Wellington National Park and Westralia Conservation Park

Draft Management Plan

2005

Department of Conservation and Land Management
Conserving the nature of WA

Conservation Commission of Western Australia

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INVITATION TO COMMENT

This draft management plan is an opportunity to provide information, express your opinion, suggest alternatives and have your say on how the Wellington National Park, Westralia Conservation Park, proposed Westralia Interim Forest Conservation Area and the Wellington Discovery Forest Reserve will be managed over the next 10 years.

If you prefer not to write your own submission you could make a joint submission with others. To ensure your submission is as effective as possible:

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

It is important to indicate those strategies and recommendations you agree with as well as those with which you disagree. Each submission is important, but those that give reasons for concerns, give support where appropriate and offer information and constructive suggestions are most useful.

All submissions will be summarised according to topics discussed. The management plan will then be reviewed in the light of submissions, according to established criteria (see below). A summary of the submissions will be prepared along with the final management plan, including an indication of how the plan was amended or not amended in response to the submissions:

1. The draft management plan may be amended if a submission:
   (a) provides additional resource information of direct relevance to management;
   (b) provides additional information on affected user groups of direct relevance to management;
   (c) indicates a change in (or clarifies) Government legislation, management commitment or management policy;
   (d) proposes strategies that would better achieve management objectives and aims; or
   (e) indicates omissions, inaccuracies or a lack of clarity.

2. The draft management plan may not be amended if a submission:
   (a) clearly supports the draft proposals;
   (b) offers a neutral statement or no change is sought;
   (c) addresses issues beyond the scope of the plan;
   (d) makes points that are already in the plan;
   (e) is one amongst several widely divergent viewpoints received on the topic and the strategy of the draft management plan is still considered the best option; or
   (f) contributes options that are not possible (generally due to some aspect of existing legislation, or Government policy).

Submissions are welcome for 2 months after the date of release of the draft management plan. Submissions can be made on the internet at http://www.calm.wa.gov.au/national_parks/management/index.html or by writing to:

Planning Officer
Wellington National Park and Westralia Conservation Park
Management Plan
Department of Conservation and Land Management
Locked Bag 104, Bentley Delivery Centre
BENTLEY WA 6983

PREFACE

The Department of Conservation and Land Management manages the reserves vested in the Conservation Commission of Western Australia and prepares management plans on their behalf. The Conservation Commission of Western Australia issues draft management plans for public comment and provides proposed (final) management plans for approval by the Minister for the Environment.

The *Conservation and Land Management Act 1984* (the 'CALM Act') specifies that management plans must contain:

(a) a statement of policies and guidelines proposed to be followed; and
(b) a summary of operations proposed to be undertaken.

In accordance with section 55 of the CALM Act, the term of the final management plan will be 10 years, or until the plan is superseded by a new management plan.

Nomenclature

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

The Department of Conservation and Land Management is referred to as the 'Department'.

The 'planning area' refers to the Wellington National Park, Westralia Conservation Park, proposed Westralia Interim Forest Conservation Area and the Wellington Discovery Forest Reserve.

When 'region' is used in this plan it refers to the Bunbury-Wellington subregion used by the Western Australian Planning Commission. This provides an appropriate scale for this plan to link with regional development and planning for local government. The 'region' follows the boundaries of the Shires of Collie, Dardanup, Harvey, Donnybrook-Balingup and Capel as well as the City of Bunbury. The Department's regional boundaries for this area are referred to as the 'South West Region'.

When 'south-west' is used it refers to the general south-west corner of Western Australia between Geraldton and Esperance.

The word 'Noongar' can be spelt in numerous ways. The spelling of Noongar in this form should also be seen to encompass the Nyoongar, Nyungar, Noongah and Nyungah spellings.

Acknowledgments

This draft management plan was prepared by the planning team for Wellington National Park, Westralia Conservation Park, proposed Westralia Interim Forest Conservation Area and the Wellington Discovery Forest Reserve: Denam Bennetts (Planner and management plan co-ordinator), Drew Griffiths (Wellington District Manager) and Peter Henderson (Parks and Visitor Services Regional Leader, South West Region).

Comment and advice during the preparation of this draft plan was provided by:

- Departmental staff—in particular Roger Armstrong, Robert Chandler, Peter Hanly, Kim Williams, Daryl Moncrieff, and Wellington District Staff;
- specialist branches within the Department;
- the Department's Corporate Executive;
- the Department of Environment,
- the Water Corporation, and
- members of the Conservation Commission of Western Australia.

Many people, individuals and agency representatives made valuable contributions to the development of this document. The assistance of the Wellington National Park Community Advisory Committee is especially acknowledged: Rosanne Pimm (Chairperson), Gemma Basely, Mark Chester, John Gardiner, Margaret Graham, Tony Jenour, Peter Murphy, Joe Northover, Ian Pigott, Ken Waterhouse, Bruce Roberts, Wayne Tingey, Ian Menzies and Rodney Smith. Allan Cross from the South West Development Commission also provided input into the planning process.

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PART A. INTRODUCTION

1. BRIEF OVERVIEW

The planning area lies on the western edge of the Darling Plateau, about 195 km south of Perth and 7 km west of the Collie townsite (see Section 3 – Management Plan Area). It comprises the Wellington National Park[1], Westralia Conservation Park, Wellington Discovery Forest Reserve and proposed Westralia Interim Forest Conservation Area. The latter is identified for reservation as in the *Forest Management Plan 2004-2013* (Conservation Commission 2004). These areas assist in meeting a comprehensive, adequate, representative (CAR) conservation reserve system to protect the biodiversity of the Jarrah Forest bioregion. The planning area also encompasses the Wellington Reservoir, a planned future drinking water source, and is surrounded predominantly by agricultural land and large tracts of State forest. The total planning area is 19 459 ha.

An outstanding feature of the planning area is the scenic quality of landforms associated with the western edge of the Darling Plateau, in particular the deeply incised valley along the lower Collie River. This area supports relatively unspoiled vegetation, indicative of the cool, damp, microclimate of the valley. Ecologically mature forest and riparian zones within this area provide valuable habitat for fauna. Interspersed throughout the valley are numerous granite outcrops, which are geographically separated from other, similar outcrops. Studies elsewhere have shown that granite outcrops support a variety of endemic, disjunct and refugial species, highlighting their conservation significance (Hopper *et al.* 1997).

Nine distinct vegetation complexes, ranging from tall open forests along the Collie River to open forests and woodlands of the Collie Basin, have been identified. Species of conservation significance have also been identified, including six priority flora species and seven species of specially protected fauna. Informal recreation, widening of utility corridors, adjoining land use and development pressures from nearby townsites are the primary threats to native vegetation communities.

Visitors are attracted to the natural attributes of the planning area, especially along the lower Collie River valley and surrounding the Wellington Reservoir. The area is highly accessible due to its close proximity to the Perth metropolitan area, population centres within region, the Ferguson and Preston river valleys and main travel routes in the south-west. Most visitors to the area come during the summer period from October to April, particularly around public/school holidays, the marron (*Cherax canei*) season and when the Wellington Dam overflows, which it does every few years. The most popular activities are bushwalking, swimming, camping, four-wheel driving and mountain bike riding. Informal camping takes place around the Reservoir.

Visitation to the planning area is increasing and during peak periods recreation sites are often filled to capacity. This is expected to continue into the future, placing the area under further pressure from visitor use and potentially leading to further conflicts between different user groups. The planning area is also important for its water resource, which in turn has implications for managing visitor use (see section below).

Aboriginal links to the planning area survive in the form of a registered mythological site along the Collie River from Minninup Pool to the Leschenault Inlet and the growing interest of local Noongars in re-establishing cultural ties to the land. The Department of Indigenous Affairs has also recorded five interim registered sites occurring in the area and, given that there has been no comprehensive surveys, it is likely that others exist. The future involvement of Aboriginal people in management of the planning area will be considered in

[1] In 2003 the Government called for public submissions on the name of the Wellington National Park. At the time of publication a name has not been decided.

light of the Government determining a policy position.

This draft management plan provides effective and relevant guidelines to protect the values of the planning area. The implementation of the final management plan will be undertaken by the Department, through the South West Regional office at Bunbury and the District work centre at Collie.

Implications of using Wellington Reservoir as a Public Drinking Water Supply

The planning area is extremely important for its water resource, especially with predictions of a drying climate (see Section 13 – Climate Change). It contains the Wellington Reservoir, which, at a capacity of 186 GL, is the largest water body in the south-west and a planned future drinking water supply. Historically, the Reservoir was used as a supply of potable water for the Great Southern Towns Water Supply Scheme (GSTWSS) and is still proclaimed under the *Country Areas Water Supply Act 1947* (CAWS Act). However, it was removed as a drinking water supply due to high salinity levels. As such, the Reservoir was made available for non-motorised water sports in 1990 and has now become a primary attraction for visitors. In 1996, the Collie River catchment was designated under the State Salinity Strategy as a recovery catchment, and it is expected that salinity will reduce to a level suitable for drinking purposes by 2015. However, it could be used much sooner if mixed with better quality water from Stirling Reservoir prior to transfer to the Integrated Water Supply System (IWSS, supplying water to Perth, Mandurah Pinjarra, Harvey and the Goldfields and Agricultural Regions and servicing approximately 1.5 million people). For that reason it is essential that the Reservoir be afforded the highest level of water quality protection to ensure its future use when needed.

The Department of Environment (DoE) is responsible for preparing Drinking Water Source Protection Plans (DWSPP) to protect the water quality of drinking water sources. DWSPP's are prepared to achieve the provisions of the CAWS Act and the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*.

DWSPP's result in the proclaimation of catchments and provide for priority classification areas and reservoir protection zones. They are prepared in full consultation with the public. More information on DWSPP's and catchment protection measures is available on the DoE website at http://drinkingwater.environment.wa.gov.au

It is important, therefore, that the management of Wellington National Park, which surrounds the Wellington Reservoir, supports the Government's intention to return the water supply to a potable drinking water standard and bring it on-line at the earliest possible time. This will be achieved by the Department supporting the DWSPP, which is under preparation by the DoE and is planned to be completed by the end of this year (2005).

It is likely therefore that, in the near future, the use of the Reservoir for recreation activities that present a risk to water quality (e.g. swimming, camping and fishing near the Wellington Reservoir) will be constrained or prevented (as occurs in metropolitan drinking water sources) under the publicly consulted DWSPP.

2. REGIONAL CONTEXT

The planning area is located in the Bunbury-Wellington subregion (the region) of the Western Australian Planning Commission, approximately 195 km south of Perth and 36 km east of Bunbury, in the Shires of Collie and Dardanup (see Section 3 – Management Plan Area). The region covers an area of approximately 614 951 ha, extending from Yarloop in the north to Balingup in the south and inland beyond the Muja mine, approximately 20 km from Collie. Major urban centres include Bunbury, Collie and Harvey, as well as smaller towns such as Dardanup, Boyanup and Brunswick Junction. For the most part, the region lies within the Wellington District of the Department.

The region is recognised by the diverse landforms of the Darling Plateau and Swan Coastal Plain and the richness of its biological and economic resources. Located inland, the Darling Plateau is an area of flat, partially forested landscapes that culminate in the great visual amenity and more dissected landscapes of the Darling Scarp. Towards the coast there are wetlands of international significance and coastlines of white sandy beaches, dune systems, estuaries and inlets leading to the Indian Ocean. A characteristic of the region is the complexity and intensity of land use, which can be attributed to its abundance of natural resources and proximity to Perth and regional population centres.

Administratively, the region comprises six local government areas covering the City of Bunbury and the Shires of Collie, Dardanup, Harvey, Donnybrook-Balingup and Capel. Liaison with local government will be important in promoting conservation values and developing nature-based tourism throughout the region.

Population

In 2001, the population of the region was approximately 78 770 people, most of which were centred in the City of Bunbury and the Shire of Harvey (SWDC 2003a). This represents a population growth of 2.6% since 1997. By 2016, it is estimated that the population of the region will be in excess of 98,500, although the Shire of Collie is expected to increase in population by only 400 people. In recent times, rapid growth has been experienced around the Greater Bunbury area. The expansion of Bunbury, demand for rural-residential development, proximity to Perth and predicted population growth means that an acceptable balance needs to be achieved between conserving the natural environment and the pressures to utilise the areas scenic attractions, natural recreational and living opportunities.

Tourism and Recreation

Tourism and visitor activity is an important economic component of the region, although most visitors use the area as a stopover to coastal and wine growing destinations in the south-west. Forested areas and inland waterways of the Darling Plateau are becoming increasingly popular for recreation and are experiencing greater visitor pressure than nearby areas on the Swan Coastal Plain. However, some coastal locations, such as the Leschenault estuary and adjoining coastline are also popular.

Attractions include the Wellington and Harvey dams, the mosaic of forest and farmland, Ferguson River valley, Golden Valley Tree Park, a wide range of recreational pursuits and the visible legacy of the region's heritage. To support this, numerous services such as caravan parks, hotels, motels and guest houses are available. The region is covered by one tourist road along Coalfields Road, adjoining the planning area, and has good access from Perth and surrounding country areas, where the majority of visitors originate.

The Department manages numerous recreation sites in the region, the most popular being the Wellington Reservoir, Hoffman Mill and the Leschenault Peninsula. Visitor numbers are increasing at most sites and recreation pressure is affecting many areas.

Land Use and Natural Resources

Since European settlement, land use within the region has been dominated by mining, agriculture, forestry, water supply, rural residential subdivision and the transmission of electricity. Land generally not conducive to agriculture, such as the shallow, gravely soils on steep slopes of the Darling Scarp, is typically described as multiple-use State forest, plantations and catchments for water supply. Conversely, the flat alluvial deposits that occur to the west, on the Swan Coastal Plain, have been largely cleared and support an array of uses including dairy and beef cattle, sheep grazing, horticulture, viticulture, orchards and softwood plantation forestry. East of the forested area, large areas of land have also been cleared for agriculture, causing elevated salinity levels in the Wellington Reservoir. In summer, areas of the coastal plain are often irrigated, using water from the Wellington Reservoir, to provide green feed. In the 1999/00 financial year agricultural production within the region was valued at $183 million (SWDC 2003c).

A network of dams exists along the western edge of the Darling Plateau, providing important supplies of water for irrigation, industry and domestic purposes. Surface water catchments designated for drinking water supply with the region include waterbodies such as Wellington, Harris, Stirling, Harvey, Brunswick reservoirs. Only the Ferguson and Capel rivers have not been dammed. Groundwater from the Swan Coastal Plain is used extensively for private irrigation while the major groundwater resource of the Collie Basin is used for industrial purposes associated with coal mining and power generation. Much of the land managed by the Department, including the planning area, also lies within developed drinking water catchments.

