lakes Nature Reserves are managed in accordance with the guidelines developed by the Ramsar Convention (Appendix 1). <p>6.3 Catchments and Hydrology</p> <ol style="list-style-type: none"> 2. Foster the implementation of an integrated catchment management strategy for the Esperance Lakes Nature Reserves in consultation with the Water and Rivers Commission, Department of Environmental Protection, Agriculture WA, Ministry for Planning and community groups. 3. Maintain support for the five catchment groups whose catchments directly feed the Reserves in the Esperance Land Conservation District in consultation with the Shire, Agriculture WA, the Water and Rivers Commission and the Department of Environmental Protection. 4. Liaise with the Shire and Ministry for Planning concerning the adoption of planning controls over future subdivision proposals to minimise the impacts of small subdivision catchments on the lakes. 9. In consultation with the Water and Rivers Commission, further investigate the relationship between the lakes and groundwater supplies, and the impacts of groundwater use on the lakes. Encourage regular monitoring of groundwater quality, and maintain awareness of monitoring results. <p>6.4 Vegetation and Flora</p> <ol style="list-style-type: none"> 1. Manage the Reserves in a manner consistent with the maintenance of ecosystem processes and the current diversity of vegetation and flora. 3. Continue surveys to record the distribution, abundance and other details of flora including species declared rare. 7. Monitor aquatic flora as part of monitoring programs designed to collect data on lake biota. <p>6.5 Fauna</p> <ol style="list-style-type: none"> 1. Protect waterbirds, particularly breeding species, and their habitats from the impacts of reserve use and management. 3. Continue surveys to record the distribution, abundance and other details of fauna including species declared rare or specially protected. 5. Assist in the development and implementation of strategies for each declared rare species to ensure continued survival and expansion of populations, and develop wildlife management programs when desirable. <p>6.6 Cultural Heritage</p> <ol style="list-style-type: none"> 7. Where appropriate, incorporate material on the cultural heritage of the area in interpretive displays and community education programs. <p>6.7 Landscape Management</p> <ol style="list-style-type: none"> 4. Provide advice to private landholders and other agencies on minimising the visual impact of operations, especially on lands adjacent to or within the viewshed of the Reserves. 5. Encourage the Shire, other Government agencies and private landholders in surrounding areas to recognise the importance of landscape management by the sensitive siting of facilities and signs, selection of site-compatible materials and colours, and careful planning and siting of utilities and roads. <p>6.8 Plant Diseases</p> <ol style="list-style-type: none"> 2. Continue to implement the South Coast Region Dieback Protection Plan, 1994-1998, and CALM's Policy No. 3 (<i>Phytophthora</i> Dieback) in all management operations in the Reserves. 5. Identify priority areas within the Reserves for protection from dieback disease based on conservation values, risk of introduction and predicted impact. 6. Continue to monitor the <i>Phytophthora</i> and <i>Armillaria</i> infections, and dieback-susceptible vegetation in the Coramup Creek area, and take appropriate management action.

KEY RECOMMENDATIONS (Cont'd)

6.9 Fire Management

1. Prepare and implement a Fire Master Plan from which annual fire management programs will be developed. Present annual fire management programs for endorsement at the relevant Shire Bush Fire Advisory Meetings.
11. In conjunction with adjoining land owners and local fire organisations, investigate the most suitable fire management boundaries of the Mullet Lake Nature Reserve taking into consideration the proposed additions to this section of the reserve.
15. Maintain close liaison with local Bush Fire Brigades, Reserve neighbours, the Shire of Esperance and other agencies and, through the mechanism of the Urban Rural Fire Protection Plan, establish mutual aid arrangements.
17. Liaise with the owner of Location 814 so as to establish the most suitable and appropriate fire management strategy for this section of the reserve.
19. Continue to liaise with the Esperance Shire and/or developers to ensure the provision of strategic fire protection with any further development of land south of the Mullet Lake system.

6.10 Introduced Plants and Animals

2. Maintain liaison with the Esperance Shire Health Inspector with regard to monitoring the risk to public safety from the presence of mosquito and midge populations in the Reserves.
7. Seek special funding for weed control from external agencies.
8. Consider the removal of introduced trees unless they are shown to be of historical or habitat significance.

8.1 Nature Appreciation

1. Provide information on waterbirds and their habitats, and the Ramsar status of the wetlands using appropriate media, e.g. display boards, pamphlets.
3. Consider the construction of bird hides at quiet locations connected to the pedestrian access system (see 8.2 Bushwalking) where such facilities will not unduly impact on waterbirds and other fauna.
4. Develop vantage points from which to view scenic attractions including waterbirds and their habitats.

8.2 Bushwalking

3. Develop a walk track as shown in Map 7.
4. Ensure that detrimental environmental impacts of construction, maintenance and use of the walk track, including disease spread, are minimised by the use of appropriate alignments, construction and surfacing techniques, and periodic maintenance as required.

8.3 Picnicking and Barbecuing

1. Provide facilities at the Woody Lake carpark area and, in consultation with the Esperance Shire, seek the upgrading of the facilities at the Lake Windabout carpark area subject to site development plans.
2. Ensure the site development plan takes into account the dieback infection on the carpark access road, and all works are subject to strict hygiene conditions.

