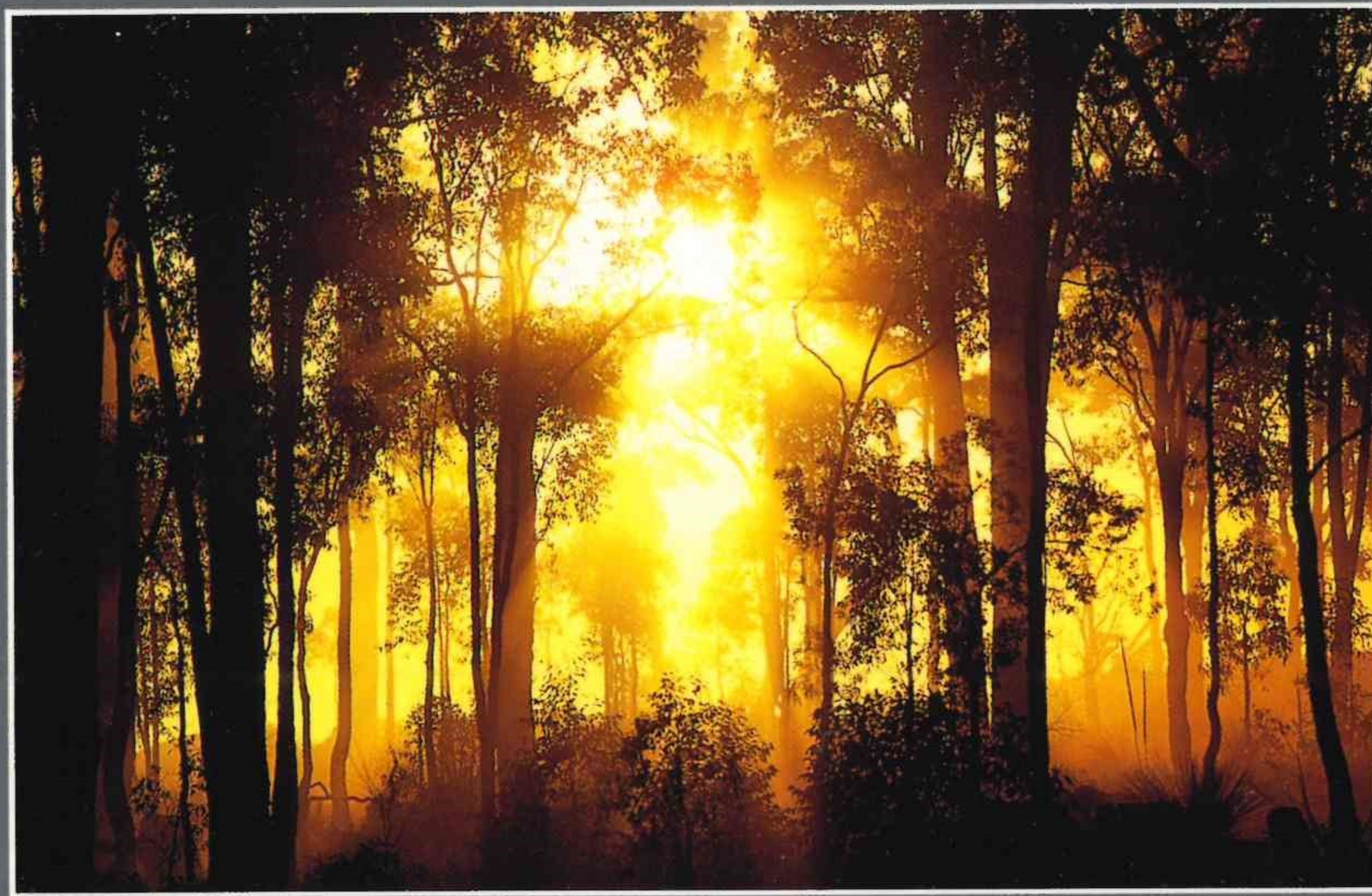


Northern Forest Region



Department of Conservation and
Land Management, Western Australia

DECEMBER 1987

**NORTHERN FOREST REGION
REGIONAL MANAGEMENT PLAN**

1987-1997



MANAGEMENT PLAN NO. 9

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PREFACE

Regional management plans are prepared by the Department of Conservation and Land Management on behalf of the Lands and Forest Commission and the National Parks and Nature Conservation Authority. These two bodies submit the plans for final approval and modification, if required, by the Minister for Conservation and Land Management.

Regional plans are to be prepared for each of the 11 regions administered by the Department of Conservation and Land Management (CALM).

This plan for the Northern Forest Region partly replaces the General Working Plan No. 87 (Forests Dept. W.A. 1982) which dealt with State forests in the south-west. In addition, this plan covers all land and water in the region vested under the CALM Act, together with wildlife responsibilities included in the Wildlife Conservation Act.

In addition to the regional plan, more detailed management plans will be prepared for certain high value or high conflict areas - e.g., some national parks - or for certain exploited or endangered species, e.g., kangaroos and the Noisy Scrub Bird. These 'area management plans' and 'wildlife management programs' will provide more detailed information and guidance for management staff.

The time frame for this regional plan is ten years, although review and restatement of some policies may be necessary during this period.

This management plan was submitted by the Department of Conservation and Land Management and adopted by the Lands and Forest Commission on 9 December 1987 and the National Parks and Nature Conservation Authority on 11 December 1987, and approved by the Hon Minister for Conservation and Land Management on 14 December 1987.

OBJECTIVES AND PRINCIPLES

The objectives of this regional management plan are:

To describe the land and wildlife resources managed by CALM in the Northern Forest Region.

To present a land use plan for land managed by CALM in the region, based on the departmental system of land classification and the principles of multiple use.

To outline the departmental policies and management guidelines on which day-to-day management of land, wildlife and resources in the region are based. To provide for public involvement in land-use planning and management by CALM.

To provide a planning and management framework for CALM responsibilities in the region, upon which more detailed operational plans can be based, and into which policy changes or research findings can be readily incorporated.

The principles upon which this plan has been prepared are:

The plan must comply with the requirements of the State Conservation Strategy for WA.

Land will be managed in such a way as to promote or achieve the purpose for which it was vested, e.g.

in the case of indigenous State forest or timber reserves, to ensure multiple use and sustained yield of the resource for the satisfaction of long-term social and economic needs [CALM Act Section 56 (1)(a)];

in the case of State forest or timber reserves planted with exotic species, to achieve the optimum yield in production consistent with the satisfaction of long-term social and economic needs [CALM Act Section 56 (1)(b)];

in the case of national parks, to fulfil as much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest [CALM Act Section 56 (1)(c)];

in the case of nature reserves, to maintain and restore the natural environment and to protect, care for, and promote the study of indigenous flora and fauna [CALM Act Section 56 (1) (d)].

All management operations are to be economical and environmentally sensitive.

The processes of land use planning and wildlife and resource management are to be assisted by public participation, particularly at the regional level.

In addition, the following principles set down in the State's timber strategy apply also to the preparation of this regional management plan:

There is to be an equitable reservation of forest areas for conservation, recreation and production, and these areas are to have security of tenure and purpose.

All areas of forest managed for timber production are also to be managed to provide for other values of the forest and all areas harvested are to be regenerated.

ASSOCIATED DOCUMENTS

This regional management plan should be read in conjunction with two other key documents:

Timber Production in Western Australia - A Strategy to take WA's South-West forests into the 21st Century (CALM 1987).

Strategies for Conservation and Recreation on CALM lands in Western Australia - the conservation, environmental protection and recreation strategies of W.A.'s Department of Conservation and Land Management (CALM 1987).

PART 1. THE DEPARTMENT OF CALM AND ITS PLANNING AND LAND USE MANAGEMENT PROCESSES

THE DEPARTMENT

Origin of the Department and the Controlling Bodies

The Conservation and Land Management Act, 1984, was proclaimed on 22 March 1985 and as a result the Forests Department, National Parks Authority and the Wildlife Section of the Department of Fisheries and Wildlife were amalgamated to form the Department of Conservation and Land Management (CALM). The Act also established two controlling bodies: the Lands and Forest Commission (LFC) in which State forest and timber reserves are vested; and the National Parks and Nature Conservation Authority (NPNCA) in which national parks, nature reserves, marine parks and marine nature reserves are vested. It also established a Forest Production Council to advise the Minister on matters pertaining to production from State forest and timber reserves.

Administrative Structure

EXECUTIVE DIRECTOR

The Department is headed by an Executive Director who is also a member of the Lands and Forest Commission, an ex-officio member of the National Parks and Nature Conservation Authority and Chairman of the Forest Production Council.

POLICY DIRECTORATE AND OPERATIONS DIRECTORATE

The Policy Directorate is headed by the Executive Director and comprises the General Manager and Policy Directors who are responsible for forests, national parks and recreation, and nature conservation. Its major task is to devise policy and liaise with the Operations Directorate about policy implementation. The Operations Directorate comprises the General Manager and five Divisional Managers (research, administration and finance, services, forest resources, and operations) who are responsible for the Departmental branches and regions.

REGIONS

The State is divided into 11 CALM regions, each with a high degree of autonomy. They are Kimberley, Pilbara, Gascoyne, Goldfields, Greenough, Wheatbelt, South Coast, Southern Forest, Central Forest, Northern Forest and Metropolitan Regions, as shown in Map 1.

Objectives of the Department (The Corporate Plan)

The first section of the corporate plan of the Department of Conservation and Land Management states:

In recognising that Western Australia has a beautiful and diverse natural environment which provides material, aesthetic and spiritual benefits and that the natural environment is an essential component of the quality of life for West Australians, a statement of mission for the Department of Conservation and Land Management as stated in the Departmental corporate plan is:

To provide for the use of the natural environment without detracting from possible future use.

The scope of the Department's responsibilities is represented by its charter which is:

To conserve Western Australia's wildlife and manage public lands and waters entrusted to the Department for the benefit of present and future generations.

The Department's primary objectives are:

Management:

To protect, restore and enhance the value of resources entrusted to the Department so as to meet, as far as possible, the diverse expectations of the community.

Conservation:

To conserve the indigenous plant and animal species and environmental processes in natural habitats throughout the State.

Production:

To provide and regulate the supply of renewable resources on a sustained yield basis for the satisfaction of long term social and economic needs, and in a manner that minimises impact on other values.

Recreation:

To facilitate the public enjoyment of the natural attributes of public lands and reserved waters in a manner that does not compromise conservation and other management objectives.

Knowledge:

To seek a better understanding of the natural environment and to promote awareness and appreciation of its values.

Land Management Planning

The CALM Act (Section 33) requires the Department to manage land covered by the Act in accordance with a 'management plan'.

Management plans are the responsibility of the NPNCA and LFC, but are prepared through the agency of the Department.

Sections 55-58 of the CALM Act specify that management plans must:

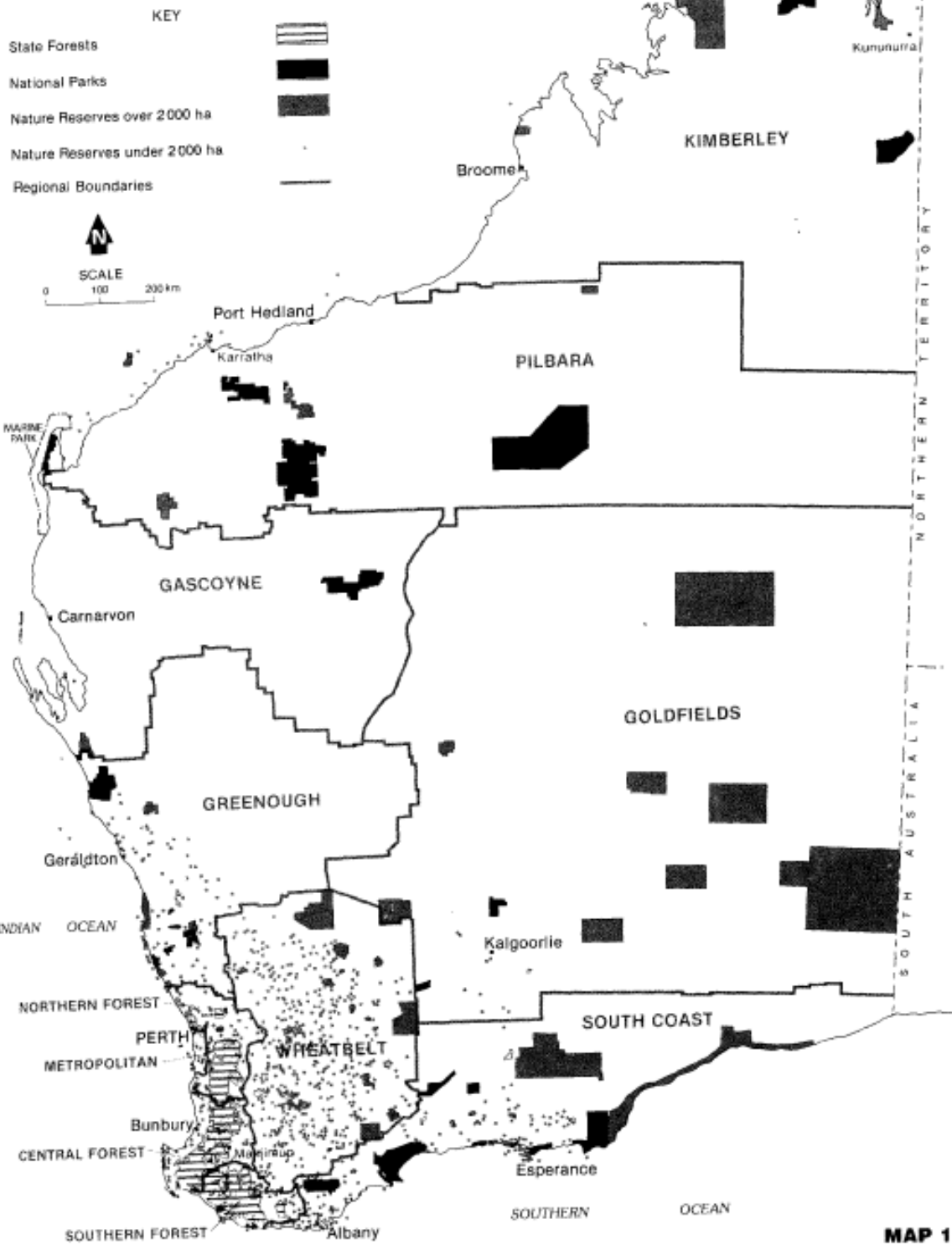
- contain a statement of policies or guidelines to be followed; provide a summary of proposed operations;
- not exceed a ten-year term;
- be open for public comment for a minimum of two months before submission to Government; promote the achievement of the purpose for which the land was vested;
- pursue particular objectives for each category of land.

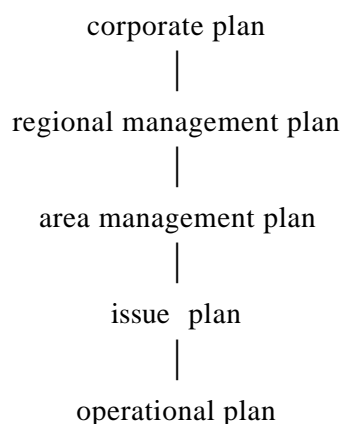
The style and order of development of management plans is a matter determined by Departmental policy. CALM Policy Statement No. I (Planning) states that management plans will contain clear statements on:

- the purpose and background of the plan;
- the resource information on which the plan is based;
- management problems, and discussion of options where appropriate;
- management proposals, including sections on implementation and monitoring;

CALM has developed five main types of plans for management of its land. Their hierarchical relationship is shown as follows:

C.A.L.M. REGIONS





The Department's strategic plan (the first part of the corporate plan) establishes the link to land management plans.

It consists of broad policy statements (see Appendices 1 and 2) for all major aspects of land use for all land and water vested in the NPNCA, the LFC and the Executive Director of CALM in Western Australia.

Regional management plans deal with land management planning at a regional level. They will be prepared for each Departmental administrative region. Map 1 shows the CALM regional boundaries.

When a regional management plan is approved, it will conform to Section 55 of the CALM Act and provide sufficient information for all NPNCA, LFC and Executive Director land in the region to be adequately managed until more detailed area management plans are available.

Area management plans cover a specific area or set of areas, often of common purpose (vesting) such as one or more national parks, marine parks, nature reserves, marine nature reserves, State forest, or other reserves. These are the most detailed management plans prepared by CALM. Area management plans will be prepared where there are management details specific to an area that cannot be adequately covered by a regional management plan.

Regional and area management plans are subject to public review in the draft form.

In addition, the Department prepares issue plans, operational plans, manuals and prescriptions. These are used to implement regional and area management plans and are discussed in Part 5. Many of these documents are available for public reference in regional or district offices on request.

VESTING, TENURE AND PURPOSE OF LAND MANAGED BY CALM

This section describes the system of classification, reservation and vesting which applies to lands managed by the Department of Conservation and Land Management.

The Controlling Bodies and the Department

The proclamation of the Conservation and Land Management Act in 1985 established two controlling bodies (the National Parks and Nature Conservation Authority and the Lands and Forest Commission) in which land is vested. The Act also established the Department of Conservation and Land Management which is responsible for management of the land vested in the controlling bodies.

The membership of the controlling bodies is representative of the many community interests associated with the lands vested in them.

Categories of Land Currently Vested in the Controlling Bodies and Managed by the Department

The CALM Act currently (September 1987) lists seven categories of land to which the legislation applies. These are:

- State forest
- timber reserves
- national parks
- nature reserves
- marine parks
- marine nature reserves
- any other land vested in the Commission or the Authority

In addition, the Department also manages land held freehold in the name of the Executive Director.

Vesting and Management

State forests and timber reserves are vested in the Lands and Forest Commission. National parks and nature reserves are vested in the National Parks and Nature Conservation Authority. Miscellaneous reserves may be vested in either body.

The Department is responsible for management of lands vested in the Authority and the Commission. Management is carried out according to government policies, and as specified in management plans submitted by the controlling bodies and approved by the Minister for Conservation and Land Management.

Tenure

'Land tenure' is the term used to describe the form of right, or title to land. The two broad classes of land tenure are private land and Crown land. Crown lands which are managed by the Department fall into two broad categories: reserves and State forests.

Security of Tenure of Land

In Western Australia, the security of tenure of Crown land reserves varies, depending upon whether the reserve is Class A, B or C.

A Class reserve - tenure can be changed only by agreement of both Houses of the W.A. Parliament.

B Class reserve - tenure can be changed by the Governor of Western Australia without approval by Parliament. However, the reasons for any change must be reported to Parliament by the Minister for Lands.

C Class reserve - tenure can be changed by the Governor, without reference to Parliament. However, any changes must be published in the Government Gazette.

This system therefore determines the degree of difficulty involved in changing the tenure of Crown land.

Most national parks and nature reserves are A Class reserves. However, some parks and nature reserves were given B or C Class status when they were created many years ago and this status has persisted.

The security of tenure of State forest is the same as that of an A Class reserve. State forest is not a 'reserve', and therefore is not classed A, B or C. However, any change to the tenure of a State forest requires the agreement of both Houses of Parliament.

Purpose and Security of Purpose

There are a variety of purposes for which lands vested in the Authority or the Commission are managed. Different categories of land have a different purpose, for example, conservation, production or recreation.

Under existing legislation, secure purpose is already provided for lands managed for conservation and recreation (for example nature reserves and national parks). On the other hand, in State forest, which in the past has been zoned for a variety of purposes (i.e., multiple use), there has been no legislative mechanism to make these purposes secure.

Therefore, although State forest has security of tenure identical to an A Class reserve, the purpose for which a particular area of State forest is managed may be decreed at the level of a management plan prepared within the Department and approved by the Minister, but without approval of Parliament.

Changes to be Introduced

The current requirements for reservation, classification, and security of purpose for land managed by CALM have disadvantages.

For example:

- marine reservation is not adequately catered for;
- there is confusion where areas of different tenure are managed for the same purpose;
- some areas (especially small conservation and recreation reserves) are inappropriately classified;
- in some instances, the tenure of the land is secure, but the purpose of its management is not.

Subject to the amendment of the CALM Act, a new system is to be adopted. Under this system there will be seven categories of Crown land managed by CALM:

- nature reserve
- national park

conservation park
marine park
State forest
timber reserve
miscellaneous reserves

In addition, the Department will continue to manage land held freehold in the name of the Executive Director.

Furthermore, it is proposed that State forests will have A Class security of purpose as well as tenure. This will mean that the procedure for removal of forest areas from public ownership will not change. In addition, the purpose for which they have been reserved (the multiple uses incorporating conservation, recreation, timber production and water catchment protection) will not be able to be changed without the agreement of both Houses of State Parliament.

The categories are defined in terms of vesting, tenure and purpose as follows:

NATURE RESERVE

Vesting: National Parks and Nature Conservation Authority

Tenure: A Class (B and C Class reserves will be progressively reviewed and changed to A Class where appropriate).

Purpose: Wildlife and landscape conservation, scientific study and preservation of features of archaeological, historic or scientific interest.

Comment: Nature reserves may be terrestrial or marine. These are areas in which wildlife values may not be commercially exploited and where forms of recreation which damage natural ecosystems are not permitted.

NATIONAL PARK

Vesting: National Parks and Nature Conservation Authority

Tenure: A Class (B or C Class parks will be progressively reviewed and changed to A Class where appropriate).

Purpose: Wildlife and landscape conservation, scientific study, preservation of features of archaeological, historic or scientific interest, together with recreational enjoyment by the public.

Comment: National parks may be terrestrial or marine. With the exception of beekeeping in some parks, commercial exploitation of flora and fauna is not permitted. Only those recreational pursuits which do not adversely affect ecosystems and landscapes are permitted.

The classification of national park applies to areas which have national or international significance for scenic, cultural or biological values.

CONSERVATION PARK

Vesting: National Parks and Nature Conservation Authority

Tenure: A Class

Purpose: Identical to national park

Comment: Conservation parks differ from national parks only in their significance, size or condition. They are managed as if they were national parks. The difference is that these areas do not have major national or international significance, are relatively small in size or the landscape or biota has been affected by past land use. Conservation parks in forest areas will not be zoned to include areas where commercial timber production may occur.

MARINE PARK

Vesting: National Parks and Nature Conservation Authority.

Tenure: A Class

Purpose: Marine conservation and recreation, with areas zoned for commercial fishing on a sustained yield basis.

Comment: This classification is generally in accord with the internationally accepted concept of a managed resource area. It allows for management for conservation and recreation, plus controlled exploitation where appropriate.

STATE FOREST

Vesting: Lands and Forest Commission

Tenure: Identical to A Class, in that the agreement of both Houses of Parliament is required before tenure can be changed.

Purpose: Multiple use.

Comment: The major uses of State forest will be for water supplies, recreation, sustainable timber production and for wildlife conservation. State forests will also provide for public utilities and mineral production, where these activities are imposed.

TIMBER RESERVE

Vesting: Lands and Forest Commission

Tenure: Similar to C class

Purpose: Timber production

Comment: Timber reserve is a transitional classification. As timber reserves are evaluated, they will be reclassified as State forest, nature reserve or conservation park, as appropriate.

MISCELLANEOUS RESERVES

Vesting: Lands and Forest Commission or National Parks and Nature Conservation Authority

Tenure: Normally B or C Class

Purpose: These reserves have a wide variety of purposes, but normally are related to recreation or wildlife conservation. As with timber reserves, this classification is often transitional, and on further evaluation the classification can be changed to a more appropriate one.

Criteria for Allocation of Land to CALM Categories

Where land is acquired by CALM, or where the classification of a particular area is under review, the following criteria are applied:

NATURE RESERVE

Areas to be managed for wildlife conservation and scientific study.

Have important conservation value, either as part of a reserve system, as a remnant or because of particular species.

No historical commitments to inappropriate uses or activities.

NATIONAL PARK

Areas to be managed for wildlife conservation, scientific study and public enjoyment.

Have important conservation, cultural and scenic values.

Nationally or internationally unique, in terms of landscape and/or biota.

Size must be sufficiently great to accommodate recreation or historical uses without significantly detracting from conservation values.

CONSERVATION PARK

Purpose identical to national park.

Areas generally are not nationally or internationally unique, in terms of landscape and/or biota.

These are areas generally less than 1000 ha in size and/or where wildlife conservation values have been affected by past activities or land use decisions.

MARINE PARK

Marine areas managed for conservation, study, public enjoyment and commercial fishing on a sustained yield basis.

Where zoning includes commercial fishing, a marine park must be large enough to allow this fishing without detracting from the overall conservation and recreational value.

STATE FOREST AND TIMBER RESERVE

Areas to be managed for multiple use, with the primary uses in most cases being sustainable timber production and protection of water catchments.

CALM Responsibilities on Lands Not Vested in the Controlling Bodies

CALM is responsible for the conservation and protection of native flora and fauna on all land and waters within the State boundaries, under Section 6 of the Wildlife Conservation Act.

Vacant Crown land and unvested reserves are nominally controlled by the Department of Land Administration. However, forest produce on vacant Crown land is controlled by CALM under Section 88 of the CALM Act. Forest produce includes trees, timber, firewood, honey, seed, rocks, stone and soil, but excludes minerals under the Mining Act 1978. The Bush Fires Board is responsible for fire

prevention measures on vacant Crown land and unvested reserves under Section 10 of the Bush Fires Act.

Under Section 45 of the Bush Fires Act, CALM may take responsibility for the suppression of bush fires threatening

State forest. Under an agreement with the Department of Land Administration, the Agriculture Protection Board has responsibility for the control of vermin and declared plants on vacant Crown land and unvested reserves.

CALM has the responsibility of administering regulations made under the Wildlife Conservation Act for the protection, management and control of nature reserves. Under section 130 of the CALM Act those provisions also apply to those reserves created under the Land Act for the conservation of flora and/or fauna, which are not vested in the National Parks and Nature Conservation Authority.

Under Section 139 of the CALM Act the forest produce on road reserves through State forest and timber reserves is controlled by CALM. However, Shires have the right to the timber from trees felled in bona fide road clearing or widening.

Under Sections 137 and 138 of the CALM Act, CALM may control the timber on particular reserves or gazetted catchments if the Governor so directs. Timber royalties derived from such reserves are usually apportioned between CALM and the vesting authority.

Under arrangements ratified by Section 151 of the CALM Act, CALM controls forest produce on Land Act timber reserves and Timber for Settlers reserves. The Department of Land Administration controls the land.

Acquisition of Private Land

As part of the State's timber and conservation strategies, CALM has a policy of seeking to acquire suitable land for forest development and for conservation values.

Exchange of land is also considered when the Department's assets will benefit from the transaction e.g. when land can be obtained for addition to a national park, or for forest production or conservation, and when the land given up in the exchange has no conservation values.

MULTIPLE LAND USE PLANNING AND MANAGEMENT IN CALM

Sustained Yield and Multiple Use

A major value of the land and reserve system managed by CALM is that it can provide indefinitely for a wide range of demands, or land uses.

This is because management is based upon two fundamental philosophies: sustained yield, and multiple use, and the integration of these philosophies into a systematic approach to land use planning and practical management.

The concept of sustained yield applies when natural resources are harvested for particular products valued by the community, for example, trees for timber, wildflowers for blooms or catchments for water supplies. For natural resources to survive in the long term, the rate of harvest must not exceed the rate of replenishment. There is both a statutory and a moral obligation on CALM to practise sustained yield management whenever natural resources are harvested.

All lands entrusted to CALM are managed for many uses. In other words, the management aim is to ensure that as wide a range of uses as possible are provided for, consistent with the designated purpose of the area. In most cases, different uses are compatible and it is a simple matter to ensure that they can take place on the same area at the same time.

For example, a nature reserve can provide harmoniously and simultaneously for wildlife habitat and some forms of recreation. Similarly, State forests can provide simultaneously for sustained yields of timber, fresh water, recreation, and most forms of wildlife habitat.

Multiple use planning becomes complex when demands on the same area of land conflict and cannot be practised simultaneously. When this occurs a priority use must be decided upon or activities rescheduled to prevent or minimise conflict.

General Principles for Land Use Planning in CALM

As a general principle, CALM attempts to provide for as many land uses as possible, so long as they are consistent with the primary purpose of the land. Most areas of land can be used simultaneously for many different purposes, without conflict or land degradation. Where this cannot be done, systematic land use planning is necessary. This involves:

identification of demands and conflicts;

- decisions on priority use;
- allocation of priority uses to areas;
- the preparation of a map showing proposed land uses and priorities.

A land use plan and map has two important functions. First, it provides the public with information about, and the opportunity to comment on and seek changes to, land use decisions. Secondly, it provides a basis for day-to-day management by CALM staff.

Aspects of Multiple Use Planning in CALM

DEMANDS

The community requires that seven principal values are provided from the lands entrusted to CALM. These are:

- wildlife (flora and fauna) conservation;
- landscape (scenic beauty and amenity);
- water;
- timber;
- recreation;
- minor resources (eg, honey, gravel, wildflowers);
- historical or cultural factors.

In addition, a number of 'imposed' activities must be provided for, e.g. community services and public utilities (roads, reservoirs, power lines), and minerals, where mining on CALM land has been approved under the Mining Act or Special Agreement Acts.

Finally, lands managed by CALM are an important resource' for research, scientific study and education, and provision must be made to ensure these activities can proceed.

PRIORITY ZONES

Every area within a land use plan proposed by CALM is allocated a priority use. This is the value which is most favoured by:

- the specific attributes of the ecosystem;
- the location, or accessibility of the area;
- public demand for various uses;
- the purpose for which the area is vested.

An area will often be suited to a number of uses.

Uses which can be carried out in addition to, and without conflicting with, the priority use are called compatible uses. Compatible uses can occur on the same area at the same time.

Uses that can be compatible with the priority use if practised under certain constraints (i.e., at certain periods or at very regulated levels) are referred to as conditional uses.

Uses which will always conflict with the priority use are referred to as incompatible uses. These cannot be permitted on the same area at the same time.

CALM follows two basic rules in the allocation of uses to an area:

any use allocated must be in accord with the tenure and purpose of the area;
and no use may be permitted which is detrimental to the priority use.

Within State forests, priority use areas were historically referred to as Management Priority Areas (MPAs). On other tenures, priority areas have been called zones. The term zone is now favoured for all tenures and will henceforth also be applied to State forests.

LAND USE PRIORITIES AND COMPATIBILITY

Six land use priorities (or zones) are recognised in the preparation of land use plans for CALM lands:

Nature conservation;
Recreation;
Protection (of water catchments or other forest values);
Production (zoned for water, timber or other products);
Mining (where this is 'imposed');
Public utility.

In Table 1 the compatibility between these uses is set out. Table 2 shows the broad relationships between land uses and reserve categories.