The most significant contributions to the region's economy are slowly changing from rural based agricultural activities to mining, processing and tourism (Western Australian Planning Commission 1995). The known mineral resources of the region comprise mainly of bauxite, coal, heavy mineral sands and minor occurrences of gold and base metals (Western Australian Planning Commission 1995). In the 2001/02 financial year, these resources were worth approximately $1.6 billion. The region also contains basic raw materials for construction including kaolin, limestone, silica sand, gravel, aggregate and building stone. All of Western Australia's coal production, which in 2000/01 was valued at $252.3 million, comes from the Premier, Muja and Ewington mine sites just east of the planning area. Western Power uses the majority of coal for power production, supplying over 50% of the State's power supply grid. The remainder is used by industry in the production of alumina, mineral sands, cement and nickel. In 1995, approximately 13% of Western Australia's alumina were produced in the region and 37% of the States mineral sands (Western Australian Planning Commission 1995). An alumina refinery is situated at Worsley near Collie.

Western Power forecast that electricity demand in the South West Interconnected System is growing at a rate of about 3% per annum (Western Power 2004). In a two-stage power procurement program, private enterprise has been encouraged by the State Government to develop a further 300–330 megawatt of baseload generating capacity by 2008. Baseload powerstations on the Collie coalfields are the principal electricity suppliers for the South West Interconnected System and an expansion of the Collie Power Station is a potential site for a new power station. Other major projects within the region are the development of Westralia Iron and Steel Corporation's $700 million Pig Iron Plant to be located south of the Muja Power Station. Service industries such as construction, transport, entertainment, retail and wholesale are also well developed. Pollution and waste disposal and the effects on surface and groundwater resources need to be considered by these industries.

The timber industry has recently undergone changes resulting from the *Protecting Our Old-Growth Forests Policy* (2001). This will see the production of hardwood log timber decrease, although native timber products will continue to be economically important produce as a result of the Government's commitment to promote value adding and downstream manufacturing. The timber industry of the region (which includes the northern and southern jarrah forest) produces sawn hardwood and softwood, woodchips and fine woodcraft and furniture ($378 million per year).

Separating conflicting land uses to ensure that they do not detract from the safe and sustainable use and enjoyment of surrounding lands is a key issue for the region.

3. MANAGEMENT PLAN AREA

This draft management plan covers the following areas (see Map 1):

- Wellington National Park;
- Westralia Conservation Park;
- proposed Westralia Interim Forest Conservation Area; and
- Wellington Discovery Forest Reserve.

Collectively these areas are referred to as the 'planning area' and occupy a total area of 19 459 ha. For the most part, they adjoin the Collie River and encircle the Wellington Reservoir, the largest waterbody in the south-west and a planned future drinking water supply for the GSTWSS and the IWSS. The closest reserves to the planning area are the Lane Poole Reserve 15 km to the north, the proposed Dardanup Nature Reserve and Conservation Park approximately 4 km to the south-west and the provisionally named Greater Preston National Park (reserve 47661) 18 km to the south-east.

Administratively, the plan covers three local government areas including the Shires of Collie, Dardanup and Harvey.

The South West Aboriginal Land and Sea Council administer Aboriginal interests within the planning area and there is currently one native title claim.

Surrounding the planning area is State forest, the proposed Westralia Forest Conservation Area to the north of Coalfields Road, other Crown reserves and freehold land (Map1). Areas of State forest are important linkages for connecting reserves. The *Forest Management Plan 2004-20013* applies for lands surrounding the planning area that are vested with the Conservation Commission of Western Australia (Conservation Commission) and fall within the geographic area of the Swan, South West and Warren Regions of the Department.

Wellington National Park

Wellington National Park covers an area of 16 790 ha and is located approximately 8 km from Collie, 16 km from Dardanup and 4 km from Allanson, the nearest small towns. It surrounds the Wellington Reservoir and has a boundary that extends up to a fixed point above the high water mark (see Section 9 – Proposed and Existing Tenure).

Adjoining the Park is the Mungalup, Bussell and Wellington pine plantations, private property (mostly to the west and north) and State forest to the east and south (Map 1). The Wellington Discovery Forest Reserve also abuts the Park to the south. Approximately 91% of the national park boundary abuts private property (including private property on the shores of the Wellington Reservoir) and 9% State forest (including pine plantations). Private property adjoining the Park contains some areas of remnant bushland that buffer the area from external influences, particularly in areas such as the lower Collie River valley. However, most land uses on adjoining private property support horticulture and agriculture and to a lesser extent, broad leaf and pine plantations and rural residence. Applications for subdivisions adjoining the Park are increasing, particularly near Pile Road and throughout the Ferguson River valley. Thirteen private freehold locations also exist as enclaves within the Park. The external influences of these land uses have the potential to impact upon the planning area. These impacts are exacerbated for small, isolated fragments of the Park such as the 147 ha portion that abuts the Wellington pine plantation.

A small mining lease of 5 ha, to be mined for sand and gravel, is surrounded by the Park and will be included as national park once mining and rehabilitation are complete (see Section 9 – Proposed and Existing Tenure).

Tree species trial plots covering approximately 146 ha are located within the Wellington National Park. These plots should be revegetated with native species when research has been completed (see Section 39 – Rehabilitation). Abutting the south-east of the Park is a salinity research plot. This site comprises two paired catchments of similar size and is of considerable significance to salinity research.

To facilitate the collection and distribution of water from the Collie River, the Wellington Dam was constructed in 1933. Subsequent infrastructure has been introduced to distribute water supplies including a pipeline to the north that connects to Harris Dam. Several transmission lines also exist.

The boundaries for the proposed additions to Wellington National Park and Westralia Conservation Park were finalised in 2003/2004 as part of the Government's *Protecting Our Old Growth Forests Policy* (2001). However, this process did not include the proposed Westralia Interim Forest Conservation Area. This draft management plan provides a mechanism to receive public comment on the boundaries of this area (see section below).

Westralia Conservation Park and proposed Westralia Interim Forest Conservation Area

The Westralia Conservation Park and proposed Westralia Interim Forest Conservation Area occupy an area of 855 and 1130 ha respectively. The Westralia Conservation Park is bounded to the north by a 3.1 km section of the Coalfields Road and abuts the Collie townsite as well as private property and numerous reserves vested within the Shire of Collie (see Section 9 – Proposed and Existing Tenure). An enclave of 106 ha exists within this Park for the purposes of a rifle range.

The proposed Westralia Interim Forest Conservation Area adjoins the Westralia Conservation Park along the upper Collie River. However, most of this area abuts State forest, except for a 0.6 km section along Mungalup Road, that borders a class C reserve for the purpose of Government requirements (see Map 1). Mungalup Road is the southern access route for visitors travelling from Collie to Dardanup.

The boundaries for the proposed Westralia Interim Forest Conservation Area are indicative and subject to fine-scale modification, as indicated in the *Forest Management Plan 2004-2013*. The Conservation Commission is seeking public comment on the boundaries through this draft management plan. Final boundaries should consider:

- the commitment to set aside old-growth forest from harvesting;
- the commitment to support a sustainable timber industry;
- alignment to easily identifiable and manageable boundaries, using features such as roads, tracks and natural boundaries such as rivers; and
- the location of State Agreement Act mining leases.

Wellington Discovery Forest Reserve

Wellington Discovery Forest Reserve (reserve 48049) occupies an area of 684 ha to the south of the Wellington National Park and comprises the Wellington Discovery Forest (see Section 43 – Information, Education and Interpretation). The Wellington National Park adjoins the Reserve to the north, west and south whilst private property and the Wellington pine plantation adjoin the southern portion of the Reserve. To the east the Reserve is bounded by State forest. For the most part, Pile, Wellington Forest and King Tree Roads border the Reserve.

4. KEY VALUES

Maintaining or enhancing the key values of lands vested in the Conservation Commission will be the major focus of this management plan. How these values relate to the auditing of the management plan are detailed in Section 11 – Performance Assessment and summarised in Appendix 1.

Conservation Values

- Extensive areas of intact fauna habitat and populations of specially protected (including threatened) and priority fauna species.
- A rich mosaic of vegetation communities, some of which are restricted.
- Networks of rock outcrops, wetlands and forested valley ecosystems.
- Distinct and interesting floral communities, including mature growth vegetation along the lower Collie River.
- A varied landscape with areas of high scenic quality such as well defined and steeply sloping valleys, granite outcrops, mature forest, rivers and a reservoir.

Recreational and Tourism Values

- A diverse array of nature-based recreational opportunities including recreational driving, cycling, bushwalking, canoeing, picnicking, camping, abseiling, fishing and marroning, some of which may not be entirely compatible with water source protection.
- A sense of seclusion whilst in close proximity to major population centres and travel routes to the south-west of the State.
- Long distance walking and proposed cycling opportunities on the Bibbulmun Track and extension to the Munda Biddi Bike Trail
- A reservoir that provides a tourist attraction to visitors.

Commercial Values

- The largest reservoir in the south-west of the State, with a high social value and an economic value for safe water consumption.
- Considerable mineral potential within the Westralia Conservation Park and the proposed Westralia Interim Forest Conservation Area.
- Commercial nature-based tourism opportunities.

Cultural Values

- An important area for use by local Aboriginal people for the continuation of cultural activities (and ceremonies).
- Aboriginal sites and landscapes of mythological, ceremonial, cultural and spiritual significance, particularly the Collie River.
- An important site for non-Indigenous cultural heritage, with evidence of former forestry workers settlements, old cottages, spot mills, formations and built structures such as Wellington Dam as well as a history of recreational use.
- Significant site to consider changing perspective on forests, forestry and protected areas.

Educational Values

- An extensive range of interpretation and education programs at the Wellington Discovery Forest that describes elements of the flora and fauna, cultural heritage and other natural processes.
- A diverse array of natural environments providing research opportunities to increase knowledge associated with vegetation health and distribution, species of flora and fauna and their ecosystems.

Drinking Water Values

- The Wellington Reservoir is a planned future drinking water source that may be required from 2017 (or sooner). The Reservoir and its catchment are gazetted under the CAWS Act to protect the source from contamination for public water supply purposes. Any proposed land uses or activites within the catchment, and specifically within a DoE proposed 2km reservoir protection zone, will need to be assesed based on this value consistent with the State Water Strategy 2003.
- Safe, good-quality raw water from Wellington Reservoir that is available for use in the IWSS and GSTWSS.

5. PUBLIC PARTICIPATION

This draft management plan has been developed in consultation with local communities, users of the planning area and other interested parties in the following ways:

- public submissions were invited through State and local newspapers during the preparation of this draft management plan.
- community consultation meetings were conducted.
- meetings were held with stakeholder groups, including indigenous groups, and interested individuals.
- Government agencies were consulted, including the Department of Indigenous Affairs, Department of Environment (DoE), Water Corporation (WC), Department of Industry and Resources (DOIR) and the Department of Fisheries.

PART B. MANAGEMENT DIRECTIONS AND PURPOSE

6. VISION

The vision for the planning area is....

In 2015, a balance will exist between the conservation of the planning areas' natural values and the public demand for recreation and water supply. The area will make an important contribution to reservation of the Jarrah Forest, where natural values, such as, granite outcrops, mature growth forest, ecosystems of the Collie River, and our knowledge of them, will be maintained and enhanced for future generations. Visitors to the area will enjoy a range of sustainable recreation opportunities in a variety of forest settings and provide an economic benefit to the regional economy.

The community will regard the area as a natural asset and will have a greater understanding of its values through the Wellington Discovery Forest and other education and interpretive facilities. The ancient landscape of the lower Collie River valley will be recognised as a forest environment of great visual aesthetic appeal, and for its rich Aboriginal heritage, which will be kept alive through the active and ongoing involvement of local Aboriginal people.

7. LEGISLATIVE FRAMEWORK

Legislation and Policy

The *Conservation and Land Management Act 1984* (CALM Act) covers such matters as defining categories of lands and waters managed by the Department, establishing and defining the functions of the Department and the controlling bodies, management planning and auditing, permits, licences, contracts, leases, offences and enforcement. National parks, conservation parks, CALM Act section 5(1)(h) reserves and State forest (proposed to become conservation park) are the four categories of land involved in this management plan. These reserves, as well as the adjoining State forest, are vested in the Conservation Commission and managed by the Department according to the CALM Act and associated regulations. Sections 54-56 of the Act specify that:

- the Conservation Commission is responsible for the preparation of management plans, through the agency of the Department, for all land vested in it;
- a management plan must contain a statement of policies or guidelines to be followed in the management of the area, and a summary of the operations proposed to be taken over the life of the management plan;
- a management plan for a national park or conservation park shall be designed to "*...fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest*";
- a management plan for CALM Act section 5(1)(h) reserves shall be designed to "*...achieve the purpose for which the land was vested in, or for which the care, control and management of the land were placed with, the controlling body...*" (see Section 9 – Proposed and Existing Tenure); and
- A management plan for State forest shall be designed to "*... achieve the purpose, or combination of purposes, provided for in the proposed management plan under section 55(1)(a)*".

Each plan is periodically subject to audit by the Conservation Commission (section 19 of the CALM Act) and remains in force until such time as a new plan is prepared. If, however,

the Wellington Reservoir is suitable to be used as a drinking water source and monitoring the effects of activities indicates a detriment to water quality, an opportunity will arise for these activities to be reduced or prohibited by an amendment made to this management plan. The procedure to make an amendment to a final management plan is governed by section 61 of the CALM Act and involves a public consultation process.

The Department is directly responsible for administration of the *Wildlife Conservation Act 1950* and associated regulations for the conservation and protection of indigenous flora and fauna on all lands and waters within the State. It is probable that during the life of this management plan the Government will replace the Wildlife Conservation Act with new legislation to protect biodiversity. To this end, a consultation paper, outlining the intent of the proposed Biodiversity Conservation Act, was released in December 2002. The proposed legislation will seek to:

- strengthen special protection for identified threatened species, and extend this protection to threatened ecological communities;
- adopt common categorisation for threatened species and ecological communities consistent with World Conservation Union (IUCN) standards; and
- list key threatening processes and enable regulations to be made to control threatening processes where they are impacting on biodiversity conservation.