8.4 Water-based Recreation

2. Develop a canoe trail for use by organised groups accompanied by a registered guide.
3. Seek to de-gazette the water-ski area from Woody Lake and phase out water-skiing in the Reserve.

8.5 Horse Riding

1. Prohibit horse riding within the nature reserves.

8.6 Off-road Vehicles

1. Prohibit the use of vehicles off road in the nature reserves.
2. Enforce regulations relating to off-road vehicle use in the nature reserves.

9.0 Commercial Visitor Services

1. Assess the potential impacts of proposed commercial concessions in and near the Reserves and, if and where appropriate, support those that are consistent with the purpose of the Reserve and its conservation values.

12.2 Basic Raw Material Extraction

7. Permit water extraction from Wheatfield Lake and Woody Lake for fire-fighting purposes and from the bore adjacent to Shark Lake for essential purposes.

KEY RECOMMENDATIONS (Cont'd)

12.3 Utilities and Services

4. Seek the removal of the poles from the former pole dump.

13.0 Information, Interpretation and Education

2. Develop a range of interpretation and education programs and facilities that highlight the Reserves' natural features, cultural heritage and management issues.
6. Develop and implement projects within the Reserves that will foster positive visitor attitudes to environmental issues.

14.0 Interaction with the Community and Other Authorities

2. Continue existing involvement with local individuals and organisations with an interest in conservation and land management. Community groups will include recreational groups, conservation groups and Aboriginal interests.

15.0 Research and Monitoring

1. Implement a program of survey, research and monitoring, including social monitoring, as resources permit, based on the recommendations in the relevant sections of this plan.

16.0 Resources

2. Seek sufficient financial resources from both Government and private sources to implement this plan.

17.0 Priorities

1. Assign priorities to the recommendations and review priorities at least annually or as circumstances change.

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APPENDICES

Appendix 1.

GUIDELINES FOR IMPLEMENTATION OF THE WISE USE CONCEPT OF THE RAMSAR CONVENTION

Introduction

Article 3.1 of the Convention states that the Contracting Parties *'shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands in their territory.'*

The third meeting of the Conference of the Contracting Parties in Regina, Canada, from 27 May to 5 June 1987, adopted the following definition of wise use of wetlands:

'The wise use of wetlands is their sustainable utilisation for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem.'

Sustainable utilisation is defined as *'human use of a wetland so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations'*.

Natural properties of the ecosystem are defined as *'those physical, biological or chemical components, such as soil, water, plants, animals and nutrients, and the interactions between them'*.

The wise use provisions apply to all wetlands and their support systems within the territory of a Contracting Party, both those wetlands designated for the List, and all other wetlands. The concept of wise use seeks both the formulation and implementation of general wetland policies, and wise use of specific wetlands. These activities are integral parts of sustainable development.

It is desirable in the long term that all Contracting Parties should have comprehensive national wetland policies, formulated in whatever manner is appropriate to their national institutions. However, as recognised by the report of the Workshop on Wise Use of the Regina Meeting, elaboration of national wetland policies will be a long term process, and immediate action should be taken to stimulate wise use. The guidelines presented below therefore include both elements for comprehensive national wetland policies and priority actions.

Establishment of National Wetland Policies

National wetland policies should as far as possible address all problems and activities related to wetlands within a national context. These may be grouped in different sections:

1. *Actions to improve institutional and organisational arrangements, including:*
 - (a) establishment of institutional arrangements which will allow those concerned to identify how wetland conservation can be achieved, and how wetland priorities can be fully integrated into the planning process; and
 - (b) establishment of mechanisms and procedures for incorporating an integrated multi-disciplinary approach into planning and execution of projects concerning wetlands and their support systems, in order to secure wetland conservation and sustainable development.
2. *Actions to address legislation and government policies, including:*
 - (a) review of existing legislation and policies (including subsidies and incentives) which affect wetland conservation;
 - (b) application, where appropriate, of existing legislation and policies of importance for the conservation of wetlands;
 - (c) adoption, as required, of new legislation and policies; and
 - (d) use of development funds for projects which permit conservation and sustainable utilisation of wetland resources.
3. *Actions to increase knowledge and awareness of wetlands and their values, including:*
 - (a) interchange of experience and information on wetland policy, conservation and wise use between countries preparing and/or implementing national wetland policies, or pursuing wetland conservation;
 - (b) increasing the awareness and understanding of decision-makers and the public of the full benefits and

values, within the terms of wise use, of wetlands. Among these benefits and values, which can occur on or off the wetland itself, are:

- sediment and erosion control,
 - flood control,
 - maintenance of water quality and abatement of pollution,
 - maintenance of surface and underground water supply,
 - support for fisheries, grazing and agriculture,
 - outdoor recreation and education for human society,
 - provision of habitat for wildlife, especially waterfowl, and
 - contribution to climatic stability;
- (c) review of traditional techniques of wise use, and elaboration of pilot projects which demonstrate wise use of representative wetland types; and
- (d) training of appropriate staff in the disciplines which will assist in implementation of wetland conservation action and policies.