TABLE 1
COMPATIBILITY OF LAND USES

Priority Use Zone	Alternative uses			
	Nature Conservation	Protection	Recreation	Production
Nature Conservation		Compatible	Conditional	Not Compatible
Protection	Compatible		Conditional	Conditional
Recreation	Conditional	Conditional		Conditional
Production	Conditional	Conditional	Conditional	

TABLE 2
COMPATABILITY BETWEEN LAND USES AND RESERVE
CATEGORIES

Land Use	Reserve Category				
	Nature Reserve	National Park	Conservation Park	Marine Park	State Forest
Nature Conservation	/	/	/	/	0
Recreation	0	0	0	0	0
Catchment Protection	/	/	/	N/A	/
Timber or Fishery Production	X	X	X	/	/
Water Production	X	0	0	N/A	/
Public Utility	X	0	0	0	0
Mining (See Text)	0	0	0	0	0

KEY / Compatible with objectives for reservation
 0 Conditional to specific time, area or use constraints
 X Not compatible with objectives for reservation
 N/A Not applicable

PART 2. THE NORTHERN FOREST REGION, ITS ADMINISTRATION AND RESOURCES

THE REGION

CALM's Northern Forest Region extends approximately from the Moore River in the north, to the eastern boundary of Northam Shire, south to Wandering. The southern boundary of the region extends from Yalgorup to Waroona and along the Murray River. The western boundary is the Indian Ocean¹, but most of the Perth metropolitan area is in CALM's Metropolitan Region.

The population of the region at the time of the 1986 census was 250 000, with about 80 per cent in that part of the Perth metropolitan area within the regional boundary. The four largest towns in the region outside urban Perth are Mandurah, Northam, Pinjarra and York.

The Northern Forest Region has an area of 1.97 million ha of which some 0.65 million ha (33 per cent) is CALM land and a further 0.05 million ha (2 per cent) is unvested land managed by CALM. The region includes all of eight local authorities (Chittering, Toodyay, Northam Town, Northam Shire, York, Mundaring, Mandurah, Murray) and parts of 14 local authorities (Gingin, Wanneroo, Swan, Kalamunda, Gosnells, Armadale, Serpentine-Jarrahdale, Beverley, Brookton, Wandering, Williams, Boddington, Waroona and Harvey).

Most of the CALM land is on developed surface water catchment or ground water areas. Major dams within the region include South Dandalup, Serpentine, Canning, Mundaring and Wungong.

About one quarter of the State's remaining jarrah forest and over one third of CALM's pine forest (mainly *Pinus pinaster*) are found in this region.

Bauxite mining is one of the region's major industries with alumina production from bauxite mined on State forest in the region valued at almost \$800 million in 1984/85.

Tourism is an important and rapidly growing industry in the region. Tourists now spend over a million visitor days per year at recreation sites managed by CALM in the region.

ADMINISTRATION

STAFF

REGIONAL RESPONSIBILITIES

The Northern Forest Region Office is located in Kelmscott. Regional and District staff under the direction of the Regional Manager are responsible for:

- the implementation of CALM policy;
- the provision of regional plans;
- the implementation and co-ordination of regional and district works programs to nominated priorities and standards;
- the management of personnel and finance;
- training and occupational safety;
- liaison with State and local government, private companies and the public;
- research, monitoring and inventory data collection.

- 1 Note that responsibility for wildlife and potential marine reserves extends for 3 nautical miles - i.e. the limit of State territorial waters.

DISTRICTS WITHIN THE REGION

The region is divided into four districts, as shown in Map 2.

Wanneroo District is the most northerly district of the region. its principal operations are the management of softwood forest (*Pinus pinaster*), water production from the Gnangara Mound, recreation and conservation. Yanchep and Neerabup National Parks are in this district.

Mundaring District extends from Julimar forest in the north, to the Brookton Highway in the south. Management of district operations is aimed at the protection of catchments, recreation and conservation. John Forrest, Walyunga and Avon Valley

National Parks and numerous nature reserves are in this district.

Jarrahdale District extends from Brookton Highway to an east-west boundary south of the Serpentine Dam. Wood and water production are important land uses as are bauxite mining and recreation. Other responsibilities are catchment protection, conservation and the Serpentine National Park.

Dwellingup District is the most southerly district of the region. Management responsibilities include wood and water production, liaison with bauxite mining companies, catchment protection, conservation and recreation. The Lane-Poole Reserve is located along the district's southern boundary (Murray River).

SPECIALIST BRANCHES

Research Division has field stations at Dwellingup and Wanneroo. Inventory Branch has a field station at Kelmscott. Personnel Branch operates a cadet school at Dwellingup. Because of the proximity of this region to Perth, most other Departmental branches service the region from Head Office.

PERSONNEL

At 1 July 1987, 263 Departmental personnel were based in the region, as shown in Table 3.

**TABLE 3
DEPARTMENT OF CALM PERSONNEL EMPLOYED IN THE
NORTHERN FOREST REGION AS AT 1 JULY 1987**

Professional staff	16
Field staff	75
Administration and Clerical Staff	13
Wildlife Officers (<i>a</i>)	-
National Park Supervisors	2
National Park Rangers	27
Wages Employees and Mechanics	126
Casual, seasonal, part-time	4
TOTAL	263

(*a*) Wildlife Officers servicing this region are located in Perth.

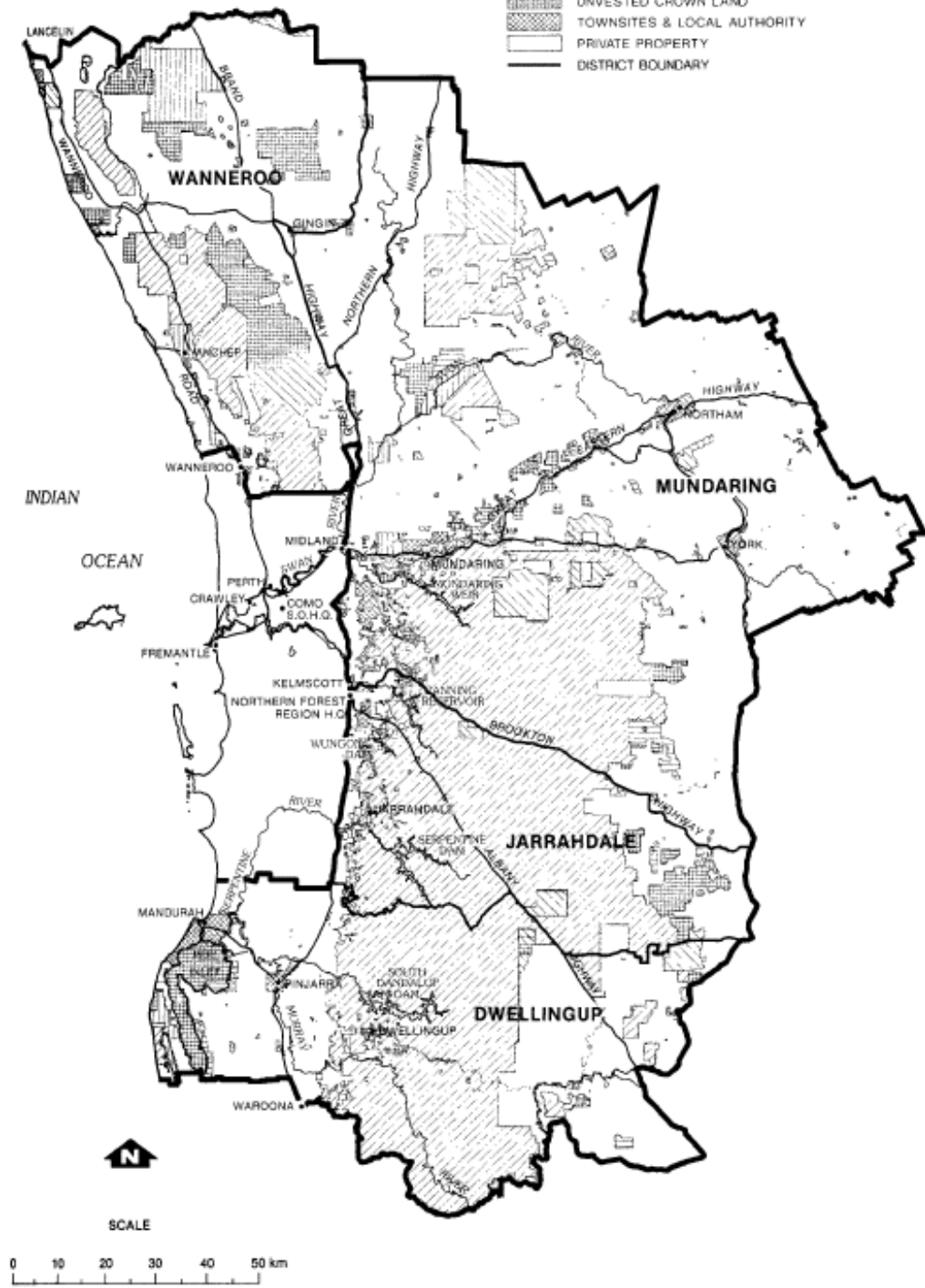
DEPARTMENTAL VEHICLES, PLANT, BOATS AND AIRCRAFT

Table 4 summarises the above resources based in the region as at 1 July 1987.

NORTHERN FOREST REGION CURRENT LAND TENURE

KEY

	NATIONAL PARK (C.A.L.M.)
	NATURE RESERVE (C.A.L.M.)
	STATE FOREST & OTHER C.A.L.M. LAND
	VESTED IN OR OWNED BY GOVERNMENT DEPTS.
	UNVESTED CROWN LAND
	TOWNSITES & LOCAL AUTHORITY
	PRIVATE PROPERTY
	DISTRICT BOUNDARY



MAP 2

TABLE 4
DEPARTMENT OF CALM VEHICLES, PLANT BOATS AND AIRCRAFT
IN THE NORTHERN FOREST REGION AS AT 1 JULY 1987

Motorcycles	6
Sedans and utilities 4 x 2	47
Sedans and utilities 4 x 4	77
Light trucks	10
Heavy trucks	24
Prime movers	-
Graders	3
Tractors, Loaders	17
Dozers	-
Buses	2
Caravans	9
Boats	1
Aircraft	2
TOTAL	198

OUTSIDE ASSISTANCE

Administrative and technical assistance and direction is provided as required from Departmental Directors, the General Manager, divisional and branch managers and support staff based mainly in Perth and Bunbury.

Assistance is provided to other regions for specific routine projects and during emergencies such as large fires. Bulldozers, graders, trucks, tractors etc. are hired from outside sources for routine work as well as during emergencies.

Local people and other agencies frequently assist CALM with fire fighting and for specific projects including volunteer programs.

Physical and Biological Resources

SYSTEM 6 STUDY

Virtually the whole region is within the Environmental Protection Authority's (EPA) System 6 or Darling System. This system was the subject of a detailed and systematic study which resulted in a

report by the EPA to Government in 1983. As part of this study an Atlas of Natural Resources was published by the Department of Conservation and Environment in 1980. The atlas includes geology and mineral resources maps by Biggs *et al.* (1980); landforms and soils maps by Churchward and McArthur (1980) and vegetation maps by Heddle *et al.* (1980).

CLIMATE

The region experiences a mediterranean climate characterised by a cool wet winter and a hot dry summer.

Average annual rainfall within the region ranges from about 400 mm east of Northam to 1300 mm near Dwellingup, as shown in Map 3.

A detailed account of the key climatic features of the region is given by the Bureau of Meteorology (1962,1965). Some climatic data for Dwellingup is presented in Map 3.

GEOLOGY AND GEOMORPHOLOGY

The region can be divided into three main geomorphic units or natural regions (Beard 1981, based on Clarke 1926). These are the Darling Plateau, Swan Coastal Plain and Dandaragan Plateau, as shown in Map 3. The Darling Scarp separates the Darling Plateau from the Swan Coastal Plain south of Bullsbrook and from the Dandaragan Plateau north of Bullsbrook. The Gingin Scarp separates the Dandaragan Plateau from the Swan Coastal Plain.

The Darling Plateau is an ancient erosion surface which is at an average elevation of about 300 m above sea level in this region, with a range from just under 100 m up to 582 m at Mt Cooke. Composed of Precambrian crystalline rocks, it has been extensively laterised.

Churchward and McArthur (1980) identified a number of landform mapping units on the Darling Plateau, including:

the Cooke unit, represented by a number of monadnock hills and crests rising above the general plateau level. The lateritic plateau, characterised by the Dwellingup unit of the higher rainfall zone and the Yalanbee unit east of the 900 mm rainfall isohyet;

the minor valleys of the plateau, represented by the Yarragil unit in the western part of the plateau, the Pindalup unit in the central part of the plateau and the Coolakin unit in the east;

major valleys occur in deep dissections of the plateau, the Helena unit occupies the deepest entrenchments just east of the Darling Scarp and the Murray unit is found upstream from it;

north of Wundowie the Yalanbee unit is found on the plateau, Coolakin and Pindalup units in the minor valleys and Bindoon and Michibin units in major valleys;

the Darling Scarp unit is on the western edge of the plateau.

The Swan Coastal Plain extends west from the Darling and Gingin Scarps to the Indian Ocean. It ranges up to about 75 m above sea level and within it a number of geomorphic units can be identified: Quindalup Dunes (nearest the coast), Spearwood Dunes, Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf (at the foot of the Darling Scarp) (McArthur and Bettenay 1960). This coastal plain is composed of sedimentary rocks of Quaternary age at the surface. The maximum thickness of sediments may exceed 15 000 m.

The Dandaragan Plateau, with an elevation of about 200 m, is composed of Jurassic and Cretaceous sandstones with some siltstone and shale.

The plateau has been laterised and modified by erosion.

For further details about the geology of the region see the 1:250 000 scale geological maps prepared by Wilde and Low, 1978 and 1980. Additional landform and soil information for parts of the region are available from Hosking and Greaves (1935), Mulcahy and Hingston (1961), Northcote *et al.* (1967) Churchward and Batini (1975) and McArthur *et al.* (1977).

HYDROLOGY

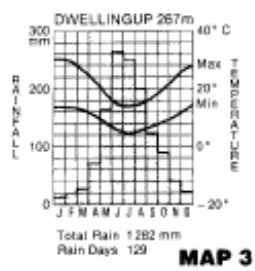
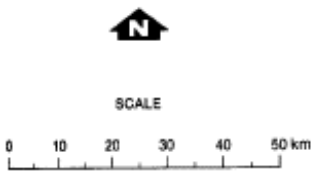
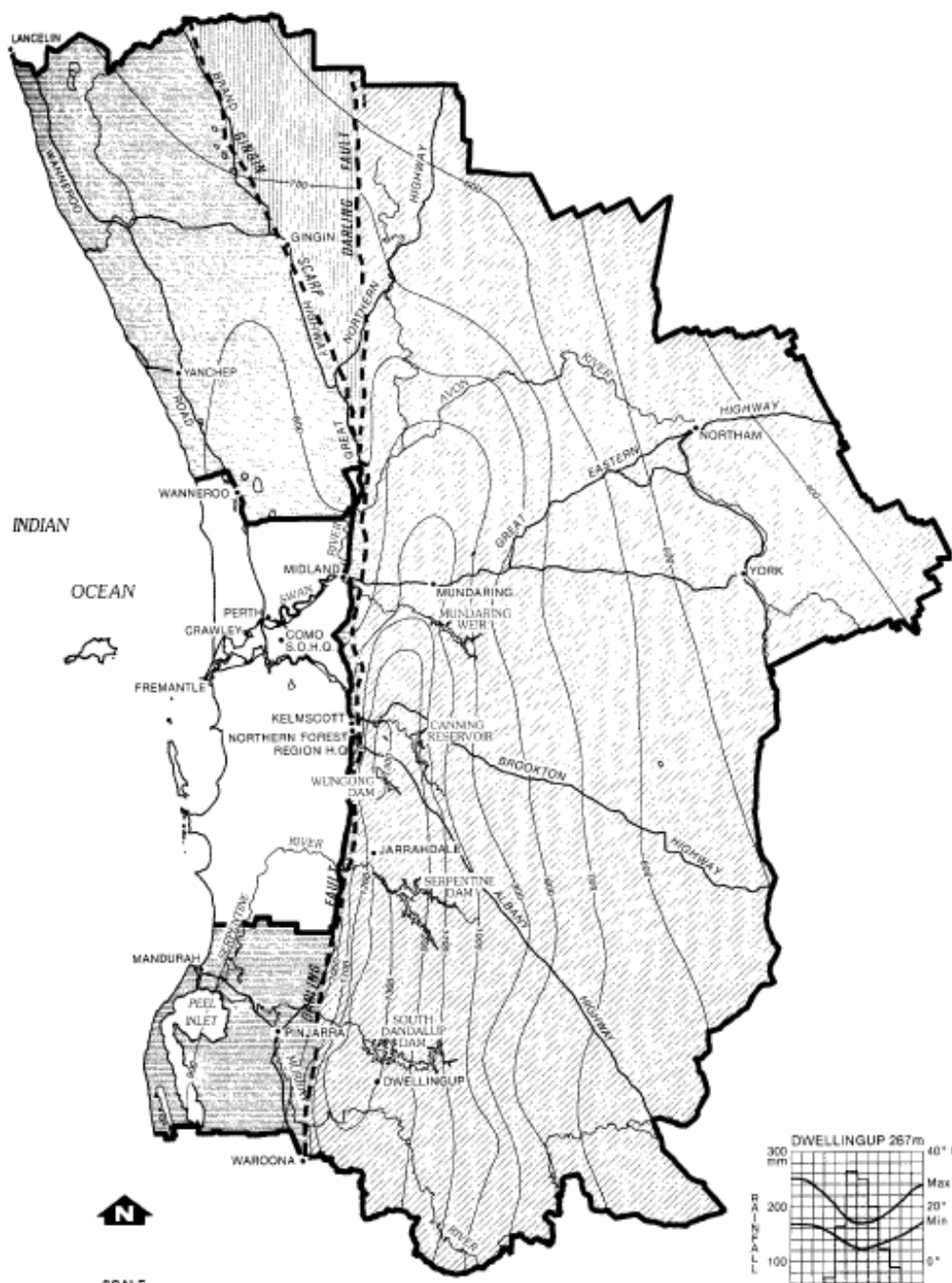
Major rivers passing through the region include the Swan-Avon, Canning, Serpentine and Murray Rivers. Most of the flow on forested catchments is fresh. Agricultural clearing has increased the input of salts in many of the lower rainfall areas (under 900 mm/year). Many of the rivers in the region have been dammed.

There are a number of significant wetlands and lakes throughout the region, notably on the Swan Coastal Plain.

Substantial underground water resources are available within the region, mainly from the Perth Basin (Biggs *et al.* 1980). However, some of this water is not fresh.

NORTHERN FOREST REGION GEOMORPHIC UNITS AND CLIMATE








- KEY
-  SWAN COASTAL PLAIN
 -  DARLING PLATEAU
 -  DANDARAGAN PLATEAU
 -  ISOHYETS



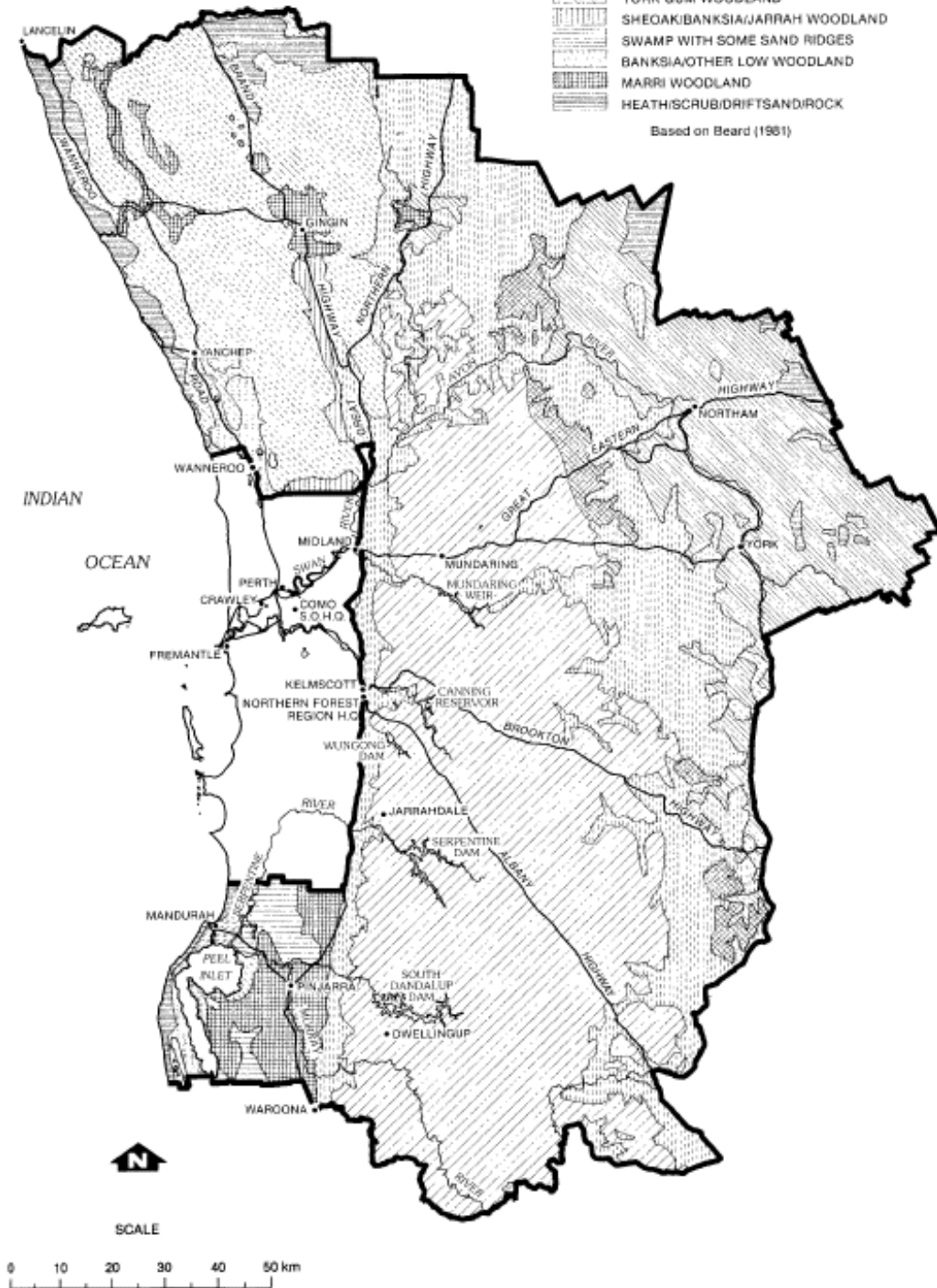
MAP 3

NORTHERN FOREST REGION VEGETATION

KEY

-  JARRAH/MARRI FOREST
-  TUART/WOODLAND FOREST
-  MARRI/WANDOO/JARRAH WOODLAND
-  POWDERBARK/WANDOO WOODLAND
-  YORK GUM WOODLAND
-  SHEOAK/BANKSIA/JARRAH WOODLAND
-  SWAMP WITH SOME SAND RIDGES
-  BANKSIA/OTHER LOW WOODLAND
-  MARRI WOODLAND
-  HEATH/SCRUB/DRIFTSAND/ROCK

Based on Beard (1981)



MAP 4

VEGETATION

The vegetation of the region has been mapped by Beard (1981) and Map 4 is based on that work. Site-vegetation mapping by Heddle *et al.* (1980) is also available for most of the region. The latter mapping is to a large extent based on the landform, site, vegetation work by Havel (1968, 1975a and b). Vegetation maps or plant species lists for parts of the region have also been produced by Williams (1932, 1945), Speck (1952), McComb and McComb (1967), Seddon (1972), Heddle (1979), Smith (1979), Crook (1981), Crook and Evans (1981), Kinhill Stearns (1984), Wallace and Moore (1985), Moore *et al.* (1985), Moore and Williams (1986), Nichols *et al.* (1986), National Parks Authority (n.d.) and Trudgen (n.d.).

API MAPS

CALM air photo interpretation (API) forest type maps have been prepared for much of the region. Table 5 shows the areas of the main site-vegetation types in the region, based on these maps and more recent work.

TABLE 5
SITE-VEGETATION TYPES IN THE
NORTHERN FOREST REGION AS AT 1 JANUARY 1986

	State Forest (a) (ha)	Other Crown Land (ha)	Private Property (ha)
Jarrah, marri etc.	408000	107000	70000
Wandoo	81000	44000	70000
Tuart	-	3000	5000
Exotic eucalypts	4000	-	-
Pine	25000	-	5000
Other native vegetation	64000	62000	215000
Cleared	3000	30000	767000
Sand	-	-	-
Lakes, water	5000	1000	4000
TOTAL	590 000	247 000	1 136 000

Note: (a) 'State forest' includes CALM Act timber reserve and freehold land held in the name of the Executive Director. Townsites are included with other Crown land. Vegetation data for other Crown land and private property is indicative only.

VEGETATION MAPPING BY BEARD

Beard's 1981:1000 000 scale vegetation map of the South West identifies 14 vegetation systems in this region, within three botanical subdistricts. A vegetation system is a particular series of plant communities recurring in catenary sequence or mosaic pattern, linked to topographic, soil or geological features. Brief descriptions of the 14 vegetation systems are as follows:

Drummond Subdistrict (on Swan Coastal Plain)

Rockingham System

Extends along the coast on the Quindalup Dunes, south of Perth. It consists of dune sands and coastal limestone. Behind the coastal communities, there is a heath in which *Acacia cochlearis*, *Olearia axilaris*, *Scaevola crassifolia* and *Acacia rostellifera* are often present.

Spearwood System

Is found inland of the Rockingham System. It consists of ridges of limestone, often mantled with yellow sand. The principal vegetation is eucalypt woodland. Numerous lakes and swamps occur in chains parallel to the coast. Species commonly present include tuart (*Eucalyptus gomphocephala*), jarrah (*E. marginata*) and peppermint (*Agonis flexuosa*) in woodland and *Melaleuca preissiana*, *M. raphiophylla* and *Banksia littoralis* in swamps.

Bassendean System

This system stretches discontinuously for the whole length of the Swan Coastal Plain, inland of the Spearwood System. Low *Banksia* woodland is common on drier sites, dominated by *Banksia attenuata*, *B. menziesii* and *B. ilicifolia*. On moister sites jarrah-marri (*E. calophylla*) woodland with *Banksia* and sheoak (*Allocasuarina fraseriana*) understorey is common.

Pinjarra Plain System

The plain occupies a more or less continuous band along the foot of the Darling Scarp, varying in width from 1 to 25 km. Marri woodland or forest was originally common with jarrah on higher ground. Flooded gum (*E. rudis*) occurs in the wetter parts. Ground subject to frequent flooding supports low woodland or forest of *Melaleuca raphiophylla*, thickets of *M. preissiana* or sedgeland.

Ridge Hill Shelf System

This system covers a narrow discontinuous band along the foot of the Darling Scarp. The principal element is forest of jarrah and marri often mixed with wandoo (*E. wandoo*) on heavier gravelly soils or sheoak on sandier soils.

Guilderton System

Represents the vegetation on the Quindalup Dune System, north of Perth. The vegetation has been much altered by fire. The climax may be *Callitris preissii* low forest.

Acacia thicket (*A. rostellifera*, *A. cyclops*), heath and bare dunes are common.

Jurien System

Represents the vegetation on the Spearwood dune system, north of Yanchep. A catena is often present, comprising *Dryandra-Calothamnus* heath on shallow soil or ridges, low *Banksia* woodland (*B. attenuata*, *B. menziesii*, *B. ilicifolia*, *E. todtiana* and *Nuutsia floribunda*) on slopes, and occasional patches of tuart.

Barramber System

Occupies alluvial flats along the Moore River and includes the Karakin Lakes. Open tree cover is often present with marri, flooded gum, scattered *Melaleuca*, *Banksia* and *Jacksonia* shrubs.

Drummond Subdistrict (on the Dandaragan Plateau)

Gingin System

In the south, near Bullsbrook, the original cover was woodland of marri and wandoo with patches of jarrah forest. Further north the plateau becomes very sandy and is covered with low *Banksia* woodland with patches of jarrah and marri. River gum and *M. preissiana* are found on larger creeks.

Dale Subdistrict (northern Darling Plateau)

Darling System

The EPA System 6 Darling System includes Beard's Darling System and much of his Bannister System. The work of Heddle *et al.* (1980) and Havel (1975 a and b) is discussed here as it is used extensively in day-to-day management by CALM.

System 6 vegetation maps

Heddle *et al.* (1980) have subdivided the area into vegetation complexes defined by Havel's site vegetation types. The vegetation complexes have names and boundaries similar to the Churchward and McArthur (1980) landform units described earlier.

The Cooke complex (monadnocks) has a range of vegetation from open jarrah-marri forest on deep soils to heath and herbland to lichens on granite rocks. Dominant (Havel) site-vegetation types are R and G.

On the laterite plateau high quality jarrah forest is found in the high rainfall zone (over 1 100 mm) of the Dwellingup complex, where the dominant site-vegetation types are S and T. In the medium rainfall zone (900 - 1 100 mm) vegetation types P and S predominate and in the low rainfall zone (under 900 mm) Yalanbee complex the main types are H, Z and M.

In the minor valleys in the medium and high rainfall zones the Yarragil complex is characterised by open jarrah-marri forest with an admixture of yarri/blackbutt (*E. patens*) and bullich (*E. megacarpa*) on the valley floors. Dominant site-vegetation types are C, D, W and E. The Pindalup complex has open jarrah-marri forest on slopes and open woodland of wandoo with some yarri in the lower gullies. Main site-vegetation types are A, M, and Y. The Coolakin complex of low rainfall areas is characterised by wandoo woodland with some yarri and jarrah and types A, M, and Y.

In the major valleys the Helena complex has a range of vegetation from high quality jarrah-marri-yarri forest to herbs and lichen on rock exposure. Site-vegetation types G and R are dominant. The Murray complex has similar forest on the slopes with fringing woodland of flooded gum and *Melaleuca raphiophylla* on the valley floors.

North of Wundowie, the Yalanbee complex is found on the plateau and Coolakin and Pindalup complexes in the minor valleys. The Bindoon complex has woodland of York gum (*E. loxophleba*), flanked by wandoo and powderbark wandoo (*E. accedens*) on upper slopes and breakaways. Michibin complex with open wandoo woodland and some York gum is found in the major valleys, with *Acacia acuminata* and thickets of *Allocasuarina heugeliana* dominating the shallower soils associated with granite outcrops.

The Darling Scarp vegetation ranges from low open woodland to lichens. Woodland components are chiefly wandoo with butter gum (*E. laeliae*) in the north, mountain gum (*E. haematoxylon*) in the south and marri throughout. Site-vegetation types R and G predominate.

Bannister System

Occupies an eastern strip of the region typified by low rainfall (under 900 mm) complexes of the northern part of System 6 such as Yalanbee, Pindalup and Michibin.