There are a number of other Acts affecting the Department's activities or conferring specific powers on the Department. Some of these Acts are briefly described below. These and other statutory provisions of relevance to the planning area are referred to throughout this plan where relevant.

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* contains provisions relating to the protection of nationally-listed threatened species and ecological communities, listing of key threatening processes and heritage protection.

The *Environment Protection Act 1986* provides for protection of the environment across the State. The Act provides for the development of Environmental Protection Policies and the assessment of development proposals and planning schemes for potential environmental impacts.

This management plan is required to conform to the *Bush Fires Act 1954* and satisfy the Fire and Emergency Services Authority that adequate fire protection will be provided for the reserves. Under section 34 (1a)(a) of that Act, the management plan requires approval from the Authority. Under section 45 of the Bush Fires Act, the Department may take responsibility for the suppression of fires threatening the conservation estate.

Under the *Aboriginal Heritage Act 1972*, the Department is required to report Aboriginal heritage sites and ensure that sites are protected. The Department's Indigenous Heritage Unit should also be notified of any sites within the planning area. The (Commonwealth) *Native Title Act 1993* requires that native title claimants and representative bodies be advised when a management plan is being prepared or major public works undertaken. The South West Aboriginal Land and Sea Council is the native title representative body for the planning area and has a number of functions prescribed under the Native Title Act.

Fisheries management throughout Western Australia is the statutory responsibility of the Department of Fisheries under the *Fish Resources Management Act 1994* although CALM has powers to designate national park areas as a restricted area where fishing is prohibited under the *Conservation and Land Management Regulations 2002*.

The CALM Act does not negate any of the powers of the *Mining Act 1978*, Government Agreement acts (*Alumina Refinery (Wagerup) Agreement and Acts Amendment Act 1978* and the *Collie Coal (Western Collieries) Agreement Act 1979*) or the CAWS Act.

The Wellington Reservoir and contributing catchment was originally proclaimed under the CAWS Act in 1952. The catchment area was subsequently amended in 1957 and again in 2000 when the catchment boundaries were amended to accurately reflect the topographical catchment. It remains a proclaimed catchment although not currently being used as a water source, and is therefore still subject to the by-laws and regulations of the Act. This management plan may be amended to make it consistent with this legislation.

In addition to legislative specifications, this management plan also conforms to the policies of the Department.

Obligations and Agreements

Australia is a participant or signatory to a number of important conservation agreements, many of which affect public conservation estate managed by the Department. For the planning area this includes the following:

Regional Forest Agreement for the South-West Forest Region of Western Australia

In 1992, State and Territory Governments agreed to the National Forest Policy Statement, which provides the framework for a long-term solution to the competing demands of conservation and industry on our forests. The National Forest Policy Statement sets out the process for undertaking Comprehensive Regional Assessments of the natural, cultural, economic and social values of Australia's forests. These assessments formed the basis for the negotiation of Regional Forest Agreements in New South Wales, Victoria, Tasmania and Western Australia.

The *Regional Forest Agreement for the South-West Forest Region of Western Australia* (RFA) was made on 4 May 1999 between the Commonwealth of Australia and the State of Western Australia, and will remain in force for a minimum of 20 years. The Agreement establishes a framework for the management of forests within the RFA boundaries, committing parties to ensuring effective conservation, forest management and forest-based industry outcomes.

The agreement:

1. identifies a CAR conservation reserve system and provides for the conservation of those areas;
2. provides for the sustainable management and use of forests within the RFA boundary;
3. has the purpose of providing long-term stability of forests and forest-based industries; and
4. has regard to studies and projects carried out in relation to all of the following matters within the RFA boundary:

    - environmental values, including mature growth, wilderness, endangered species, national estate values and world heritage values;
    - indigenous heritage values;
    - economic values of forested areas and forest-based industries, including mineral exploration and production;
    - social values (including community needs); and
    - principles of ecologically sustainable management.

The planning area is located entirely within the bounds of the RFA (see Section 12 – Biogeography).

The Burra Charter

The Burra Charter (formerly known as the Australian International Council on Monuments and Sites Charter for the Conservation of Places of Cultural Significance) was adopted from the Venice Charter at a meeting in 1979 in Burra, South Australia. It has widely been adopted as the standard for heritage conservation practice in Australia.

7 – Legislative Framework

Key Points:

- The CALM Act defines the functions of the Department and the categories of lands and waters to which these apply. Under the CALM Act, the Department is responsible for administering the Wildlife Conservation Act, which provides for the conservation and protection of indigenous flora and fauna on all lands and waters within the State.
- In the planning area, national parks, conservation parks and reserves defined in section 5(1)(h) of the CALM Act , as well as surrounding State forest, are vested in the Conservation Commission and managed by the Department. These areas are managed in accordance with the CALM Act and regulations, and the policies of the Department and the Conservation Commission.
- The Mining Act takes precedence over the CALM Act and may override the contents of this management plan.
- The *Regional Forest Agreement for the South-West Forest Region of Western Australia 1999* (RFA) obliges the State Government to establish a framework for the management of forests, committing parties to ensuring effective conservation, forest management and forest-based industry outcomes.

The objective is to adhere to legislation and agreements.

This will be achieved by:

1. managing the planning area in accordance with the CALM Act, the Wildlife Conservation Act and other relevant legislation; and
2. implementing the State's obligations under the RFA.

8. MANAGEMENT ARRANGEMENTS WITH ABORIGINAL PEOPLE

There is a strong interest by Noongar people to be involved in the management of conservation estate in the south-west and to strengthen cultural ties to the land. Working together with Aboriginal people to care for the land will be beneficial to the preservation of natural and cultural heritage as well as for cross-cultural awareness.

The Government has indicated a commitment to explore joint management arrangements with traditional owners by developing a consultation paper outlining options for ownership, administration and joint management of conservation lands in Western Australia (Government of Western Australia 2003b). This paper discusses how these arrangements may work.

A memorandum of understanding is already in place between the Department and the South West Aboriginal Land and Sea Council Aboriginal Corporation, which, under the Native Title Act is the representative body for the south-west of the State. This memorandum of understanding sets out both principles and guidelines under which access and co-operative management agreements between the Department and Aboriginal people may be established within the existing provisions of the CALM Act. During the preparation of this management plan, the native title representative bodies, as well as the native title claimants, were contacted and notified of the management planning process. In addition, local Aboriginal people were consulted extensively over management proposals in the draft management plan, and in particular, management of recreational use and access along Lennard Track (see Section 24 – Indigenous Heritage, Section 27 – Visitor Access and Section 28 – Recreational Use).

9. PROPOSED AND EXISTING TENURE

The planning area comprises the Wellington National Park, Westralia Conservation Park, proposed Westralia Interim Forest Conservation Area and the Wellington Discovery Forest Reserve (see Section 3 – Management Plan Area). These lands are reserved under the *Land Administration Act 1997* and vested within the Conservation Commission for management by the Department. Table 1 provides a description of their reserve category and purpose.

Table 1 – Reserve Category and Purpose

Reserve Category	Reserve Purpose
National Park	National parks have national significance for scenic, cultural or biological values, and can accommodate recreation that is consistent with maintaining these values. National parks are managed to fulfil so much of the demand for recreation 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 features of archaeological, historic or scientific interest
Conservation Park	Conservation parks are managed identically to national parks but mostly have regional or local, rather than national, significance. Conservation parks do not have the same security as national parks under the Mining Act, so can reflect areas with potential for mining
Section 5(1)(h) reserve	Scientific research and education
State forest*	Indigenous vegetation managed for purposes that include nature conservation, recreation, and water catchment protection as well as other purposes prescribed by the regulations, which may include beekeeping and water extraction and storage.

* At the time of publication, the proposed Westralia Interim Forest Conservation Area is part of State forest and proposed to be reserved under the Land Administration Act as class A conservation park, vested in the Conservation Commission for management by the Department (see Section below on Land Classification). In the interim, it has the management objective of State forest as stated in Table 1. State forest that connects the planning area has the additional purpose of timber production on a sustainable yield basis.

Wellington National Park, formerly owned by the Worsley Timber Company, was gazetted in 2000 as a class A reserve (No. 46213), vested in the Conservation Commission and set-aside for the purpose of 'national park'. On 8 December 2004, 13 745 ha of State forest No. 25 was added to the Park under the *Reserves (National Parks, Conservation Parks and Nature Reserves) Act 2004*, increasing the total area to 16 790 ha. This Act also set aside 684 ha of State forest No. 25 known as the Wellington Discovery Forest and reserved it as a new class A reserve for the purpose of 'scientific research and education'. Because of its purpose, this reserve comes under section 5(1)(h) of the CALM Act.

The Wellington National Park surrounds the Wellington Reservoir. The park boundary lies above the high water mark or dam full storage level (the level of water in the Reservoir when the dam is overflowing). Land between the park boundary and a surveyed line below the high water mark is freehold land in the name of the State of Western Australia. This includes a small portion of land just north of the Coalfields Road. The Department has acquired this land and is in the process of reserving it as Wellington National Park. In some years of very low rainfall, the water may retreat below this surveyed line. In these instances, land between the watermark (waters edge) and the surveyed line has no tenure. The waterbody itself also has no tenure and is managed by the WC.

The Westralia Conservation Park was created on 30 November 2004 under the *Reserves (National Park and Conservation Parks) Act 2004*. This provided for 855 ha of State forest No. 4 to be excised and reserved as a class A reserve (No. 45961) vested in the Conservation Commission for the purpose of a 'conservation park'. The Act resulted in the Westralia Conservation Park being limited to a depth of 30 m from the natural surface of the land in recognition of the occurrence of known coal deposits.

At the time of writing, Wellington National Park is surrounded by State forest, some of which is incorporated into the planning area as proposed interim forest conservation area (see Section on Land Classification below).

Other proposed tenure changes are listed in Table 2.

Table 2 – Proposed Tenure Changes[2]

Tenure	Purpose	Vesting	Class	Area (ha)	Proposed Changes
Reserve No. 25973	Foreshore management and public recreation	Waterways Commission	C*	39	Gazette the reserve as Wellington National Park
Reserve No. 6563	Public utility	Unvested	C*	57	As Above
Mining tenement M70/271 in State Forest No. 25	State forest with a sand mining lease	Conservation Commission	**	5	Gazette as Wellington National Park once mining and rehabilitation are complete

* Crown reserve created under the *Land Act 1933* and treated as unclassified or not of class A under the Land Administration Act.

** Created under the CALM Act, which has no classification.

Numerous freehold locations occur as enclaves of private property within the planning area. There are also Crown reserves vested in or under the control of the Shire of Collie. A surveyed and made road (No. 2429) exists between Pile and Arcadia roads.

Areas of private property and reserves adjoining or contained within the planning area may add to its ease of management, conservation value and reserve design if consolidated into the planning area. Subject to an assessment of the values of these areas, and their availability, consideration should be given to their acquisition and addition to the planning area. As part of current management, the Department would continue to operate in accordance with its proposed *Good Neighbour Policy* (subject to final consultation). This Policy is aimed at building mutually beneficial relationships with neighbours to deal with a range of cross-boundary management issues such as fencing, fire management, natural resource management and weed and feral animal control.

Land Classification (Zoning)

A strategy for the conservation of natural and cultural values and the facilitation of sustainable resource use, is the implementation of a land classification scheme to designate appropriate levels and types of access. Section 62 (1) of the CALM Act provides for the classification of lands into various categories (these are sometimes called zones):

- wilderness area;
- prohibited area;
- limited access area;
- temporary control area;
- forest conservation area;
- recreation area for purpose specified in the notice; or
- such other class of area as the Minister on recommendation of the Conservation Commission thinks necessary to give effect to the object of this area.

Under the *Forest Management Plan 2004-2013*, it is proposed that a portion of State forest (No. 4 and 26) in the Mungalup forest block be classified (zoned) as an interim 'Forest Conservation Area' (Westralia Interim Forest Conservation Area on Map 2). This area was previously identified for reservation in the *Central Forest Region Management Plan 1987* and in the RFA. The interim land classification is a protective measure that will remain in place until the area is converted to a conservation reserve under the Land Administration Act.

Generally, the classification is proposed where there is an existing impediment, such as mineral prospectivity, to an immediate change to a formal reserve land category. On lifting of this impediment, the proposed Westralia Interim Forest Conservation Area is to be reserved as conservation park. In the interim, the area has the management objective for State forest as stated in Table 1.

[2] Tenure changes are listed in order of priority.

The primary objective for managing forest conservation areas is for biodiversity conservation. Therefore, they will not be available for timber production, but other productive activities that do not involve harvesting of sawlogs or other residue logs, such as apiculture, may be allowed (see Section 41 – Forest Produce). If activities, such as mining, are approved in the proposed Westralia Interim Forest Conservation Area, then timber may be salvaged for use within the planning area (see Section 35 – Mining).

In accordance with section 60 (3)(a) of the CALM Act, notice of the management purposes of State forest proposed to become Westralia Conservation Park, will be published in the Government Gazette. This will be published in the same notice that states that the Minister for the Environment has approved the final management plan. With respect only to the proposed Westralia Interim Forest Conservation Area, this notice will replace the purposes of State forest identified in the *Forest Management Plan 2004-2013* and the 22 March 1994 Gazettal notice issued for the *Forest Management Plan 1994-2003*. Where possible, management of the area will be consistent with the impending tenure change and the purpose for conservation parks as stated in Table 1.

9 – Proposed and Existing Tenure

Key Points:

- The planning area comprises the Wellington National Park, Westralia Conservation Park, proposed Westralia Interim Forest Conservation Area and the Wellington Discovery Forest Reserve (reserve 48049). These lands are reserved under the *Land Administration Act 1997* and vested within the Conservation Commission for management by the Department (see Map 2).
- The proposed Westralia Interim Forest Conservation Area is currently part of State forest. Under the *Forest Management Plan 2004-2013*, it is proposed that this area be reserved as conservation park once existing impediments to reservation as a formal reserve category have been lifted. Its reservation will contribute to a CAR reserve system in the Jarrah Forest bioregion. In the interim, it has the purpose for State forest as stated in Table 1.

The objective is to protect reserves of the planning area with the maximum security of tenure and their gazetted purpose.