4. Actions to review the status of, and identify priorities for, all wetlands in a national context, including:

- (a) execution of a national inventory of wetlands including classification of the sites;
- (b) identification and evaluation of the benefits and values of each site (see b above);
- (c) definition of the conservation and management priorities for each site, in accordance with the needs and conditions of each Contracting Party.

5. Actions to address problems at particular wetland sites, including:

- (a) integration from the outset of environmental considerations in planning of projects which might affect the wetland (including full assessment of their environmental impact before approval, continuing evaluation during their execution, and full implementation of necessary environmental measures). The planning, assessment and evaluation should cover projects upstream of the wetland, those in the wetland itself, and other projects which may affect the wetland, and should pay particular attention to maintaining the benefits and values listed in 3b above;
- (b) regulated utilisation of the natural elements of wetland systems such that they are not over-exploited;
- (c) establishment, implementation and, as necessary, periodic revision of management plans which involve local people and take account of their requirements;
- (d) designation for the Ramsar List of wetlands identified as being of international importance;
- (e) establishment of nature reserves at wetlands, whether or not they are included in the List; and
- (f) serious consideration of restoration of wetlands whose benefits and values have been diminished or degraded.

Priority actions at national level

Whether or not national wetland policies are being prepared, several actions should receive immediate attention at national level in order to facilitate the preparation of national wetland policies, and to avoid delay in practical implementation of wetland conservation and wise use. Contracting Parties will naturally select actions, according to their own national priorities and requirements, from those listed above under 'Establishment of national wetland policies'. They may wish to carry on institutional, legislative or educational measures (such as those listed under sections 1, 2, 3 above) and at the same time initiate inventories of scientific work (such as those listed under section 4); in this way the institutional, legislative and educational instruments will be available in time to deal with scientific results. Equally, Contracting Parties wishing to promote wise use of wetlands without waiting until national wetland policies have been developed, may, based on their situation and needs, wish to:

- (i) identify the issues which require the most urgent attention;
- (ii) take action on one or more of these issues;
- (iii) identify the wetland sites which require the most urgent action; and
- (iv) take action at one or more of these wetlands, along the lines set out under 'Priority actions at particular wetland sites' below.

Priority actions at particular wetland sites

As at national level, immediate action may be required in order to avoid destruction or degradation of important wetland values at particular wetland sites. These actions will undoubtedly include some elements listed in section 5 above, and Contracting Parties will select those appropriate to their own national priorities and requirements.

Whenever planning is initiated for projects which might affect important wetlands, the following actions should be taken in order to promote wise use of the wetland:

- (i) integration from the outset of environmental considerations in planning of projects which might affect wetlands (including full assessment of their environmental impact before approval);
- (ii) continuing evaluation during their execution; and
- (iii) full implementation of necessary environmental measures. The planning, assessment and evaluation should cover projects upstream of the wetland, those in the wetland itself, and other projects which may affect the wetland, and should pay particular attention to maintaining the benefits and values listed in 3b above.

ADDITIONAL GUIDANCE FOR THE IMPLEMENTATION OF THE WISE USE CONCEPT

Introduction

Article 3.1 of the 1971 Ramsar Convention provides that the Contracting Parties '*shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List and, as far as possible, the wise use of wetlands in their territory*'.

In the early years of the Convention, the wise use provision proved to be difficult to apply. Most attention was focused upon the designation of sites onto the Ramsar List in line with global priorities to secure the conservation of internationally important areas. Over time, as the essential need to integrate conservation and development has become recognised throughout the world, the Contracting Parties to the Ramsar Convention have made wise use a central theme for the functioning of the Convention.

The wise use concept was defined at the Third Meeting of the Conference of the Contracting Parties held in Regina, Canada, in 1987 (Recommendation 3.3), as '*the sustainable utilisation of wetlands for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem*'.

The Third Meeting of the Conference of the Contracting Parties also decided to establish a Working Group on Criteria and Wise Use (Recommendation 3.1), charged inter alia with the development of draft guidelines for the implementation of the wise use concept. These guidelines were adopted by the Fourth Meeting of the Conference of the Contracting Parties at Montreux, Switzerland, in 1990 (Recommendation 4.10).

In addition to adopting the guidelines, the Contracting Parties requested the Wise Use Working Group to undertake additional tasks including '*fostering further development and refinement of the guidelines to apply to a diversity of wetland types, regions, resources and uses ...*'

In 1990, the Ramsar Convention Bureau initiated the coordination of a three-year project on the wise use of wetlands funded by the Government of The Netherlands. The Wise Use Working Group was also requested by the Montreux meeting to oversee the implementation of this project, which comprises a series of case studies demonstrating applications of the wise use concept in different ecological and socio-economic situations throughout the world.