Chittering System

Is found north of the Darling System. It differs from the Bannister System in that York gum is often present in the valleys.

Mogumber System

Adjoins the Chittering system in the north. Jarrah is virtually absent and is replaced by marri-wandoo woodland.

Avon District (to the east of the Darling System)

York System

This system is found in the north-eastern extremity of the region. Wandoo is often present and salmon gum (*E. salmonophloia*) sometimes present. Flooded gum and *Allocasuarina obesa* are often found along watercourses.

NATIVE FAUNA

Information about the fauna of the region is available from Butler (1975), Christensen *et al.* (1977, 1985, n.d.), W.A. Museum (1978), Crook (1981), Crook and Evans (1981), Dell (1983), Forests Department (1977,1981), Kimber *et al.* (1983), Moore *et al.* (1985,1986), Nichols *et al.* (1980,1986), Wallace and Moore (1985), Worsley Alumina Pty Ltd (1985).

Based on the above, common vertebrate species in various vegetation types are as follows:

Jarrah forest

Western grey kangaroo (*Macropus fuliginosus*), western brush wallaby (*Macropus irma*), southern brown bandicoot (*Isodon obesulus*), mardo (*Antechinus flavipes*), dugite (*Pseudo-naja affinis affinis*), black tiger snake (*Notechis ater occidentalis*), silvereve (*Zosterops lateralis*), scarlet robin (*Petroica multicolor*), grey fantail (*Rhipidura fuliginosa*), white tailed black cockatoo (*Calyptorhynchus baudinii*), Carnaby's cockatoo (*Calyptorhynchus latirostris*), tawny frogmouth (*Podargus strigoides*).

Wandoo woodland

Western grey kangaroo, western brush wallaby, common brush-tail possum (*Trichosurus vulpecula*), southern brown bandicoot, mardo, dugite, emu, purple crowned lorikeet, western rosella, Port Lincoln ringneck (*Bamardius zonarius*), golden whistler (*Pachycephala pectoralis*), grey fantail, red wattlebird, (*Anthochaera carunculata*), brown goshawk (*Accipiter fasciatus*), wedge tailed eagle (*Aquila audax*).

Coastal plain

(tuart, peppermint, banksia, swamps) Western grey kangaroo, southern brown bandicoot, western brush wallaby, dugite, emu, purple crowned lorikeet, Port Lincoln ringneck, scarlet robin, golden

Whistler, grey fantail, red wattlebird, New Holland honeyeater, silvereeye, Australian raven (*Corvus coronoides*), silver gull (*Larus novaehollandiae*).

Wetlands and Estuaries

Water rat (*Hydromys chrysogaster*), white faced heron (*Ardea novaehollandiae*), Australian pelican (*Pelicanus conspicillatus*), black swan (*Cygnus atratus*), Pacific black duck (*Anas supercifiosa*), maned duck (*Chenonetta jubata*), eurasian coot (*Fulica atra*), darter (*Anhinga melanogaster*), silver gull, whistling kite.

Social and Economic Resources

HISTORY AND LAND USE

Aborigines

Aborigines occupied the area during at least the past 40 000 years. Further details are provided later in the plan.

Exploration

European exploration of the coastline dates from the early 1600's (Houtman 1619). Terrestrial exploration dates from 1829 when Perth was settled.

Agriculture

The dates of first European settlement at various locations within the region are believed to have been as follows: Pinjarra 1830, Kelmscott 1831, York 1831, Toodyay 1833, Northam 1833, Chittering Valley 1841, Brookton 1846, Wandering 1859, Boddington 1862, Jarrahdale 1871, Dwellingup 1911.

The early settlers used the more fertile soils near Perth and Pinjarra for intensive mixed farming and grew crops such as wheat, barley and potatoes. Extensive mixed farming was practised in the Northam-York area with grain, sheep and/or cattle.

Currently, the main farming activities are sheep and cereal grains along the eastern fringe of the region, with sheep relatively more important in higher rainfall areas closer to the coast. On the coastal plain south of Perth, dairy cattle, vegetables and beef cattle are important and north of Perth beef farming predominates, with horticulture important close to Perth. On the Darling Plateau, orchards, vineyards and poultry farms are common close to Perth and beef and sheep farming more important further out.

Water production

Water production from this region began with the construction of Victoria Reservoir in 1890. This was followed over the next 30 years by the construction of Mundaring Weir, Bickley Reservoir, Churchman Dam and pipeheads on the Canning and Wungong Brooks. Dams were constructed on the Serpentine and Dandalup Rivers during the 1960s and 1970s. These developments effectively cover almost the entire northern forest with catchments supplying drinking water. This resource is critical to Perth's survival and growth and hence has a high priority in the Department's management of forests in the region.

Timber production

The first sawmills in the region operated in the hills near Perth. There were sawmills at Jarrahdale in 1871, Kelmscott and Roleystone in 1872, Canning Mills 1874, Sawyers Valley in 1883 and at Pickering Brook and Karragullen in 1892. The first State forest in the region was dedicated south of Mundaring in 1924. By 1930 much of the current area of State forest was dedicated.

Until about 1970, virtually all of State forest was available for timber production. Since then, increasing areas have been allocated to other uses.

Mining

The first mine in the State was at Mundijong where lead ore was mined sporadically from 1846. The first production of iron ore in the State was from a mine at Clackline in 1899. Iron ore has also been mined at Wundowie. Several shafts were sunk for gold along the Darling Scarp prior to 1900 with minimal success but some gold has been obtained from near Chittering and Jimperding Hill. Recent exploration resulted in a new gold mine near Boddington. Large amounts of basic raw materials, such as limestone, gravel, sand, diatomaceous earth, rock, clay and some peat, are extracted for use in the metropolitan area. A number of exploratory oil wells have been drilled in the Perth Basin. The most important mineral in the region is bauxite which has been mined at Jarrahdale since 1959 for supply to the refinery at Kwinana. Bauxite has also been mined at Del Park since 1971 and Huntly since 1976 and refined at Pinjarra. Mineral sand mining commenced north of Waroona in 1985.

Conservation and Recreation

The first reserve for the conservation of flora and fauna in the region was the North Dandalup-Pinjarra Reserve of 64 000 ha gazetted in 1894. In 1897 however, the area was reduced and the remainder set aside in 1911 for timber production (Government requirements). Most of the area was subsequently incorporated into State forest in 1926. The original national park in the State is 'John Forrest' which was declared in 1895. Yanchep National Park was established in 1905. Forests Department General Working Plan No. 85 of 1972 formally set aside State forest areas for conservation and recreation.

LOCAL GOVERNMENT AND POPULATION

The region includes all of eight local authorities (Chittering, Toodyay, Northam Town, Northam Shire, York, Mundaring, Mandurah, Murray) and parts of 14 local authorities (Gingin, Wanneroo, Swan, Kalamunda, Gosnells, Armadale, Serpentine-Jarrahdale, Beverley, Brookton, Wandering, Williams, Boddington, Waroona and Harvey), as shown in Map 5.

Based on the 1986 census (Australian Bureau of Statistics 1987) the population of the region at that time was about 250 000. About 80 per cent of this population is in that part of the metropolitan area within the regional boundary. A further 800 000 people within the CALM Metropolitan Region are within half an hour's drive of some part of the Northern Forest Region.

The larger towns within the region (outside urban Perth) and their populations as at 30 June 1981 were as follows: (Australian Bureau of Statistics 1982)

Mandurah	10978
Northam	6791
Pinjarra	1336
York	1136
North Pinjarra	1128

Land Tenure in the Region

AREA STATEMENT

Table 6 summarises land tenure in the region as at 1 January 1987.

CALM ESTATE

Map 6 shows the current extent of CALM land.

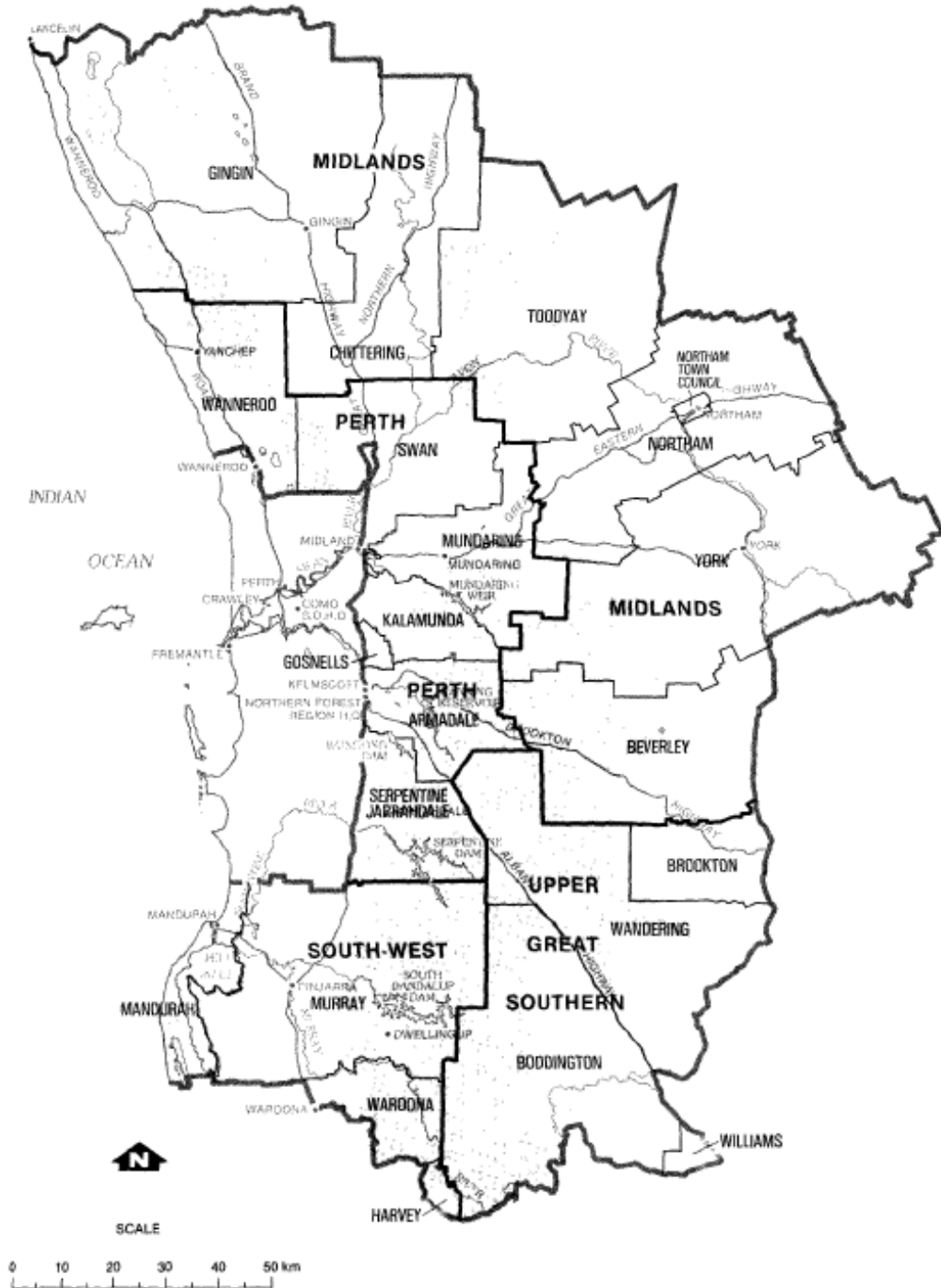
TABLE 6
LAND TENURE STATEMENT FOR THE NORTHERN FOREST REGION
AS AT 1 JANUARY 1987

	Area (ha)	%
CALM LAND		
- vested		
- State forest	565580	
- CALM Act timber reserve	21060	
- National parks	33820	
- Nature reserves	15480	
- Other reserves	5650	
- owned		
- Executive Director	3550	
	Sub Total	645140
		33%
UNVESTED LAND		
- Land Act timber reserves	13400	
- National parks	10	
- Nature reserves	1130	
- Other reserves	11380	
- Vacant Crown land	68100	
	Sub Total	94000
		5%
OTHER GOVT. LAND (a)		
- Land Act timber reserves	270	
- National parks	140	
- Nature reserves	530	
- Other reserves (b)	96960	
	Sub Total	97900
		5%
PRIVATE PROPERTY	1135700	57%
	TOTAL (c)	1972760
		100%

Note: (a) Other Government land includes Commonwealth, State and local government land.
(b) Townsites are included under 'other reserves'.
(c) Excludes State territorial waters.

NORTHERN FOREST REGION
LOCAL GOVERNMENT BOUNDARIES

- KEY
- LOCAL GOVERNMENT BOUNDARIES
 - STATISTICAL DIVISION BOUNDARIES
 - C.A.L.M. ESTATE



MAP 5

PART 3. LAND USE CLASSIFICATION AND MANAGEMENT

LAND USE PROPOSALS

Present Land Use in the Region

The present land use plan for the region derives from the former Forests Department's General Working Plan No 87 for State forests and timber reserves, and from management plans prepared by the former National Parks Authority and Department of Fisheries and Wildlife.

A number of changes to the previous plans are proposed in this regional plan. These changes will allow the introduction of proposed new categories, will improve the security of purpose for many areas and will change the name and vesting of other areas to better reflect the purpose for which they are managed.

Changes in Tenure, Vesting or Purpose

In accordance with the changes to the system of land vesting, tenure and purpose described in Part 2 of this plan, and subject to Parliamentary agreement, a number of changes are proposed to areas of land managed by CALM. These are shown in Table 7 and Map 7.

The changes derive from the following sources:

Conservation reserve proposals. Relates to recommendations by the Conservation Through Reserves Committee (CTRC) and the System 6 Committee as reviewed by the EPA (reports: 1975, 1976, 1980, 1983).

Land proposed for State forest or timber reserve (CALM Act). Involves areas still under consideration by the Department of Land Administration.

Unvested nature reserves are being considered for vesting in the NPNCA.

Changes proposed by CALM in this management plan.

Map 8 shows the CALM estate proposed by this plan.

Although the majority of the areas which are proposed for reservation already have been designated in one form or another as conservation or recreation reserves, some are subject to existing mineral leases and others may contain mineral resources. It is proposed that these mineral claims be progressively evaluated by an appropriately constituted committee. The Reserves Review Committee will continue to progressively evaluate areas within the EPA System 6 area.

All proposals to change land tenure or to reserve vacant Crown land will be referred to the Lands and Forest Commission and the National Parks and Nature Conservation Authority, and will be subject to the normal review processes by the Department of Land Administration. This will involve consultation with affected government and local government authorities. Furthermore, it will be necessary for both Houses of Parliament to agree to any changes involving A class Reserves or State forest.

The boundaries of the proposed parks and reserves and additional State forest areas shown on Map 8 are not final and may be adjusted during the consultation and legislative processes described above. In addition, boundary modifications maybe recommended in future area management plans.

Details of Proposed Major Changes

All proposed changes in tenure, vesting or purpose are listed in Table 7.

The most important or significant proposals are:

NEW OR EXPANDED NATURE RESERVES

It is proposed to vest a number of unvested nature reserves, other reserves and vacant Crown land as nature reserves with the NPNCA.

Three areas of State forest (the Melaleuca, Caraban and Wabbling management priority areas for flora, fauna and landscape) will be converted to nature reserve vested in the NPNCA.

Moore River National Park will be reclassified as nature reserve and expanded by the addition of a large tract of adjoining Vacant Crown Land. This more accurately reflects the purpose of the area.

NEW OR EXPANDED NATIONAL PARKS

Yanchep National Park will be enlarged by the addition of two areas of adjoining State forest, including the Ridges management priority area.

Avon Valley National Park will be enlarged by incorporating into it the adjoining vacant Crown land, nature reserves and a large timber reserve.

Yalgorup National Park will be enlarged by incorporation into it of an area of freehold land held in the name of the Executive Director, as well as the adjacent Clifton, McLarty and Myalup management priority areas (which are in the Central Forest Region).

Serpentine National Park will be enlarged by the addition of Gooralong and Serpentine reserves, Karnet nature reserve and one other reserve.

CONSERVATION PARKS

Nine new conservation parks will be formed by conversion of areas of State forest - e.g., Boyagarring, Duncan, Gyngoorda, Julimar, Lake Leschenaultia, Lupton, Marradong, Wandering.

A 'Wandoo Conservation Park' will be formed by incorporation of the Gunapin, Russell and Sullivan MPAs, the Dobaderry Nature Reserve and adjoining vacant Crown land.

The Dale, Monadnocks and Lane Poole Reserves will become conservation parks.

Several small national parks will be reclassified as conservation parks, including Burkinshaw Road, Gooseberry Hill, Greenmount, Kalamunda, Lesmurdie Falls and Neerabup.

Origin of Conservation and Recreation Priority Areas in State Origin Forest

All of the conservation and recreation priority areas set aside in State forest by the Forests Department in its General Working Plans 86 and 87 (Appendices 3 and 4, and Map 8 from GWP 87) are proposed for reclassification in this plan, either to nature reserve, national park or conservation park.

The reserve system developed by the Forests Department was based on the objectives of

- (i) setting aside representative ecosystems in all the main forest types, and
- (ii) ensuring that recreational demands in the forest could be met in the long term.

The reserve system was reviewed and endorsed by the Environmental Protection Authority in its land use studies of Systems 1, 2, 4 and 6 published in the period 1975-1983.

TABLE 7
PROPOSED CHANGES IN TENURE, VESTING AND PURPOSE IN
THE NORTHERN FOREST REGION

ID No.	Area Name(a)	Current Classification (d)	Proposed Classification
DWELLINGUP DISTRICT			
1	Burnside	NR unvested	NR vested in NPNCA
2-6	Goegrup Lakes	other reserve	NR vested in NPNCA
7	(Meelon)	NR unvested	NR vested in NPNCA
8	(Marraru)(e)	NR unvested	NR vested in NPNCA
9-13	(North Dandalup)	other reserve	NR vested in NPNCA
14	Duncan	State forest	conservation park
15	Duncan	VCL	conservation park
16	Gyngoorda	State forest	conservation park
17-21	Lane Poole Reserve	5g reserve	conservation park
22	Lane Poole Reserve	Executive Dir.	conservation park
23-25	Lane Poole Reserve	5g reserve	conservation park
26	Marradong	State forest	conservation park
27	Wandering	other reserve	conservation park
28-31	Wandering	timber reserve	conservation park
32	Yalgorup	Executive Dir.	national park
JARRAHDALÉ DISTRICT			
33	(Karnet)	NR unvested	national park
34	Araluen-Canning	other reserve	conservation park
35	Boyagarring	VCL	conservation park
36	Gooralong	5g reserve	national park
37-38	Lupton	other reserve	conservation park
39	Monadnocks	5g reserve	conservation park
40	Serpentine	5g reserve	national park
41	(Serpentine)	other reserve	national park
43-44	Strange Rd	NR unvested	NR vested in NPNCA

MUNDARING DISTRICT

45	(Beechina North)	NR unvested	NR vested in NPNCA
46	(Burkinshaw Rd)	national park	conservation park
47	(Bullsbrook)	other reserve	NR vested in NPNCA
48-49	(Clackline)	NR unvested	NR vested in NPNCA
50	(Clackline)	VCL	NR vested in NPNCA
51	(Hoddy Well)	NR unvested	NR vested in NPNCA
52-53	Lesmurdie Falls	national park	conservation park
54-55	(Nanamoolan)	NR unvested	NR vested in NPNCA
56	(Parkerville)	NR unvested	NR vested in NPNCA
57-59	(Wandoo CP)(b)	VCL	conservation park
60	(Wooroloo)	other reserve	NR vested in NPNCA
61-64	(Wundowie)	other reserve	NR vested in NPNCA
65	Dale	5g reserve	conservation park
66	Dale	Executive Dir.	conservation park
67-69	Dobaderry(b)	nature reserve	conservation park
70	Gooseberry Hill	national park	conservation park
71	Greenmount	national park	conservation park
72	Gunapin(b)	State forest	conservation park
73-76	Julimar	other reserve	conservation park
77-80	Julimar	State forest	conservation park
81	Kalamunda	national park	conservation park
82	(L. Leschenaultia)	State forest	conservation park
83	Lesmurdie Falls	national park	conservation park
84	Moondyne (c)	VCL	national park
85-90	(Mundaring)	other reserve	conservation park
91	(Mundaring)	State forest	conservation park
92-93	(Mundaring)	other reserve	conservation park
94-95	Russell(b)	State forest	conservation park
96	Sullivan(b)	State forest	conservation park
97	(Toodyay) (c)	timber reserve	national park
127	Moondyne	NR (NPNCA)	national park
128	Morangup	NR (NPNCA)	national park
129	Julimar	other reserve	conservation park

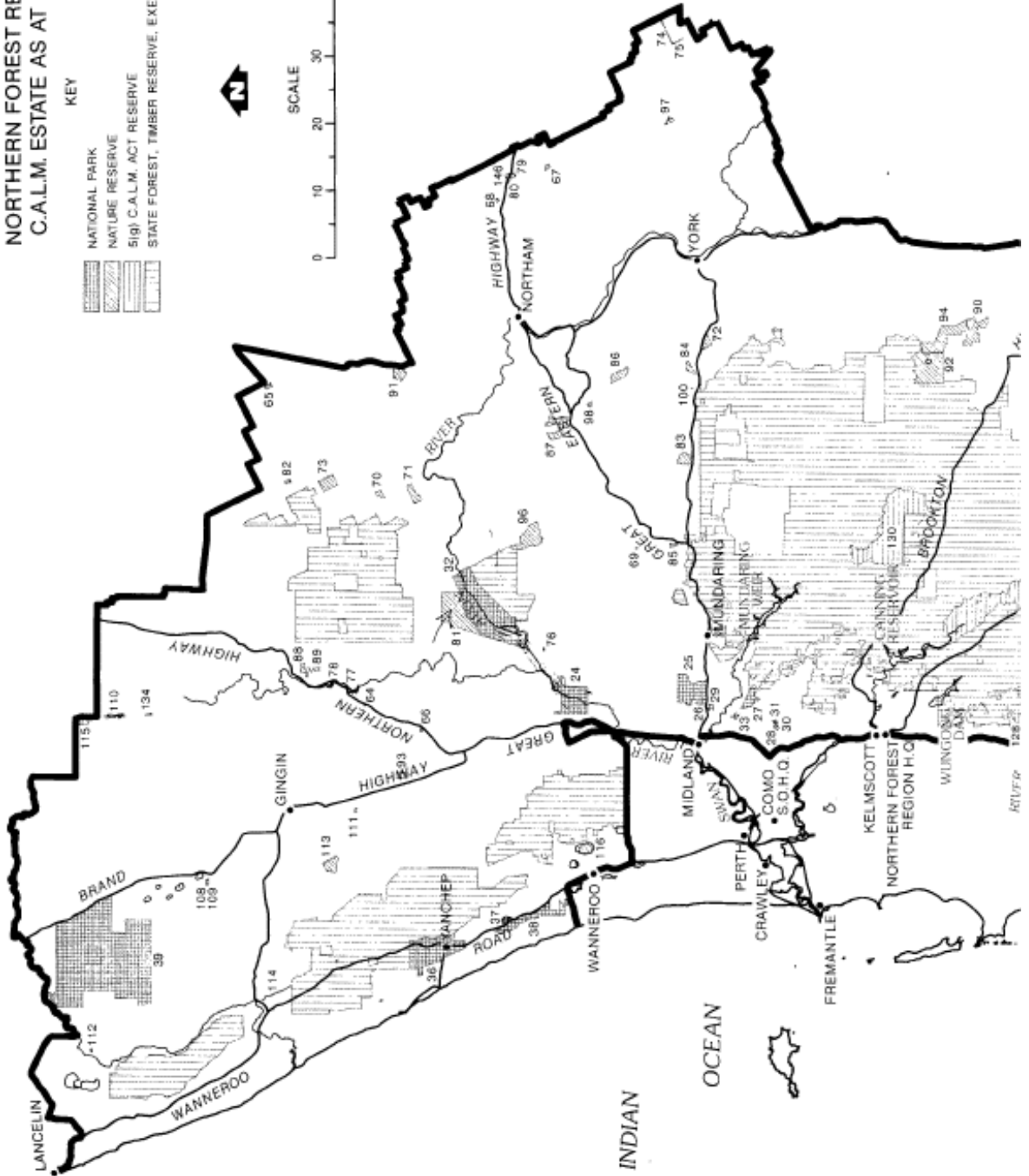
WANNEROO DISTRICT

98-101	(Gingin-Boonanarring)	VCL	NR vested in NPNCA
102	Neerabup	national park	conservation park
104	(Yeal Swamp)	VCL	NR vested in NPNCA
105-107	Bampanup	NR unvested	NR vested in NPNCA
108-110	Caraban	State forest	NR vested in NPNCA
iii	(Caraban)	state forest	NR vested in NPNCA
112	(L. Muckenburra)	other reserve	NR vested in NPNCA
113	Melaleuca Park	State forest	NR vested in NPNCA
114-117	(Moore River)	VCL	NR vested in NPNCA
118	Moore River	national park	NR vested in NPNCA
119	Neerabup	national park	conservation park
120	(Pinjar)	VCL	State forest
121	Ridges	State forest	national park
122	(Ridges)	State forest	national park
123-125	Wabling	State forest	NR vested in NPNCA
126	Yanchep	State forest	NR vested in NPNCA
130-131	(Mogumber)	Executive Dir.	NR vested in NPNCA

- Note:
- CP conservation park
 - MPA management priority area
 - NR nature reserve
 - VCL vacant Crown land
 - 5g reserve under Section 5g of CALM Act.
 - (a) Names in brackets are unofficial.
 - (b) Wandoo conservation park incorporates Gunapin, Russell and Sullivan MPAs, Dobaderry nature reserve and VCL.
 - (c) The possibility of linking Avon Valley and Walyunga national parks will be investigated during the period of this plan.
 - (d) Executive Dir. is land held freehold in the name of the Executive Director.
 - (e) Since this plan was drawn up Marraru nature reserve has been vested in the NPNCA.

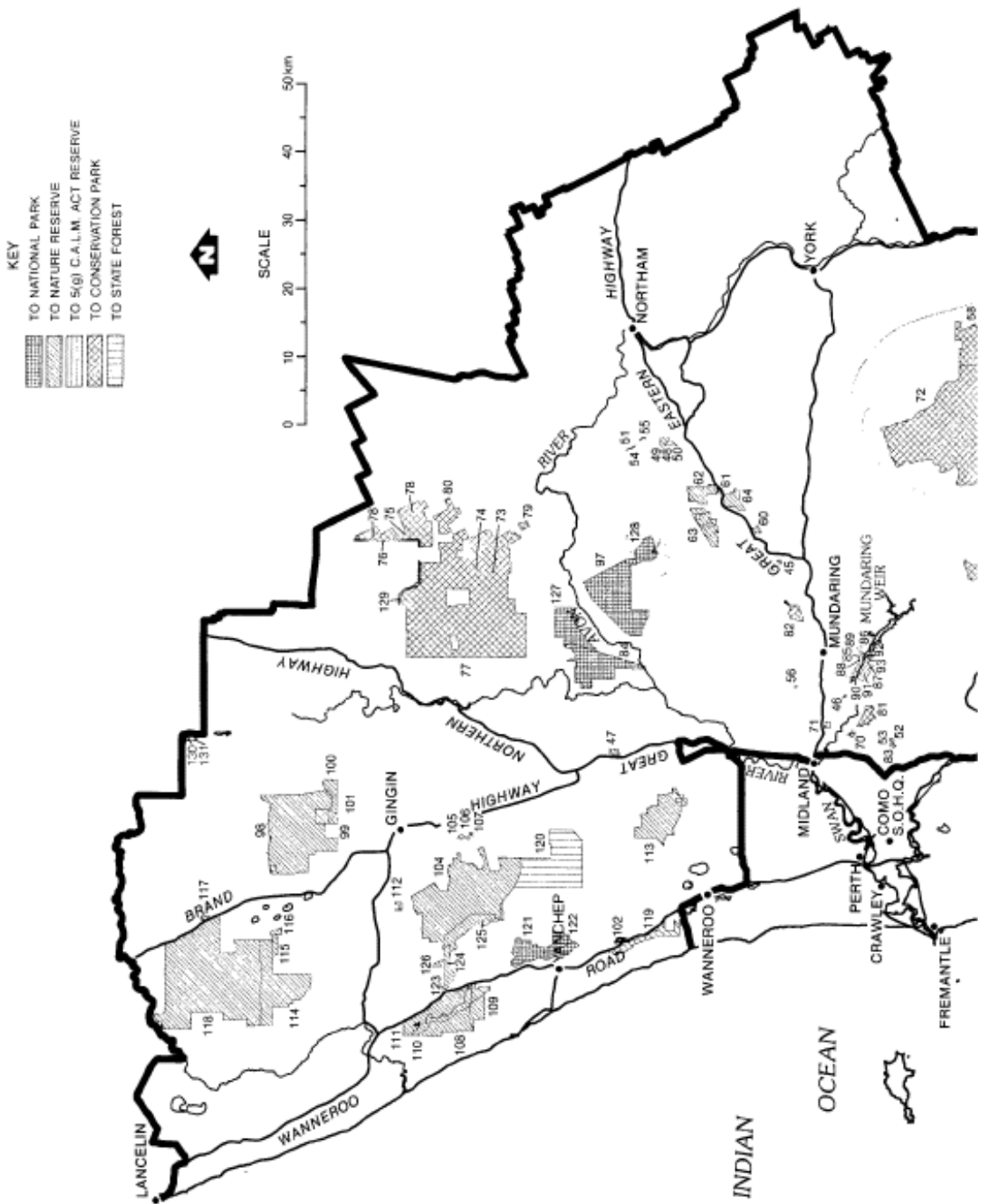
**NORTHERN FOREST REGION
C.A.L.M. ESTATE AS AT 1987**

- KEY**
- NATIONAL PARK
 - NATURE RESERVE
 - 5(1) C.A.L.M. ACT RESERVE
 - STATE FOREST, TIMBER RESERVE, EXECUTIVE DIRECTOR LAND