This will be achieved by:

1. the Department and Conservation Commission initiating all actions for which they are responsible to reserve the proposed Westralia Interim Forest Conservation Area as Westralia Conservation Park on lifting of existing impediments to an immediate change to a formal reserve land category;
2. implementing the proposed tenure changes as per Table 2;
3. acquisition of private property if it becomes available, and subject to an assessment of its values; and
4. continuing to identify and assess the values of other areas that might be worthy of reservation and where appropriate, recommending tenure acquisitions.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
9.1 Changes in land tenure and purpose	9.1 To formally change the land tenure and purpose of the proposed Westralia Interim Forest Conservation Area to Conservation Park (Class A) , within 2 years of impediments to its reservation being lifted	After 2 years

10. MANAGEMENT PLANNING

The Department initiates the preparation of management plans according to State-wide priorities and on behalf of the Conservation Commission. The process of producing a management plan is as follows:

Management of lands managed by the Department is also dealt with at a broader level through the *Forest Management Plan 2004-2013* and the RFA. These documents currently provide the planning and management framework for land vested in the Conservation Commission and proposed additions to the conservation estate, including additions to the planning area.

10 – Management Planning

Key Points:

- This management plan is dealt with at a broader level through the *Forest Management Plan 2004-2013* and the RFA. Where possible, this plan is consistent with the plans and strategies of other agencies.
- The success of this plan is measured using the performance indicators (see Section 11 – Performance Assessment).

The objective is to maintain the integrity of this management plan and the functions of the Department within other planning processes in the region.

This will be achieved by:

1. providing opportunity for other agencies to comment on this draft management plan; and
2. continuing to provide input into plans and strategies prepared by other agencies so as to maintain consistency with this management plan and other plans, policies and commitments of the Department.

11. PERFORMANCE ASSESSMENT

The Conservation Commission will measure the success of this plan by using performance indicators, and other mechanisms as appropriate. It is not efficient to measure all aspects of management given resource and technical impediments – consequently, indicators will target 'key' components of the plan. Kanowski *et al.* (2001) defined 'key' performance indicators (KPIs, listed in Appendix 1), when considering the conservation of biodiversity, as:

"*the minimum set, which if properly monitored, provides rigorous data describing the major trends in, and impacts on, Australian biodiversity.*"

In the case of this plan, it includes the specification of a measure and target, reporting requirements and a management response to any target shortfall. These components provide a basis for adaptive management, whereby management is altered if necessary to meet a desired outcome.

The Department is responsible for providing information to the Conservation Commission to allow it to assess and audit the success of the Department's management and meeting targets specified in the KPIs. The frequency of these reports will depend upon the requirements of each KPI. Where a report identifies a target shortfall, a response to the Conservation Commission is required. The response may identify factors that have led to the target shortfall, and propose alternative management where appropriate. The Conservation Commission will consider the Department's response on the target shortfall and evaluate the need for action in the context of its assessment and audit function under section 19(1)(g)(iii) of the CALM Act. The Conservation Commission will make the results of audits available to the public.

PART C. MANAGING THE NATURAL ENVIRONMENT

The responsibilities of the Department include conservation of biodiversity at ecosystem, species and genetic levels, and the sustainable management of the resources they provide. The Conservation Commission also has a role in biodiversity conservation through the development of policies "...for the preservation of the natural environment..." (section 19(1)(c) of the CALM Act) and the preparation of management plans.

The CALM and Wildlife Conservation acts give the Department responsibility for the conservation and protection of indigenous flora and fauna on all lands and waters throughout the State. Various Departmental policy statements also provide management directions, including:

- Policy Statement No. 3 – *Management of Phytophthora and disease caused by it* (CALM 1998);
- (proposed) Policy Statement No. 9 – *Conserving threatened species and ecological communities* (subject to final consultation) (CALM 1992a);
- Policy Statement No. 19 – *Fire management* (CALM 1987);
- Policy Statement No. 34 – *Visual resource management of lands and waters managed by CALM* (CALM 1989);
- Proposed Policy Statement *Management of Pest Animals on CALM managed lands* (subject to final consultation); and
- Proposed Policy Statement *Environmental Weed Management* (subject to final consultation).

12. BIOGEOGRAPHY

Bioregions

The National Reserve System Program was adopted to preserve Australia's native biodiversity and initiate a protected reserve system that meets the world's best standards in terms of comprehensiveness, adequacy and representativeness (Thackway and Cresswell 1995). As a framework for developing this reserve system, the National Reserve System Program initiated the Interim Biogeographic Regionalisation for Australia, which divided Australia into 80 bioregions based on dominant landscape characteristics of climate, lithology, geology, landforms and vegetation.

Seven bioregions, the Jarrah Forest, Warren, Swan Coastal Plain, Avon Wheatbelt, Geraldton Sandplains, Esperance Plains and Mallee lie within the south-west. Two subregions are recognised within the Jarrah Forest bioregion as the Northern Jarrah Forest and Southern Jarrah Forest, differentiated principally by the slight variations in climate, geology and understorey species composition. The planning area lies on the boundary of these two subregions (Map 3).

At the time of publication, just over 5% of the Jarrah Forest bioregion is within a conservation reserve[3] (231 441 ha). On a subregional scale, this comprises 8% (152 958 ha) of the Northern Jarrah Forest and 3% (78 483 ha) of the Southern Jarrah Forest. Proposed reservations of the Jarrah Forest bioregion will result in 16% of the bioregion being reserved, making the Jarrah Forest bioregion one of the most highly reserved bioregions within the State, comparable to reservation in the Mallee and Geraldton Sandplains bioregions.

[3] Conservation reserves include nature reserves, national parks, conservation parks and 5(1)(g) and (h) reserves which have a purpose of conservation.

Comprehensive, Adequate, Representative Conservation Reserve System

In the south-west of the State, the Jarrah Forest and Warren bioregions encompass the boundaries of the RFA for most of its extent. The RFA was initiated to provide a specific framework for managing forests in the south-west, recognising the need for a more in-depth analysis of environmental, social, economic and indigenous heritage values in this area (see Section 7 - Legislation Framework). As such, 26 forest ecosystems were defined and used to assist in the establishment of a CAR conservation reserve system to protect the biodiversity of the south-west forest area. The forest ecosystem definition process is consistent with the criteria used for determining bioregional boundaries but is at a finer scale.

The reservation target for forest ecosystems was set at 15% of their pre-1750 distribution, except for some rare ecosystems where 100 per cent of the extant distribution was the target. This ensures that viable examples of each ecosystem are included in the protected reserve system. To assist in decisions on areas for reservation, information provided at a finer scale was also considered, including vegetation complexes, species richness, relictual and disjunct species and the presence or absence of mature growth vegetation.

The *Forest Management Plan 2004-2013* added to the conservation reserve system proposed in the RFA by incorporating the policy commitments in the Government's *Protecting Our Old Growth Forests Policy* (2001). The addition of the reserve proposals in the *Protecting Our Old Growth Forests Policy* (2001) significantly increased the representation levels of many forest ecosystems. The informal reserve system within State forests is also managed to increase the protection of less well reserved forest ecosystems.

Seven forest ecosystems occur in the planning area, six of which (jarrah north west, jarrah sandy, jarrah woodlands, rocky outcrops, sand dunes and shrub herb and sedgelands) meet the agreed target for the CAR conservation reserve system (Conservation Commission 2004). The forest ecosystem that does not meet the CAR target for conservation reserves is the Darling Scarp. Protection of this ecosystem is required on private land to meet the CAR target.

Biogeography of the Planning Area

The planning area shares similarities with other parks and reserves of the Darling Plateau, such as Lane Poole Reserve, Serpentine National Park and the proposed Monadnocks National Park to the north. All of these areas share a common geology and contain major river systems that flow through deeply incised valleys. As a result, some rivers have been dammed for water supply. Numerous wetlands and networks of rock outcrops also exist.

Outstanding natural values occur to the west of the planning area on the Swan Coastal Plain where remnant wetlands occur in chains parallel to the coast. These systems, such as the lakes within the Yalgorup National Park, provide significant refuge and feeding habitat for a number of waterbird species including trans-equatorial migratory waders. In forested catchments to the east of the planning area, important wetlands not affected by salinity exist at Yourdamung Lake and Nalyerin Lake. There are no such wetlands in the planning area although the Wellington Reservoir and major river systems such as the Collie River support some waterbirds species, some which may use the systems as a wildlife corridor.

Conservation reserves of the planning area total 18 329 ha. Under the CAR conservation reserve system, a further 1130 ha is proposed. This, when combined with management for conservation in adjacent multiple-use State forest, provides a sizeable, relatively unfragmented area of forest that extends along the Darling Plateau from the Avon River valley near Perth to the Blackwood Plateau around Nannup. The Wellington National Park, Westralia Conservation Park and surrounding State forest are all vested with a single authority (the Conservation Commission) and managed by the Department.

12 – Biogeography

Key Points:

- The National Reserve System Program was adopted to preserve Australia's native biodiversity on a regional scale, and initiate a CAR conservation reserve system.
- The planning area lies within the Jarrah Forest bioregion and straddles its two subregions (Map 3).
- The Jarrah Forest and Warren bioregions encompass the boundaries of the RFA for most of its extent.
- The RFA was initiated to provide a specific framework for managing forests in the south-west, recognising the need for a more in-depth analysis of the values in this area. Therefore, the 26 forest ecosystems defined for the RFA are used to assist in the establishment of a CAR conservation reserve system to protect the biodiversity of the south-west forest area.
- Reserve proposals in the *Protecting Our Old Growth Forests Policy* (2001) significantly increase the representation levels of many forest ecosystems.
- Seven forest ecosystems occur in the planning area, six of which meet the agreed target for the CAR conservation reserve system.

The objective is to ensure protection of a comprehensive, adequate and representative conservation reserve system within the National Reserve System.

This will be achieved by:

1. acquiring, by purchase or exchange, and when opportunities arise and funds are available, areas adjoining the planning area that have significant conservation or recreational values, or management benefits that could assist in protecting the planning area;
2. negotiating with the relevant State agencies and local governments to add important conservation and recreation reserves under their control to the planning area; and
3. taking into account any refinements to the Interim Biogeographic Regionalisation for Australia over the life of this management plan.

13. CLIMATE CHANGE

The planning area experiences a warm temperate Mediterranean-type climate, characterised by cool, wet winters and hot, dry summers. The climate is influenced by anticyclonic activity, which results in regular cold fronts in winter and occasional heavy summer storms. The area experiences high winter rainfall (1000–1200 mm) in a strong west-east gradient.

Observed and Projected Climate Change

There is now broad scientific agreement that global climate change due to human induced increases in the concentrations of greenhouse gases is already apparent. Observed climate changes include an increase in global average temperatures of $0.6 \pm 0.2°$ C since 1900 (CSIRO 2001). Australia's continental average temperature has risen by about 0.7° C from 1910-1999, with most of this increase occurring after 1950 (CSIRO 2001).

The south-west of Western Australia has been identified as a region that is especially vulnerable to climate change (Pouliquen-Young and Newman 1999) and a priority area for developing climate change strategies within Australia. Trends indicate that from 1910-1995 the area has already become 25% drier in winter (mostly since the mid 1970s) (Hennessy *et al.* 1999, Hennessy 2000) and experienced a decline in river flows. Recent research on climate change suggests that:

- rainfall will continue to decline (by as much as 60% from 1990 levels) and temperatures increase up to 5°C by 2070 (CSIRO 2001, Hughes 2003);
- river flows will also decline as a result of decreased rainfall;
- weather events may generally be more extreme, with more frequent and prolonged drought;

- there will be more frequent bushfires;
- there will be an increase in the number of days of very high and extreme fire danger (Williams *et al.* 2001); and
- atmospheric carbon dioxide concentrations will increase.

A study of the Stirling catchment also found that an 11% reduction in annual rainfall by the middle of the century could result in a further 31% reduction in annual water yield (Berti *et al.* 2004). This is likely to be representative of responses of other catchments along the Darling Scarp, including that of the planning area. Consequently, it is probable that there will be increased pressure on existing water sources and demand for new sources, such as the Wellington Reservoir.

Impacts of Climate Change

The projected climate changes discussed above will have significant social, economic and ecological impacts on vulnerable systems. The *National Biodiversity and Climate Change Action Plan 2004-2007* (Department of Environment and Heritage 2004) has identified some of the potential ecological impacts, relevant to the planning area, as:

- changes in species distribution and abundance;
- reductions in the geographic range of some species;
- changes to the timing of species' lifecycles;
- changes in population dynamics and survival;
- changes in location of species' habitats;
- increases in the risk of extinction for species that are already vulnerable;
- increased opportunity for range expansion of invasive species;
- changes in the structure and composition of ecosystems and communities; and
- changes in plant growth and ecosystem function arising from increased carbon dioxide concentration in the atmosphere.

The impact of climate change on native species and ecosystems may also be exacerbated by non-climatic stresses, such as habitat fragmentation/modification, competition by introduced species and altered fire regimes. Species and communities that may be more vulnerable include those:

- that are already located at the limit of their climatic ranges;
- with very limited or restricted climatic ranges;
- with limited dispersal ability;
- with very specialised habitat requirements; and those
- with small populations and/or low genetic diversity.

(Department of Environment and Heritage 2004).

Responses to Climate Change

Given the significant potential adverse effects of climate change, the issue has been the subject of intense international and national focus. Responses to climate change involve a number of global, national, State and local level initiatives including for example, the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and the National Greenhouse Strategy. On a national level, 'loss of climatic habitat caused by anthropogenic emissions of greenhouse gases' has also been identified as a key threatening process under the Environment Protection and Biodiversity Conservation Act. At State level, the *Western Australian Greenhouse Strategy* (Western Australian Greenhouse Taskforce 2004) facilitates fulfilment of the State's responsibilities regarding national and international agreements regarding climate change.

The issue of projecting and responding to climate change is complicated by significant knowledge deficits and uncertainty. These are numerous but include for example, uncertainty regarding the interplay of natural climate variability and human induced climate change, uncertainty regarding future levels of global greenhouse emissions and region-specific

impacts to natural environments. In view of these uncertainties, management strategies to cope with climate change need to:

- use adaptive management principles that generate better understanding of the interaction between taxa and community resilience and climate factors;
- be flexible to allow use of better knowledge as it is generated;
- promote the resilience of taxa and communities to climate change by limiting or reducing those pressures over which we have some management control;
- manage for uncertainty (e.g. by extending the conservation reserve system as appropriate and providing buffers, corridors and climate refugia); and
- monitor changes to taxa and community structure and representation over time.

The *Western Australian Greenhouse Strategy* includes specific provision for investigation into the biodiversity impacts of future climate change. More specifically, under the strategy the Department has commenced work on actions requiring it to:

- undertake biodiversity response modelling to investigate the potential vulnerability of Western Australia's plants and animals to climate change; and
- develop a climate-biodiversity strategy.