Several basic conclusions can be drawn from the case studies considered under this project:

1. Social and economic factors are the main reasons for wetland loss and therefore need to be of central concern in wise use programs.
2. Special attention needs to be given to the local populations who will be the first to benefit from improved management of wetland sites. The values that indigenous people can bring to all aspects of wise use need special recognition.
3. Although one agency may be responsible for coordinating national action to conserve wetlands, other public and private institutions have expertise which is of importance for effective long-term wetland management. Wise use programs should seek to involve and, where appropriate, work through these partners.
4. Specific site projects may often demonstrate the need for more general institutional requirements for the wise use of wetlands.
5. Where wetlands form an integral part of a wider coastal zone or catchment, wise use must also take into account the problems of the surrounding coastal zone or catchment.
6. While comprehensive understanding of the ecological constraints of a wetland system should be sought, activities affecting wetlands need to be governed by the 'precautionary principle' when such knowledge is not available. In other words, if the impact of specific actions is not clearly understood, then these actions should be prohibited even if there is insufficient evidence to prove a direct link between the activities and resulting wetland degradation.

In view of the lessons learned from the case studies and further analysis by the Wise Use Working Group, additional guidance is proposed to the Contracting Parties to the Ramsar Convention for the application of the wise use provision of the Convention. This guidance must be applied in the light of other national and international obligations for nature conservation, including the conservation of biodiversity, climate change and pollution control measures, as adopted by the UN Conference on Environment and Development (UNCED, Rio, 1992) and in other international fora.

The 1992 Convention on Biological Diversity is of special relevance for the conservation and wise use of wetlands, and the preparation of national biodiversity strategies, action plans and programs as required under the Convention on Biological Diversity may provide good opportunities to include wetland conservation and wise use on a wider scale.

The following points of guidance address the main elements for the application of the wise use concept. They are meant to amplify the Wise Use Guidelines by providing further assistance to those officials responsible for the application of the Ramsar Convention. As the wise use concept is central to all aspects of the convention, this guidance is also relevant for action to be taken under several of the obligations of the convention, including international cooperation, reserve creation and the conservation of listed sites.

The Scientific and Technical Review Panel established at Kushiro by Resolution RES. C.5.5 has among its tasks '*evaluation of the application of the Additional guidance on wise use*'.

I. ESTABLISHMENT OF NATIONAL WETLAND POLICIES

I.1 Institutional and organisational arrangements

1. The main message given by the wise use guidelines is that the wise use of wetlands requires a coordinated approach on a national scale; this necessitates planning, which can be in the framework of wetland policies, conservation policies or policies with a broader scope (environment, application of water laws, or resource planning); institutional and administrative arrangements should be made.

Obstacles to the development of national wetland policies may however include:

- a lack of institutional mechanisms designed to encourage the involvement of both public and private sectors of the society, at regional or local level as well as at national level;
- insufficient coordination among public agencies;
- policies that discourage conservation and wise use objectives;
- inadequate policy research programs; and
- lack of cooperative arrangements with neighbouring countries for joint management of shared wetlands or wetland species.

2. There are many different ways in which countries may attempt to overcome these obstacles.

A few examples can be given:

- At international level, countries may wish to establish cross-boundary water commissions or other coordinating boards to avoid action in one country adversely affecting wetlands in another country and to guarantee that water quality and quantity are maintained in such a way as to preserve the functional values of wetlands. In addition, countries that are range states for migratory species dependent on wetlands may wish to establish coordinated conservation programs for those species and set common guidelines on development aid in the field of conservation and wise use of wetlands.
- At national level, countries might create inter-ministerial boards or commissions, national wetland committees or other bodies to oversee coordination and cooperation for wetland management. These bodies should include wide representation (based on a catchment approach) from the authorities with responsibility for wetlands and might include government agencies dealing with environment, nature conservation, agriculture, forestry, aquaculture, hunting, fishing, shipping, tourism, mining, industry, health, development assistance, and other relevant subjects; they should also include interested governmental and non-governmental conservation organisations.
- At local level, countries might establish procedures to guarantee that local populations are involved in the decision-making process related to wetland use and to provide local populations with sufficient knowledge of planned activities to assure their meaningful participation in this decision-making process.

There should be established working groups or advisory boards representing users, NGOs and local authorities.

I.2 Policy/Legislation and other appropriate measures

Governments can use several instruments to promote policy such as legislative tools; five different mechanisms are necessary in order to implement wise use in practice:

1. Periodical review of existing legislation to ensure that it is generally compatible with the wise use obligation, and make adjustments if necessary; this applies to particular legislation regarding mandatory wetland destruction or to that which encourages such destruction through tax benefits and subsidies.
2. General wise use legislation for wetlands should consider the following:
 - inclusion of wetlands in the zones of land-use plans which enjoy the highest degree of protection;
 - institution of a permit system for activities affecting wetlands. This should include a threshold under which

a permit would not be required, as well as a general exemption for activities which, because of their nature, are deemed to be compatible with any performance obligation;

- execution of an environmental impact assessment in order to determine if a proposed project is compatible with the general requirements of wise use and the maintenance of the ecological character of the wetlands concerned.
- special rules relating to the contents of an environmental impact assessment will be needed in order to ensure that no important factor specifically related to wetlands is overlooked. The cumulative effects of separate projects should also be taken into consideration.