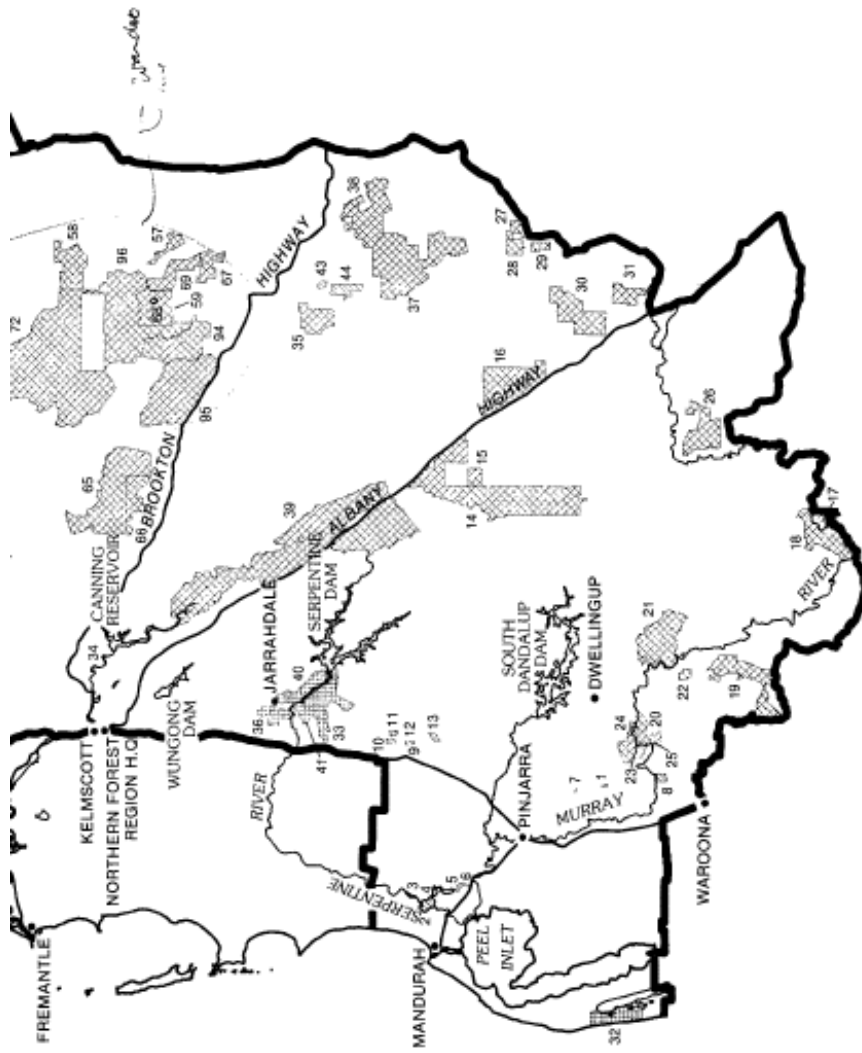


MAP 6

NORTHERN FOREST REGION
 PROPOSED CHANGES IN TENURE VESTING OR PURPOSE



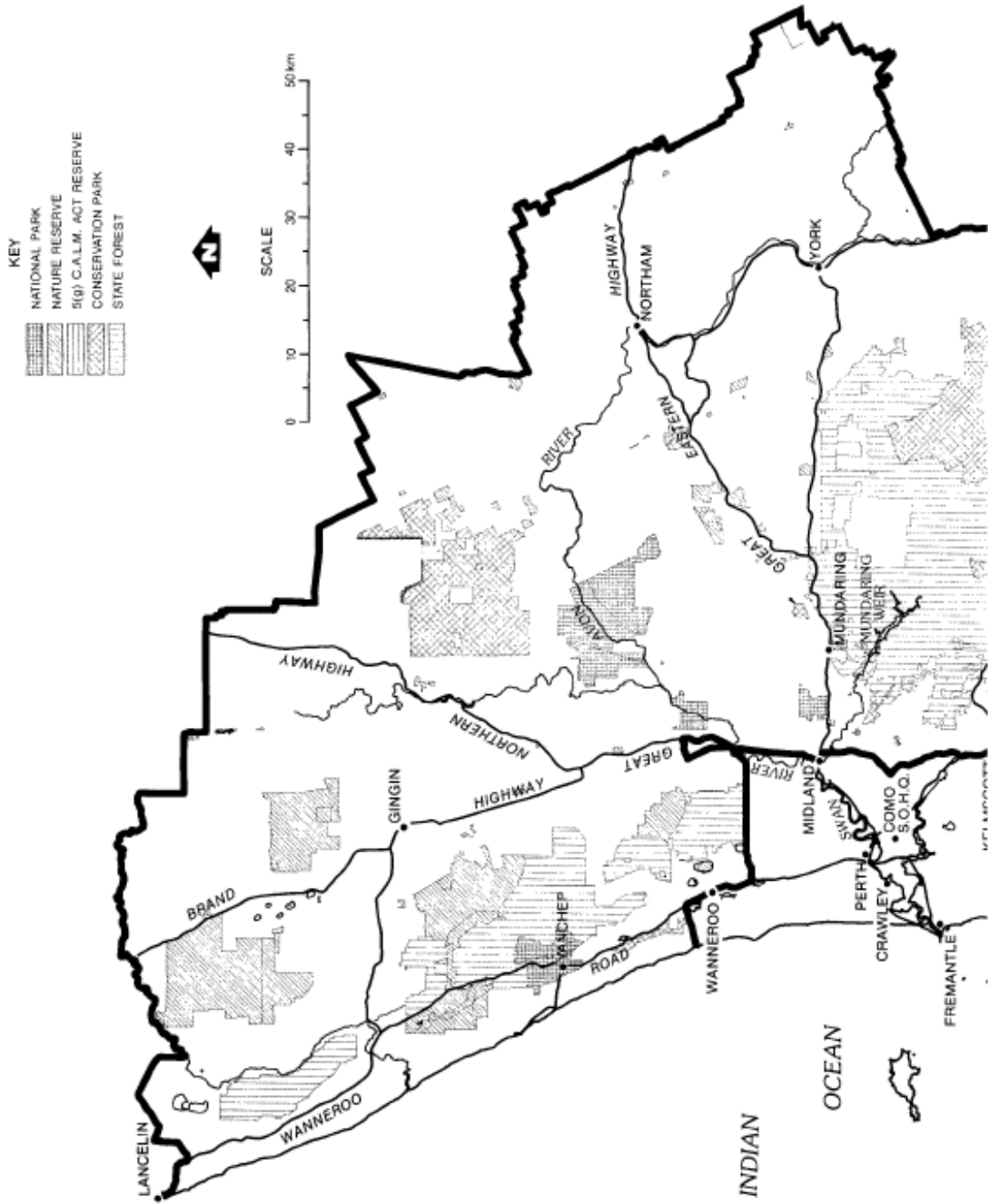
MAP 7



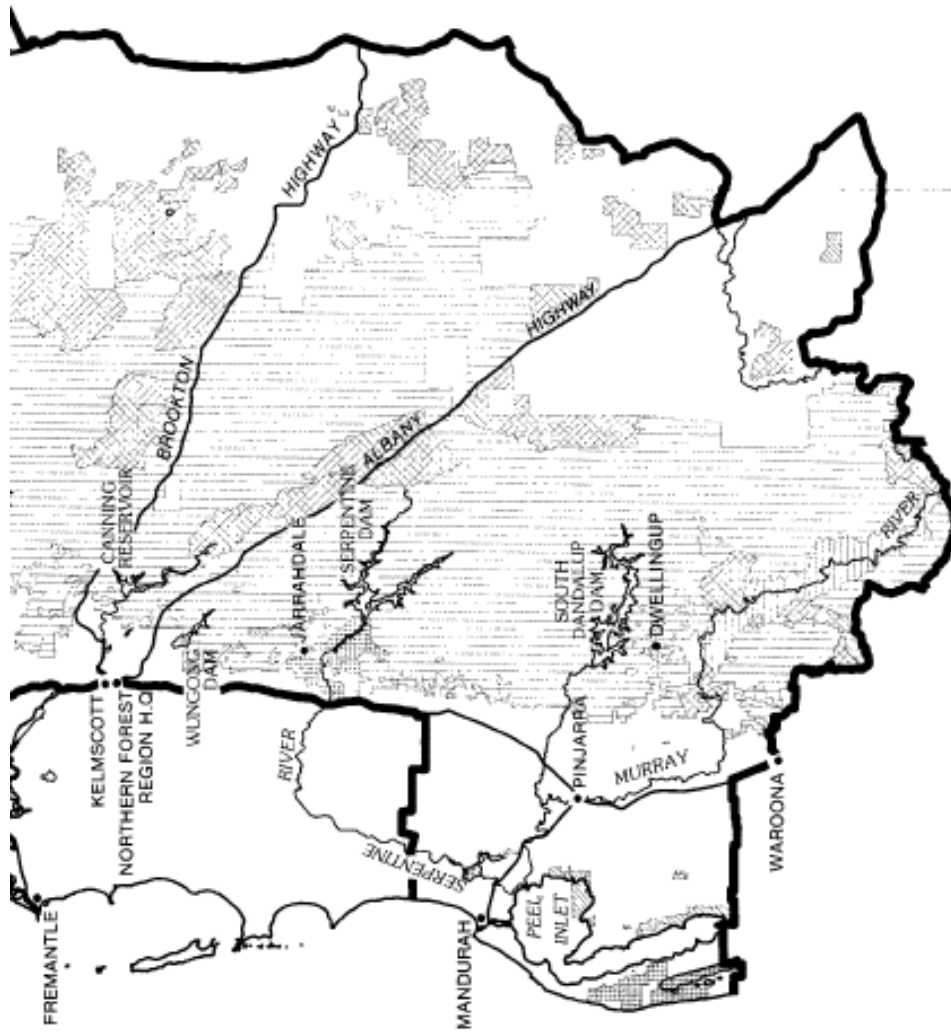
MAP 7

MAP 7

NORTHERN FOREST REGION
 C.A.L.M. ESTATE AS PROPOSED BY THIS PLAN



MAP 8



MAP 8

Fate of Conservation and Recreation Priority Areas in State Forest

The Forest Department's General Working Plan 87 (Appendix 3) listed 64 flora, fauna and landscape MPAs. These fall within the Northern Forest, Central Forest and Southern Forest regions of CALM.

It is proposed that these areas be reclassified as follows:

16 will become national parks

14 will become nature reserves

34 will become conservation parks

General Working Plan 87 (Appendix 4) listed 7 recreation MPAs in State forest.

It is proposed that these be reclassified as follows:

2 will become national parks

5 will become conservation parks

The Department will in time produce 'area management plans' for each of these areas.

Zoning of State Forest, Parks and Reserves

In addition to the proposed allocation of lands to the categories of nature reserve, marine park, national park, conservation park or State forest areas may further be zoned to give priority to certain land uses in selected areas.

Areas maybe zoned to emphasise conservation, protection, recreation or production. This process will be developed in detailed management plans for specific areas.

Apart from the Lane Poole Reserve where zoning was determined at the time of creation, no management priority zones have yet been allocated for national park, nature reserve or conservation park. The zoning system for these areas will be determined later when their management plans are developed. At this time, pending changes to the CALM Act to permit this to be done, the possibility of giving zones A class security of purpose will be considered.

RESOURCES, ISSUES AND STRATEGIES

The topics covered are:

- Land Dedication and Acquisition
- Conservation of Flora, Fauna and Landscape
- Cultural Areas
- Protection
- Recreation
- Public Participation and Liaison
- Production
- Public Utilities

The format is:

- Background information on resources and issues.
- Regional strategies, which add some specific details to the Departmental policy guidelines presented in Appendix 2.

Regional strategies are not ranked in order of priority. This is partly because it is intended that all strategies listed will eventually be implemented. But it also reflects the absence of a policy on ranking priorities on resource allocation within CALM. It is intended that such a policy be developed during the period of this plan.

Land Dedication and Acquisition

The classes of land controlled under the CALM Act are described in Part I of this plan, and areas within the region listed in Table 6. CALM also manages some unvested land (proposed for CALM Act tenure) as shown in Map 7. Some CALM land is leased for grazing or other purposes under historical agreements. There are currently some 100 CALM Act leases covering about 2 100 ha in the region.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 & 2), during the period of this plan CALM staff in the region will:

- (i) monitor the availability of private land advertised for sale and if high priority for acquisition, seek funds for the purchase of land;
- (ii) oppose grazing or other leases which do not benefit the designated land use;
- (iii) support EPA (CTRC) reserve recommendations and other proposals or additions to CALM tenure, subject to the provision of adequate funds and staff for management;
- (iv) prepare a program for the orderly implementation of these recommendations.

Conservation of Flora, Fauna and Landscape

Conservation is defined as

... the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus, conservation is positive, embracing preservation, maintenance, sustainable utilization, restoration and enhancement of the natural environment. Living resource conservation is specifically concerned with plants, animals and microorganisms, and with those non-living elements of the environment on which they depend. Living resources have two important properties the combination of which distinguishes them from non-living resources: they are renewable if conserved; and they are destructible if not. (IUCN, 1980 in Dept. of Conservation and Environment, 1987).

CALM manages 700 000 ha of land in the region, of which 242 000 ha or 35 per cent has a nature conservation priority. The question of whether this area was adequate was examined by the Conservation Through Reserves Committee (CTRC) (for System 4) and the System 6 Committee. This culminated in the release of the EPA's 'Systems red books' in 1975-83. Numerous recommendations were made to improve the reserve system. Some of these recommendations have been implemented, but many have yet to be acted upon. A comparison between the EPA, Forests Department and CALM recommendations for these areas is provided in Appendix 3.

Security of purpose of conservation reserves, particularly those that do not have an 'A' classification, is a major issue. Greater security of purpose for State forest nature conservation priority areas can be provided by making them 'A' class reserves vested in the NPNCA. This is proposed in this plan.

LANDSCAPE

Land management can result in substantial changes to the landscape. Undesirable visual effects can be avoided or minimised through understanding and application of landscape management principles.

Attractive landscape features of the region include:

Darling escarpment; river valleys, e.g. Avon, Murray, Helena;
Darling Ranges;
lakes, e.g. Loch McNess;
mountains, e.g. Mt Cooke;
jarrah forest;
tuart woodland;
wandoo woodland;
coastal plain;
beaches.

Factors which may have a deleterious effect on landscapes include:

insect attack and fungal disease;
logging;
mining;
prescribed burning;
wildfires;
public utilities.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) classify landscape features on CALM lands in the region according to the Departmental system;
- (ii) research public perceptions of visual resources;
- (iii) develop and implement strategies for the management of visual resources for all landscape features in the region;

- (iv) Liaise with private landholders and other land management agencies concerning management practices on their lands. Assist them in planning for minimisation of deleterious visual impact of their operations.

FLORA AND FAUNA

The Department is responsible for flora and fauna on CALM land and for the protection of native flora and fauna throughout the State under the Wildlife Conservation Act. The latter Act gives the Department responsibilities on private property as well as on Crown land. Liaison is required with private landholders and other land management agencies to inform them of their obligations and offer advice and assistance on matters of conservation.

A major aim of management in areas whose primary function is wildlife conservation is to maximise diversity and species richness. In some reserves, management is directed to providing habitat for particular species or communities. Such reserves in the Northern Forest Region will be progressively defined by CALM scientific staff.

In lands managed by the Department where wildlife conservation is not the primary purpose, management practices will aim to maximise wildlife values, as far as this is consistent with the primary land use.

Knowledge of the existence and distribution of the thousands of native flora and fauna species in the region is considerable but not complete. High priority is given to investigating and protecting endangered species and their habitat.

Eighteen plant species known to occur in the region are currently (November 1987) gazetted as rare or in need of special protection (Table 8A). During the life of this plan, the list will be revised from time to time.

There are thirteen species of rare vertebrates known to occur within the region (Table 8B). Although they once occurred in the region, there are now no known colonies of woylies (*Bettongia penicillata*), or tammars (*Macropus eugenii*).

Harvesting, hunting or culling of local native species, particularly kangaroos, ducks, parrots and wildflowers, is another issue. Some fauna species have been favoured by land clearing and development and have become agricultural pests. Other species have been harvested commercially or hunted for decades.

TABLE 8A
GAZETTED RARE FLORA SPECIES KNOWN TO OCCUR WITHIN
THE NORTHERN FOREST REGION AS AT NOVEMBER 1987

<i>Acacia aphylla</i>	
<i>Caladenia gemmata</i> var. <i>ixioides</i>	
<i>Caladenia integra</i>	
<i>Caladenia</i> sp. (jarrah forest)	S.D. Hopper 3990
<i>Diuris purdiei</i>	
<i>Drakea jeanensis</i>	
<i>Drakea</i> sp. (south-west)	S.D. Hopper 3566
<i>Drosera occidentalis</i>	
<i>Eucalyptus</i> sp. (eastern forest)	M.I.H. Brooker 9046
<i>Eucalyptus</i> sp. (Yanchep)	M.I.H. Brooker 8608
<i>Hydrocotyle lemnoides</i>	
<i>Leschenaultia laricina</i>	
<i>Leschenaultia pulvinaris</i>	
<i>Thelymitra stellata</i>	
<i>Thomasia</i> sp. (York)	A.S. George 8075
<i>Urocarpus grandiflorus</i>	
<i>Urocarpus niveus</i>	
<i>Wurmbea druminondii</i>	

TABLE 8B
GAZETTED RARE FAUNA SPECIES KNOWN TO OCCUR WITHIN THE
NORTHERN FOREST REGION OR ADJOINING WATERS AS AT
MARCH 1987

Common name	Scientific name
Blue whale	<i>Balaenoptera musculus</i>
Dell's skink	<i>Clenotus delli</i>
Western quoll or chuditch	<i>Dasyurus geoffroii</i>
Red-eared fire-tail finch	<i>Emblenta oculatum</i>
Southern right whale	<i>Eubalaena australis</i>
Peregrine falcon	<i>Falco peregrinus</i>
Crested shrike-tit	<i>Falcunculus frontatus</i>
Lined burrowing skink	<i>Lerista lineata</i>
Humpback whale	<i>Megaptera novaeangliae</i>
Numbat	<i>Myrmecobius fasciatus</i>
Carpet snake	<i>Python spilotos</i>
Freckled duck	<i>Stictonetta naevosa</i>
Black striped snake	<i>Vermicella calonotus</i>

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) continue research to gather data on ecosystems that occur within the region;
- (ii) develop prescriptions for management of conservation reserves in the region, to maximise wildlife (flora and fauna) diversity and to maintain representative habitats;
- (iii) maintain close liaison with landholders, other agencies and the public regarding their responsibilities under the Wildlife Conservation Act and Regulations;
- (iv) continually review the adequacy of lands reserved for conservation in the region in the light of the System 6 recommendations (Department of Conservation and Environment 1983) and new data on conservation requirements;
- (v) continue surveys to record the distribution and abundance of rare and threatened species, on CALM and other lands;
- (vi) assist research staff to develop and implement strategies for rare species to ensure the survival and expansion of populations;
- (vii) monitor populations of rare species;
- (viii) continue to implement the Department's Kangaroo Management Program.

WETLANDS AND ESTUARIES

Wetlands occur as lakes, swamps, rivers, reservoirs and estuaries. Many of the wetlands in the region occur on the Swan Coastal Plain.

Major wetland areas managed by CALM within the region are listed in Table 9.

Wetlands are threatened by pollution from runoff water, spread of weeds, recreational use, clearing and water extraction.

Water use from the Gngara Mound will alter water levels in adjacent wetlands and lower slopes, and have effects on flora and fauna, as discussed in the recently released ERMP (Dames and Moore 1986).

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) oppose the degradation or alienation of wetlands on CALM land;
- (ii) take an inventory of the wetland resource (CALM land and other) in the region. Identify key values for each wetland;
- (iii) rehabilitate degraded wetlands as resources allow, and consider the creation of new wetlands where appropriate, e.g. after mining;
- (iv) liaise with private landholders and other agencies, e.g. Department of Agriculture, WAWA, Waterways Commission, local government, to promote wetland conservation;
- (v) monitor the condition of wetlands.

MARINE CONSERVATION

There are currently no marine reserves under CALM management in the region, but the conservation of marine mammals and seabirds is the responsibility of CALM under the Wildlife Conservation Act.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2) during the period of this plan CALM staff in the region will:

- (i) evaluate possible marine reserves;
- (ii) protect and assist marine fauna, e.g. stranded whales, seals.

TABLE 9
MAJOR WETLANDS MANAGED BY CALM IN THE NORTHERN
FOREST REGION

LAKES AND SWAMPS	TENURE
Loch McNess	national park
Yonderup Lake	" "
Wilgarup Lake	" "
Lake Bambum, Lake Nambung	nature reserve
Lake Mungala	" "
Lake Chittering	" "
Lake Chandala	" "
Lake Nowergup	" "
Lake Wannamal	" "
Jandabup Lake	" "
Dobaderry Swamp	" "
Yeal Swamp	" "
Darkin Swamp	State forest
Melaleuca Park	" "
RIVERS (PARTS OF)	
Serpentine River	national park (& State forest)
Avon River	" "
Helena River	State forest
Canning River	" "
Serpentine River	" "
North & South Dandalup River	" "
Murray River	" "
ESTUARIES ETC.	
Peel Inlet	nature reserve
Harvey Estuary	" "

Cultural Areas

Areas of cultural importance occur within all CALM lands. Historic and Aboriginal sites are scattered throughout, while limestone caves on CALM land in this region are confined to Yanchep National Park.

ABORIGINAL SITES

Aboriginal people occupied the region for 40 000 years or more and many important sites have been identified. These sites are most plentiful on the Swan Coastal Plain. All Aboriginal sites are protected by the Aboriginal Heritage Act.

Records of Aboriginal sites are not held by CALM but by the W.A. Museum.

Jarvis (1979) refers to a number of sites in the region, at the following locations:

Avon River in Walyunga National Park (Pearce 1977);
Frieze and Dales Caves near York (Hallam 1979);
Orchestra Shell Cave near Wanneroo (Hallam 1979);
Wandering (McCarthy 1970);
Serpentine.

Reference to a number of sites is made in the Draft Lane Poole Reserve management plan (Nichols et al. 1986) and also in the ERMP for Toodyay Quarry (Kinhill Stearns 1984).

Aboriginal site locations must be confidential as they can be threatened by over-visitation and vandalism. CALM operations need to be carefully planned to avoid disturbance to Aboriginal sites.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) collate existing information on Aboriginal sites and ensure that sites are known by the Registrar of Aboriginal Sites at the W.A. Museum. Seek to maintain a confidential register in the Regional Office and each district;
- (ii) train staff in the recognition of Aboriginal sites and update registers when new sites are found;
- (iii) develop and implement management guidelines for Aboriginal sites in liaison with the W.A. Museum, tertiary institutions and Aboriginal organisations;

HISTORIC SITES

There are numerous sites of historic interest and value on CALM land in the region. These range from old homesteads, stockyards, wells and examples of early fencing to the intricate stonework carried out by sustenance workers during the depression in Yanchep and John Forrest National Parks.

There is no detailed set of records of historic sites in this region, but this will be developed as information becomes available.

The location of some old townsites and mills are shown on departmental maps. Existing management plans refer to sites within the area of interest. The National Trust (W.A.) and Heritage Commission (Commonwealth) both maintain registers of significant sites.

Below is a list of some historic sites identified on CALM land to date. The ones with asterisks are classified by the National Trust.

*'Dale' in Dale Block;

'Russell' in Russell Block;

Nanga Bridge, Long Gully and Dawn Creek Bridges (Lane Poole Reserve);

'Sawyers' sawpits in Sawyers Block;

Balmoral and Marrinup Prisoner of War Camps;

Old goldmines - Darling Scarp;

Remains of old sawmills and/or settlements (Amphion, Ashendon, Bartons Mill, Beraking, Berkley, Bombala, Carinyah, Chadoora, Clinton, Curara, Darkin, Duncan, Gleneagle, Hakea, Holyoake, Huntley, Illawarra, Inglehope, Kinsella, Lesley, Marrinup, Mudros, Mundlimup, Nanga, Pindalup, Plavins, Smailes Mill, Westons, Wuraming).

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) collate existing information on historic sites and maintain a register of sites in the Regional Office and in each District. Liaise closely with the Heritage Commission and National Trust in the preparation and maintenance of registers;
- (ii) update registers with information on new sites;
- (iii) develop management guidelines for historic sites in liaison with the Heritage Commission, National Trust, W.A. Museum, tertiary institutions and historical 'Societies.

CAVES

Caves are found in limestone in the vicinity of Yanchep National Park and also south of Mandurah, adjoining Harvey Estuary.

Two prominent caves in Yanchep National Park are Crystal Cave and Yonderup Cave. Crystal Cave is open to tourists, and typically about 70 000 people visit this cave each year. Yanchep has hundreds of caves, and during the early 1900s five caves were accessible to tourists.

There are also some caves (rock hollows) in granitic rocks in the east of the region which contain Aboriginal artefacts.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) convene a Cave Management Committee with membership to include CALM, speleological groups and others with a responsibility for cave management. The committee's functions will include recommending cave management practices, maintaining an inventory of caves and keeping records of their use, condition and any damage by vandalism;
- (ii) base cave management on a classification system which reflects their conservation status and accessibility;
- (iii) ensure the location of wild caves will be known only to members of the Committee and held in confidence;
- (iv) foster public safety by appropriate means;
- (v) levy a fee on cave users to defray maintenance costs;
- (vi) seek a strengthening of Departmental powers under the CALM Act to manage and protect caves;
- (vii) manage field operations to prevent damage to caves.

Protection

The Department is responsible for the protection of CALM lands from fire, disease, weeds, pests and pollution; and the rehabilitation of harmful effects from these or other agencies. The Department also has responsibilities for the protection of its neighbours and of visitors to CALM lands.

FIRE

Fire is a natural phenomenon of the local environment because of summer drought and lightning storms. It was used deliberately by Aboriginals before European settlement, but since the advent of European settlement, fires seem to have become more common. Certainly, over the last 150 years values have changed and it is considered generally undesirable for uncontrolled wildfires to burn on or out of CALM lands.

The Departmental policy on fire is given in detail in Appendix 2. In essence it requires that:

- all possible steps will be taken to prevent bushfires;
- an effective organisation will be maintained to detect and suppress fires;
- liaison will be maintained with local bush fire brigades and control officers;
- where appropriate, fire suppression will be made easier and safer by the practice of cyclic prescribed burning;
- a continuing research program into fire ecology and fire control will be given high priority.

Fire management, particularly in heavy forest country, is a controversial issue. There are significant risks associated with uncontrolled wildfires burning in accumulated fuels. The Department expects that all of its fire policies and practises will be the subject of public debate.

All of the Department's resources within the region are available for fire suppression purposes. These are supported when necessary by resources from other regions.

In addition, there are considerable resources available through the volunteer bush fire brigades in the region (generally where wildfires threaten private property or life values), and the co-ordination and communication resources of the Bush Fires Board. Assistance from the Police and State Emergency Service has also been provided when life and property have been threatened.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) continue to maintain an efficient fire detection system and fire fighting force;

- (ii) wherever appropriate, reduce fuels by prescribed burning;
- (iii) develop a regional framework for the integration of fire management between priority land use and operations;
- (iv) consistent with the requirement to protect life, property and ecological values, introduce diversity into prescribed burning fire regimes;
- (v) implement inter-agency agreements with shires for fire management in remote areas;
- (vi) train CALM staff in firefighting techniques to minimise damage to rare and endangered species and ecosystems;
- (vii) develop interim protection plans for national parks and nature reserves;
- (viii) establish and maintain firebreaks on all CALM lands;
- (ix) priority will be given to protection of high value production areas such as pine plantation, regeneration or rehabilitation areas and to high risk areas such as private property;
- (x) plan fire protection requirements in advance of mining, logging or plantation establishment to ensure fire protection buffers are established within the area or adjacent land;
- (xi) review research needs for fire management in liaison with Research Division;
- (xii) conduct public meetings about fire management on natural lands;
- (xiii) develop neighbour and public interest in fire protection needs of CALM Act lands;
- (xiv) fire buffers may be established in conservation land when biological surveys have been done and results indicate consequences will be acceptable as decided by the Executive Director;
- (xv) provide assistance to neighbours and protection of visitors during times of fire crisis;
- (xvi) continue liaison with other Government agencies and users of CALM land in relation to prescribed burning.

DISEASE

The major plant disease of concern to the Department is dieback, which is caused by the introduced fungus *Phytophthora cinnamomi*. This disease is fatal to many native plant communities on lateritic or poorly drained soils in the south-west of the State.

The effects of dieback disease can include:

- destruction of many native plants;
- increased salinity, degraded fauna habitat and aesthetic values;
- reduction in productivity of jarrah forest;
- increased water production.

The area infected by dieback in the region is about 52 000 ha, some 9 per cent of the total area of State forest. Dieback disease cannot be eradicated once it is established at a specific site. Control measures therefore concentrate on preventing the disease from establishing or spreading.

The principal methods involved have included:

- proclamation of Disease Risk Areas (DRA) - currently 241000 ha within the region is in DRA (Map 9);
- a sophisticated photography and survey program for disease recognition and mapping - Map 9 shows progress with dieback mapping;
- a major research program;
- devising and implementing disease hygiene measures;
- training of staff, and forest and park users in disease management;
- trials of operations (eg. logging) in DRA to enable impact to be determined.

Numerous other minor plant disorders are present on CALM lands in the region, including diseases caused by other species of *Phytophthora* and also *Armillaria*. These are monitored continuously.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) control access and operations so as to protect secure dieback-free areas;

- (ii) improve road access on CALM lands (inside and outside DRA), following a review of the need for access, and routes to be used;
- (iii) direct operations to areas where dieback mapping has been undertaken;
- (iv) assess all operations with a 7-Way test (Dieback Policy 1982);
- (v) for those areas without air photo dieback maps, undertake ground survey of the disease;
- (vi) improve self-policing of dieback hygiene by industry (eg. logging, mining);
- (vii) continue research into site vegetation and dieback impacts;
- (viii) continue to develop practical hygiene monitoring systems for logging, bauxite mining and other operations;
- (ix) seek to improve public understanding of the dieback problem on CALM lands by conducting seminars and workshops, and providing interpretive signboards, demonstration areas;
- (x) develop a brochure on dieback research, trial results and management;
- (xi) improve media awareness of disease spread problems;
- (xii) review the areas of DRA for recreation.

WEEDS AND PESTS

Weeds are plants (usually self-sown exotics) growing where they are not wanted. Pests are troublesome or destructive animals (including insects) either exotic (feral) or native.

The Department has responsibility to eradicate, control or contain declared weeds and animals on CALM lands in specified shires or areas, under Section 37 of the Agriculture and Related Resources Protection Act. Declared weeds in the region include blackberry (*Rubus fruticosus*), apple of sodom (*Solanum hermannii*) and St John's wort (*Hypericum perforatum*). There are also numerous non declared weeds in the region, such as veldt grass (*Ehrharta longiflora*).

Feral animals such as the cat (*Felis catus*), fox (*Vulpes vulpes*), rabbit (*Oryctolagus cuniculus*) and pig (*Sus scrofa*) cause widespread environmental problems on CALM lands. There is also evidence that foxes are predators of native marsupials and have been responsible for the decline of some species.