At individual reserve level, the implementation of strategies in this plan aimed at reserve creation, pest animal and weed control, fire management, and re-introduction programs, will help improve the resilience of species and ecosystems and hence decrease their vulnerability to climate change.

13 – Climate Change

Key Points:

- The south-west of Western Australia has been identified as a region that is especially vulnerable to climate change and a priority area for developing climate change strategies within Australia. Decreased in rainfall and river flows, as well as increased temperatures, are already apparent.
- Climate change will have significant impacts on vulnerable species and ecosystems, and adaptation strategies are required to improve understanding and increase the resilience of natural systems to these changes.
- Reserve creation, introduced pest and weed control, fire management and re-introduction programs could help improve the resilience of species and ecosystems within the planning area, and decrease their vulnerability to climate change.
- Reduced river flows across the south-west may place increasing pressure on the Wellington Reservoir to become available for public drinking water supply.

The objective is to understand and consider the effects of climate change on the planning area.

This will be achieved by:

1. investigating the potential vulnerability of species and communities of the planning area to climate change (in particular species and communities of special conservation significance or likely to be highly vulnerable to climate change);
2. adapting climate change management approaches as necessary in response to new knowledge or changes in statewide climate-biodiversity strategies;
3. protecting adequate and appropriate space within the reserve system to provide buffers, corridors and climate refugia (e.g. implementing proposed additions to the public conservation estate as indicated in Section 9 – Proposed and Existing Tenure);
4. incorporating the potential for climate change impacts into recovery plans for threatened species and communities;
5. limiting non-climate stresses for species and communities that are vulnerable to climate change; and

6. liaison with the DoE and WC on the timeframe for use of Wellington Reservoir as a drinking water source.

14. GEOLOGY, LANDFORM AND SOILS

Geology

Geology of the planning area and the evolution of both its landforms and climate provide the basis for sustaining natural ecosystems.

The planning area is situated on the western edge of the Yilgarn Craton geological province, which extends northward into the Murchison and eastward to include the Goldfields. The Yilgarn Craton is a stable shield, consisting of linear belts of metamorphosed sedimentary and volcanic rocks, which have been invaded by large areas of granite, about 2600 million years ago (Archaean period). The Craton is characterised by linear belts of greenstone rocks that are highly mineralised and have given rise to numerous gold and nickel mines. The Boddington gold mine close to Collie is in one of these belts.

Some 290–320 million years ago, when Australia was part of the ancient supercontinent of Gondwana and close to the south pole, much of today's Western Australia was covered by a massive ice sheet. As the Australian continent broke off and drifted away, northward, the sheet glacier melted, leaving thick beds of tillite. Subsequently, a warmer and wetter era (Permian) supported luxuriant vegetation in swamps and extensive forests, which eventually developed as coal measures.

Except in a few places, most of the signs of ancient glaciation and the evolving forests has been eroded away back to the basement rock of the Yilgarn Craton. However, in the Collie region, discrete crustal deformations occurred, producing the Collie, Wilga and Boyup Basins, in which remnants of coal formation have been preserved. The Collie Basin covers an area of 223 km^2 and is partially within the Westralia Conservation Park. It comprises Permian sedimentary rocks, approximately 280 million years old, including coal measures composed of conglomerate, sandstone, siltstone, shale and seams of sub-bituminous coal. Permian sediments of the Collie Basin do not outcrop except for rare exposures of the coal measures in the bed of the Collie River.

Up to this time, Australia and 'Greater India' were still linked, but the two land masses subsequently parted. The southern part of the Yilgarn Craton's western edge is marked by a major rock-deforming feature, the Donnybrook-Nannup Shear Zone. It passes through the western part of the planning area, and here much of the original granite has been transformed (metamorphosed) into gneiss. The deforming processes and exposure to weathering have created some mineral enrichment, as with tin and tantalite at Greenbushes. Subsequent weathering of the granites and gneisses also developed a veneer of laterite over the surface, which in places is enriched with bauxite, which is mined further north of the planning area.

The western edge of the Yilgarn Craton is marked by the Darling Fault, visually expressed in the Perth to Bunbury area by its erosion feature, the prominent Darling Scarp. The adjoining Swan Coastal Plain overlies a deep sedimentary basin (Perth Basin) west of the escarpment. Over time, the Yilgarn Craton has been uplifted relative to the Perth Basin, resulting in rejuvenated drainage that is largely controlled by joints and fractures and the erosion of more easily weathered rocks. As a consequence of these actions, the Collie River and valley was formed. Granitic monadnocks or outcrops, resulting from this erosion, are sometimes exposed as emergent features throughout the planning area. Many of these outcrops are small, isolated, and are likely to provide important refugia for flora species beyond their current main range.

Known Minerals

The planning area is considered to have potential for bauxite, tin-tantalum-lithium, nickel and gold mineralisation. The latter has been reported from the upper reaches of the Ferguson River at Wellington Mill. The Collie Coal Measures are high in mineral potential with an

estimated 6.5 million tonnes of coal present (URS 2001), contributing significantly to the State's power supply (see Section 2 – Regional Context).

Landform and Soils

The planning area comprises the Darling Plateau physiographic unit, or unit of physical geography. It is an undulating surface with an average elevation of 250–300 m above sea level, which extends along the Darling Fault from the Perth hills south, to the Whicher Range. Overlying the Darling Plateau are topographical features of the earths surface or landforms, such as plains, plateaus, valleys and ridges. These are strongly influenced by the uplift of the Yilgarn Craton and the underlying geological nature of the substrate or basement rock, as well as features such as faults. Landform units can be differentiated by the degree of dissection of the laterite duricrust by rejuvenated drainage patterns, the slope and relief of the valley systems and the degree of stripping of the weathered mantle. These units include Lateritic Uplands, Minor Valleys, and Major Valleys.

Lateritic Uplands

The lateritic uplands can be found on hillcrests and ridges between river and creek systems, where they are characterised by gently undulating surfaces and open jarrah forest. They occupy the highest areas of the landscape, set some 50–100 m above the swampy valleys, and have little variation in a general elevation of about 280 m. Projecting even further above these areas, are prominent hills, such as Mt Lennard (320 m). A characteristic of the uplands in the planning area is the presence of large rock outcrops of granite that occur sporadically along the valley. These areas are important for conservation and have been demonstrated elsewhere to contain endemic, refugial and disjunct species (see Section 18 – Species and Communities of Conservation Significance). To the east, in the Collie Basin, the lateritic uplands are broad and flat, and comparable to those on the surrounding Archaean rocks. In these areas, the uplands reach a general elevation ranging from 200–250 m.

Soils of the lateritic uplands differ between those of the Collie Basin and those of the surrounding Archaean rocks, despite the similarities in landform. Massive ironstone duricrust pavements, loamy gravels, sandy gravels and numerous lateritic outcrops dominate soils on the Archaean rocks, which originate from granites and gneisses. Soils of the Collie Basin however, originate from sedimentary rocks such as sandstone, which gives rise to infertile, yellow brown sandy gravels, unique to the region. The difference in soil type becomes apparent in the vegetation, where the poorer, sandier soils of the Collie Basin support a more open forest environment, which contains a stronger second storey of species such as woody pear (*Xylomelum occidentale*) and bull banksia (*Banksia grandis*). Where vegetation is removed, soils of the uplands are predisposed to erosion (see Section 22 – Soil and Catchment Protection) and the management of visitor use becomes important.

Minor Valleys

Minor valleys of the planning area generally connect to major valleys, and comprise of small tributaries and creek systems such as the Gervasse River. They are common on the western half of the Darling Plateau, particularly north of the Preston River around the Murray River catchment. Minor valleys dissect the lateritic uplands, forming narrow valleys with gentle side slopes and flat swampy floors. The tributaries and creek systems that characterise these valleys exhibit a clear north-west to south-east lineation, which is related to dominant structural elements of the basement rock, such as faults. Soils comprise of loamy gravels, sandy gravels with some loamy earths and deep sands. These soils are sandier than those of the lateritic uplands as the weathering of exposed granite material is more apparent, particularly downslope of laterite ridges.

In the Collie Basin, the minor valleys are shallow, with low slopes that are dominated by sandy gravels and deep sands. The poor moisture and nutrient retention capabilities of these soils supports different vegetation to the open forests of minor valleys on the surrounding Archaean rock types, comprising of open woodlands of moonah (*Melaleuca preissiana*), swamp banksia (*B. littoralis*) and holly-leaved banksia (*B. ilicifolia*).

Major Valleys

The deeply incised landform of the lower Collie River valley is a spectacular example of the major river valleys found along the western edge of the Darling Plateau. It dominates the planning area, providing striking scenic attributes and numerous recreation opportunities, as well as supporting valuable habitats for conservation. This type of landform is associated with major river systems such as the Collie River, which has carved deep into the valley along joints and fractures in the basement rock. The deepest of these entrenchments is along the lower Collie River, below the Wellington Dam, where slopes may be greater than 25 degrees and have a relief of 120–200 m. The narrowest point of the Collie River valley defines the location of the Wellington Dam. Between the Mungalup pine plantation and the dam wall, landforms are characterised by broader, more moderately incised valleys, lesser relief and slopes that are predominantly 15–25 degrees. These valley landforms are also common to other reservoir areas such as the Stirling Dam, and to a lesser extent, the Harris Dam.

The patterning of soils in major valleys is complex, depending on relief and steepness of valley systems, rockiness of the slopes, and the nature of the valley floor. This is particularly evident in the lower Collie River, where stony soils occur around granite outcrops, red and brown loamy earths on the upper slopes and brown loams in the lower slopes and floors. The shallow nature of soils in this area and the steep slopes make it particularly susceptible to erosion and environmental degradation (see Section 22 – Soil and Catchment Protection). Consequently, managing visitor access and use, limiting development to manageable areas and providing interpretation is essential to preserve the integrity of these areas. Above the dam, soils in the major valleys are predominantly red and yellow loamy earths and in the upper reaches of valleys systems, loamy earths and gravels.

The Lateritic Soil Profile

All landscapes of the planning area consist of a weathered mantle at the surface, which has formed as a result of weathering of granite, gneiss, migmatite and dolerite rock types. The upper part of this mantle consists of ferruginous and aluminous horizons, which together make up the laterite soil profile. This profile is characterised by the presence of jarrah-marri forest ecosystems and consists of topsoil containing a gravely sandy loam up to a depth of five metres and deeper kaolinitic clay 30 m above the bedrock. The patterning of soils relates to a situation where land dividing valley systems are extensively occupied by the laterite mantle, and the valleys show morphology and soils determined by topography, the degree weathering and the geology of the basement rock.

14 – Geology, Landform and Soils

Key Points:

- The planning area is located on the Darling Plateau, which forms the western edge of the Yilgarn Craton, an ancient area of Archaean granitic and gneissic rocks.
- The Collie Basin forms an unusual geological feature of the Yilgarn Craton, different to the surrounding granitic and gneissic rocks, and comprises of Permian sedimentary rocks that have been deposited as sediment in structural depressions in the basement rock. This makes up what is known as the Collie Coal Measures.
- The Collie River valley is a spectacular example of the incised river valleys found along the length of the Darling escarpment. The valley dominates the landscape, providing striking scenic attributes and numerous recreation opportunities.

The objective is to protect the geology, landforms and soils of the planning area.

This will be achieved by:

1. minimising soil disturbing activities in, and public access to, areas of steep and moderate slopes, particularly in the lower Collie River valley;
2. identifying geological features and soil types vulnerable to environmental damage and potentially threatened by human use, and protecting these areas;

3. rehabilitate eroding areas, superfluous tracks and disturbed areas as necessary; and
4. providing interpretive information on geology within the planning area, its relationship with landforms, soils and vegetation and their vulnerability to damage.

15. LANDSCAPE

Landscape management is based on the premise that the visual quality of any landscape is a resource in its own right and can be assessed and managed in much the same way as other resource values, such as fauna, flora, water and recreation. The role of landscape management is to ensure that all uses and activities are planned and implemented to complement rather than detract from the inherent visual quality of the environments in which they occur.

In the context of this management plan, the term 'landscape' refers to the appearance or visual quality of an area. For many, visual appearance is the most direct way visitors will experience an area and, therefore, is often the criterion by which land management practices are judged.

Landscape Character Type

Every landscape has an identifiable visual character determined by its context of geomorphology, hydrology, soils, vegetation, land-use and cultural heritage values. Most people's understanding and response to their environment is largely visual. According to these features, landscapes in Western Australia have been broadly identified and described as landscape character types in order to assess their visual landscape values (CALM 1994a).

The Darling Uplands is the major landscape character subtype within the planning area.

Visually, the most significant landscape elements of this subtype are:

- granite domes and outcrops;
- undulating and steeply sloping escarpment;
- well defined and steeply incised valleys;
- isolated peaks or hills;
- permanent watercourses, lakes and reservoirs;
- areas of remnant native vegetation; and
- distinctive stands of remnant vegetation.

Scenic Quality

Within each landscape character type, the scenic quality has been classed as high, moderate or low. This is typically based on diversity, uniqueness, prominence and naturalism of landform, vegetation and waterform within each type (CALM 1994a).

The portion of the planning area deemed to have the highest scenic quality is the lower Collie River valley. Its mature forests, thick riparian vegetation and stream sections with rapids and massive rock outcrops are a prominent feature. Other areas of high scenic quality include exposed water or water edge, valleys, steep slopes and isolated hilltops and areas where these elements combine with mature vegetation that offers scenic landscape viewing.

The area around the dam is particularly notable for scenic diversity with long open views across the Reservoir, overviews of the dam's massive concrete wall and the valley below. The waterbody itself is changeable in character and from the shores there are views across the water and of the steep, forested background. The long views of the waterbody and forested background are attractive to visitors and their attributes should be incorporated into scenic walking routes. The number of unseen areas around the waters edge also lends itself to development, especially where there may be minimal visual impacts on the landscape. However, any water-based recreation development will need to meet water source protection requirements (see Part E – Managing Visitor Use).

Pine forests that are located at the southern end of the Reservoir also provide a different character to the native forest. The Forest Products Commission will consider the impact of plantation operations on the visual quality of the landscape in these areas. Where reasonable and practicable, operations will be conducted in a manner that seeks to reduce or negate impacts.