Environmental impact assessments should also be prepared not only for activities and projects in the wetlands concerned but also for activities outside these areas when they may have significant effect on wetlands. Environmental impact assessments should also cover the long-term effects of proposed activities, projects, plans and programs as well as interactions between all components of the water system at the catchment level.

- monitoring of the effects of authorised actions and carrying out unbiased environmental audits of these actions when they have been completed;
- institution of a system of management agreements between relevant government agencies, landowners and landusers to provide for positive management measures by the latter when this is required for the maintenance of the ecosystem;
- provision of financial incentives including taxes and subsidies to encourage activities which are compatible with the maintenance of wetlands, and which promote and contribute to their conservation. Financial tax incentives should not permit activities which have detrimental effects upon wetlands;
- obligation to refrain from introducing invasive alien species, and to take preventive measures to minimise the risk of accidental introductions; existing guidelines for these purposes need to be taken into consideration;
- obligation to make all appropriate efforts to eradicate introduced and translocated species which may cause significant ecological disturbances in water systems and, in addition, provide for the possibility of claiming civil damages from those responsible for unlawful introductions; and
- right of appeal by private organisations against governmental agency decisions which might violate obligations laid down by law.

3. Legislation for the conservation and wise use of specific wetland sites (e.g. Ramsar sites, ecologically sensitive areas, areas with a high degree of biodiversity, sites containing endemic species, wetland nature reserves).

Such legislation will generally apply to large wetland areas where human activities compatible with the conservation of the ecosystem should be maintained, encouraged and developed for the benefit of local populations. This legislation will be in addition to those provisions laid down in the previous paragraph in respect of wetlands in general. It should consider the following points:

- definition of a special legal status for large wetland areas allowing for the control of any potentially damaging activity, including agriculture, forestry, tourism, fishing, hunting, aquaculture;
- division of those wetlands into different zones with particular regulations applying to each type of zone; these regulations would be defined to ensure that the carrying capacity of the area concerned is not exceeded in respect of each activity authorised;
- encouragement of traditional and other ecological and sustainable activities in these areas through incentives and advice; establishment of a management system in each area which should have legal support and of a management body to oversee the implementation and to ensure that regulations are observed;
- association of populations living in or close to the area with its management, through appropriate representation; scientific institutions and conservation NGOs should also be associated with management, at least in an advisory capacity;
- application of special environmental impact assessment rules to these areas in view of their particular environmental sensitivity; and
- submission of activities which may have adverse affects on the area, to environmental impact assessment or to other forms of evaluation. Such activities should only be authorised when the evaluation has shown

that no significant damage to the area will occur.

4. Review of division of jurisdiction among government agencies.

This issue, which concerns both territorial and functional matters, often constitutes a considerable obstacle to integrated management of wetlands since it needs to be based on a catchment-wide approach. A review of legal and administrative constraints which prevent management at the correct scale (e.g. catchment-wide management) should be undertaken with a view to developing appropriate solutions to jurisdictional problems. Particular attention should be paid to the need to manage coastal wetlands as single units, irrespective of the usual division of jurisdiction between land and sea.

5. Development of cooperative arrangements for water systems shared between two or more countries to achieve wise use.

This will entail the conclusion of agreements for the conservation, management and wise use of such systems as required by Article 5 of the Convention. As relevant, elements of the present guidance should be used in the development of these agreements. Furthermore, such actions need to be pursued in coordination with or through other existing treaties such as the 1992 Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes, the 1979 Bonn Convention on the Conservation of Migratory Species of Wild Animals and the 1991 Espoo Convention on Environmental Impact Assessment in a Transboundary Context.

II. KNOWLEDGE OF WETLANDS AND THEIR VALUES

In order to manage wetlands, it is necessary to have adequate knowledge of their functioning. To promote and apply the wise use of wetlands, inventory, research, monitoring and training activities should be undertaken.

The values of wetlands need to be much more widely promoted in educational programs and to the general public. Special attention should be devoted to targeting audiences by taking geographical, economic and political considerations into account. Different mechanisms should be used to approach each target audience.

Some countries have had considerable experience in the application of the wise use concept. Important sources of information are the case studies on wise use published by the Ramsar Convention Bureau. The Bureau, with the assistance of its partners, could be used as a focal point for information pertaining to wise use implementation.

II.1 Inventory

Inventories can produce information in the form of maps, check-lists, regional analyses, narratives of ecological or cultural resources. However, they need not be elaborate to be useful. The goals of an inventory may vary so that defining goals will help to determine the methods and extent of each inventory.

1. Some goals for an inventory may include:

- identification of resources (ecological, cultural and traditional);
- determination of these resources in geographic or socio-economic context;
- identification of known uses of wetlands;
- identification of priorities for research (improved knowledge base), management and protection;
- identification of present and potential problems;
- provision of a tool for future planning and monitoring.

A wetland inventory should not be seen as a final document, but rather as a continuing process. It can be a long-term commitment for both collecting and updating information. Inventories may include input from various disciplines, such as ecology, limnology, hydrology, social sciences, agronomy, wildlife management, fisheries, as well as input from policy makers.