Native fauna such as the red capped parrot (*Purpureicephalus spulius*) and grey kangaroo (*Macropus fuliginosus*), and biting insects can be pests for CALM neighbours.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) continue surveys to determine the occurrence of weeds and pests;
- (ii) in conjunction with the Agriculture Protection Board, prescribe a program to control declared weeds and pests;
- (iii) carry out control programs as resources permit;
- (iv) educate the public on the problems with weeds and pests and use of safe control measures;
- (v) assess the efficiency of control techniques and where necessary modify techniques to achieve greatest efficiency.

REHABILITATION

Rehabilitation processes return disturbed land to a predetermined surface, land use or productivity.

Rehabilitation may be required after any site disturbance such as mining, gravel pit working, roadworks, logging, clearing, disease, or pest attack. Rehabilitation may also be required after recreation activity or fire. In the broader sense, historic buildings may require rehabilitation.

The need for rehabilitation of disturbed sites depends upon the capacity of the site to restore itself and/or the degree of acceptable departure from natural processes.

The plant species used for rehabilitation should be local species wherever possible, not conflict with the priority land use and should be resistant to dieback disease, fire and environmental stresses eg. drought and nutrient deficiencies. Integration with the aesthetics and the operations of surrounding lands is also necessary.

Most of the rehabilitation site works on CALM land is undertaken by the agency responsible for the site disturbance eg. gravel pit rehabilitation by Main Roads Department, timber industry and shires. Special Agreement Acts for mining on State forest require rehabilitation of mined areas.

Rehabilitation work in this region on CALM land is of the following order:

- rehabilitation of bauxite mining areas 300 ha/year;
- Forest Improvement and Rehabilitation Scheme (FIRS) 1500 ha/year;
- rehabilitation (planting) of gravel and other pits 20 ha/year;
- rehabilitation of dieback areas 10 ha/year.

Many areas of CALM land disturbed long ago remain unrehabilitated e.g. limestone quarries, gravel pits and areas degraded by dieback disease. These areas will remain in a degraded condition until resources can be provided for their rehabilitation.

Much of the bauxite mining rehabilitation undertaken in the 1960s and early 1970s is of an unacceptable standard. Since 1985 Alcoa has implemented remedial treatment of some of these older areas to the current acceptable standard.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) prepare rehabilitation prescriptions for all disturbances on CALM lands. Important factors are the need to conform to land use priority and to provide an acceptable level of resources and values;
- (ii) continue to maintain an inventory of CALM lands within the region and quantify the areas and locations of disturbance that require rehabilitation;

- (iii) provide guidelines and standards for rehabilitation practices and monitor their implementation;
- (iv) establish schedules of agreed working arrangements between CALM and the relevant organisations, to cover all phases of the operation, e.g. objectives, success criteria, methods of evaluation, responsibilities and funding;
- (v) liaise with Research Division on current findings. Use this knowledge to improve objectives and prescriptions.

Recreation

The direct expenditure by tourists in Western Australia in 1984/85 was \$342 million including \$51 million in the South West statistical division (W.A. Tourism Commission 1985).

The number of recreational visits to national parks and State forests in the region probably exceeds 1000 000 per year and is expanding rapidly. Recreation opportunities on CALM land are shown on Map 10.

important aspects for management are:

- camping;
- day use;
- motorised recreation;
- horseriding;
- pets;
- swimming, fishing and boating;
- hunting.

CAMPING

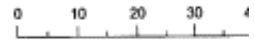
Camping is a traditional activity on many CALM lands.

CALM campsites are shown on Map 10. Camping may be either as an adjunct to backpacking, or vehicle based. Backpack camping is permitted in many areas of State forest and national parks but is not allowed in nature reserves or in developed water catchment areas other than at approved sites. Vehicle based camping is allowed at designated sites.

NORTHERN FOREST | RECREATION OPPORT

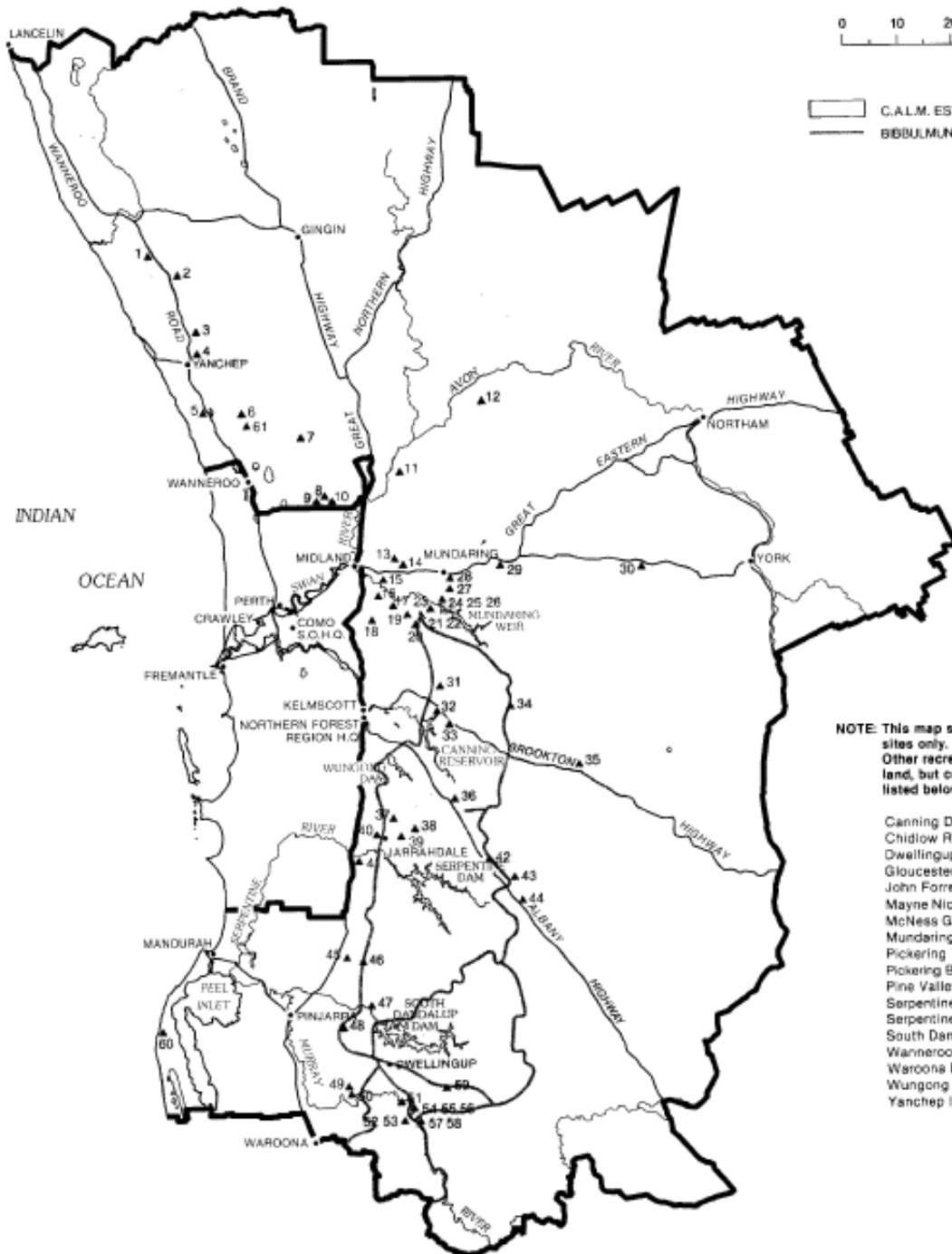


SCALE



KEY

- C.A.L.M. ESTATE
- BIBULMUN TRACK (existing)

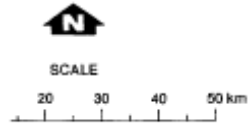


NOTE: This map shows C.A.L.M. r sites only. Other recreation sites and land, but controlled by oth listed below.

- Canning Dam
- Chidlow Rifle Range
- Dwellingup Golf Course
- Gloucester Lodge
- John Forrest Tavern
- Mayne Nickless Pistol Ran
- McNess Guest House
- Mundaring Rifle Range
- Pickering Brook Golf Fair
- Pickering Brook Rifle Range
- Pine Valley Pistol Range
- Serpentine Dam
- Serpentine Dam Restaura
- South Dandalup Dam
- Wanneroo Pistol Range
- Waroona Dam Caravan Pa
- Wungong Dam
- Yanchep Inne

MAP 10

RN FOREST REGION
RECREATION OPPORTUNITIES



KEY
M. ESTATE
MUN TRACK (existing and proposed)



map shows C.A.L.M. managed recreation only.
recreation sites and leases on C.A.L.M. but controlled by other authorities are below.

- ing Dam
- ow Rifle Range
- ingup Golf Course
- ester Lodge
- Forrest Tavern
- ie Nickless Pistol Range
- ss Guest House
- aring Rifle Range
- ring Brook Golf Fairways
- ring Brook Rifle Range
- Valley Pistol Range
- ntline Dam
- ntline Dam Restaurant
- 1 Dandelup Dam
- eroo Pistol Range
- ions Dam Caravan Park
- ong Dam
- hep Inne

C.A.L.M. RECREATION SITES	RECREATION OPPORTUNITIES										
	BARBECUES	FISHING	SWIMMING	CANOEING	MARKED WALK TRAIL	TOILETS	DRINKING WATER	CAMPING	LOOKOUT	HANDICAPPED FACILITIES	MOTORCYCLE AREA
1 WILBINGA GROVE	*										
2 WABLING HILL	*										
3 JARRAH'S END	*										
4 YANCHEP NATIONAL PARK	*			*	*	*			*		
5 NEERABUP NATIONAL PARK	*										
6 PINJAR SETTLEMENT	*			*			*				
7 MELALEUCA PARK	*										
8 GNANGARA OLD MILL	*										
9 GNANGARA MOTOR-CYCLE AREA										*	
10 PINE DRIVE	*										
11 WALYUNGA NATIONAL PARK	*	*	*	*	*	*	*	*	*	*	*
12 AVON VALLEY NATIONAL PARK	*		*		*	*	*	*	*	*	*
13 ROCKY POOL	*				*	*	*	*	*	*	*
14 JOHN FORREST NATIONAL PARK	*	*	*	*	*	*	*	*	*	*	*
15 GREENMOUNT NATIONAL PARK	*				*	*	*	*	*	*	*
16 GOCSEBERRY HILL NATIONAL PARK	*				*	*	*	*	*	*	*
17 KALAMUNDA NATIONAL PARK	*				*	*	*	*	*	*	*
18 LESMURDIE FALLS NATIONAL PARK	*				*	*	*	*	*	*	*
19 THE DELL	*				*	*	*	*	*	*	*
20 MOUNT GUNGIN	*				*	*	*	*	*	*	*
21 FARRELL GROVE	*			*	*	*	*	*	*	*	*
22 GUNJIN GULLY	*				*	*	*	*	*	*	*
23 SOUTH LEDGE	*				*	*	*	*	*	*	*
24 JACOBY PARK	*			*	*	*	*	*	*	*	*
25 BIG LOG	*				*	*	*	*	*	*	*
26 NORTH LEDGE	*				*	*	*	*	*	*	*
27 GREVILLEA MYCUMBENE	*				*	*	*	*	*	*	*
28 PIMELEA MYCUMBENE	*				*	*	*	*	*	*	*
29 FORSYTHE'S MILL	*				*	*	*	*	*	*	*
30 MOUNT OBSERVATION	*				*	*	*	*	*	*	*
31 CARINYAH	*				*	*	*	*	*	*	*
32 BOULDER ROCK	*				*	*	*	*	*	*	*
33 LESLEY	*			*	*	*	*	*	*	*	*
34 MOUNT DALE	*			*	*	*	*	*	*	*	*
35 CHRISTMAS TREE WELL	*				*	*	*	*	*	*	*
36 GLENEAGLE FOREST	*				*	*	*	*	*	*	*
37 LANGFORD PARK	*				*	*	*	*	*	*	*
38 BLUE ROCK	*				*	*	*	*	*	*	*
39 MUNDLIMUP	*				*	*	*	*	*	*	*
40 GOORALONG BROOK	*			*	*	*	*	*	*	*	*
41 SERPENTINE NATIONAL PARK	*	*	*	*	*	*	*	*	*	*	*
42 SULLIVAN ROCK	*			*	*	*	*	*	*	*	*
43 MOUNT COOKE	*				*	*	*	*	*	*	*
44 WINDSOR	*				*	*	*	*	*	*	*
45 GOLD MINE HILL	*			*	*	*	*	*	*	*	*
46 WHITTAKERS SCARP MILL	*				*	*	*	*	*	*	*
47 SOUTH DANDALUP RIVER BRIDGE	*				*	*	*	*	*	*	*
48 OAKLEY DAM	*	*	*	*	*	*	*	*	*	*	*
49 SCARP LOOKOUT	*				*	*	*	*	*	*	*
50 SCARP POOL	*	*	*	*	*	*	*	*	*	*	*
51 BADEN POWELL	*	*	*	*	*	*	*	*	*	*	*
52 NANGA MILL	*				*	*	*	*	*	*	*
53 NANGA TOWNSITE	*				*	*	*	*	*	*	*
54 CHARLIE'S FLAT	*	*	*	*	*	*	*	*	*	*	*
55 ISLAND POOL	*	*	*	*	*	*	*	*	*	*	*
56 TONY'S BEND	*	*	*	*	*	*	*	*	*	*	*
57 YARRAGIL	*	*	*	*	*	*	*	*	*	*	*
58 THE STRINGERS	*	*	*	*	*	*	*	*	*	*	*
59 INGLEHOPE PARK ARBORETUM	*				*	*	*	*	*	*	*
60 YALGORUP NATIONAL PARK	*				*	*	*	*	*	*	*
61 PINJAR MOTORCYCLE AREA										*	*

MAP 10

Issues of importance to managers with respect to camping are:

- provision of suitable camping areas;
- minimising conflicts with day users;
- managing and maintaining camp sites.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices I and 2), during the period of this plan CALM staff in the region will:

- (i) list existing and potential campsites on CALM land in the region - sites will be chosen for their suitability for camping, as well as their exclusion from day-use recreation pressures;
- (ii) designate each site (or parts of each site) for either small or large group camping, but not both;
- (iii) liaise with local authorities and other agencies in the region over the need for, and location of, new campsites;
- (iv) apply restrictions on certain activities at each site to ensure that conservation objectives are not compromised and that the enjoyment of nearby campers is not unduly affected by the activities of others;
- (v) maintain campsites in good condition;
- (vi) evaluate and, if appropriate, allow larger and more formal camp sites to be developed as concessions.

DAY USE

Most recreational pursuits on CALM lands are carried out during the course of one day. These include picnicking, barbequing, bushwalking, jogging, cycling, photography, painting, climbing, abseiling and orienteering. These activities can take place either at developed recreation sites or in a more dispersed fashion.

CALM recreation sites are shown on Map 10.

There are a number of recreation developments such as golf courses and rifle ranges on leases on CALM lands. There are also Water Authority dams on CALM land which are tourist attractions. Many of these dams have developed picnic sites, some have restaurants.

Major issues are:

location and design of facilities;
the provision of facilities, e.g. toilets, walking trails, barbeques, parking areas;
access and roading;
facilities for the disabled;
maintenance of sites;
visitor safety;
commercial tourist operations.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will, either directly or with assistance from commercial sources, as appropriate:

- (i) assess requirements for recreation sites;
- (ii) evaluate existing sites in terms of location, design and suitability;
- (iii) upgrade, or close recreation areas as necessary;
- (iv) provide new recreation areas, including provision of facilities and walking trails, where necessary and appropriate, as resources for their development and maintenance become available;
- (v) restrict the activities of commercial tourist operators to certain times or to certain areas to minimise conflicts with the general public;
- (vi) eliminate or reduce hazards and bring them to the attention of the visiting public;
- (vii) restrict or prohibit access where hazards cannot be minimised or eliminated;
- (viii) ensure that all sites are regularly cleaned and tidied;
- (ix) when upgrading or providing new sites, make provision for disabled access where resources permit.

MOTORISED RECREATION

Under this heading is included four-wheel drives, trail bikes, unlicensed off-road vehicles, pleasure driving and rallying.

Licensed vehicles of any kind are permitted on public roads on CALM lands and normal road traffic rules apply. Exceptions are restricted access roads in declared Disease Risk Areas, as a temporary measure in State forest for management purposes (e.g. logging), nature reserves and some parts of national parks. There are numerous management tracks in CALM lands. These tracks are not maintained for public use.

Designated off-road motorcycle areas are planned for Gngangara and Pinjar pine forests. Unlicensed off-road vehicles are not permitted on any other areas of CALM land in the region. Under the Control of Vehicles (Off-Road Areas) Act, eight areas of Crown land in this region and the Metropolitan Region are available for the use of off-road vehicles registered under that Act. These areas are at Lancelin, Ledge Point, Beechboro, Amaroo, Medina, Port Kennedy, Dawesville and Chidlow, (Department of Land Administration 1986).

Car and motorcycle rallying is permitted in some areas of State forest by special arrangement with the Department, but not in national parks or nature and Water Authority reserves.

Information about off-road vehicles is presented in the Department of Conservation and Environment poster 'Off-Road Vehicles and the Environment' (1985) and pamphlet 'Joining a Club' (1986).

There are two main issues associated with motorised recreation. The first of these is the high environmental impact of vehicles. These impacts include physical damage to roads and the environment, such as erosion, spreading dieback disease, damaging vegetation, disturbance to neighbours and wildlife caused by noise and dust.

The second conflict occurs with other user groups. Many recreational activities require peace and solitude in natural environments and are not compatible with noisy vehicular use of the same areas. Visitor safety is also important.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) identify areas of CALM land currently being used for motorised recreation;

- (ii) evaluate the suitability of each area for this use by evaluating impacts on the environment and on other users;
- (iii) identify potential suitable sites to which displaced activities can be relocated and develop these as resources for their creation and maintenance become available;
- (iv) where impacts in (ii) are unacceptably high either modify the activity or relocate;
- (v) all proposed activities are to be examined in the field, and where on catchments, endorsed by the Water Authority of W.A.

HORSE RIDING

Horse riding and horse exercising are common recreational pursuits on CALM lands.

Horses can create some problems through spread of weeds (through their droppings), trampling and browsing of native vegetation and erosion of trails. They may also spread dieback, and conflicts between horse riders and other recreationists can occur.

Horses are generally not permitted on developed water catchments, DRA, nature reserves, national parks and conservation parks except in designated areas e.g. in parts of John Forrest National Park.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) identify and where compatible with other uses develop suitable areas for horse riding in conjunction with WAWA;
- (ii) develop plans which avoid conflicts between horse riders and other recreationists on CALM lands;
- (iii) review the impact of horse riding and give periodic 'rests' to areas if degradation is occurring;
- (iv) liaise with equestrian groups to seek co-operation in the maintenance of horse trails;
- (v) specific horse riding events (eg. W.A. Horse Riding Enduro Club) are to be checked in the field, and where on catchments endorsed by the WAWA.

PETS

Many recreationists and people who work on CALM land take their pets with them when they travel, particularly dogs.

They can cause problems, particularly by annoying other people in camping grounds or picnic areas, as well as disturbing native animals and vegetation.

Pets (under control) are normally allowed on CALM land which is managed for multiple use but are not permitted on developed catchments (W.A. Water Resources Council 1985) or nature reserves. Subject to provisions below, they may be allowed in specified zones of national parks and conservation parks.

Seeing eye dogs accompanying blind persons are allowed in national parks.

In addition licensed gun dogs are allowed in game reserves during the duck shooting season, e.g. Yurine Swamp and Wannamal Lake Nature Reserves in Gingin Shire.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices I and 2), during the period of this plan CALM staff in the region will:

- (i) identify and publicise areas where pets and domestic animals are permitted;
- (ii) explain the Departmental policy to the public and enforce as necessary.

SWIMMING, BOATING AND FISHING

Swimming, wading, boating, fishing, marroning and crabbing are all activities which occur in the region.

Details of permitted activities are given in Table 10.

TABLE 10
WATER-BASED RECREATION ACTIVITIES PERMITTED ON CALM
LAND IN THE NORTHERN FOREST REGION

Recreation Activity	Nature Reserve	National Park Conservation Park	Other State Forest
POWER BOATING	No Except (b)	No Except Avon Valley Descent	Yes Except Catchments (a)
CANOEING, ROWBOATS, SAILING	No Except (b)	Yes Except Yanchep (f), Serpentine, Catchments (a)	Yes Except Catchments (a)
FISHING, MARRONING (d)	No Except (b)	Yes Except Catchments (a) (g) and as determined by area management plans	Yes Except Catchments (a)
SWIMMING WADING	No Except (b),(c)	Yes Except Yanchep, Catchments (a)	Yes Except Catchments (a)
DUCK SHOOTING	No Except (e)	No	No

Note (a) Some of these activities are permitted on certain catchments eg. undeveloped catchments or irrigation dams. Consult the W.A. Water Resources Council publication 'Recreation in Darting Range Catchments' for details.

(b) Recreational activity and professional fishing are not permitted in nature reserves. However, some traditional activities may continue as set out in the management plan for a particular reserve.

(c) Wading is permitted in game reserves to retrieve ducks, during season.

(d) Fishing is permitted only under the relevant Fisheries Act Regulations, unless restricted or prohibited under a management plan.

(e) Only permitted in designated game reserves, during season.

(f) Departmental boats may be used at Yanchep.

(g) Fishing and marroning is prohibited in Yanchep and Serpentine National Parks.

Information about recreation on catchments is presented in the W.A. Water Resources Council booklet 'Recreation on Reservoirs and Catchments in Western Australia' (1985) and pamphlet 'Recreation in the Darting Range Catchments' (1985).

Further information about various water-based recreation activities is available from the following sources:

Forests Department leaflet 'Foresters at Work - Fishing' (n.d.);
Fisheries Department 'Recreational Fishing. A Guide to the Rules' (1985);
Fisheries Department 'Trout in Western Australia' (1982);
Department for Sport & Recreation 'Canoeing guides No. 1-9' (n.d.);
Department of Marine & Harbours - boating regulations.

Important water-based recreation issues are:

minimising conflicts between user groups;
protecting the environment from damage through excessive or inappropriate use.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) list sites at which water-based recreation does or could occur;
- (ii) determine which activities are appropriate for each site;
- (iii) develop plans to separate conflicting uses. This can be done by separating them physically or by restricting activities to particular times;
- (iv) publicise alternative sites for users whose traditional recreation is considered to be inappropriate at a particular location;
- (v) monitor the effects of water-based recreation on the environment in and around the water body and modify plans in the light of any changes;
- (vi) continue close liaison with WAWA on the issue of recreation in catchments to ensure compatibility of recreation plans with all management objectives.

HUNTING

Shooting of ducks and quail on designated game reserves is the only form of recreational hunting permitted on CALM lands.

The rules for duck shooting are summarised in the latest edition of CALM 'Duck Shooter's Guide' (1987). There are currently two game reserves in the region, both in Gingin Shire. They are Yurine Swamp Nature Reserve and part of Wannamal Lake Nature Reserve.

The length of the game shooting season and duck and quail species able to be taken each season are determined annually by the Minister for Conservation and Land Management.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) monitor the condition of game reserves to determine the impacts;
- (ii) report on management considerations to be taken into account in the annual review of the hunting season;
- (iii) enforce regulations on game reserves.

Public Participation and Liaison

There is increasing public interest and concern for the management of public land and ecosystems in the State. CALM promotes this through education, interpretation, public participation and extension services.

COMMUNITY EDUCATION AND INTERPRETATION

CALM wishes to promote community awareness, appreciation and understanding of conservation and public land management.

The Department utilises a variety of communication techniques (such as printed and electronic media, public contact and interpretive facilities such as display shelters, nature trails and signs) to reach the widest public audience.

CALM has a regional parks and reserves officer and a part-time recreation officer in each district. Other specific programs involve the development of the Icy Creek property in the Lane Poole Reserve as an information and education centre.

The regional office at Kelmscott and the district office at Mundaring are open on many weekends throughout the year for public enquiries. Districts undertake patrols in State forest most weekends to guide and provide information to the public, and to monitor any illegal activities, such as the removal of forest produce. Most national parks and the Lane-Poole Reserve are staffed on days throughout the year, and provide a significant recreation and conservation service to the public.

A range of printed material on public firewood collection, recreation facilities, camping, the use of fire, maps, and technical information is available at all Departmental offices in the region.

Interpretive trails have been provided at both Langford Park and Marrinup, to inform the public of bauxite mining and rehabilitation programs. Interpretive trails have also been established at Yanchep and Walyunga National Parks. A demonstration area of plantation thinning has been created at Gnangara.

Arbor Day is promoted at schools to increase the awareness of the value of trees. Tree planting and maintenance activities are often conducted.

A range of public meetings and workshops are conducted to either inform and/or receive feedback regarding community attitudes on the management of natural lands.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) promote increased public awareness of conservation and land management issues;
- (ii) develop comprehensive regional and district libraries, to assist staff in providing information and extension services;
- (iii) develop interpretive trails in national parks and other areas of high public use;
- (iv) increase distribution of interpretive and recreational information.

COMMUNITY INVOLVEMENT

The CALM Act (Sections 14, 57-59) makes statutory provision for public participation in the preparation of management plans. Some public involvement in other Departmental planning matters

is also desirable. The Department wishes to be involved in local communities and provide appropriate assistance.

Examples of community involvement include:

staff involvement in local tourist bureaux and with agricultural shows;
advice about landscaping and tree planting in townsites;
co-operation with schools eg. work experience, Arbor Day;
advisory committees, 'Friends of the park' and volunteer groups.

Public participation requires considerable staff resources to plan, implement, review and follow-up. Volunteer programs require staff time for supervision, and materials for the implementation of works programs.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) maintain the present initiatives on public participation;
- (ii) continue to review the effectiveness of these programs by the identification of 'concerned' public and proper communication with these groups;
- (iii) seek regular 'feed back' on Departmental policies and management practices from the public, through both informal and formal contacts.

INFORMATION AND ADVISORY SERVICES

The public, public utilities, farmers and business people are provided with a wide range of information and advice from the Department on matters of conservation and land management.

Information and advice can be provided at district, regional or Departmental level. Enquiries can also be referred to other departments or authorities.

Regional Strategy

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) prepare and implement a plan for an efficient information and extension service and actively market the extension service,

Production

Numerous activities associated with the production of natural resources occur on CALM lands, for example: forest produce (timber, wildflowers, seed and honey), basic raw materials such as gravel, minerals and water.

WATER

Catchments are managed to optimise both the quantity and quality of water produced. CALM land on gazetted catchments and water reserves is jointly managed by CALM and WAWA.

The quantity of water collected varies according to seasonal rainfall, soil storage and natural use by forests and agricultural crops. High impact dieback disease, clearing and forest thinning operations increase water yield.

Water quality is affected by colour, turbidity, salinity, chemical pollutants, bacteria and viruses. Increased salinity is the most serious potential threat. In low rainfall zones, clearing releases soil-stored salts. Water quality in the Avon and Murray Rivers has been seriously degraded in this way.

The Resource

Surface water supplies on the main catchments in the region are shown in Table 11. Significant underground water supplies also exist on the Swan Coastal Plain.

The latest proposals for the Gnangara area are discussed in the Gnangara Mound ERMP (Dames and Moore 1986). The Water Authority's plans for future developments are presented in the latest version of their Sources Development Plan and also in their publication 'Planning future sources for Perth's water supply' (WAWA 1986).

As a salinity control measure, clearing controls have been imposed by WAWA on the Helena catchment. Clearing or logging of indigenous vegetation on this catchment can only be carried out under a WAWA licence and based on guidelines relating to salinity hazard zones A, B, C and D.

Some details about the principal dams in the region are presented in Table 12.

Map 11 shows the main catchments and groundwater management areas within the region.

TABLE 11
HYDROLOGICAL DETAILS FOR SOME OF THE CATCHMENTS
IN THE NORTHERN FOREST REGION

River	Catchment area above likely damsite		Mean annual flow	Mean annual salinity level
	km ²	% Cleared	in m ³ x 10 ⁶	mg/L TDS
Swan/Avon	119000	75	418	5000
Helena	1470	2.5	72	360
Canning	754	0	65	400
Serpentine	663	0	81	200
Murray	6840	70	351	1800

Data from Public Works Department (1979).

The data refers to the whole catchment, some of which may extend outside this region.

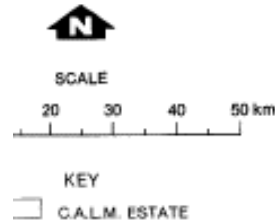
TDS = total dissolved solids.

TABLE 12
SOME DETAILS ABOUT THE PRINCIPAL DAMS IN THE NORTHERN FOREST REGION

Dam	Capacity m ³ x 10 ³	Supplying water to
Mundaring	77000	Goldfields, Agricultural area, Perth
Victoria	859	Metropolitan area (Perth)
Churchman Brook	2160	" " "
Canning	93400	" " "
Wungong	60000	" " "
Serpentine Pipehead	3850	" " "
Serpentine	184880	" " "
South Dandalup	208000	" " "

Data from Public Works Department (1984).

IN FOREST REGION MENTS AND DAMS



CATCHMENT CLASSIFICATIONS

Surface catchments and ground water management areas in the south-west of the State have been classified as follows by the Water Authority for management purposes. Restrictions on recreation are indicated.

Type 1a Public Water Supply Area

Type 1b Groundwater Area

Type 1c Water Reserve

Type 2a Active catchment area—domestic supply.

(i) Small diversion dam. Access is only permitted, if at all, along open roads, marked walk trails, designated picnic areas, but not to the water area.

(ii) Large dam. Pedestrian access within 2 km from the water area is only permitted along open roads, marked walk trails and at designated picnic areas. Pedestrian access beyond 2 km is unrestricted.

Type 2b Active catchment area—irrigation. Access is permitted to all of the catchment, the water area, and to the dam wall.

Type 2c Active catchment area—domestic and irrigation. All are currently as for 2a (ii) large dams.

Type 3 Water reserve. Potential water resource that has been gazetted.

Type 4 Important potential surface water catchment area (not gazetted).

Other Not classified.