Isolated hilltops that offer elements such as panoramic views, steeply sloping areas, water surfaces and granite outcrops offer the greatest scenic quality. However, within the planning area, only two hilltops have been made accessible with developed walking tracks. These are the Kurliny Tjenangitj Track and the Sika Circuit. Hilltops north and west of the Wellington Reservoir potentially offer these qualities and the promise of great scenic views but are constrained by informal or no access. Whilst hilltops in the vicinity of these areas provide quality viewpoints, it is also recognised that the deeply incised landscape and erodible soils make track design of paramount importance.

Some areas of high scenic quality within the planning area are under-exposed to current visitor routes. This includes areas such as the north-eastern portion of Wellington Reservoir and the area east of Wellington Dam Road.

R. Muench unpubl (2001) suggested that utility corridors (e.g. transmission lines and railways) and other cultural features (e.g. gravel pits), have a negative impact on visitor's perception of the natural environment and hence are undesirable within the landscape. This is particularly so where they are visible from tourist routes or destinations and where they are dominant features of the landscape, such as along the Coalfields Road. Access routes absent of these features should be considered for promotion as scenic drives (see Section 28 – Recreational Use – Scenic Tourist Routes).

Several roads adjoining the planning area are proposed for upgrading (road widening) under the Roads 2020 Regional Road Development Strategy (see Section 28 – Recreational Use–Visitor Access). In these circumstances, the Department and Conservation Commission should provide advice to the Main Roads Western Australia, with the aim of minimising the impact on visual landscape values. Logging activities may also cause negative impacts upon scenic quality in the short to medium term. Sites that are potentially exposed to these visual impacts occur along King Tree Road and areas east of Wellington National Park, which is State forest.

Landscape Management

Landscape management involves maintaining, restoring or enhancing natural and cultural landscape values, as well as planning and designing land use activities and developments to provide diverse views and minimise negative impacts. Human imposed changes to the landscape should be subordinate to the established natural visual character.

Key factors to consider in landscape management include:

- visual changes to the landscape occur continually. Natural changes are generally subtle, harmonious and occur very slowly whereas human-imposed changes can visually dominate natural elements, appear discordant, alien and occur abruptly, and must be managed to ensure minimal impact on the landscape;
- the ability of landscapes to absorb change without loss of scenic value varies, depending on factors such as slope, soils, vegetation cover and scope of change; and
- landscape management involves extensive broadscale and on-site analysis, project impact evaluation, and sensitive site planning, design and construction methods.

Guidelines for Management

The Department's Policy Statement No. 34 – *Visual resource management of lands and waters managed by CALM* (CALM 1989) provides broad guidelines for landscape

management, particularly the planning and implementation of new facilities, buildings, recreation sites, signs and infrastructure.

Areas of high scenic quality (such as the lower Collie River valley) are the areas of greatest concern in terms of visual landscape management and are the most sensitive to alterations. Any changes should borrow from the natural established landscape character and be imperceptible to the casual observer.

Changes to areas of moderate scenic quality should borrow significantly from natural elements but may be apparent to the observer.

Areas of low scenic quality are of least visual concern and sensitivity to alterations. Changes should consider natural elements but may be dominant to the observer.

Guidelines for management in high, moderate and low quality scenic landscapes within the planning area are included in Appendix 2.

15 – Landscape

Key Points:

- The planning area is representative of the Darling Uplands landscape character type.
- The portion of the planning area deemed to have the highest scenic quality is along the lower Collie River valley and where mature vegetation is combined with areas that include exposed water or water edge, valleys, steep slopes and isolated hilltops.
- Areas of high scenic quality, such as the north-eastern portion of Wellington Reservoir and the area between Coalfields Road and Wellington Dam Road, are underexposed to current visitor routes.
- Several isolated hilltops exist within the planning area that offer the potential for rewarding panoramic views, but only two, the Kurliny Tjenangitj Track and the Sika Circuit, have formal access (see Section 28 – Recreational Use).
- The Department's Policy Statement No. 34 – *Visual resource management of lands and waters managed by CALM* provides broad guidelines for landscape management.

The objectives are:

1. **to protect and enhance the visual landscape qualities of the planning area; and**
2. **to provide opportunities to appreciate aspects of the landscape.**

This will be achieved by:

1. applying the Department's Policy Statement No. 34 – *Visual resource management of lands and waters managed by CALM* and following the landscape guidelines set out in Appendix 2;
2. ensuring that visual landscape management is considered for all proposed management activities and developments in the planning area and for timber harvesting operations on adjacent State forest;
3. liaising with neighbouring landowners, industry, local and State government agencies to ensure visual landscape management guidelines are considered in any development or operations they may undertake, and provide advice upon request;
4. encouraging sensitive management of visual resources along access corridors to tourist destinations, features of the planning area and areas of high scenic viewing; and
5. providing access and recreational opportunities to areas of high scenic quality where this is environmentally sustainable, compatible with other values of the planning area and in accordance with the proposed visitor management settings.

16. NATIVE PLANTS AND PLANT COMMUNITIES

The planning area forms part of the broad-leaved evergreen sclerophyllous forests of Australia. It lies within the Dale Botanical Subdistrict of the Darling Botanical District, a division of the South West Botanical Province (Beard 1980). Geographically it is situated on the western edge of the Darling plateau and the western margin of the jarrah forest. In addition, it is located on the boundary of the northern and southern jarrah forests, a continuum defined by slight variations in rainfall and the transition from the drier open forests in the north to the tall forests of the south.

Vegetation is representative of that of the jarrah forest, displaying a remarkable structural homogeneity in overstorey species, principally dominated by jarrah (*Eucalyptus marginata* subsp. *marginata*), marri (*Corymbia calophylla*) and, on deeper valley soils, Swan River blackbutt (*E. patens*). The diversity in floristic composition, adaptive characteristics displayed by plants, patterns of groupings and the structural features of plant communities coincides with changes in environmental conditions across the jarrah forest, principally variations in climate, topography and soil type.

A rapid intensification of land use demands on the jarrah forest has occurred since the 1960s, placing greater conservation significance on those remaining species and communities in conservation reserves (McKenzie *et al.* 1996), such as those located within the planning area. The variety of vegetation types, wide range of habitats, presence of major river systems, scenic values and continuity with adjoining State forest make plants and plant communities of the planning area significant for conservation and a valuable contribution to the CAR conservation reserve system (see Section 12 – Biogeography).

Native Plants

There are 194 native vascular plant taxa[4], representing 64 families recorded in the planning area, although botanical collections and surveys have been limited. The largest number of species belong to the family Papilionaceae (peas), followed by Proteacea (banksias and grevilleas), Myrtaceae (eucalypts and paperbarks), Asteracea (daisies) and Mimosacea (wattles). The plant species list is probably a significant under-estimate for the planning area as a comprehensive study has not been completed.

The diversity of vascular plant species of the planning area, and other parts of the south-west, was modelled as species richness for the RFA. This predicted 500–600 species/km^2 for the planning area, similar to that elsewhere within the Jarrah Forest bioregion.

Vegetation Communities

Vegetation of the planning area is a mosaic of forest, wetland and woodland vegetation types. On a local scale, the vegetation ranges from tall open forest formations along the lower Collie River valley to open forests and open woodlands of the Collie Basin. Woodlands and forests typically occur on lateritic soil types, especially in the uplands, and are dominated by an overstorey of jarrah and marri. Common understorey species include bull banksia, sheoak (*Allocasuarina fraseriana*), waterbush (*Bossiaea aquifolium*) and snottygobble (*Persoonia longifolia*), as well as grass tree (*Xanthorroea preissii*) on hilltops.

A number of distinct and interesting floral communities exist. Of particular note is the unusual mixture of marri and Swan River blackbutt forest that dominates the deeper, and more fertile, red and yellow loamy earths of the lower Collie River valley. This area contains populations of riverside vegetation including flooded gum (*E. rudis*), swamp paperbark (*M. rhaphiophylla*), peppermint (*Agonis flexuosa*) and river banksia (*B. seminuda*). On the fertile riverside loams, understorey species such as karri hazel (*Trymalium spatulatum*) and *Chorilaena quercifolia*, which are typical of karri forest, occur. The presence of these species is indicative of the cool, damp, microclimate of the lower Collie River valley and is different to vegetation elsewhere in the planning area and in

[4] Records obtained from the Western Australian Herbarium 2003

similar landform types of the northern jarrah forest. The vegetation has remained largely unaffected from human disturbance, an uncommon feature within the bioregion, and a primary reason for the occurrence of ecologically mature forest in this area. Elsewhere, this type of vegetation has been eliminated or reduced due to the damming of rivers, agricultural land clearing and the creation of pine plantations. Conservation of this area is paramount especially given the increase in visitors and vulnerability of the landforms to erosion. Where possible, compatible off-reserve conservation of adjoining lands is encouraged.

Riparian vegetation along the lower Collie River is characterised by very narrow fringing sedgeland communities dominated by sheath twigrush (*Baumea vaginalis*) with some spreading sword-sedge (*Lepidosperma effusum*), both which occur repeatedly along its length (Syrinx Environmental Planning 2003). Granite heath communities comprising of prickly moses (*Acacia pulchella*) and various *Melaleuca* species as well as thickets of winged wattle (*Acacia alata*) also exist. This provides an ideal environment for understorey species such as narrow-leaved pimelea (*Pimelea angustifolia*) and a variety of fauna. Plant communities containing sheath twigrush and *Meeboldina decipiens* would be at particular risk if stream flows were reduced, predisposing the area to erosion, weed invasion and the loss of fish habitat (see Section 22 – Soil and Catchment Protection).

Small but significant granite outcrop communities are also located along the lower Collie River. Hopper *et al.* (1997) demonstrated that elsewhere, such as the wheatbelt, granite outcrop communities supported a number of endemic, refugial and disjunct species (see Section 18 – Species and Communities of Conservation Significance).

Westralia Conservation Park, within the Collie Basin, contains plants that have a distinct structure and floristic composition, different to the surrounding vegetation. Geomorphologically this area is an island within the Yilgarn Craton, and consequently may contain endemic plants. A distinguishing characteristic of this landscape is the broad, flat depressions, which support woodlands of sheoak and open woodlands of moonah, swamp banksia and holly-leaved banksia. Shrub species such as horned leaf hakea (*Hakea ceratophylla*), swamp peppermint (*Acacia linearifolia*), white myrtle (*Hypocalymma angustifolium*) and swamp teatree (*Pericalymma ellipticum*) are prominent particularly in water-gaining sites and areas of humus rich podsol soils.

Vegetation Complexes

During the RFA, vegetation for the forested area within the south-west was considered at forest ecosystem, ecological vegetation system and vegetation complex levels (Mattiske and Havel 1998). Vegetation complexes were the finest scale unit of classification. Mattiske and Havel. (1998) identified nine vegetation complexes within the planning area: Collie, Dwellingup 1, Helena 1, Hester, Lowden, Murray 1, Yarragil 1, Darling Scarp and Muja (Appendix 3). These provide the basis for determining landscape conservation units (LCUs) and fire management within the planning area (see Section 23 – Fire). Map 4 shows their distribution whilst Section 18 – Species and Communities of Conservation Significance contains a description of their importance.

Previous vegetation mapping has been undertaken by Heddle *et al.* (1980) in the Darling System (System 6) and by Beard (1981).

Threatening processes

Plant species and communities of the planning area face a number of threatening processes viz:

- informal recreation;
- widening of utility corridors;
- adjoining land use such as dumping of rubbish, firewood collection and weed invasion;
- inappropriate fire regimes;
- development pressures from nearby townsites;

- spread of the disease caused by *Phytophthora cinnamomi*;
- salinisation to the east of the planning area; and
- climatic change.

These are addressed in the relevant section of this draft management plan.

16 – Native Plants and Plant Communities

Key Points:

- Vegetation is representative of that of the jarrah forest, displaying a remarkable structural homogeneity in overstorey species, principally dominated by jarrah, marri and to a lesser degree, Swan River blackbutt. Floristic differences in understorey composition are strongly correlated to changes in the underlying soils, as well as landform and climate.
- A feature of the area is the vegetation along the lower Collie River valley. This area contains ecologically mature forest, granite outcrop communities, and some plant species typical of the karri forest.
- Westralia Conservation Park contains vegetation that has a distinct structure and floristic composition, different to the surrounding matrix.

The objective is to protect native plants and plant communities of the planning area.

This will be achieved by:

1. participating in Departmental programs to research the susceptibility to dieback disease, response to fire, reproduction biology, taxonomy and age to maturity of plant species. This should be undertaken on a priority basis with the initial focus on all threatened and priority plant species;
2. making use of existing research plots to monitor the long-term change in species composition and structure of granite outcrops along the lower Collie River valley. Additional plots will be established if required and subject to the availability of resources;
3. minimising the development of new roads (public and management) and rationalising the existing network of management roads and tracks. Close, and where necessary, rehabilitate those not required for access;
4. encouraging regeneration of degraded areas where disturbance is severe and natural regeneration is less likely to occur (see Section 39 – Rehabilitation);
5. continuing to apply fire for biodiversity conservation according to best practice and Department policy;
6. assessing all proposed operations and developments and consider their effect on flora, vegetation and other nature conservation values of the planning area;
7. prohibiting firewood collection within the planning area (see Section 41 – Forest Produce). Alternative areas for firewood collection will be designated on nearby areas of Department managed estate (e.g. State forest); and
8. liaising with local government and private landholders to promote compatible management on adjoining lands.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
16.1 Changes in species composition and structure within granite outcrops of the lower Collie River valley	16.1 To maintain species composition and structure within granite outcrops of the lower Collie River valley subject to natural variations	Every 5 years

17. NATIVE ANIMALS AND HABITATS

The planning area supports an assemblage of fauna species and associated habitats that are representative of the jarrah forest. It is located in the high rainfall zone midway along a faunal continuum from north to south (Christensen *et al.* 1985, 1997). Along this continuum, the distribution of species is primarily influenced by temperature and moisture gradients, although on a local scale, individual species distribution is affected by variations in vegetation, soil structure and composition, landform and the presence and quality of water. Most species do not appear to be restricted to the planning area.

Species diversity of mammals and other large vertebrates, such as land birds, is low in the jarrah forest compared to other areas such as the semi-arid zone (Abbott 1988). However, there are many different species of invertebrates and small vertebrates (McKenzie *et al.* 1996).

The planning area constitutes many of the major habitats of the jarrah forest including jarrah uplands, jarrah valleys, and depressions and uplands of the Collie Basin. Within these habitat types, there are several distinctive microhabitats: granite outcrops, wetlands and riparian zones along watercourses, adding to the diversity of species able to coexist in the area (Nichols and Muir 1989). Some habitats are particularly notable, such as the ecologically mature forest along the lower Collie River, which provides tree hollows, thickets and vegetative corridors for movement of species downstream.