2. Possible applications of an inventory may include:

- base-line information for land use and management planning;
- base-line for future monitoring;
- information for impact assessments;
- availability of data through publication of regional, national or local inventories, such as those carried out for Africa, Asia, the Neotropics and Oceania;
- provision of quantifiable data for future management application;
- tools for recognising diminishing or threatened types of wetlands;
- drawing associations between wetland types/sizes with socio-cultural uses and needs to help develop standardised approaches for these classifications; and
- setting of priority actions whether for research, policy or management.

II.2 Monitoring

Monitoring is the process of measuring change in ecological character in any wetland over a period of time.

1. The following points should be observed in any monitoring effort:

- the need to produce objective information;
- the need to follow up any activity taking place in a wetland;
- the knowledge gained from a specific project or activity, but also from activities taking place in similar wetlands.

Monitoring can be carried out at different levels of intensity, depending on available funding and/or technology. It should be noted that monitoring does not automatically require sophisticated technology or high investment.

2. The following approaches might be used:

- changes in wetland area or catchment utilisation can be monitored by remote sensing or field observations;
- ecological character and productivity can be monitored using available information or quantitative sampling techniques;
- changes in social values and uses may be monitored by participatory observation.

II.3 Research

Research can be anything that expands upon basic knowledge. Particular areas that may deserve attention are both identification and quantification of wetland values, sustainability of wetland use, and landscape functioning and modification. Contracting Parties should take positive steps to acquire and, when possible, share any knowledge developed on wetland values, functions and uses.

1. Priority research actions may include:

- the development of a vocabulary of terms, understandable world-wide;
- the development of means to emphasise landscape or catchment approaches in management;
- the development of techniques for monitoring ecological change and forecasting the evolutions of wetland characteristics under the pressure of present uses;
- the improvement of the knowledge base of wetland functions and values, especially the socio-economic values of wetlands, in order to learn about the traditional management techniques of the local populations and their needs;
- the improvement of the knowledge of the scientific classification of wetlands micro-organisms, plants and animals, and the lodging of study specimens with museums or other appropriate institutions;
- the development of methodologies to evaluate sustainable practices;
- the provision of the data on which alternative/wise use technologies can be developed;
- the development of techniques for restoration of wetlands.

2. The above-mentioned research questions represent an indication of needs. In practice, it can be expected that the number of specific research questions to be addressed will increase as progress is made in natural resource programs. Research priorities must be based on management needs.

II.4 Training

1. Attention should be devoted to four aspects of training:

- the definition of training needs;
- the differing needs between regions, countries and sites;

Expertise may not always be available and some key aspects of wise use may not be covered in the existing program. These key aspects must be considered as priorities for further training activities. Therefore, the first step in establishing a training program should be to carry out a training needs analysis.

- the target audience;

There is a huge difference between educational and awareness programs and professional training. Generally, it can be said that while the general public and senior policy makers should be made aware of ecological, cultural, social and economical values of wetland ecosystems, training should be provided for those who are directly involved in administering and practising wetland management. Training sessions should focus on the most up-to-date methods for implementing wise use. Such sessions need also to be organised for judicial authorities and other law enforcement officials.

- the subject;

Training should furnish wetland managers and administrators with the professional knowledge needed for establishing, defending, and implementing the concept of wise use of wetlands.

2. Three broad types of training appear to be of particular relevance for wetland professionals:

- courses on integrated management;

Training should seek to bring together specialists from different fields to generate a common understanding and a common approach to wetland management and planning.

- courses on wetland management techniques;

Training should seek to provide the participants with the most up-to-date and effective techniques of inventory, planning, monitoring, environmental impact assessment (EIA) and restoration.

- courses for field staff;

Wardens and rangers need to have a very basic understanding of the concept of wise use and to be able to deal with day-to-day situations such as enforcement of legislation and public awareness.

The development of training manuals and other resource materials should be an important long-term goal for any training program.

3. Training methods and resources:

Training activities and transfer of appropriate knowledge should be an integrated component of all wise use projects. Those activities should be as catalytic as possible, and seek to train potential trainers at regional level who can then pass on their expertise to lower levels, and involve the cooperation of governmental and non-governmental organisations, using local resources and institutions whenever possible.

11.5 Education and public awareness

Education and public awareness (EPA) are fundamentally different from the training required by professional staff in order to manage wetlands wisely. Education is the deeper and longer-term process of change in individuals, and their development of longer-term skills and values; awareness is an individual's state of knowledge, which often precedes and stimulates more interest, and leads to further learning and action.

The values of wetlands have not yet been communicated effectively to the public at large through EPA programs. Most people do not know what wetlands are and, even if they do, they tend to see them as wastelands, which do not generate the public support that has been generated for tropical forests. Improving EPA for wetlands is fundamental to achieving wise use. The following activities are required:

- definition of the target audiences

Awareness programs should be designed for management authorities, landowners, local government officials, communities depending on wetland resources for their livelihood, and the general public.

- market research

This should identify the most appropriate techniques for increasing awareness of the values of wetlands in different regions of the world.