No.	CATCHMENT	TYPE.	No.	CATCHMENT	TYPE
1	BICKLEY	3	25	WAROONA	2b
2	BODDINGTON	2a(i)	26	WANNEROO G.A.	1c
3	CANNING	2a(ii)	27	WANNEROO P.W.S.A.	1a
4	CHURCHMAN	2a(i)	28	WUNGONG	2a(ii)
5	DIRK BROOK	3	29	YANCHEP G.A.	1c
6	SAMSON	2c	30	JULIMAR	4
7	GINGIN G.A.	1c	31	BROCKMAN RIVER	4
8	GNANGARA WATER RES	1c	32	GINGIN BROOK	4
9	HELENA	2a(ii)	33	LENNARD BROOK	4
10	KANGAROO GULLY	2a(i)	34	ELLEN BROOK	4
11	LOWER HELENA	2a(i)	35	JMFERDING BROOK	4
12	GOORALONG	3	36	RED SWAMP BROOK	4
13	LITTLE DANDALLUP	3	37	WOOROLOO BROOK	4
14	MURRAY RIVER	3	38	SUSANNAH BROOK	4
15	MURRAY G.A.	1c	39	JANE BROOK	4
17	NORTH DANDALLUP	2a(i)	40	DEEP GLEN BROOK	2a(i)
18	PEEL G.A.	1c	41	LOWER CANNING	2a(i)
19	SOUTH-WEST COASTAL G.A.	1c	42	LOWER S DANDALLUP P/H	2a(ii)
20	SERPENTINE	2a(ii)	43	MARRINUP BROOK	4
21	SERPENTINE PIPEHEAD	2a(i)	44	DWELLINGUP S.W.	2a(i)
22	SOUTH DANDALLUP	2a(ii)	45	DRAKES BROOK	2b
23	STIRLING	2c(ii)	46	NANGA BROOK	3
24	VICTORIA	2a(i)	47	BIG BROOK	3

Regional Strategies

In addition to implementing Department policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) seek to comply with water purity standards required by WAWA;
- (ii) maintain regional representation on WAWA Steering Committees for all major water supply projects on, or likely to impinge upon, CALM lands;
- (iii) maintain existing liaison with WAWA on land management (eg. Mining Operations Group for bauxite mining, Water Resources Council for recreation);
- (iv) consult with WAWA on other management activities likely to affect water quality and/or quantity on both CALM and WAWA lands e.g. road construction, mining other than bauxite, noxious weed control, logging intensity on forested catchments, prescribed burning;
- (v) seek liaison with WAWA on proposed changes of land purpose in water supply catchments;
- (vi) co-ordinate forest hydrology research (CALM) with water management research (WAWA);
- (vii) as required, develop management plans for catchments jointly with WAWA;
- (viii) seek financial assistance from WAWA where their policies impact on management of CALM land.

HARDWOOD TIMBER

The forest based industries are among the State's major industries, employing more than 20 000 people directly and indirectly and having an annual turnover in timber and timber products of \$330 million as at June 1985.

The timber industry began from the earliest days of European settlement when forested areas were cleared for settlement and agriculture. The industry grew rapidly in the 1890s as export markets were developed. High levels of cutting continued after the turn of the century. This period of heavy exploitation earned the State valuable export income. It also led to township development in the region and provided the roads and basic infrastructures that assisted the development of other industries.

Concern about forest exploitation highlighted the need for organised forest management which took effect when the Forest Act was passed in 1918. From that time areas of prime forest have been permanently dedicated as State forest and conservation policies developed and implemented.

Jarrah silviculture has been described by Bradshaw (1985). The northern jarrah forest is now largely uneven-aged as a consequence of early exploitation and selection logging practises. Forest structure is variable, ranging from old growth stands to pole and sapling stands. Silviculture is aimed at encouraging regeneration or increasing growth rates of selected crop trees. High quality stands receive follow-up stand improvement treatment after logging, including the removal of logging residue from the trunks of retained trees and the removal by cutting and poisoning of suppressed trees, and competing species.

The Resource

The hardwood forests of this region can be broadly categorised into jarrah, wandoo, or exotic eucalypts. The areas of these forest types are indicated in Table 5.

The volume of first grade sawlogs harvested from Crown land in the region for the last five years has averaged 106 000 m³/annum, almost exclusively jarrah. The region supports seven sawmills, three of which are supplied with more than 20 000 m³ of sawlogs per annum (Dwellingup, Jarrahdale and Welshpool).

From 1989 it is proposed to use about 160 000 tonnes/annum of residues from sawlogging and thinning operations for charcoal production. The charcoal will be used for silicon production.

Apart from sawlogs, other hardwood products include SEC poles, rails, fenceposts and commercial firewood. A valuable resource also exists at Mundaring and Jarrahdale (in particular) for those wanting to collect their own domestic firewood.

All important issues are addressed in the paper 'Timber Production in Western Australia' CALM (1987).

For further details about timber resources, future yields, the level of the cut, allocation of the cut and log pricing, see the above paper.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) implement the strategy described in 'Timber production in Western Australia' CALM (1987);
- (ii) maximise growth on retained trees or regeneration;

- (iii) minimise artificial introduction, spread and impact of jarrah dieback disease, and protect soil and water values;
- (iv) implement the 'Code of hardwood logging practice' and 'Manual of specifications for control of hardwood logging operations in the Northern Jarrah Forest' (CALM, 1986);
- (v) prepare plans for sawlog harvesting each year;
- (vi) provide minor forest produce for public and commercial sale based on resource plans to be developed during the life of this plan.

SOFTWOOD TIMBER

In recent years about 500 ha of CALM land has been planted with pines each year in this region. Most of this plantation is on the Gnangara Mound, however, no new land will be planted here in future.

The Resource

The area of CALM pine forests established in the region to December 1985 was approximately 26 000 ha. The majority of this (88 per cent) is *P. Pinaster*, most of which is located on the coastal plain in Wanneroo District.

Some *P. pinaster* has also been planted on the poorer soils in the Darling Range. *Pinus radiata* has been planted on the best available soils in the Darling Range, but prospects for new CALM plantations in this area are remote.

Small areas of clearfelling of mature plantations at Wanneroo and Mundaring has commenced and these areas are being replanted on a trial basis.

Prior to the commencement of large scale operational re-planting of clearfelled areas at Wanneroo a land use study will be undertaken in co-operation with appropriate authorities.

For further details about timber resources, future yields, the level of the cut, allocation of the cut and log pricing, see the paper 'Timber Production in Western Australia' CALM (1987).

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) carry out intensive silvicultural regimes in existing plantations;

- (ii) prescribe plantation stocking at places and at times which integrate the water production criteria required by WAWA, with the need to supply industry with the resource and the market with various pine products;
- (iii) develop a model for optimising pine tending, economics and management for existing plantation areas;
- (iv) reduce fire hazards in pine forests to acceptable levels using mild, prescribed fire in winter in strategically located fuel reduced buffers, both inside and outside the plantation and provide appropriate detection, access and fire suppression systems;
- (v) maximise utilisation of resource through application of the 'Code of Softwood Logging Practice';
- (vi) undertake education programs about softwood forestry using brochures, public workshops, seminars and provide extension advice;
- (vii) implement the results of research;
- (viii) prepare harvesting plans each year.

MINING

The mining of minerals (as defined under the Mining Act) significantly interacts with natural land management in the region. Mining is one of the region's major industries, with alumina production from bauxite mined in the region valued at almost \$800 million in 1984/85.

Mining (including exploration) is regulated by the Mining Act. It is through this Act that the Minister for Conservation and Land Management consents or does not consent to new mining activity, subject to conditions. Special Agreement Acts apply to some mining operations.

The effects of mining and rehabilitation on the jarrah forest environment are best known for bauxite mining. They may be summarised as follows:

In high rainfall zones (1 100 mm/year) water yields may increase by 20 to 30 per cent in the decade following mining. Stream salinity is relatively unaffected. The salinity response to mining in lower rainfall zones is being evaluated;

Dieback disease can be spread by mining activity.

Rehabilitated systems have aimed at establishing viable ecosystems. Their impact on the surrounding forest values can affect fire protection, disease management and landscape values.

Today, the emphasis on rehabilitation management ensures the integration of all these factors.

The Resource

Map 12 shows approved mining leases and claims, bauxite conveyor lines and refineries and current and proposed mining operations. The known mineral resources of the region are discussed in the explanatory notes provided with the geological maps produced by Wilde and Low (1978, 1980) and for the System 6 study (Biggs et al. 1980). Access to minerals is provided under Special Agreements or the Mining Act.

Bauxite deposits at Jarrahdale were first mined in 1959, and in 1963 the mine began supplying ore to the alumina refinery at Kwinana. An annual mining capacity of 13 million tonnes of bauxite requires the clearing of 300 ha of land (Department of Conservation and Environment 1984). Over the next 25 years operations will be located in the south-east sector at Jarrahdale and between the Serpentine and South Dandalup Dams.

Sand mining for building supplies is occurring at Mundaring and a similar industry is planned for silicon production at Wanneroo. There is extensive limestone mining in the Wanneroo District.

Drilling and stream sediment prospecting for gold has recently taken place throughout much of the region. Work on the Worsley/Reynolds gold mine near Boddington commenced in March 1986. Ore will be derived from open cut mines in private property and State forests east of Dwellingup.

Clay, peat, diatomaceous earth and mineral sand mining occurs within the region, but has had minimal effects on CALM lands to date.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices I and 2), during the period of this plan CALM staff in the region will:

- (i) where exploration and mining occur on CALM land, and in conjunction with the companies involved, prepare agreed working arrangements to provide for planning, clearing, mining, rehabilitation, monitoring, maintenance, and fire protection;
- (ii) consolidate operations to reduce the range of ages of mine pit rehabilitation; allow for the more orderly return of both mined and unmined forests and landscapes to the land use priority; minimise forest and conservation values lost for ore gained;

- (iii) evaluate rehabilitation after mining and where acceptable standards are not met, prepare a program of the post-rehabilitation management;
- (iv) review rehabilitation research requirements and consolidate research activities to a small percentage of operational plantings;
- (v) maintain effective liaison with mining companies, either through regular and direct contact or through established committees such as the Mining and Management Planning Liaison Group (MMPLG) and the Mining Operations Group (MOG).

BASIC RAW MATERIALS (GRAVEL, SAND AND STONE)

The more important resources are sand, clay, limestone, stone for road aggregate, gravel and peat. Many of these basic raw materials are also defined as minerals under the Mining Act, and certain resources are subject to mineral exploration and/or mining leases.

The Departments of Mines and CALM have procedures for joint administration of mineral and basic raw material resources.

In recent years over 10 000 t_{in 3} of basic raw materials have been extracted from CALM land in the region each year.

Proximity to Perth places pressure on CALM land in the region to supply basic raw materials for urban development.

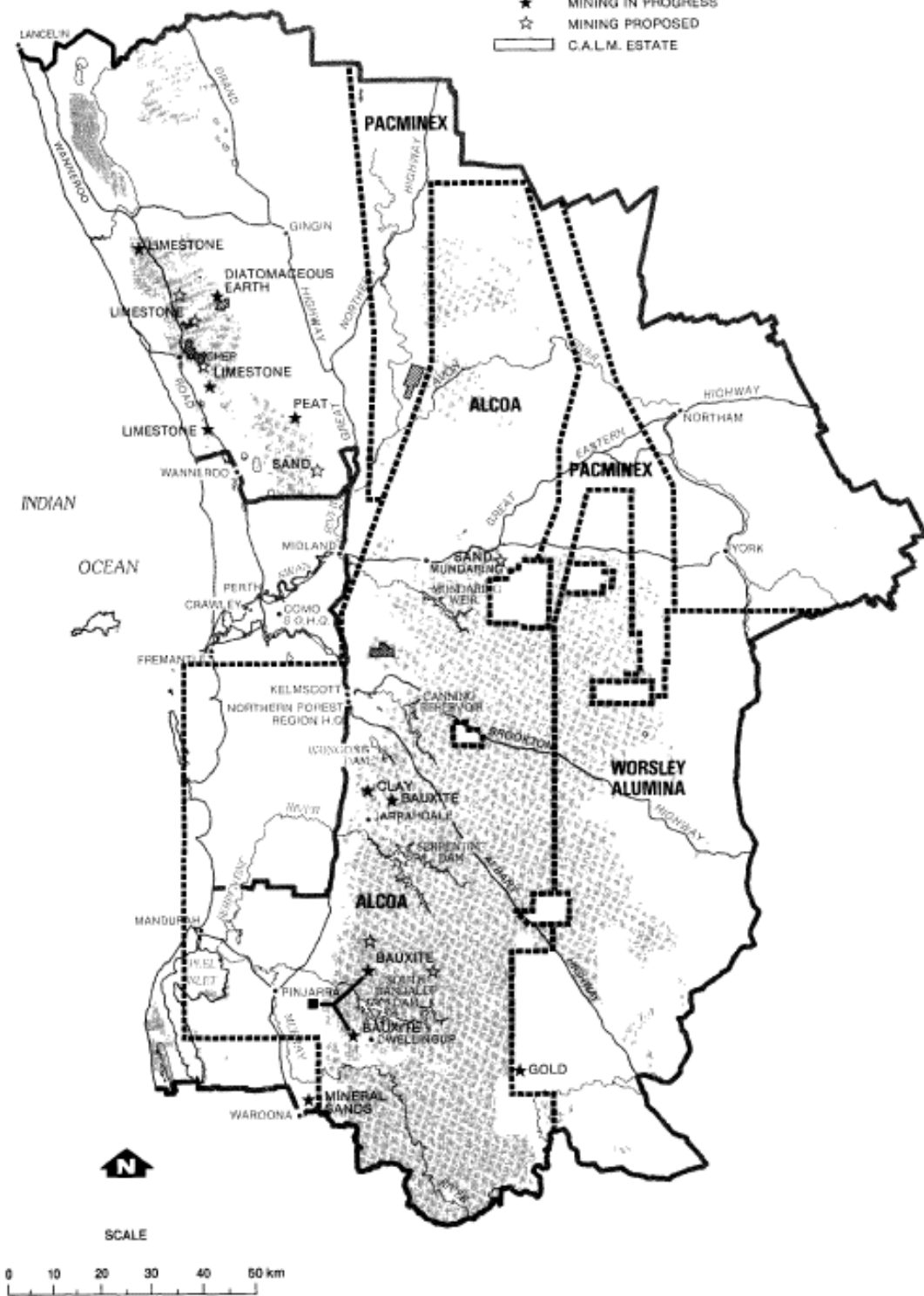
Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) develop basic raw material plans for CALM lands, taking into account the resources on private and other Crown lands;

NORTHERN FOREST REGION MINING

- KEY
- APPROVED BAUXITE MINING LEASES AND CLAIMS
 - OTHER APPROVED MINING LEASES AND CLAIMS
 - CONVEYOR LINES
 - REFINERIES
 - ★ MINING IN PROGRESS
 - ☆ MINING PROPOSED
 - C.A.L.M. ESTATE



MAP 12

- (ii) regulate raw materials supply using CALM leases. Where the provision of material is required for a specific job, Excavation Licences may be used;
- (iii) for **all** CALM basic raw materials leases/licences, develop agreed working arrangements. In particular, leasees must use efficient and cost effective methods that optimise rehabilitation conditions e.g. the removal of topsoil before mining for subsequent use as a planting and natural seed germination medium. In the case of Excavation Licences, where more than one operator is involved, CALM will undertake rehabilitation, but recover this cost per cubic metre of material utilised.

WILDFLOWERS

Wildflower production is an important industry in this State, with production valued at over \$2 million in 1980/81.

All native flora is protected and a licence is required before any wildflowers can be picked on private property as well as Crown lands. Three forms of licence are issued by CALM, which controls wildflower picking under the Wildlife Conservation Act:

commercial purposes licences, which allow the sale of protected flora taken on Crown land;

commercial production licences, which allow the sale of protected flora taken on private land;

scientific or prescribed purposes licences, issued to people intending to take native plants, but not to sell them.

These licences allow the picking of all but gazetted rare flora.

Commercial wildflower picking under licence is permitted on State forest. Usually no picking is allowed within 50 m of public roads, due to roadside amenity. Commercial picking is not permitted on nature reserves, national parks or conservation parks.

The main species collected in this region include *Stirlingia latifolia*, *Anigozanthos manglesii*, *Conospermum stoechadis* *Verticordia drummondii*, and *Chamelaucium uncinatum*, and various Banksia species including *B. menziesii*, *B. grandis*, and *B. prionotes*.

Commercial wildflower picking can have adverse effects on conservation values through overpicking, trampling and disease spread, if not managed properly.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) identify the wildflower resource in terms of land use, regeneration type and determine the appropriate level of harvest;
- (ii) develop and implement a monitoring system, and adjust management according to measured impacts on conservation values.

NURSERIES

Gnangara pine nursery is the only CALM nursery in the region.

Gnangara nursery was established primarily for Departmental requirements but public demand has grown to utilise 30 per cent of the 1.8 million bare rooted planting stock and 0.5 million cuttings raised annually. The following demands are met from Gnangara nursery:

Regional pine planting program;
various species required in the Central Forest Region which develop better at Gnangara than at Nannup Nursery;
private plantations, woodlots, public use;
the propagation of pine cuttings.

Regional Strategy

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) continue to manage Gnangara as a cost efficient nursery to produce seedlings for Departmental and public needs;
- (ii) recoup costs of seedlings raised for public sale.

APICULTURE

In 1985/86 annual production from apiary sites in this State was of the order of 2800 t of honey and 47 t of beeswax with a gross value of over \$2.4 million. Much of this production was from apiary sites on CALM lands. The Department acts as the central registration authority for apiary sites on all Crown lands.

The area of Crown land available for honey supply is unlikely to increase in the future and the number of sites available on CALM lands is limited by management constraints such as the 3 km minimum spacing between sites, dieback hygiene requirements, forest regeneration activities.

Currently some 82 apiarists hold over 650 registered sites within this region, most of which are on CALM land. In addition, there are numerous sites on adjoining private property with the bees using CALM Act land to a significant extent. Feral bees are present throughout the region (Moore et al. 1983). The environmental effects of bees are the subject of current research.

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) continue research into environmental effects and take appropriate action as results become available;
- (ii) improve the administration of the honey production industry on CALM lands by the promotion of self-regulation e.g. for notification, site security, hygiene;
- (iii) liaise regularly with the apiary industry and the Department of Agriculture to ensure CALM land management (e.g. prescribed burning) does not unreasonably impinge upon honey production.
- (iv) encourage use of private property instead of nature reserve, national park, and conservation park for apiary site location.

FISHING

Fishing (both amateur and professional) is controlled by the Fisheries Department. However, CALM has responsibility for the conservation and protection of wildlife under the Wildlife Conservation Act and can control access by fishermen on CALM land and waters.

Amateur fishing in areas managed by CALM includes inland fishing for marron and trout.

Amateur fishing is permitted on CALM lands except nature reserves, under conditions established through the Fisheries Act, unless restricted or prohibited under a management plan. The rules for amateur fishermen are summarised in 'Recreational fishing, a guide to the rules' Fisheries Department (1985).

Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) summarise data on amateur and professional fishing on CALM lands and waters in the region e.g. spots fished, target species, number of fishermen, with a view to minimising impacts on access, environment and resources;
- (ii) summarise information about constraints on fishing e.g. Fisheries Regulations, restrictions on access (DRA), catchment;
- (iii) maintain liaison with the Fisheries Department and if necessary seek changes in fishing regulations and access.
- (iv) disseminate this information to the public.

Public Utilities

The main public utility organisations with responsibilities affecting CALM lands are:

The Water Authority;
State Energy Commission;
Local Government Authorities;
Westrail;
Telecom;
Main Roads Department.

The major public utilities on CALM land are shown in Map 13. In addition public utility agencies currently hold 36 forest leases and 15 gravel leases on CALM land within the region.

Public utilities provide essential community needs but can have serious negative visual effects and cause permanent loss of natural land estate and resources. Existing public utilities will be maintained and new developments will take place during the period of this plan.

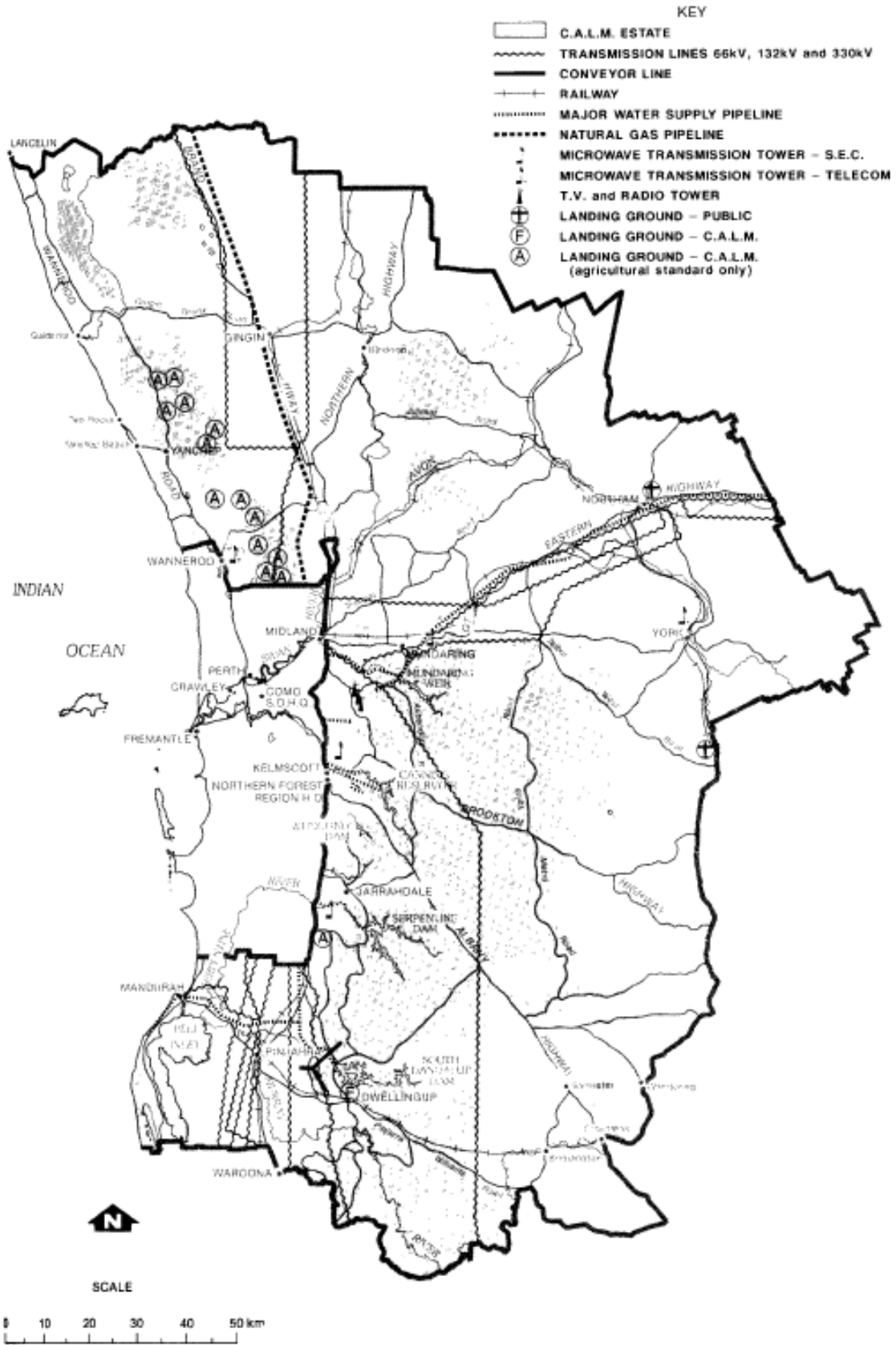
Regional Strategies

In addition to implementing Departmental policies and guidelines (see Appendices 1 and 2), during the period of this plan CALM staff in the region will:

- (i) form advisory committees, comprising CALM and representation from other Government agencies. These committees will report to the Regional Manager on the benefits and costs of proposed public utilities, alternatives, public opinion and compensation to CALM;

- (ii) determine environmental damage from public utilities, prepare agreed working arrangements, implement and monitor rehabilitation programs;
- (iii) aim to minimise environmental impacts wherever possible;
- (iv) determine implementation timetables by liaising with public utilities which are using CALM land.

NORTHERN FOREST REGION PUBLIC UTILITIES



MAP 13

PART 4. RESEARCH

Organisation of the Division

The Division of Research is one of five divisions in the operations wing of the Department, under the overall control of the General Manager. The division is led by the divisional manager and a corporate team consisting of two senior principal research scientists and two principal research scientists. Internal organisation is on the basis of research programs, each led by a program leader. Staff are located at five research centres (Busselton, Como, Dwellingup, Manjimup, Woodvale), each under the administrative control of research centre manager and at two regional headquarters (Kalgoorlie, Karratha), which are administered by Woodvale. Some Como research centre staff are located at Narrogin and Wanneroo district offices.

The program structure for the division has only recently been adopted. It was designed to achieve the following objectives:

to integrate the two research groups that came together with the formation of CALM;

to foster better review and planning of research between workers in related subjects;

to achieve better co-ordination with other CALM divisions and with external research organisations;

to enable clearer definition of priorities and greater mobility of resources across the research spectrum.

Twelve programs have been established. Four are ecosystem based, six are process or goal based and two are service based. The programs are as follows:

Ecosystem based:

- jarrah forest
- karri forest
- pine
- wetlands and waterbirds

Process/goal based:

- biogeography
- fauna conservation
- flora conservation
- fire

plant disease
rehabilitation

Services: computing
executive and administrative support

Major Areas of Research

Each region is serviced primarily by centres located within that region, concentrating on regional problems. However research on such topics as wood utilisation, fire, fauna and dieback service wider Departmental needs as well as the region in which the staff are located.

The Northern Forest Region is serviced primarily from Dwellingup, Como and Wanneroo. Dwellingup is the main centre for research on disease (*Phytophthora cinnamond*). The main aim of the dieback research at Dwellingup is to develop a site mapping system which can be used by operations to predict the impact of *P. cinnamomi* on jarrah. Another major aim of the program is to develop an understanding of host disease and site water relations which will lead to an understanding of the way in which dieback develops and spreads in the jarrah forest.

The work at Dwellingup is supported by work from Como where further research into aspects of the impact of *P. cinnamomi* in other ecosystems, including proteaceous heaths, and other susceptible communities is being done.

Other work at Dwellingup includes hydrology research and jarrah silviculture. Major aims of this work include the protection and enhancement of water quality and quantity. Studies are concentrating on the problems associated with the experimental thinning of catchments to increase water yield. Research is also being done with the aim of increasing the productivity of jarrah regrowth stands and identifying stands which can be safely and profitably managed for timber production.

More recently research has commenced on the genetic improvement of selected commercial eucalypts. Jarrah (*Eucalyptus marginata*) and wandoo (*E. wandoo*) provenance trials have been established and work on *P. cinnamomi* tolerant jarrah is proceeding at Como. Work on other eucalypts and major bauxite rehabilitation species is also underway.

Research on bauxite pit rehabilitation is being wound down. The work is now concentrating on putting the results of past research into practice.

Research work at Wanneroo is largely concerned with pine silviculture, primarily *P. pinaster*. Much of this work is now routine measurement of long term trials. Some new work is starting on nursery problems associated with producing *P. radiata* cuttings at Gnangara.

The Como research centre services the regions needs with regards to chemical and soil analysis, biometrics and computer analysis. Assistance with fire research problems, fauna and flora, agroforestry and other matters is available from other centres when required.

Delineation and monitoring of populations of rare flora is carried out by staff of Woodvale research centre. Long term monitoring of waterbird populations is being conducted in conjunction with the Royal Australasian Ornithologists Union.

Studies on the conservation of the chuditch (*Dasyurus geoffroii*) are being carried out by two visiting scientists based at Dwellingup.

PART 5. PLAN IMPLEMENTATION

The regional management plans provide a framework for more detailed area and operational plans and link these to the corporate, strategic and other plans. Regional plans do not present detailed management proposals on an area basis, but they provide a structure within which more detailed planning can take place.

LEGAL RESPONSIBILITIES

In both the preparation and implementation of management plans, Departmental staff must comply with the various Acts and legislation which impinge on operations. These are:

Acts Administered by this Department:

Conservation and Land Management Act, 1984 as amended
Timber Industries Regulation Act, 1926 as amended
Wildlife Conservation Act, 1950 as amended
Sandalwood Act, 1929 as amended

Acts under which the Department has specific responsibilities are:

Alumina Refinery Agreement Act, 1961 as amended
Alumina Refinery (Pinjarra) Agreement Act, 1969 as amended
Alumina Refinery (Wagerup) Agreement and Acts Amendment Act, 1978 as amended
Alumina Refinery (Worsley) Agreement Act Amendment Act, 1978 as amended
Bush Fires Act, 1954 as amended
Land Tax Assessment Act, 1976 as amended
Mining Act 1978 as amended
Wesply (Dardanup) Agreement Authorization Act, 1975 as amended
Wood Chipping Industry Agreement Act, 1969 as amended
Wundowie Charcoal Iron Industry Sale Agreement Acts, 1974 as amended.

Other Acts which affect the Department's land management responsibilities include:

Aboriginal Heritage Act, 1972 as amended
Aerial Spraying Control Act, 1966 as amended
Agriculture and Related Resources Protection Act, 1976 as amended
Agriculture Protection Board Act, 1950 as amended
Beekeepers Act, 1963 as amended
Control of Vehicles (Offroad Areas) Act, 1978 as amended
Country Areas Water Supply Act, 1947 as amended

Environmental Protection Act, 1986 as amended
Fisheries Act, 1905 as amended
Land Act, 1933 as amended
Local Government Act, 1960 as amended
Main Roads Act, 1930 as amended
Mining Act, 1978 as amended
Metropolitan Water Supply Sewerage and Drainage Act, 1909 as amended
Mineral Sands (Western Titanium) Agreement Act, 1975 as amended
Public Works Act, 1902 as amended
Rights in Water and Irrigation Act, 1914 as amended
Soil and Land Conservation Act, 1945 as amended
South West Development Authority Act, 1984 as amended
State Energy Commission Act, 1979 as amended
State Planning Commission Act, 1985 as amended
Water Authority Act, 1984 as amended.

International treaties signed by the Commonwealth Government which may impinge on the Department's responsibilities are:

CITES - Convention on International Trade in Endangered Species
Ramsar Agreement - Convention on Wetlands of International Importance especially as Waterfowl Habitat
JAMBA - Japan Australia Migratory Birds Agreement

LIAISON REQUIRED

Effective liaison is required at appropriate levels between CALM and State and Commonwealth departments and authorities, local government, organisations and individuals affected by Departmental operations, particularly the following:

Associated Statutory Authorities - Commonwealth Government include the following:

CSIRO
Department of Defence
Telecom Australia

Associated Statutory Authorities - State Government include the following:

Agriculture Protection Board
Bush Fires Board
Department of Agriculture

Department of Industrial Development
Department of Land Administration
Department of Marine and Harbours
Department of Sport and Recreation
Education Department
Environmental Protection Authority
Fisheries Department
Main Roads Department
Police Department
South West Development Authority
State Energy Commission
State Government Insurance Office
State Planning Commission
Valuer Generals Office
Waterways Commission
Water Authority of Western Australia
W.A. Tourism Commission
Westrail

Local Government

All cities and shires which contain CALM land.

SUBSEQUENT PLANNING

The regional plan will be implemented by a series of area management plans, issue plans, operational plans, manuals and prescriptions prepared at district or branch level.