The planning area is an important refuge for fauna species of the jarrah forest, primarily due to its good condition, size and continuity with adjoining State forest.

Mammals

Since European settlement, few mammal fauna of the Jarrah Forest Bioregion have become extinct, although some species have contracted in range and become more fragmented. Within the planning area, eleven native mammal species are known to occur, which is low compared to the diversity of mammals in eastern Australian forests. This is characteristic of the jarrah forest generally and can be attributed to a wide distribution of species, the apparent structural homogeneity of the landscape and the fact that the tree component is dominated by only a few species. No species are restricted to habitats of the planning area in their distribution. However, many mammals inhabit streamside vegetation and utilise tree hollows for shelter and breeding and the conservation of these areas will therefore be an important component of this management plan.

The planning area, together with the Tone-Perup Nature Reserve and Dryandra Woodland, is one of the few refuge areas for the chuditch (*Dasyurus geoffroii*), which is increasing in numbers. However, some species, such as the quokka, western ringtail possum and woylie (*Bettongia penicillata*) occur only in low population levels (see Section 18 – Species and Communities of Conservation Significance). These species are of a size (0.35 g – 5 kg or critical weight range) that renders them susceptible to predation by introduced carnivores, in particular the fox *(Vulpes vulpes*). As such, many have declined in range and abundance, and persist in refugial habitats that may not be the most favourable to them, but least favourable to their agent or means of decline (Caughley 1994). Typically these refugial habitats include densely vegetated thickets in river, stream and wetland systems, many which also provide corridors for migration.

Larger species such as the western grey kangaroo (*Macropus fuliginosus*) appear to be much less affected by predation by the fox and are relatively common throughout the jarrah forest (Havel 1989). Fox control is undertaken as part of the Western Shield program (see Section 20 – Pest Animals).

Other contributing factors to the decline of mammals in the 0.35 g – 5 kg weight range may include impacts outside the planning area that are associated with European settlement, such as land clearing (particularly riparian vegetation), habitat alteration, grazing, changes in

burning patterns and the introduction of other feral species. As such, integrated management, which includes fox control, is required to conserve fauna of the planning area.

Even though the planning area provides suitable habitat, some mammal species known from the region have not yet been recorded. This includes several species of bat, although this could be attributed to a lack of survey effort.

Birds

The Birds Australia Atlas contains a data set of 66 recorded observations of native bird species present within the planning area, almost half the number known to occur across the entire jarrah forest (Nichols and Muir 1989). The most abundant species appear to be insectivorous birds. Distribution of species is generally attributed to structural differences rather than variations in floristics.

Most birds appear not to be specialised to, or dependent on the forest environment (Nichols and Muir 1989, Wykes 1983). However, several bird species, or groups of species, rely heavily on particular habitats of the planning area. Cockatoos, parrots, owls, ducks and tree-martins use tree hollows for nesting (Abbott and Whitford 2002). Competition from feral honey bees for nest hollows appears to be a significant threat to forest cockatoos (see Section 20 – Pest Animals). Smaller bush birds, such as wrens, robins and some honeyeaters, require and thrive in the dense thickets of hakea and grevillea found around granite outcrops. Creek and streamline vegetation also provide important habitat for wrens and robins, in particular White-breasted Robins (*Eopsaltria georgiana*) and Red-winged Fairy-wrens (*Malurus elegans*). The major river system and reservoir of the planning area also supports a number of waterbirds including cormorants, Pacific Black Duck (*Anas superciliosa*), Australian Shelduck (*Tadorna tadornoides*) and Australian Wood Duck (*Chenonetta jubata*). A study by Wykes (1983) found that the greatest abundance of birds in the jarrah forest generally occurs along watercourses and adjacent vegetation, where food, shelter and water is available. Such habitats of the planning area include the ecologically mature forest along the lower Collie River and adjoining creek systems.

Reptiles and Amphibians

Reptiles and frogs of the south-west of Western Australia are distinct from the arid zone and temperate south-east Australia. Geographical factors distinguish species from these areas, with the composition of fauna being a blending of the arid adapted elements from the north and east and the meso-temperate elements from the extreme south-east of Australia (Storr 1964). Many reptiles with wide distributions in arid Australia extend well into the south-west but exclude the extreme south-west. Chapman and Dell (1985) noted that there was a hiatus line between Perth and Albany, where only 35 of the 109 species found to the north of this line extended further into the south-west. Agamids and geckos are particularly poorly represented south of this line. The geographic separation of the south-west corner of the State could account for speciation in both reptiles and frogs.

There have been few studies on reptiles that are specific to the planning area. Elsewhere in the jarrah forest most reptiles appear to be predators, varying from large, active foraging elapids (e.g. dugite (*Pseudonoaja affins affins*) to the smaller, mostly insectivorous skinks and geckos. Species such as the bobtail (*Tiliqua rugosa)*, king's skink (*Egernia kingii)*, red-legged skink *(Ctenotus labillardieri)* and Gould's monitor (*Varanus gouldii*) appear to be common. The carpet python (*Morelia spilota imbricata*) was once common in the jarrah forest and wheatbelt but has declined in geographic distribution (Nichols and Muir 1989). It is listed as a specially protected species likely to occur in the planning area (see Appendix 4). Dell's skink *(Ctenotus delli)*, also a Priority 4 species likely to occur in the planning area, is endemic to the south-west of the State. Reptiles are likely to take advantage of shelter from logs, rocks, tree hollows and leaf litter. The granite outcrops of the area provide specialised habitat for reptiles.

Nichols and Muir (1989) suggested that there is likely to be some differences in reptile communities between mid to upslope sites and other heath sites and woodlands. No frogs have been recorded in the planning area although it is possible that they exist.

Fish

The lower Collie River contains deep, clear, well-flushed pools that provide ideal habitat for the five species of fish (3 native and 2 introduced) recorded in the area. Two of the native fish species, nightfish (*Bostockia porosa*) and western minnow (*Galaxias occidentalis*), are endemic to the south-west. Preferred habitat for these species is under ledges, rocks, and logs and amongst root mats and inundated vegetation. Both species have distinct migratory requirements, leaving the main river system in winter and spring to spawn in small tributaries, especially seasonal streams (WRM 2003).

Western Australian Museum records indicate that adult pouched lamprey (*Geotria australis*) were also recorded in portions of the lower Collie River adjoining the planning area but this species has not been recorded since. Western pygmy perch (*Edelia vittata*) have been recorded in the upper reaches of the Collie River but are not recorded in the planning area, possibly due to predation by introduced species such as redfin perch or variations in habitat quality (see Section 20 – Pest Animals). Native fish species of the planning area are widely distributed and abundant in rivers, streams, lakes and pools throughout forest and agricultural areas of much of the south-west (Morgan *et al.* 1998).

Invertebrates

Majer and Abbott (1989) considered soil and litter invertebrates of the Dale Botanical Subdistrict as one of the best-studied in Australia, many seasonal in their abundance or activity. Later surveys on arthropod fauna by Abbott *et al.* (1992) found 396 species in foliage of the jarrah forest, mostly leaf chewers, sapsuckers and predators. Abbott (1992) suggested that the total number of insect species alone in the south-west forests may be in the order of 15 000-20 000. Few invertebrate species lists have been specifically compiled for the planning area.

Macroinvertebrates

In the planning area, 47 families of aquatic macroinvertebrates have been recorded through the AusRivAS program and surveys of the lower Collie River, all which are representative of species found in the south-west and none that are confined to the Collie River (Halse *et al.* 2001). The richest diversity for macroinvertebrates was found in portions of the upper and lower Collie River, whilst the Wellington Reservoir had the poorest diversity. The most important habitat for macroinvertebrates is fringing and submerged aquatic plants, particularly rushes and sedges (DoE 2001). The AusRivAS program assessed the Collie River to have similar macroinvertebrate conservation values to other catchments on the Darling Plateau. However, higher conservation value catchments were found further south on the Shannon, Donnelly and Warren rivers.

Alterations to water quality, such as the increase in stream salinity in the Collie River, may have affected macroinvertebrate communities. However, it is possible that the small, fresh water tributaries connecting to this system provide refugia for species once representative of the area. The importance of monadnocks is recognised in providing surface pools and wetlands at their bases as habitat for a poorly understood but potentially important group of macroinvertebrates. The DoE will continue to monitor macroinvertebrate populations of the lower Collie River.

Decapods

Decapod species found along the lower Collie River includes the freshwater prawn, gilgie (*Cherax quinquecarinatus*) and marron (*Cherax canei*). Freshwater prawns and gilgies appear to be present in low numbers compared to other rivers flowing off the Darling Plateau (WRM 2003), possibly reflecting poor water quality or predation by introduced fish species (see Section 20 – Pest Animals). Marron inhabit sandy bottoms of rivers, lakes and streams

of the south-west and are a very popular species for recreational fishing. Stock downstream of the dam wall appears to be stable and in good numbers, although the number of large marron has declined. Similar to other stocks, marron of the lower Collie River are susceptible to climate change and the flow and quality of water. To sustain marron populations, the Department of Fisheries regulates size and bag limits, gear controls, closed seasons and licencing (see Section 28 – Recreational Use). However, illegal marroning out of season still occurs.

17 – Native Animals and Habitats

Key Points:

- At a local level the distribution and diversity of fauna is affected by factors such as the diversity of understorey flora, soil moisture, rainfall, variations in relief and the presence of fire.
- Greatest faunal diversity is likely to occur along riparian vegetation bordering river systems, surrounding granite outcrops and in seasonal pools formed within granitic monadnocks.
- The greatest threat to native animals of the planning area is competition from and predation by the introduced fox.

The objective is to protect native fauna and their habitats.

This will be achieved by:

1. where possible, protecting key fauna habitats from threatening processes;
2. maintain and enhance the Department's threatened species monitoring programs in the area and expand these where required;
3. supporting the DoE to continue monitoring of water quality, water quantity and the presence and abundance of macroinvertebrates along the lower Collie River (see Section 22 – Soil and Catchment Protection);
4. implementing Departmental programs to reintroduce native fauna to areas where they are known to have formerly occurred once threatening processes have been identified and controlled;
5. considering the requirements of fauna species within the planning area and, where possible, using fire to maintain or increase biodiversity (see Section 23 – Fire);
6. controlling introduced species that are damaging or could potentially damage native fauna in ways that do not compromise other conservation objectives (see Section 20 – Pest Animals);
7. prohibit domestic animals within the planning area (see Section 33 – Domestic Animals); and
8. discourage feeding of native fauna around campsites and where necessary, provide educational material to visitors on its effects.

18. SPECIES AND COMMUNITIES OF CONSERVATION SIGNIFICANCE

At a State level, the Wildlife Conservation Act provides special protection for species of native flora and fauna that is likely to become extinct, or is rare, or otherwise in need of special protection. The Minister for the Environment declares these species by notice in the Government Gazette.

The Commonwealth's Environment Protection and Biodiversity Conservation Act provides a listing of threatened ecological communities. Under current State legislation, only individual taxa are afforded special protection (see below), not threatened ecological communities, although this is proposed to change if and when the proposed Biodiversity Conservation Act is enacted (see Section 7 – Legislative Framework). Legislative protection is currently provided for threatened ecological communities listed under the Commonwealth's Environment Protection and Biodiversity Conservation Act. A Ministerially approved list of

threatened ecological communities is also maintained by the Department, and some protection provided under other State legislation, such as the *Environmental Protection Act 1986*.

Fauna

The Wildlife Conservation Act provides for the Minister to declare species to be specially protected for a variety of reasons, viz:

- they are threatened (they are rare or likely to become extinct);
- they are presumed to be extinct but may be rediscovered;
- they are covered by an international agreement; or
- they are uncommon or have commercial value.

Within the planning area there are seven species of specially protected fauna (Wildlife Conservation (Specially Protected Fauna) Notice 2004). Five of these are threatened species and two, the Peregrine Falcon (*Falco peregrinus*) and carpet python (*Morelia spilota imbricata*), are listed as specially protected fauna because, whilst not currently threatened, they may be poached because of their high commercial value or because they are uncommon. This action may lead to the species becoming threatened. The five threatened fauna species are:

1. chuditch;
2. quokka;
3. western ringtail possum;
4. Baudin's Cockatoo (*Calyptorhynchus baudinii*); and
5. Carnaby's Cockatoo (*Calyptorhynchus latirostris*)*.

* Likely to occur, but not recorded within the planning area

In addition to specially protected fauna, the Department also maintains a 'reserve list' of priority species[5], which includes both fauna and flora. Priority species are not gazetted under the Wildlife Conservation Act. However, the priority fauna and flora lists are maintained as a mechanism to highlight species of special conservation interest. Management direction for priority species is provided by advice from the Department's Wildlife Branch, and specialised staff in the Department's South West Region.

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[5] Priority flora and fauna species are species that:

a may be threatened but there is insufficient survey data available to accurately determine their true status (Priority 1 to 3).

b are adequately known, are rare but not currently threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons (Priority 4).

c are conservation dependant (Priority 5).

Priority 1 flora and fauna species are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation (e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases under threat of habitat destruction or degradation). Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

Priority 2 flora and fauna species are known from one or a few collections or sight records (generally less than five), some of which are on lands not under imminent threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.

Priority 3 flora and fauna species are species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

Priority 4 flora and fauna species are categorised as either Rare, Near Threatened and other species in need of monitoring:
a Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
b Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent (Priority 5), but that are close to qualifying for Vulnerable.
c Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Priority 5 flora and fauna species are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Twelve Priority fauna species are likely to be present within the planning area, including one Priority 2 species, four Priority 3 species, five Priority 4 and two Priority 5 species. A description of the habitat requirements and threatening processes for specially protected and priority fauna within the planning area is included in Appendix 4.

Specially protected fauna of particular significance to the planning area are the quokka and western ringtail possum.

At the time of printing, there are nine known quokka populations in the planning area, persisting in riparian habitats along river and wetland systems. One population, north of the Collie River, is considered to be the largest in the northern jarrah forest, although numbers appear to be declining. Many other quokka populations of the northern jarrah forest are small and also appear to be declining and contracting in range. Elsewhere in forested areas of the south-west, quokkas are widespread, particularly along the south coast where their status appears to be stable.