- EPA campaigns

EPA will only work through a bottom-up approach. However, a great deal could be achieved through globally or nationally coordinated campaigns, which would enable sharing of materials and expertise, as well as generating the necessary momentum to raise the global profile of wetlands.

III. ACTION AT PARTICULAR WETLAND SITES

III.1 Ecological aspects

Wetland management should be an integrated process, taking into account the criteria of time and space. It needs to incorporate long term sustainable goals. It also needs to take into account the catchment approach. As an integrated process, it needs to incorporate different uses and activities that are compatible with sustainability.

This management also needs to incorporate an inter-disciplinary approach that reflects the wide variety of human endeavours, drawing inter alia upon principles of biology, economics, policy and social sciences. In many cases, it also needs to respond to global concerns, especially as they relate to shared species, shared water systems, and to the issue of global change.

III.2 Human activities

In order to achieve wise use of wetlands, it is necessary to attain a balance that ensures the maintenance of all wetland types through activities that can range from strict protection all the way to active intervention, including restoration.

Wise use activities therefore can be varied in nature, ranging from very little or no resource exploitation, to active resource exploitation as long as it is sustainable. It must be recognised, however, that there are very few wetlands not currently being utilised by local populations in some way.

Wetland management should be adapted to specific local circumstances, sensitive to local cultures and respectful of traditional uses. Management therefore is not a universal concept that can be broadly applied; rather, it needs to be adapted to suit local conditions.

III.3 Integrated management planning

Wetland management may be implemented by the development of management plans or strategies for a specific area or region. Workshop C of the Kushiro Conference reviewed draft 'Guidelines on management planning for Ramsar sites and other wetlands', later adopted in plenary session (see Annex to Resolution RES. C.5.7).

These guidelines emphasise that management planning applies not just to wetland reserves but to all wetlands, and that it is a process subject to constant review and revision. Management plans should therefore be regarded as flexible, dynamic documents.

1. In general, a management plan is organised as a four-part unit:
 - Description (this provides the factual basis on which management decisions can be taken, and may be revised in the light of improved knowledge of a site);
 - Recognition of the past modifications of the sites and of the possible threats;
 - Evaluation and objectives (from the description, the goals of management can be defined, in terms of both long term objectives and of immediate operational objectives for the short term);
 - Action plan (definition of work to be done in order to achieve the objectives; activities to be considered include: habitat management; species management; usage; access; education, interpretation and communication; and research).

Monitoring is an integral part of the planning process. Annual and longer term reviews of the plan need to be undertaken, and may lead to amendment of the description, objectives and action plan.

2. A management authority charged with the implementation of the management process should be appointed; this may be particularly relevant in large wetlands where planning must take account of all interests, uses and pressures. Strong cooperation and participation from governmental and non-governmental agencies, as well as from local people, needs to be achieved.
3. When appropriate, management plans should incorporate both traditional and modern technologies. The plan must reflect the overall carrying capacity of the system. Implementation should optimise the sustainable use of existing resources.

Wetland management needs to be incorporated into overall national policies, as already indicated in the Montreux guidelines. These policies should reflect the best technical information available. Specific technical information can be obtained through the Ramsar Bureau and its partner organisations.

III.4 Technical issues

For many regions of the world, wise use is not a new concept. Humans have been building civilisations around wetlands for thousands of years, and have developed technologies of utilisation.

Many of these technologies are sustainable, and should therefore be identified, studied and promoted as a matter of urgency. In the cases where these technologies are not sustainable, they should be refined and adapted to optimise their sustainability.

Appendix 2.**VERTEBRATE FAUNA (EXCLUDING BIRDS) IN THE ESPERANCE AREA ³**

		Sources:	W.A. Museum records (1995)	Kitchener <i>et al</i> (1975)
<u>Mammals</u>				
Western Grey Kangaroo	<i>Macropus fuliginosus</i>	-	-	X
Quenda (R)	<i>Isoodon obesulus</i>	-	-	X
Pigmy Possum	<i>Cercartetus concinnus</i>	-	-	X
Honey Possum	<i>Tarsipes rostratus</i>	X	X	X
Southern Bush Rat	<i>Rattus f. fuscipes</i>	X	X	X
Ashy-grey Mouse	<i>Pseudomys albocinereus</i>	-	-	X
King River Eptesicus	<i>Eptesicus regulus</i>	X	-	-
Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>	X	-	-
House Mouse *	<i>Mus musculus</i>	X	X	X
Black Rat *	<i>Rattus rattus</i>	X	-	-
European Rabbit *	<i>Oryctolagus cuniculus</i>	-	-	X
Fox *	<i>Vulpes vulpes</i>	-	-	X

R - Gazetted as rare or likely to become extinct.

* - Introduced species.