Issue plans

Issue plans are either a follow-up to an approved management plan, or are for necessary operations where there is not yet an approved management plan. Issue plans cover all relevant topics such as:

bauxite rehabilitation
dieback
fire protection
logging
recreation
research
wildlife management

Many of these issue plans are prepared for a three- to four-year period, but revised annually.

Operational plans

The operational plan for a region is the sum of the annual works programs for the districts within the region. An operational plan shows where operations are to be carried out in a financial or calendar year. Intended works over a three- to four-year period may also be indicated. An operational plan has identifiable targets and criteria for measuring performance. It is prepared annually to incorporate any change in priorities.

The following works programs, covering the topics listed, will continue to be prepared during the period of this regional management plan:

feral animal control fire control hardwood regeneration hardwood silviculture hardwood logging
noxious weed eradication rehabilitation prescribed burning pine silviculture pine planting pine
logging regional and district recreation road construction and maintenance

Wildlife Management Programs

These present historical and scientific data and details of strategies and management options for particular fauna or flora species. Examples include:

The Noisy Scrub Bird Management Program (Burbidge, Folley and Smith 1986);
Kangaroo management in Western Australia (McNamara and Prince 1986).

Wildlife management programs are prepared by specialist staff to guide management of specific species.

Departmental Manuals and Prescriptions

Manuals provide guidelines on how operations are to be carried out, whereas prescriptions are job specific. Prescriptions may include details such as a map of the work area, personnel required, cost estimate, safety rules, environmental protection specifications and liaison requirements.

Written job prescriptions are used for most jobs carried out by Departmental gangs and for some jobs carried out by staff and contractors.

The following manuals will continue to be used and others will be drawn up as necessary:

Foresters Manual (to be progressively incorporated into a CALM Operations Manual);

Pine management guide;

Working arrangements;

Code of hardwood logging practice;

(Hardwood) industry control manual;

(Hardwood) operations manual;

Dieback hygiene manual (1986);

Rare flora register for forest regions (1986);

District managers guide (1986);

Code of softwood logging practice (1986);

Recreation operations manual;

Signs manual;

Chemicals manual,

Guidelines for Necessary Operations

The CALM Act (Section 33) provides that certain operations can be carried out when there is no management plan. For national parks and nature reserves, these are defined as those actions necessary for the preservation or protection of persons, property, land, flora or fauna, or for the preparation of a management plan. For indigenous State forest they are defined as those actions that ensure multiple use and sustained yield of that resource for the satisfaction of long term social and economic needs.

Guidelines for 'necessary operations' are prepared by district and specialist staff for approval by the directors.

Regional, District, Branch Strategic Plans

Each year, or as required, Regional Managers draw up a strategic plan detailing such matters as:

responsibilities;

objectives and key strategies;

priorities for the period, including reference to work deferred because of insufficient resources;

liaison requirements;

administrative structure and arrangements;

update of resources (personnel, etc);

targets and/or performance indicators and control systems to measure success or failure;

reports required, such as annual reports by districts.

Planning by other Departments, Authorities and Organisations

Many other departments, authorities and organisations produce management plans. It is the intention of this Department to conform to the appropriate Acts, Regulations, By-laws and plans of other organisations providing that these do not conflict with our Acts, Regulations and responsibilities. This Department also intends that other departments should conform to our Acts and Regulations.

Our plans are discussed with organisations and individuals likely to be affected by them and we seek input into other organisations plans that are likely to affect us.

Examples of the types of plans which may affect this Department are:

Commonwealth Government

Telecom: microwave link proposals, telephone cable developments,

State Government

Environmental Protection Authority: coastal management plans, conservation reserve proposals for Systems;

Main Roads Department: proposals for major roadworks etc;

State Energy Commission: proposals for new electricity or gas lines;

State Planning Commission: regional or area plans;

Water Authority: proposals for major new developments, catchment recreation plans;

Waterways Commission: inlet/estuary management programs.

Local Government

Town (shire) plans, proposals for major new developments,

Private Enterprise

Mining Companies: proposals including ERMP for major new developments.

WORKS PROGRAMS AND FINANCE

The Departmental objective for financial management is to prepare budgets which reflect Departmental goals and priorities and to manage works programs according to approved budgets.

PERSONNEL

Increase in personnel numbers is justified in a number of areas. In the current economic situation, however, personnel numbers are likely to decrease in line with Government policy.

CALM aims to develop and maintain a system of management that will give full scope to individual capacity and ability, and encourage teamwork. High priority is given to the safety of CALM personnel and other people who recreate or work on land managed by CALM.

Training

In accordance with the Departmental training policy (See Policy Statement No. 6 'Staff Training and Career Development') training needs for staff and employees will be evaluated each year, included in annual works programs and budget submissions, and implemented on a priority basis as resources permit.

RESEARCH, INVENTORY AND MONITORING

Research, inventory and monitoring requirements are continually reviewed by regional and research staff, Inventory Branch and other Departmental Branches. Depending on factors such as urgency, likely cost and priority the required work is either carried out, programmed or deferred, depending on existing resources and workloads.

REPORTS AND RECORDS REQUIRED

Management records will continue to be kept in the manual Hardwood Operations Control System (HOCS) and Pine Operations Control System (POCS) and the computerised Conservation and Land Management Information System (CALMIS). Specified area and volume data will be provided for inclusion in the Departmental annual report and continuously for management requirements.

Standard reports will be produced by the computerised hardwood and pine logging systems and financial reports by the general ledger system.

Comments on progress in implementing the regional management plans will be incorporated in the Departmental Annual Report as appropriate.

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GLOSSARY

Aquifer: A zone of soil or subsoil material that allows the passage of water faster than adjoining zones.

Basic raw materials: Gravel, sand, rocks, limestone, clay used for fill and for roads and buildings.

Bedrock: Barren formation underlying the exploitable part of a mining deposit.

Buffer: An area of land managed in such a way as to protect another area from outside influences.

Catchment: The surface area from which water runs off to a river or any other collecting reservoir, e.g. swamps, groundwater.

Catena: A gradual succession of soil types over an area, usually due to variation in relief (topography).

Cave: A natural underground cavity formed in rock, usually with an opening to the surface. Significant caves are large enough to be entered by humans.

Clearfelling: The felling and removal of the standing crop. The subsequent crop is even-aged.

Compatible uses: Uses that do not conflict with the priority use.

Conditional uses: Uses that conflict to an extent with the priority use and are only permitted so long as there is no significant harm to the priority use.

Conservation: Management of human use of the environment so that it may yield the greatest sustainable benefit to present generations while maintaining the potential to meet the needs and aspirations of future generations.

Corporate plan: A document expressing an organisation's direction and commitments, e.g. in terms of its mission, charter, objectives and strategies.

Cretaceous: Period of geological time from about 65 million to 135 million years ago.

Crystalline rocks: Igneous rocks (formed by the cooling of hot fluid material - magma) or metamorphic rocks (originally igneous or sedimentary but altered by heat and/or pressure).

Day use recreation: Recreational use of an area for a period of one day or less.

Disease: A disorder which results in a morbid (sickly) condition of a plant or animal.

Ecosystem: A specific environment, e.g. lake including all its biological, chemical and physical components.

Endangered: Flora or fauna in danger of extinction and whose survival is unlikely if the causal factors continue operating.

Endemic: Flora or fauna that is confined in its natural occurrence to a particular region.

Environment: The physical surroundings in which an organism or group of organisms live.

Erosion: Wearing away of the land surface by natural forces.

Estuary: A partially enclosed coastal body of water either permanently or periodically open to the sea.

Exotic: A plant introduced from another locality. Not indigenous.

Fauna: Animal life.

Feral: An introduced or domestic animal now living in the wild.

Flora: Plant life.

Forest: An ecosystem characterised by a more or less dense and extensive tree cover.

Geology: The science which investigates the history of the earth's crust, from the earliest times to the commencement of the historical period.

Geomorphology: The description and interpretation of landforms.

Group: Selection: A silvicultural system in which the crop is felled in small groups either to permit regeneration to develop or to release advance growth.

Hardwood: The timber of broadleaved trees, and the trees themselves, belonging to the botanical group Angiosperms, e.g. Eucalypts.

Hydrology: The study of water movements, quality, distribution and utilisation, above, on and below the ground.

Interpretation: The process of communicating the significance (bringing out the meaning) of an area by describing and explaining its characteristics.

Jurassic: Period of geological time, from about 135 million to 195 million years ago.

Landform: All the physical, recognizable, naturally formed features of land, having a characteristic shape; includes major forms such as a plain, mountain, or plateau, and minor forms such as a hill, valley or alluvial fan.

Landing: A site at which logs have been accumulated for the purpose of loading on to a hauling vehicle.

Laterite: The weathering of rock/soil which leads to the removal of silica and alkalies, resulting in a soil or rock with high concentrations of iron and aluminium oxides (laterite).

Mature forest: The stage at which a stand best fulfils the (main) purpose for which it was maintained e.g. produces the best possible supply of specified products.

Mesozoic: Era of geological time from about 65 million to about 245 million years ago.

Monadnock: An isolated hill or mass of rock which stands above the surrounding country because its rock has been more resistant to erosion than the rock of the area.

Multiple use management: The use of land, especially forest land, for several different purposes. Some types of use are compatible with each other, but others may not be compatible, in which case it is necessary to set a priority or even exclusive use for a particular area.

Objective: A specific statement of measurable results to be achieved within a specific time period.

Permian: Period of geological time from about 240 million to about 280 million years ago.

Pests: Troublesome or destructive animals, including insects, either introduced or native.

Plain: An extensive area of level or gently undulating land, usually of low altitude.

Plateau: An extensive, level or mainly level area of elevated land.

Podzolic: A soil with a very thin organic-mineral layer (horizon) above a bleached layer which rests upon a clay enriched dark coloured horizon. Podzols are acid soils with clearly defined boundaries between horizons.

Policy: The courses of action to be followed to achieve an organisation's objectives.

Pollution: Any direct or indirect alteration of the environment by discharging, emitting or depositing wastes or substances which are harmful or potentially harmful.

Precambrian: The oldest period of geological time, from about 550 million years ago to the time of consolidation of the earth's crust about 4 500 million years ago.

Prescribed Burning: The application of fire to land under such conditions of weather, soil moisture, time of day and other factors that will result in the controlled spread and intensity of heat required to accomplish specific silvicultural, environmental or fire hazard reduction objectives.

Priority use: The use which will prevail in any situation of conflict between various uses.

Quaternary: The most recent period of geological time, from the present to about 1.8 million years ago.

Rare species: Less than a few thousand reproductively mature specimens are known to exist in the wild.

Rehabilitation: Process necessary to return disturbed land to a predetermined surface, land use or productivity.

Restricted: Flora or fauna that occurs only in a confined area.

Rutile: A reddish-brown tetragonal mineral common in acid igneous rocks, in metamorphic rocks, and as residual grain in beach sand.

Salinity: The measure of total soluble (dissolved) salt, i.e. mineral constituents, in water. Water containing more than 500 parts per million (mg/L) is not considered desirable for domestic use.

Scarp: An inland cliff or steep slope, often formed as a direct result of a geological fault.

Sedgeland: Areas of coarse, grassy, rush-like or flag-like plants growing in wet places.

Sedimentary rocks: Formed from pre-existing rocks by the action of erosion (e.g. sandstone), chemical precipitation (e.g. rock salt) or the activity of organisms (e.g. limestone).

Silviculture: The art and science of establishment and tending of forest.

Snig Track: Track on which a log is hauled from tree stump to a loading point (or landing).

Softwood: The timber of trees, and the trees themselves, belonging to the botanical group Gymnosperms, e.g. Pines.

Strategy: Explains how policy is intended to be achieved.

Sustained Yield: As applied to forest policy, a method or plan of management (sustained yield management) that implies continuous production with the aim of achieving, at the earliest practicable time and at the highest possible level, an approximate balance between net growth and yield.

Tertiary: Period of geological time, from about 1.8 million to 65 million years ago.

Thinning: A felling made in an immature stand for the purpose of improving the growth of trees that remain without permanently breaking the canopy.

Topography: The delineation of the natural and artificial features of an area.

Turbidity: Discolouration of water due to suspended silt or organic matter.

Underground water: Water which occupies the pores and crevices of rock and soil.

Virgin forest: Forest which has not been cut over (logged).

Weeds: Plants (often self-sown exotics) growing where they are not wanted.

Wetland: Any lowland covered by shallow and sometimes temporary or intermittent waters, e.g. swamps, creeks, rivers, lakes, estuaries.

Woodland: A plant community in which trees form only an open canopy, the intervening area being occupied by lower vegetation, usually grass or scrub.

GLOSSARY OF ABBREVIATIONS

A.	Acacia
B.	Banksia
CALM	(Department of) Conservation and Land Management
CSIRO	Commonwealth Scientific and Industrial Research Organization
CTRC	Conservation Through Reserves Committee
DRA	Disease Risk Area
E.	Eucalyptus
EPA	Environmental Protection Authority
ERMP	Environmental Review and Management Program
<i>et al.</i>	and others
ha	hectares
ID no.	Identity number
IUCN	International Union for the Conservation of Nature and Natural Resources
km	kilometre
L.	Lake
LFC	Lands and Forests Commission (a controlling body established under Section 20 of the CALM Act, 1984).
M.	Melaleuca
MPA	Management Priority Area
P.	Pinus
m	metre
m ²	square metres
m ³	cubic metres
mg/L	milligrams per litre
n.d.	No date
NPNCA	National Parks and Nature Conservation Authority (a controlling body established under Section 21 of the CALM Act, 1984)
SEC	State Energy Commission
TDS	Total dissolved solids
VCL	vacant Crown land
WAWA	Water Authority of Western Australia
10 ³	1000
10 ⁶	1000000

APPENDIX 1. DEPARTMENTAL POLICY STATEMENTS

CALM inherited policies from the three agencies amalgamated to form the Department, and is currently developing new policies covering the complete range of Departmental management responsibilities.

Policies are published and distributed throughout the Department as Policy Statements. They can be made available to any member of the public who wishes to read them.

Policy statements issued or in final stages of drafting (at 1 July 1987) are as follows:

No.	Title	Date of issue or amendment
1	Planning	Jan 1986
2	Basic Raw Materials	Nov 1985
3	Dieback and Logging	Sep 1986
4	Departmental Advisory Committees	Dec 1985
5	Research and Technical Publications	Jan 1986
6	Staff Training & Career Development	Jan 1986
7	Recreation in Nature Reserves	Jan 1986
8	Financial Management	May 1986
9	Conservation of Endangered Flora in the Wild	-
10	Rehabilitation of Disturbed Land	Nov 1986
11	Protection of Aboriginal Sites	-
12	Arbor Day	Aug 1986
13	Taking of Protected Flora in the Kimberley Region	Dec 1986
14	Weeds on CALM land	Nov 1986
15	Public Participation	Apr 1987
16	Computer Purchase and Use	Dec 1986
17	Housing	Feb 1987
18	Recreation	Apr 1987
19	Fire Management	May 1987
-	Reporting, Monitoring and Re-evaluation of Ecosystems	-
-	Management of Conservation Lands	-
-	Communications	-
-	Marine and Estuarine Reserve System (W.A.)	-

Policies are being developed for a further 20 issues relevant to CALM activities and responsibilities.

Until the full range of policies is available, Departmental management guidelines (see Appendix 2) are used as a basis for operations. These provide managers with day-to-day guidelines for planning and management. They are based upon new CALM policies, or policies inherited by CALM from the former agencies.

THE TIMBER STRATEGY FOR WESTERN AUSTRALIA

A comprehensive statement on the timber strategy for W.A. has been released i.e. 'Timber production in Western Australia. A strategy to take W.A.'s south-west forests into the 21st century' (CALM, 1987).

The timber strategy is a component of the land management plans, and is consequently a statutory document.

The timber strategy covers:

- the demand for wood;
- W.A.'s forest resources;
- the forest-based industries in W.A.;
- forest management;
- setting the allowable cut;
- allocation of the cut;
- log pricing;
- timber utilisation;
- timber marketing.

THE CONSERVATION AND RECREATION STRATEGY

A statement on the policies and management guidelines used by CALM in areas of conservation and recreation has been released i.e. 'Strategies for Conservation and Recreation on CALM lands in Western Australia. The conservation, environmental protection and recreation strategies of W.A.'s Department of Conservation and Land Management.' It covers:

- wildlife conservation;
- recreation;
- landscape management;
- environmental protection;
- fire;
- mining;
- wildflower picking.
- dedication of land;
- cultural areas;
- community education and interpretation;
- apiculture;
- public utilities.

APPENDIX 2 DEPARTMENTAL MANAGEMENT GUIDELINES

Note:

Management guidelines are continually under review and may change during the period of this plan, particularly as new CALM policies are developed.

Each Management guideline comprises:

A broad objective - a broad statement of what the Department expects to achieve.

Specific objectives - the courses of action to be taken to achieve the broad objective.

Strategy - which explains how the objectives are intended to be achieved.

DEDICATION OF LAND

Objective

To reserve natural ecosystems and other significant land areas of the State within appropriate definition of purpose and security of tenure to meet conservation needs and public demands for use.

Specifically the aim is to:

assess the potential of land within the State to meet the requirements of the Conservation and Land Management Act;

advise Government on the value of vacant Crown land for forestry, national parks and nature reserves;

pursue dedication of vacant Crown land suitable for Departmental management;

purchase suitable areas of private property as they become available and ensure suitable vesting, or make agreements for joint management, as appropriate;

oppose alienation of State forests, national parks, nature reserves and marine reserves;

consolidate existing reserves by negotiation to ensure that boundaries are manageable with respect to adjacent land uses.

Strategies

- (i) Continue survey of all non-dedicated land (and waters) which could be of value to the public estate.
- (ii) Exchange land where the Department's assets will benefit from the transaction.
- (iii) Issue leases for activities not opposed to the purpose of the land, where this will assist management objectives.
- (iv) Continue biogeographical studies and research to identify further areas or ecosystems for inclusion in the reserve system.

WILDLIFE CONSERVATION

Objectives

To manage forest, parks and reserves for conservation of native wildlife (flora and fauna); to ensure long-term maintenance of species' diversity and genetic resources; and provide for the persistence of those habitats, species and ecological processes which comprise natural ecosystems.

To protect and manage wildlife populations throughout the State, and provide special protection for species declared to be rare and endangered.

Specifically, the Department will aim to:

Develop a Reserve system

Establish and manage a system of parks and reserves dedicated to a primary purpose of wildlife conservation which:

is broadly representative of the region's natural habitats and contains viable populations of plants and animals representative of the indigenous flora and fauna; and is sufficiently and appropriately spaced to provide refuge for migratory and nomadic species as well as habitat for sedentary species.

Manage parks and reserves whose primary function is wildlife conservation to:

maximise diversity and species- richness, or provide habitat for particular species or communities.

Manage those State forests and reserves whose primary function is not wildlife conservation to meet wildlife conservation objectives to the maximum extent possible without compromising the area's primary purposes.

Maintain habitat for those species of indigenous plants and animals which are rare or endangered.

Undertake ecological research and monitor change in reserve environments and species populations to develop a knowledge-base appropriate to reserve management objectives.

Strategies

Protect Wildlife

- (i) Ensure that wildlife protection regulations are adhered to throughout the State.
- (ii) Ensure that protected flora and fauna are taken for private or commercial purposes only in accordance with regulations and permits, and that the numbers taken do not endanger the longterm sustainability of populations in the wild.
- (iii) Ensure that any native species taken for private or commercial purposes are treated as humanely as possible.
- (iv) Provide assistance to other land-holders for protection of populations of rare and endangered species, where appropriate.
- (v) Maintain an information system pertaining to the location, condition and management needs of populations of rare and endangered plants and animals.
- (vi) Maintain an effective enforcement unit and inspectorial programs.
- (vii) Monitor the status of wild populations, habitat and seasonal conditions and ensure that permits to take are consistent with the long-term maintenance of population numbers.
- (viii) Monitor the take of wildlife subject to permit and ensure that conditions are adhered to.

Establish a representative reserve system

- (ix) Assess and characterise the qualities of existing conservation reserves to determine conservation values and particular management problems in each one.

- (x) Evaluate the extent to which conservation reserves act as a system, both internally and in the extent to which they need to be integrated with other land whose primary function is not wildlife conservation.
- (xi) Assess the extent to which the existing conservation reserves are representative of the biota of Western Australia and develop a strategy for acquisition of additional land for reservation where the existing reserve system is shown to be deficient.
- (xii) Develop a set of priorities for each region for the allocation of resources to research, planning, and management of conservation reserves.

Management of conservation reserves

- (xiii) Develop and maintain an inventory of conservation reserves containing information on vesting and management history, location, size and shape, landscape, biotic diversity, environmental condition, and the presence of species in need of special protection.
- (xiv) Prepare management plans for individual conservation reserves or groups of similar reserves with clearly defined objectives for protection and, where necessary, restoration of identified conservation values, and with special emphasis as appropriate on:
 - maintenance of species- richness and continuance of natural ecological processes;
 - protection of rare or endangered species;
 - protection of unique habitats or communities;
 - maintenance of habitat for migratory species.
- (xv) Exclude from conservation reserves, as far as possible, species of plant and animal not native to the area. Where exotic organisms have been introduced, take measures to eradicate them from the reserve or, where that is not possible, to control their populations to levels where they do not damage the conservation values of the reserves.
- (xvi) Provide facilities to service those recreational or educational activities in the reserve which are prescribed in an approved management plan.

LANDSCAPE MANAGEMENT

Objective

To ensure that all land uses and activities on CALM land are planned and carried out in ways that complement the inherent visual qualities of the natural environment.

Specifically, the aim is to:

employ staff trained in landscape architecture and related design disciplines to promote sound landscape management practices within CALM planning and operations;

develop a landscape classification system which will assist in the identification, evaluation and amelioration of visual impacts, and which is applicable to and compatible with both broad scale and detailed project planning;

prepare a comprehensive manual and set of landscape management guidelines covering all operations that have an effect on the landscape;

conduct training courses covering visual resource and landscape management and planning concepts for Departmental staff and other interested groups who work on CALM lands.

Strategies

- (i) Harvest State forest areas designated for timber production in ways that are sympathetic to existing landscape patterns and within the limits imposed by sound silvicultural and management techniques.
- (ii) Establish pine forests in accordance with accepted landscape design principles so that possible intrusive effects on the landscape are minimised.
- (iii) Plan and design facilities for recreation that are in harmony with the natural environment.
- (iv) Locate and design roads and utility corridors to minimise both environmental and social impacts on the areas they traverse.
- (v) Ensure that major disturbances imposed on CALM lands (dams, mines) are planned and implemented to minimise the impact on existing landscape values.
- (vi) Locate and design all new buildings and structures using materials and colours compatible with the surrounding landscape.
- (vii) Develop and implement a standard system of signs to cater for the various sign requirements of the Department.

- (viii) Evaluate land use proposals on adjacent lands in terms of their potential impact on landscape and recommend how these can be mitigated.

CULTURAL AREAS

Objective

To ensure the preservation and enhancement of significant cultural areas (modified landscape, historic sites, Aboriginal sites, caves) on land controlled by the Department.

Specifically the aim is to:

locate and record the presence of significant sites;

liaise with the Museum, universities, historic societies, National Trust and other relevant bodies to ensure suitable classification, registration, protection and management of sites;

manage the sites as appropriate; encourage further research where required;

liaise with industry, local government and public utilities to ensure the protection of these sites.

Strategies

- (i) Where necessary, ensure protection by suitable tenure and provision within management plans for the area or region concerned.
- (ii) Employ regional committees to assist in site location and evaluation.
- (iii) Facilitate site location and classification by concentrating on areas in which potentially damaging operations are to be carried out.
- (iv) Maintain the necessary degree of confidentiality where required to protect values.
- (v) Record as required in Departmental information systems to prevent inadvertent damage by Departmental operations.

ENVIRONMENTAL PROTECTION

Objective

To protect CALM lands from environmental degradation caused by natural agencies (e.g. insects, fungi, dieback), exotic agencies (e.g. weeds, feral animals) and human activities (e.g. mining, pollution, litter, roading).

Specifically, the aim is to:

- manage land, wherever possible, to avoid disturbance that degrades natural ecosystems;
- develop appropriate environmental controls for all CALM activities;
- monitor the extent and severity of physical disturbances and infestations on CALM lands;
- classify CALM land on the basis of sensitivity to disturbances and pollution;
- develop appropriate environmental and legal controls to minimise environmental damage by other agencies and private individuals;
- encourage research into harmful natural and exotic agencies.

Strategies

- (i) Include environmental guidelines and controls in all management proposals and prescriptions.
- (ii) Ensure that landscape management and rehabilitation procedures are considered in planning all operations that can cause disturbance.
- (iii) Ensure that all staff are adequately informed and trained in aspects of environmental management.
- (iv) Disseminate information about environmental factors to other agencies and members of the public.
- (v) Allocate appropriate resources (staff, money, training) to ensure that the policies can be implemented,

FIRE

Objectives

To protect community and environmental values on lands managed by the Department from damage or destruction by wildfire.

To use fire as a management tool to achieve land management objectives, in accordance with designated land use priorities.

Specifically, the aim is:

Fire Suppression

The Department will:

Respond to fires occurring on or near CALM land to a degree that is appropriate to the values at risk.

Assess its response to a fire in the light of potential damage to the following values in order of priority:

- (i) Human life;
- (ii) Community assets, property and environmental values;
- (iii) Cost of suppression in relation to values threatened.

Where values dictate:

- (i) provide a detection system which will give timely warning of the presence of a fire threatening community or environmental values;
- (ii) provide a well-trained and equipped suppression organisation capable of containing several simultaneous unplanned fires under extreme weather conditions in conjunction with other firefighting organisations.

Use of Fire

The Department will:

Use planned fire only where this use is in accordance with an approved management plan, or, where such a plan does not exist, to protect and maintain the designated priority land use.

Prepare written prescriptions in advance, for approval by senior designated officers, before any planned fires are undertaken.

Use fire conservatively in areas where information about the impacts of fire is limited, and in areas where the primary land use is conservation of flora and fauna.

In such areas, the use of fire will be restricted to:

- (i) protection of neighbouring community assets; and
- (ii) providing a diversity of fuel and vegetation ages, but ensuring as much as possible of each major vegetation association is maintained in the mature condition.

Use prescribed fire or other methods to reduce fuels on CALM lands, where it can be demonstrated that this is the most effective means of wildfire control, and where undesirable ecological effects do not result.

The frequency of fuel reduction measures will be governed by the rate of build-up of fuels, the value of the assets to be protected, and the resources available to carry out the work.

Liaison

The Department will:

Ensure effective liaison with neighbours, bush fire brigades, shires, Bush Fires Board and other fire control organisations.

Support the concept of shire district fire plans and promote mutual aid interagency agreements for fire control of lands of mixed tenure with common fire problems.

Public Awareness

The Department will provide for public education in relation to the prevention of fire, and the role and use of fire in ecosystem management, and hazard and risk reduction.

Research

The Department will undertake research into fire prevention and control, and fire effects and fire behaviour on CALM lands to improve the scientific basis for, and effectiveness of, fire management programs.

DISEASES

Objective

To minimise the damage caused by plant and animal diseases on Departmental lands.

Specifically, the aim is to:

maintain a record of all plant and animal diseases of significance to management of CALM lands;

classify land and populations according to disease presence, susceptibility of habitats and resistance to disease;

investigate the cause and effect of diseases and prescribe effective control measures, where warranted;

ensure that all management practices for an area are in accord with effective disease control;

inform the public of the nature and significance of disease on CALM land and request their co-operation in prevention and control;

rehabilitate infected areas or populations where appropriate.

Strategies

- (i) Maintain effective expertise on pathogens within the Department.
- (ii) Ensure that disease effects are considered in all ecological studies.
- (iii) Use quarantine and hygiene methods for control, as necessary.
- (iv) Provide for staff training in disease detection and control.

WEEDS AND PESTS

Objective

To achieve a safe and systematic management of weeds and pests of ecological significance, on CALM lands.

Specifically, the aim is to:

direct management to eradication, control or containment depending on land management objectives, and the nature of the weed or pest;

monitor the extent or severity of infestations on Departmental lands;

control declared weeds and animal pests on Departmental land where it is economically feasible to do so; ensure conservation values are not prejudiced in control work;

carry out research to determine the most effective method of control to meet priority use objectives;

liaise with other departments, authorities, shires, industry and neighbours involved in weed and pest control and related matters.

Strategies

- (i) **Ensure that all** artificial control programs are carried out with safety of the operator and public a priority.
- (ii) All chemical controls must conform with prescribed techniques and have the approval of the district or regional manager.
- (iii) Wherever possible expert control teams will be employed for hazardous control procedures.
- (iv) Biological control of exotic weeds or pests must be approved by the Director of Nature Conservation.

REHABILITATION

Objective

To regenerate degraded land with self-regulating ecosystems consistent with the purpose of the land and, where possible, to restore indigenous biological communities.

Specifically, the aim is to:

rehabilitate land managed by the Department which has been degraded by disturbance so that it will best meet the needs of the designated land use for the area;

apply restoration techniques which favour natural values, wherever possible;

ensure that the cost of rehabilitation is borne by the agency responsible for site degradation, wherever possible;

ensure that rehabilitation provides for as many secondary land uses as possible;

monitor regeneration programs and encourage research to ensure that the aims are being achieved and that techniques are continually being improved;

Liaise with other Government departments, miners, industry and other land users to continue the exchange of ideas, techniques and standards for rehabilitation.

Strategies

- (i) Ensure that agreements and planning for disturbances on CALM land make provision for rehabilitation.
- (ii) Employ species and genotypes native to the original site in restoration, whenever possible.
- (iii) Encourage natural regeneration of indigenous vegetation.
- (iv) In the absence of natural regeneration, planting or seeding procedures should be planned to simulate the original vegetation with respect to species diversity, composition and spacing.
- (v) For areas where nature conservation is not the priority use, if naturalness cannot be achieved, rehabilitation should enhance priority uses or maintain them at an acceptable level as determined by landscape architects.

RECREATION

Objective

To cater for the widest range of recreational activities giving the most satisfying experience for users, through the planning and managing of activities and facilities on land controlled by the Department. This is to be done having regard to the preservation of natural land values, consistency of recreational activity with purpose of vesting, equity, and the capacity of the Department to manage the proposed activity.

Specifically, the aim is to:

Provide and allow for the widest range of recreational opportunities consistent with:

the purpose and vesting of the land;
the ability of the natural system to sustain the activity without impairment;
the ability of the Department to supervise the activity where land values may be impaired.

Provide facilities and information to enhance use and enjoyment of recreation sites.

Plan facilities to involve users (both individuals and groups) to the fullest possible extent.

Where appropriate, obtain assistance in the provision of services from non-public sources. This may be by way of commercial concessions or voluntary help.

Recoup costs through charges to users where recreational opportunities create a management cost, and where it is practical to do so.

Ensure safety, through planning, maintenance, information and signs.

Strategies

- (i) Identify opportunities for recreation when regional and area management plans are being prepared.
- (ii) Monitor existing activities and facilities and collect data on use to ensure that the quality of opportunities is maintained; the current use is appropriate to the primary objectives of land reservation; and resources are allocated based on need.
- (iii) Consult with individuals and organisations about management of recreational opportunities and further requirements.
- (iv) Plan the most appropriate recreational use of areas, based on preservation of natural values and anticipated recreation demands. Anticipate the need to minimise maintenance and management costs and reduce conflicts between users.
- (v) Regularly review fees to ensure that they are equitable, and reflect management costs incurred.
- (vi) Continually and effectively inform the public of:

recreational opportunities available to them and the positive efforts made by the Department to provide them;

the reasons for management decisions regarding restrictions on use;

behaviours which maximise the retention of natural values;

requirements for safety of all users.

COMMUNITY EDUCATION AND INTERPRETATION

Objective

To promote community awareness and understanding of the natural environment and encourage public attitudes and behaviour compatible with, and supportive of, conservation of flora and fauna and the management of forests, parks and reserves.

Specifically, the aim is to:

encourage people to learn about State forests, parks, reserves and wildlife;

foster the desire in people to experience the natural environment and its management;

interpret the environment in forests, parks and reserves for visitors;

co-ordinate and assist public participation in management planning and implementation through advisory committees and 'friends' groups;

research and evaluate methods and techniques available for achieving effective community education and interpretation;

liaise with associated agencies, organisations and interest groups to integrate education and interpretation programs.

Strategies

- (i) Provide an education/interpretation section within the Information Branch.
- (ii) Provide facilities such as self-guided walk trails, visitor centres, displays and brochures.
- (iii) Train regional and district staff in interpretation and effective communication with the public.

- (iv) Provide the Education Department and private school system with appropriate advice and assistance in curriculum development, and assist with in-service training of teachers, teacher-trainers and relevant community group leaders.
- (v) Produce and market appropriate educational films, videos, slides, sound tapes, pamphlets, brochures and other audio visual material and publications.
- (vi) Promote the use of planned tours, seminars, workshops, field days and lectures to explain conservation and land management, at the regional level.
- (vii) Ensure public inquiry into CALM's activities is satisfied.

SUPPORT SERVICES

Objective

To assist in achieving the goals of resource management under the responsibility of CALM in an effective manner.

Specifically, the aim is to:

provide information, advice, trained personnel and equipment necessary to achieve resource management objectives;

acquire knowledge and skills so that management decisions are based on the most up-to-date information and expertise;

review management techniques, information, staff finance and equipment needs at regular intervals;

promote public understanding of natural ecosystems, conservation and CALM policy.

Strategies

- (i) Maintain sufficient support staff to provide information, advice and equipment to allow resource management goals to be achieved.
- (ii) Ensure management systems and controls are effective.

- (iii) Maintain training and recruiting programs to ensure that the expertise necessary to achieve resource management goals is always available.
- (iv) Prepare statements indicating the technical value of projects in a way that allows a financial priority to be allocated.
- (v) Provide information on conservation matters for the public, using appropriate means such as publications, talks and field visits.
- (vi) Maintain contact with Government departments and other organisations with interest in areas managed by CALM.

CATCHMENT MANAGEMENT

Objective

To manage catchments needed for water supply so as to maintain or enhance water quantity and quality in accordance with the requirements of the Water Authority of Western Australia (WAWA).

Specifically, the aim is to:

protect existing healthy vegetation from agents that might lead to deterioration of water quality;

rehabilitate degraded areas to ensure water quality is maintained or restored;

regulate other uses of gazetted catchments when they compete with water supply objectives;

monitor the quality of streams where changes in land uses are involved;

investigate techniques of land management with the aim of maximising water supply without detrimentally affecting quality;

liaise with water supply authorities (WAWA) concerning all aspects of water supply and any new management practices proposed;

ensure that CALM plans allow for new dams and major supply facilities proposed by WAWA.

Strategies

- (i) Direct management of salt-sensitive areas to establish and maintain a deep-rooted perennial crop, and restore vegetation cover as quickly as possible where it is removed.
- (ii) Design harvesting and silvicultural practices to increase water quantity while protecting water **quality**.
- (iii) Protect and maintain stream reserves.
- (iv) Keep road construction and maintenance to a standard necessary for catchment protection.
- (v) Minimise the spread of dieback disease, particularly in salt-sensitive areas.
- (vi) Continue prescribed burning on catchments in such a way as to minimise turbidity and ash pollution and to regulate run-off.
- (vii) Manage existing land uses on catchments to minimise the risks of siltation, turbidity, salinity and biological pollution.
- (viii) Avoid land use changes where they prejudice water values or potential storage sites.
- (ix) Plan recreational activities on catchments according to guidelines prepared by the Western Australian Water Resources Council.

WOOD PRODUCTION

Objective

To produce the maximum range and type of wood products, so as to provide long term economic and social benefits to the people and to sustain the forests of W.A.

Specifically, the aim is to:

adjust the cut from the native forest progressively to a level consistent with the growth of the forest, having due regard for associated regional economic stability;

ensure wood production areas are dedicated and protected, to permit long term forecasting and effective silvicultural management;

ensure that the wood products from the forest are used conservatively in conversion and in marketing to favour the highest value product;

provide softwood plantations to supplement the hardwood cut, to meet demand, wherever it is economically and socially desirable to do so, and in accord with effective land use management;

continue research to ensure the best possible inventory, protection, silvicultural, utilisation and harvesting techniques are employed in management;

expand the hardwood sawlog resource base by encouraging use of lower quality logs, smaller logs and residues;

monitor wood production operations to ensure they are environmentally sound and favour multiple use management of the forest;

liaise with local government and the timber industry concerning environmental protection, future availability of the resource, and utilisation standards.

Strategies

- (i) Regulate log sale agreements and royalties to favour conservative use of timber and stability of the timber industry.
- (ii) Integrate harvesting operations to favour the best extraction and use of all log and round wood materials.
- (iii) Provide direction to industry through research into the use and marketing of timber resources.
- (iv) Control and direct wood use from the forest through regional management and operational plans.
- (v) Encourage private involvement in hardwood and softwood production.

MINING

Objective

To ensure that approved exploration and mining operations proceed according to conditions specified to minimise environmental damage and to rehabilitate in conformance with the purpose of vesting.

Specifically, the aim is to:

abide by the Mining Act which allows for proposals to be rejected or approved subject to conditions by the Hon Minister for Conservation and Land Management on national parks, State forest and A class reserves;

ensure that when any proposal for exploration or mining is submitted involving land and waters under CALM management that the land values affected by the proposal are fully considered;

where conditions applying to exploration and mining are being considered by Government, ensure the development of the most appropriate conditions to preserve the values for which the land was reserved;

liaise with Mines Department, the Department of Resources Development and the Environmental Protection Authority to ensure that the most appropriate conditions for exploration and/or mining on parks, reserves and forests, are developed;

ensure that conditions applied to exploration and mining are complied with;

continue research into techniques aimed at minimising environmental damage and land use conflict;

liaise with exploration companies to ensure they are aware of the effects of mining on the environment and other land uses, and of rehabilitation techniques;

liaise with authorities responsible for administering mining agreements and with other organisations authorised to study mining effects and rehabilitation techniques;

rehabilitate areas affected by mining to suit the designated land use, and in accordance with conditions imposed by State Government under the various special agreement Acts and Mining Act.

Strategies

- (i) Seek the inclusion of appropriate conditions governing environmental protection into the mineral leases issued under the Mining Act.
- (ii) Ensure that exploration on CALM land is conducted in strict adherence to conditions stipulated by the relevant departments.
- (iii) Seek to direct mining operations into areas where there will be least conflict with other land uses.
- (iv) Where possible obtain realistic compensation from companies mining on CALM land to cover loss of conservation values, land purchase and the continuing cost of rehabilitation and management of areas affected by mining.

BASIC RAW MATERIALS

Objective

To minimise the effect of the extraction of gravel, stone and sand on conservation values on Departmental land.

Specifically, the aim is to:

lease sites to Government and semi-government bodies for gravel, stone and sand for use on roads on or within 5 km of land controlled by this Department, where economic sources are unavailable outside CALM land;

prohibit gravel, stone and sand extraction by the Department or its authorised agents from Departmental land over which a mining tenement (for gravel) has been granted;

control supplies for other purposes (for commercial use, for other Departments) under the Mining Act on approved Mining Act tenements/or extractive industry licences under the Local Government Act;

ensure appropriate environmental measures are taken with all operations.

Strategies

- (i) Locate borrow pits, wherever possible, outside stream and road reserves, and where they are not in view from the public roads.

- (ii) Rehabilitate borrow pits according to the designated land use.
- (iii) Minimise pits in national parks, conservation parks and nature reserves.
- (iv) Review extractive industry plans prepared by local authorities where these affect CALM land.

WILDFLOWER PICKING

Objective

To control the commercial harvesting of flora on Crown land and private property within sustainable levels, to minimise detrimental effects on conservation values on Crown land, and to maintain a supply of seed from native flora.

Specifically, the aim is to:

permit picking and seed collection on State forest and Crown land other than nature reserves, conservation parks and national parks, subject to land use priorities and management conditions;

ensure royalties or collection fees are paid to reimburse service charges and control collection, wherever it is practicable to collect them; license picking on private property;

collect data on the range of occurrence of species in commercial demand and investigate their management requirements;

identify, protect and manage species of rare flora that occur on both Crown land and private land;

encourage commercial interests to meet the demand for blossom and plants from private nurseries and orchards;

provide suitable seedlings and seed from Departmental nurseries and seed stores for rural conservation projects where these materials are not satisfactorily available from private sources.

Strategies

- (i) Monitor distribution and management of protected flora and those species declared as rare flora.

- (ii) Ensure pickers are licensed in accordance with the provision of the Wildlife Conservation Act, and are familiar with the conditions and endorsements applicable to their licences.
- (iii) Establish and maintain seed orchards for species that are of limited supply or are difficult to collect.

APICULTURE

Objective

To facilitate beekeeping subject to the need to minimise conflict with other land use objectives.

Specifically, the aim is to:

ensure apiary sites are sited to optimise the use of available areas, consistent with the primary land use requirements;

control apiculture on the Department's land, other reserves and Crown land by the issuing of permits and allocation of apiary sites;

advise registered beekeepers of proposed CALM activity that could conflict with the location of their hives or honey production from a site;

investigate the allocation and use of apiary sites with respect to nectar and honey production.

Strategies

- (i) Locate apiary sites at acceptable intervals, taking account of constraints such as:
 - existence of suitable vehicular access to the apiary site;
 - need to avoid transference of disease, including dieback;
 - effects of European honey bees on high conservation value ecosystems and rare flora/fauna which are strongly dependent on nectar and pollen;
 - proximity of current or proposed activity by CALM and other authorised users;
 - risk of water pollution caused by beekeepers' activities;
 - requirements of other Authorities controlling Crown land or Government reserves;
 - location in relation to private property;
 - relevant Acts and Regulations.
- (ii) Notify the Government Apiculturist of the Department's prescribed burning program each year.

- (iii) Continue liaison with other authorities that control Crown land on which apiary sites are located.
- (iv) Gather data on resource use and honey production by a system of annual returns.
- (v) Support research into the affect of European bees on native flora and fauna.

FISHING

Objective

To provide for fishing, permitted under the Fisheries Act and Regulations, in locations where access is consistent with land management objectives.

The aim is to:

permit fishing in non-reserved tidal waters in inlets and off the coast as regulated by the Department of Fisheries;

permit recreational freshwater fishing on CALM land under conditions established through the Fisheries Act;

prohibit fishing on CALM land under any conditions where it can be shown that it could be a threat to sustenance of the species or populations concerned;

liaise with Local Government, special interest groups and the public to improve planning for fishing on CALM lands and waters;

encourage monitoring and research to determine acceptable limits to resource use on CALM lands.

Strategies

- (i) Control fishing operations through the operations of the Department of Fisheries and within the provisions of the Fisheries Act.
- (ii) Regulate use of favourable sites on CALM land through control of access.
- (iii) Plan for fishing within recreational programs, wherever applicable.

PUBLIC UTILITIES

Objective

To limit development of public utilities that result in loss of reserve area and conservation values on CALM land to those considered essential by Government and for which there is no reasonable alternative location.

The aim is to:

retain as much as possible of the land managed by the Department free of public utilities.

guide the location of public utilities on CALM land into areas where land use conflict and environmental damage are minimised;

rehabilitate redundant sites to suit the designated land use;

liaise with, and advise, service authorities to ensure their operations are in sympathy with the environment and other land uses.

Strategies

- (i) Liaise with shires to avoid the use of CALM land for access to new subdivisions.
- (ii) Obtain compensation, where appropriate, to offset loss of Departmental land and associated values.
- (iii) Guide public utilities into areas where risk of dieback disease spread, salinity, and aesthetic impact are minimised. Encourage the use of landscaping.
- (iv) Encourage the use of the same sites for more than one utility.
- (v) Ensure management practices do not endanger public utilities.
- (vi) Develop procedures for rehabilitation of redundant sites in conjunction with and, where appropriate, at the expense of, the agency responsible.
- (vii) Ensure that proposals for public utilities are provided for in management plans for CALM lands.

APPENDIX 3. COMPARISON BETWEEN EPA, FORESTS DEPARTMENT AND CALM REGIONAL PLAN PROPOSALS FOR EPA SYSTEMS 1,2,4 AND 6

These tables indicate the way individual areas have been dealt with by the EPA in its Systems reports, the Forests Department in its last General Working Plan and CALM in the draft and final regional plans.

Note:

1. All proposals by CALM to change land tenure will be subject to the normal review processes by the Controlling Bodies, Department of Land Administration and affected government and local government authorities. Both Houses of Parliament must agree to any changes of tenure of State forest or A Class Reserves.
2. No boundaries are final. Final boundaries will only be established after all consultative processes have been completed.

**APPENDIX 3.
COMPARISON BETWEEN EPA, FORESTS DEPARTMENT AND
CALM REGIONAL PLAN PROPOSALS FOR EPA SYSTEMS 1,2,4
AND 6**

EPA no.	Locality	EPA proposal	Forests Department GWP 87 (1982) App.3,4,5	Draft Regional Plan (Apr'87)	Final Regional Plan
System 1					
1.1.2	Ludlow	SF	FFL	NP/SF	NP/SF
1.3	Whicher-Bovell	FP	FFL	NR	NR
1.4	Leeuwin-Naturaliste	NP	-	NP	NP
1.4	Boranup	FP	FFL	FP	NP
1.5	Milyeannup	FP	FFL	NR	NR
1.5	Rapids	FP	R	FP	CP
1.5	Chester	FP	FFL	NR	NR
-	Mowen	-	FFL	FP/SF	NR/SF
-	Blackwood	-	R	FP	CP/SF
-	Witchcliffe	-	SF	SF	SF
System 2					
2.1	Scott NP	NP	-	NP	NP
2.2	Pemberton NP	NP	-	NP	NP
2.3	D'Entrecasteaux	NP	-	NP	NP
2.4	Shannon basin	SF/FP	FFL/SF	NP	NP
2.4	Dickson	FP	FFL	NR	NR
2.4	Iffley	FP	S	SF	SF
2.4	One Tree Bridge	FP	R	FP	CP
2.4	Brockman	FP	R	NP	NP
2.4	Dombakup	FP	FFL	-	CP
2.4	Lindsay	FP	S	SF	SF
2.4	Johnston O'Donnell	FP	FFL	NP	NP
2.4	Soho	FP	FFL	NP	NP
2.4	Beavis-Giblett	FP(a)	SF	SF	SF
2.4	Strickland	FP(a)	FFL	NR	NR
2.4	Hawke-Treen	FP	FFL	NP	NP
2.4	Boorara	FP	FFL	FP	CP
2.4	Curtin	FP	FFL	NP	NP
2.4	Wattle	FP	FFL	NP	NP
2.4	Lower Shannon	FP	FFL	NP	NP
2.4	Mitchell Crossing	FP	FFL	NP	NP
2.4	Muirillup Rock	FP	R	FP	CP
2.5	Perup	FP	FFL	FP	NR
2.6	Lake Muir	NR	-	NR	NR
2.12	Gingilup Swamp	CFF	-	NR	NR

EPA no.	Locality	EPA proposal	Forests Department GWP 87 (1982) App.3,4,5	Draft Regional Plan (Apr'87)	Final Regional Plan
2.13	Islands	CFF	-	NR	NR
2.15	Kent-Denmark	SF	SF	SF/SP	SF/NP
-	Mt Frankland MPA	-	R	NP	NP
-	Keystone- Swarbrick	-	S	FP	SF
-	Giants	-	SF	FP	NP
-	Paget MPA	-	FFL	NR	NR
-	One Tree Bridge NR	-	-	FP	NR
-	Jardee NP	-	-	5g	CP
-	Jervik Park NP	-	-	5g	CP
-	Sheepwash	-	SF	NP	NP
-	Mt Lindesay	-	SF	SP	NP
-	Sir James Mitchell NP	-	-	NP/SF	NP/SF
System 4					
-	Chowerup VCL	-	-	SF	SF
-	Wournbelup VCL	-	SF	NR	SF
-	Bolbelup	-	SF	NR/SF	NR/SF
System 6					
C 2	Moore River NP	NP/CFF/RP	-	NR	NR
C 6	Yurine Swamp	CFF	-	NR	NR
C 9	Gingin-Boonanarring	CFF	-	NR	NR
C 10	L. Wannamal	CFF	-	NR	NR
C 12	Caraban MPA	FFL	FFL	NR	NR
C 13	Wabbling MPA	FFL	FFL	NR	NR
C 14	L. Muckenburra	CFF	-	NR	NR
C 15	Gin Gin	CFF	-	NR	NR
C 17	L. Chandala	CFF	-	NR	NR
C 18	Burroloo Well	CFF	-	NR	NR
C 19	Needonga-Chittering	CFF/RP	-	NR	NR
C 20	Mt Byroomanning	CFF/RP	-	NR	NR
C 21	Julimar MPA	RP	FFL	FP	CP
C 23	Culham	CFF	-	NR	NR
C 26	Bullsbrook	CFF	-	NR	NR
C 27	Beelaring-Goonaring	CFF	-	NR	NR
C 28	Wundowie	CFF	-	NR	NR
C 29	Clackline	CFF	-	NR	NR
C 30	Inkpen Rd	CFF	-	NR	NR
C 32	Dale MPA	FFL	FFL	VP	CP
C 33	Russell MPA	RP	FFL	FP	CP
C 34	Gunapin MPA	FFL	FFL	FP	CP
C 35	Sullivan MPA	FFL	FFL	FP	CP
C 36	Eagle Hill MPA	FFL	FFL	FP	CP

EPA no.	Locality	EPA proposal	Forests Department GWP 87 (1982) App.3,4,5	Draft Regional Plan (Apr'87)	Final Regional Plan
C 37	Brookton and Albany Hwy	RP	SF/FFL	SF/FP	SF/CP
C 38	Cooke MPA	RP	FFL	FP	CP
C 39	Windsor MPA	RP	FFL	FP	CP
C 40	Boyagarring MPA	FFL	FFL	FP	CP
C 41	Lupton MPA(b)	FFL	FFL	FP	FC
C 42	Duncan MPA	FFL	FFL	FP	CP
C 43	Gyngoorda MPA	FFL	FFL	FP	CP
C 44	Wandering MPA(b)	FFL	FFL	FP	CP
C 47	North Dandalup	CFF/RP	-	NR	NR
C 48	North Dandalup	CFF/RP	-	NR	NR
C 49	North Dandalup	CFF/RP	-	NR	NR
C 50	Peel Inlet	CFF/AR/RP	-	NR	NR
C 51	Harvey Estuary	CFF/AR/RP	-	NR	NR
C 52	McLarty-Mealup	CFF/RP	-	NR	NR
C 54	Yalgorup NP	RP	-	NP	NP
C 55	Clifton MPA	RP	FFL	NP	NP
C 56	McLarty MPA	RP	FFL	NP	NP
C 57	Myalup MPA	FFL	FFL	NP	NP
C 59	Wagerup	CFF	-	NR	NR
C 60	Harvey	CFF/W	-	NR	NR
C 61	L. Preston	CFF	-	NR	NR
C 62	Harvey	CFF	-	NR	NR
C 63	Myalup-Mialla	protect	-	FP	CP
C 65	Benger Swamp	CFF	-	NR	NR
C 72	Teesdale MPA	RP	FFL	FP	CP
C 73	Murray Valley MPA	RP	R	FP	5g
C 74	Plavins MPA	RP	FFL	FP	CP
C 75	Samson MPA	RP	FFL	FP	CP
C 76	Federal MPA	RP	FFL	FP	CP
C 77	Bell MPA	RP	FFL	FP	CP
C 80	Reserves, Harvey	CFF	-	NR	NR
C 82	Surface MPA	RP	FFL	FP	CP
C 83	Nalyerin MPA	RP	FFL	FP	CP
C 84	Trees MPA	RP	FFL	FP	CP
C 85	Stene MPA	RP	FFL	FP	CP
C 86	Dardanup MPA	RP	FFL	FP	CP/SF
C 87	Lennard MPA	RP	FFL	FP	CP/SF
C 88	Westralia MPA	RP	FFL	FP	CP
C 90	Preston MPA	FFL	FFL	FP	CP/SF
C 91	Noggerup MPA	FFL	FFL	FP	CP/SF
C 92	Goonac MPA	FFL	FFL	FP	CP
C 93	Muja MPA(b)	FFL	FFI,	FP	CP
C 94	Bennelaking MPA(b)	FFL	FFL	FP	CP

EPA no.	Locality	EPA proposal	Forests Department GWP 87 (1982) App.3,4,5	Draft Regional Plan (Apr'87)	Final Regional Plan
C 95	Mullalyup MPA	RP	FFL	FP	CP/SF
C 96	Wilga	CFF	-	NR	NR
C 97	St John Brook MPA	RP	FFL	FP	CP
C 98	Blackwood R.	RP	-	NR	NR
C 99	Greenbushes MPA	RP	FFL	FP	NR
C100	Dalgarup MPA	RP	FFL	NR/SF	NR/SF
C101	Nollajup MPA	FFL	FFL	FP	NR
M 3	Yanchep NP	RP	-	NP	NP
M 4	Ridges	RP	FFL	NP	NP
M 5	Yeal NR	CFF	-	NR	NR
M 6	Neerabup NP	RP	-	SP	CP
M 8	Wanneroo	RP	-	NR	NR
M 9	Melaleuca MPA	FFL	FFL	NR	NR
M 14	Bullsbrook	CFF	-	NR	NR
M 16	Avon Valley NP	NP/CFF	-	NP	NP
M 18	Walyunga NP	RP	-	NP	NP
M 21	John Forrest NP	RP	-	NP	NP
M 25	L. Leschenaultia	RP	R	FP	CP
M 27	L. Manaring	CFF	-	NR	NR
M 28	Wooroloo	CFF	-	NR	NR
M 29	Greenmount NP	RP	-	SP	CP
M 34	Gooseberry Hill NP	RP	-	SP	CP
M 34	Kalamunda NP	RP	-	SP	CP
M 34	Kalamunda SF	FFL/W	SF	FP	CP
M 34	Burkinshaw Rd NP	RP	-	SP	CP
M 80	Lesmurdie Falls NP	RP	-	SP	CP
M 84	Gooralong MPA	RP	FFL	SP	NP
M 85	Serpentine NP	RP	-	SP	NP
M 86	Karnet MPA	RP	FFL	SP	NP
M 87	Serpentine MPA	RP	FFL	SP	NP
M108	Goegrup Lakes	CFF	-	NR	NR
-	Marradong	-	R	FP	CP
-	Araluen-Canning	-	-	SP	CP
-	Yanchep SF	-	SF	NR	NR
-	Kemerton	-	-	FP	CP/5g
-	Camballan	-	SF	SF	SF
-	Wagerup NP	-	-	SP	CP
-	Gwindinup NP	-	-	SP	CP
-	Bridgetown NP	-	-	SP	CP

Note

Some areas considered in the EPA Systems reports are vested in authorities other than CALM, or are outside the boundaries of the Northern, Central and Southern Forest Regions and are therefore not listed above.

Legend

- AR aquatic reserve
- CFF conservation of flora and fauna reserve
- CP conservation park
- FFL flora, fauna and landscape MPA
- FP forest park
- MPA management priority area
- NP national park
- NR nature reserve
- R recreation MPA
- RP regional park
- S scientific study, education MPA
- SF State forest
- SP State park
- VCL vacant Crown land
- W water reserve
- 5g reserve under Section 5g of CALM Act.
- (a) The EPAs 1982 report on Karri forest conservation amended the EPAS earlier recommendation for these areas to FFL MPAs.
- (b) These areas are located within System 4.

APPENDIX 4. CONSERVATION RESERVES PROPOSED BY THIS PLAN NORTHERN FOREST REGION

Name (or locality)	Area ha (a)	Vegetation type and/or Special features
NATURE RESERVES		
Dwellingup District		
Carrabungup	120	Peel Inlet
Mealup Point	30	adjoins Harvey Estuary
Austin Bay	1400	Peel Inlet
(Lake Mealup)	20	Lake Mealup, wetlands
Nine Mile L.	110	wetlands
Kooljerrenup (part)	1 100	adjoins Harvey Estuary
McLarty	50	adjoins Harvey Estuary
Moorapulling (c)	600	jarrah, marri, wandoo
(Lake McLarty)	170	Lake McLarty, wetlands
Boodalan	<i>(b)</i>	Peel Inlet
(Marraru)	110	jarrah, marri, flooded gum
(Burnside)	10	jarrah, marri
(Meelon)	<i>(b)</i>	wandoo, jarrah, marri
(North Dandalup)	220	jarrah, marri, wandoo, butter gum
(Goegrup Lakes)	300	waterbirds, paperbark, sw. sheoak
	<u>4240</u>	
Jarrahdale		
Brookton Highway	450	wandoo, powderbark, marri, jarrah
(Strange Rd)	550	wandoo, marri, powderbark, jarrah
	<u>1000</u>	
Mundaring		
Burroloo Well	10	jarrah, marri, wandoo
Wattening	40	York gum, jam
Barracca	20	marri, banksia
(Mortlock)	40	York gum
Throssell	20	wandoo, Salmon gum, York gum
(Needham)	<i>(b)</i>	jarrah, marri
Poison Gully	90	wandoo, powderbark, marri, mallet
(Rugged Hills)	240	marri, wandoo, powderbark, York gum
Wambyn	200	powderbark, wandoo
Flat Rock Gully	380	marri, powderbark, wandoo
(Batkuling)	10	York gum, wandoo
Copley Dale	<i>(b)</i>	jarrah, marri, wandoo
Chittering Lakes	230	Chittering Lakes, wetland
Meenaar	100	York gum, sandalwood, heath
Bewmalling	40	York gum, jam, wandoo
(Woottating)	240	jarrah, marri, wandoo
St Ronans	110	powderbark, marri, wandoo
Beechina	50	jarrah, marri, wandoo

Mokine	300	powderbark, wandoo, sheoak, jam
Clackline	640	wandoo, powderbark, jarrah, marri
(Mt Byroomanning)	170	York gum, wandoo
Wongamine	300	wandoo, powderbark, York gum
Chandala	140	swamp sheoak, paperbark
(Wills)	40	wandoo, powderbark
(Goldfields)	60	York gum, heath
(Warranine)	30	wandoo, jarrah
Bartrarn	70	wandoo, powderbark
(Berry Brow)	(b)	marri, wandoo
(Parkerville)	(b)	jarrah, marri
(Beechina North)	30	jarrah, marri, wandoo
(Nanamoolan)	10	wandoo, marri
(Hoddy Well)	10	wandoo, marri
(Bullsbrook)	120	paperbark, banksia, sedges
(Clackline)	10	jarrah, marri, wandoo, powderbark
(Wundowie)	2400	jarrah, marri, wandoo
(Wooroloo)	90	wandoo, powderbark, marri, jarrah
	<u>6230</u>	

Wanneroo

Mogumber	160	banksia
Yurine Swamp	20	paperbark, flooded gum, banksia
L. Wannamal	120	freckled duck, waterbirds, York gum
Bambanup	90	jarrah, marri, banksia, paperbark
(Nabaroo)	10	banksia
(Yeal L.)	340	banksia, paperbark
(Gingin Stock Route)	60	banksia
Jandabup	240	banksia
(Wannamal)	20	tea tree, marri, wandoo
(Yeal Swamp)	10700	banksia, paperbark, jarrah, marri
Gingin-Boonanarring	10100	jarrah, marri, banksia
L. Muckenburra	70	Lake Muckenburra
Moore R.	2100	wildflowers
Wabling	2300	paperbark, tuart, sheoak, banksia
Caraban	5500	banksia
Melaleuca Park	3200	banksia, paperbark
	<u>55030</u>	

NATIONAL PARKS

Avon Valley	15800	Avon River, jarrah, marri, wandoo
John Forrest	1500	jarrah, marri, wandoo
Serpentine	4500	Serpentine Falls, Darling Scarp
Walyunga	1800	Swan River, rapids, scenic views
Yalgorup (part)	4500	Wart, jarrah, marri
Yanchep	5200	tourist facilities, caves, L. McNess
	<u>33300</u>	

CONSERVATION PARKS

Araluen-Canning	30	Canning River
(Burkinshaw Road)	10	jarrah, marri
Boyagarring	1200	wandoo, powderbark, rock sheoak
Dale	6900	jarrah, marri, wandoo, Mt Dale
Duncan	8300	jarrah, virgin wandoo
Gooseberry Hill	40	Darling Scarp, scenic views
Greenmount	50	marri wandoo heath, scenic views
Gyngoorda	3500	jarrah, marri, wandoo, powderbark
Julimar	29000	jarrah, marri, wandoo, powderbark
Kalamunda	400	jarrah, marri, wandoo, scenic views
L. Leschenaultia	340	jarrah, marri, wandoo
Lane Poole Res. (part)	9800	jarrah, marri
Lesmurdie Falls	60	falls, scenic views, marri, wandoo
Lupton	8700	wandoo, powderbark, jarrah
Marradong	1900	jarrah, marri, wandoo
Monadnocks	15400	jarrah, marri, yarri, monadnocks
Mundaring	830	jarrah, marri, wandoo
Neerabup	1240	tuart, wetland vegetation
Wandering	4300	jarrah, marri, wandoo, powderbark
Wandoo Conservation Park	38500	wandoo, jarrah, powderbark, wetlands
	<u>130500</u>	

CALM ACT SECTION 5G RESERVE

Lane Poole Res.(part)	11600	Murray River jarrah, marri, yarri
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Note

- (a) Areas under 1000 ha are to nearest 10 ha
Areas over 1000 ha are generally to nearest 100 ha
- (b) Under 5 ha
- (c) Also known as Mooradung