Reptiles

Geckos	<i>Diplodactylus spinigerus</i>	-	X
	<i>Phyllodactylus marmoratus</i>	-	X
	<i>Phyllurus milii</i>	-	X
Legless Lizards	<i>Pygopos lepidopodus</i>	-	X
	<i>Delma australis</i>	-	X
	<i>Aprasia striolata glauerti</i>	-	X
Dragon Lizards	<i>Tympanocryptis adelaidensis</i>	-	X
	<i>Pogona minor</i>	X	X
	<i>Ctenophorus ornatus</i>	X	X
Skink Lizards	<i>Ctenotus labillardieri</i>	-	X
	<i>Ctenotus gemmula</i>	-	X
	<i>Ctenotus catenifer</i>	-	X
	<i>Egernia multiscutata bos</i>	-	X
	<i>Egernia kingii</i>	-	X
	<i>Egernia nitida</i>	-	X
	<i>Leiopisma trilineatum</i>	-	X
	<i>Lerista microtis</i>	-	X
	<i>Lerista distinguenda</i>	-	X
	<i>Hemiergis peronii</i>	-	X
	<i>Menetia greyii</i>	-	X
	<i>Morethia obscura</i>	-	X
	<i>Tiliqua occipitalis</i>	-	X
	<i>Tiliqua rugosa</i>	-	X
	<i>Varanus rosenbergi</i>	-	X
Monitor			
Blind Snake	<i>Ramphotyphlops australis</i>	-	X
Carpet Python (S)	<i>Morelia spilota imbricata</i>	-	X
Front-fanged Snakes	<i>Notechis curtus</i>	X	X
	<i>Notechis coronatus</i>	X	X
	<i>Notechis scutatus</i>	X	X
	<i>Pseudonaja a. affinis</i>	X	X
	<i>Acanthophis antarcticus</i>	X	-

S - Gazetted as specially protected fauna.

Amphibians

Ground Frogs	<i>Crinia georgiana</i>	-	X
	<i>Ranidella pseudinsignifera</i>	-	X
	<i>Heleioporus eyrei</i>	-	X
	<i>Limnodynastes dorsalis</i>	-	X

³ Lists are provisional only. Additional species may occur.

Appendices

	Sources:	W.A. Museum records (1995)	Kitchener <i>et al</i> (1975)	Hodgkin and Clark (1989)
Tree Frogs	<i>Litoria adelaidensis</i>	-	X	
	<i>Litoria cyclorhynchus</i>	-	X	

Fish

Trout Minnow	<i>Galaxias truttaceus</i>	X	X	-
Spotted Minnow	<i>Galaxias maculatus</i>	X	-	-
Hardyhead spp.	<i>Atherinosoma elongata</i>	-	X	X
	<i>Atherinosoma presbyteroides</i>	-	X	X
	<i>Atherinosoma wallacei</i>	X	-	-
Blue-spotted Goby	<i>Pseudogobius olorum</i>	X	X	X
Long-finned Goby	<i>Favonigobius lateralis</i>	-	-	X
Black Bream	<i>Acanthopagrus butcheri</i>	X	-	X
Yellow-eyed Mullet	<i>Aldrichetta forsteri</i>	-	-	X
W.A. Salmon	<i>Arripis truttaceus</i>	-	-	X

Appendix 3.

LANDSCAPE CHARACTER TYPES

Esperance Plains Sub-type	
Visual Quality Classification - Frame of Reference	
Scenic Quality	General Description
HIGH	
Landform	Isolated peaks and ranges with distinctive form which become focal points, e.g. Barren Ranges. U-shaped valleys and well defined steep-sided drainages, e.g. Pallinup River. Dunal formations of distinctive height or shape which are obvious in contrast to the surrounding landscape, e.g. Dillon Bay. Cliffs, headlands, all islands, offshore reefs and sandbars, e.g. Recherche Archipelago. Dunes which display areas of active weathering, steep slopes or sand-blown areas, e.g. Cape Arid. Irregular coastline edges often emphasised by distinctive rock outcrops, bays and inlets, e.g. Hellfire Bay.
Vegetation	Strongly defined vegetation patterns including eucalypt forest, dune vegetation and heath, with barren rock, e.g. coastal vegetation. Wind-shaped, gnarled or dwarfed vegetation, e.g. coastal heath. Unique specimen stands of vegetation displaying unusual form and distinctive colour, e.g. Royal Hakeas. Dramatic displays of seasonal colour, e.g. spring wildflowers.
Waterform	All inlets, estuaries, swamps and lakes, e.g. Stokes Inlet. Unusual ocean shoreline motion associated with islands, reefs, surf zones and shoreline configuration, e.g. Doubtful Island Bay. Streams with permanent flow characteristics, e.g. Lort River.
MODERATE	
Landform	Slightly undulating country which is not distinctive or prominent. Shallow stream associated dissections and depressions. Regular coast edges without bays, inlets, headlands or cliffs.
Vegetation	Heath vegetation with little diversity or moderately defined patterns. Vegetation which exhibits the range of size, form, colour, texture and spacing found in the surrounding landscape.
Waterform	Intermittent streams. Common ocean shoreline character and motion characteristics.
LOW	
Landform	Expanses of virtually flat terrain which provides few landmarks with which to orient.
Vegetation	Extensive areas of similar vegetation such as grassland with few if any trees.
Waterform	Waterforms absent.