The decline of quokkas in the northern jarrah forest has given rise to small, isolated populations that, whilst highly mobile, are at threat. It is thought that their decline is primarily due to predation by the introduced fox, *Vulpes vulpes*. Whilst the fox is targeted under 1080 baiting programs quokka numbers are not responding. Increased predation pressure has also restricted quokkas to swamp habitats where they appear to be habitat specialists, preferring early seral stage swamp habitat that has been burnt within the previous 10 years, particularly as part of a mosaic of different age classes. The status of quokka populations in the northern jarrah forest warrants strategic and adaptive management to manage their habitats in perpetuity and obtain more knowledge on the species and its threats. Research needs to focus on a variety of management practices including use of fire, fox baiting and pig control.

The western ringtail possum, once widespread across the south-west of the State but at low density, now appears to be confined predominantly to the coastal plain (west and south coast) and dense riparian vegetation of the Darling Plateau. An isolated population exists within the planning area near Honeymoon Pool, although suitable habitat for the species exists elsewhere along lower Collie River valley. This population comprises the second most northerly known extant population for the species. However, the population is declining, a trend that is expected to continue elsewhere in the south-west where there are increasing pressures on suitable habitat. Predation by the fox and land clearing has been implicated as a cause of decline of the species. Monitoring within the planning area is necessary to determine the distribution of western ringtail possums as well as the impact of recreation. Fire also appears to be an issue in managing their habitat (see Section 23 – Fire).

Some species, such as the woylie, have been re-introduced to the area following predator control. Successful translocations of woylies from Batalling State forest occurred in June and July 2000. Their numbers are steadily increasing and spreading throughout suitable habitats of the planning area.

Recovery Plans

The Department, often in collaboration with other State and Federal agencies and other parties, prepares recovery plans for the most threatened species. Species within the planning area that have recovery plans at the time of writing include the chuditch, woylie and Carnaby's Cockatoo. Only the western ringtail possum has an approved interim recovery plan. At the time of publication a recovery plan is being prepared for the Forest Red-tailed Black Cockatoo.

Flora

Rare and Priority Flora

The Department has the statutory responsibility for flora conservation and particular responsibility for threatened flora, which are declared as 'rare flora' under the Wildlife

Conservation Act. In addition to rare flora, the Department also manages 'priority species'(see footnote 5 in the above section for a definition of 'priority species').

Within the planning area, there are three Priority 3 species (*Acacia oncinophylla* subsp. *oncinophylla*, *Acacia semitrullata* and *Tetratheca parvifolia*) and three Priority 4 species (*Calothamnus graniticus subsp. leptophyllus*, *Grevillea ripicola* and *Senecio leucoglossus*). A description of the habitat requirements and threatening processes affecting these species can be found in Appendix 5.

Vegetation Complexes

Vegetation complexes of particular importance to the planning area are the Lowden and Helena 1 vegetation complexes, which are both identified as uncommon, and poorly represented in the existing and proposed formal reserve system, and on Crown land. The majority of their reservation within the formal reserve system is contained within the planning area. For example, the Lowden complex has only 14% of its pre-1750 distribution represented in reserves, 10.4% of which is contained with the planning area. This makes the planning area the largest reservation for this complex. The Helena 1 complex is also at the southern extremity of its distribution and hence species composition is likely to be different to its northern occurrence. Outside the formal reserve system, these complexes are mostly located on private land.

Other vegetation complexes that are inadequately provided for in the existing and proposed formal reserve system include the Collie, Muja and Darling Scarp vegetation complexes. However, these complexes are only represented to a limited degree within the planning area. Additional reservation to the planning area should consider representation of these vegetation complexes as a priority for future reservation.

Significant Habitats

Granite Outcrops

Small, isolated and disjunct granite outcrop communities are interspersed throughout the planning area, particularly along the lower Collie River valley. These outcrop communities provide a contrast to the surrounding forest in terms of species composition and vegetation structure, and also because they are likely to have a higher proportion of obligate seeders (Hopper *et al.* 1997). Species composition varies dependant on soil depth and ranges from lichen encrusting bare rock, through moss swards and herbfields to shrublands and heathlands on deeper soils (Smith and Sage 2002). These outcrops are significant to the region as they are geographically separated from similar outcrops, the nearest of which occurs in Lane Poole Reserve, Shannon National Park and the proposed Monadnocks National Park.

The evolution of a distinct suite of plant species associated with rock outcrops is probably due to a number of factors, including the diversity of microhabitats (alternatively extremely dry and wet), high light levels and a relatively longer interval between fire than the surrounding vegetation. The diversity of microhabitats and soil moisture regimes is likely to have facilitated the evolution of several endemic species in the south-west, and the persistence of refugial species beyond their main range (Hopper *et al.* 1997). Many of these endemics are not found in surrounding habitats, although they may be found in granite outcrops over a wide geographical range. The refugial characteristics of granite outcrops are demonstrated by *Daviesia hakeoides* subsp. *hakeoides*, which has persisted within the planning area as a disjunct outlier from the main population. Its presence shows a significant extension in the range of this species.

Granite outcrops throughout the south-west also contain some of the most diverse plant life in the South West Botanical Province (Hopper *et al.* 1997). Surveys of the planning area in 2002 indicate that the number of species is comparable to other outcrops within this region (Smith and Sage 2002). A high proportion of rare flora is also likely. Hopper *et al.* (1990) found that 12% of plants listed in 1989 as rare flora under the Wildlife Conservation Act were found in granite outcrops. Within the planning area, outcrops support the Priority 3 species

Acacia oncinophylla subsp. *oncinophylla* and *Synaphea hians* as well as the Priority 4 species *Calothamnus graniticus* subsp. *leptophyllus*.

Granite outcrop communities are fragile habitats, susceptible to weed invasion, grazing by feral animals, too frequent fire, loss of shrub layer, salinity and the disease caused by *Phytophthora cinnamomi*. In the planning area, eleven weed species, mostly small, annual plants, were found to comprise 12% of the species composition (Smith and Sage 2002). Disturbance by trampling can also lead to loss of vegetative cover, erosion and increases in weed invasion if not controlled. This is already apparent along Lennard Drive.

Further surveys are necessary to ascertain the significance of granite outcrops for refugial species and their response to fire. Existing research plots have been established to assess the species composition, weed invasion and vegetation condition in selected outcrops. This will continue over time.

Wetlands and riparian habitats

Important wetland habitats exist as seasonally or permanently inundated features along creek systems of the planning area. They are typically small, often less than 5 ha, and occur sporadically throughout the jarrah forest. Most of the wetlands contain fresh water originating from forested catchments and contain emergent vegetation that is waterlogged for most of the growing season. The main riparian habitat of the planning area occurs along the lower Collie River, which, despite modified flow regimes caused by damming of the river and increased salinity levels, provides a valuable habitat and acts as a wildlife corridor.

Dominant plant species include peppermint and *Thomasia* species. This vegetation provides significant habitat for fauna species, especially small macropods such as the quokka and quenda, as they find a reliable food supply and protection from predators. The habitat provided by these areas is likely to have once supported common species such as the Bush Stone Curlew (*Burhinus grallarius*) although this species is currently absent from this area. Whilst the reasons for this have not been determined, predation by the fox is the most likely cause.

Wetlands and riparian habitats can be impacted upon by exotic plants, salinisation, climate change and unmanaged human access. Pest animals such as pigs also have the potential to damage riparian vegetation. Fire regimes appropriate to the maintenance of ecosystem function and the maintenance of biodiversity will be applied to protect wetland systems of the planning area (see Section 23 – Fire).

Ecologically Mature Forest

A small portion of ecologically mature forest exists along riparian zones of the lower Collie River, where the effects of disturbances such as timber harvesting, roading and clearing are considered negligible. The only noticeable degradation is the increasing erosion of tracks and riverbanks, caused by recreation.

The presence of mature forest is necessary to protect the full range of biodiversity values and sustain viable populations of fauna, especially species such as common brush-tail possum and cockatoos, which require large tree hollows. A reduction in suitable tree hollows caused by land clearing outside the planning area, and competition for hollows from introduced species such as the honey bee (*Apis mellifera*) and Laughing Kookaburra (*Dacelo novaeguineae*), highlights the habitat value of mature growth forest. Disturbance in these areas has the potential to limit the availability of tree hollows. Therefore, any disturbance activity within the planning area (e.g. recreational site development and fire) will be assessed for its impact on tree hollows.

Ecotones

The transition zones between adjacent but different environments, which may include habitats, forest ecosystems, landscapes or biomes are described as ecotones. Ecotones regulate interactions between environments by modifying the flow of species between them,

particularly in response to changes in climate or disturbances. They generate evolutionary diversity and serve as repositories of genetic diversity to be used for rehabilitation of adjacent environments if and when these areas loose species (Volis *et al.* 1998, Kark *et al.* 1999). Ecotones are often narrow areas of land that have a high number and variety of species, making them vitally important for biodiversity conservation. An example of ecotones within the planning area might be the transition zone between a wetland or granite outcrop habitat and the surrounding jarrah forest. The ecotone between the geology, landform and vegetation of the Yilgarn Craton and Collie Basin within the Westralia Conservation Park is also an important transitional zone. Where possible, recreation development should avoid ecotones.

18 – Species and Communities of Conservation Significance

Key Points:

- The Wildlife Conservation Act provides for species of native flora and fauna to be specially protected. Within the planning area, there are seven species of specially protected fauna, five of which are threatened and two that are specially protected. The most significant of these species are the western ringtail possum, quokka and Baudin's Cockatoo.
- The decline in range and abundance of critical weight range mammal species can be attributed primarily to fox predation (see Section 20 – Pest Animals).
- The Department prepares recovery plans for the most threatened fauna species. For the planning area recovery plans exist for the chuditch, woylie and Carnaby's Cockatoo. Interim recovery plans also exist for the western ringtail possum.
- The planning area contains six priority plant species. Of these, there are three Priority 3 species and three Priority 4 species.
- The Lowden and Helena 1 vegetation complexes are the most significant complexes in the planning area due to their poor representation in reserves elsewhere.
- Significant habitats within the planning area include granite outcrops, wetlands, mature forest and the ecotones that exist between them and the surrounding vegetation. These habitats may support a higher diversity of plant and animal life and contain refugial and endemic species, disjunct populations and relictual species of a Gondwanan era.

The objective is to protect habitats of conservation significance and populations of threatened flora and fauna species from threatening processes.

This will be achieved by:

1. providing added statutory protection for species by appropriately listing them under the Wildlife Conservation Act;
2. recording the location of threatened flora and fauna species within the planning area and maintaining information on the State database;
3. supporting the preparation and implementation of recovery and translocation plans for fauna species that are identified in, or reintroduced into, the planning area, such as those for the chuditch, woylie and Carnaby's Cockatoo;
4. conserving significant habitats and vegetation complexes that support threatened flora and fauna species within the planning area and considering them in future management activities;
5. where disturbance is proposed, survey for the occurrence of, and potential impacts on, priority and threatened species and ecological communities. Use this information to assess the level of threat to these species and communities and to determine appropriate management action;
6. reducing where practical and resources permit, the threats to native vegetation and flora by minimising the impact of environmental weeds, pest animals and other threatening processes;
7. protecting specially protected and priority fauna species from introduced predators through appropriate control regimes, such as the Western Shield program, if/as required;

8. using all available knowledge, protect threatened flora and fauna species and communities by continuing to apply fire where appropriate, and according to best practice and Department policy;
9. participating as appropriate, and subject to corporate priorities, in Departmental studies on threatened and priority flora and fauna species and others susceptible to threatening processes, with a focus on:
    - surveying and monitoring the presence, distribution, population size, status of known populations, abundance, habitat requirements and ecology of both translocated and specially protected species, with an emphasis on the quokka and western ringtail possum;
    - reviewing the need for management intervention, specifically the role of fire to create an appropriate vegetation mosaic at existing and potential sites; and
    - identifying breeding sites of threatened Cockatoo species of the planning area with a view to ensuring their protection.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
18.1 Changes in the range and population size of critical weight range mammals within the planning area	18.1 Subject to natural variation, recovery and maintenance of viable populations of critical weight range mammals within the planning area	As per recovery plans for individual species or in their absence, annually
18.2 The number of viable populations of rare and priority flora species and the number of individuals within populations	18.2 Subject to natural variation, maintenance or increase in the number of viable populations of rare and priority flora species and the number of individuals within populations	
18.3 Evidence of second generation (F2) progeny from translocated species	18.3 The successful establishment of translocated species	

19. ENVIRONMENTAL WEEDS

The *Environmental Weed Strategy for Western Australia* (CALM 1999) describes environmental weeds as "... plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade". Weeds displace indigenous plants, particularly on disturbed sites, by competing with them for light, nutrients and soil moisture. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many weed species.

Environmental Weed Management

An integrated approach to environmental weed management was developed in the *Environmental Weed Strategy for Western Australia* (CALM 1999a). As part of this Strategy, environmental weeds are rated as high, moderate, mild or low in terms of their environmental impact on biodiversity. The criteria used to determine the rating for each weed are:

- *invasiveness* – ability to invade bushland in good to excellent condition or ability to invade waterways;
- *distribution* – wide current or potential distribution including consideration of known history of wide spread elsewhere in the world;
- *environmental impacts* – ability to change the structure, composition and function of ecosystems and in particular an ability to form a monoculture in a vegetation community.

These ratings are used in conjunction with the Department's proposed Policy Statement – *Environmental Weed Management* (subject to final consultation) and local knowledge to guide the approach and priority setting for the control of environmental weeds on the public conservation estate. Priorities for action are to first control any weed that impacts on threatened or priority flora, fauna or ecological communities, or that occurs in areas of high conservation value, and then address high, moderate and low rated environmental weeds in decreasing priority as resources allow. The impacts of weeds and potential spread in local environmental conditions must also be considered.

Options for environmental weed management include prevention, eradication, control, containment, or do nothing. The preferred option is to prevent the introduction of environmental weeds through appropriate management, as eradication is rarely feasible. Effective control programs encourage the growth of native species and the suppression of weeds with the overall aim of boosting the areas resilience to further weed invasion. However, it is imperative that these control measures be used in conjunction with a revegetation plan to prevent reinfestation from occurring (See Section 39 – Rehabilitation). Consideration to the spread of weeds needs to be considered across Department operations, especially with respect to beekeeping, prescribed fire and planning for visitor access and site development. In addition, the Department should endeavour to use volunteers to assist with weed control where possible.

Problem Weeds

Thirty-seven species of environmental weeds are recorded within the planning area. The suppression of watsonia (*Watsonia marginata*) (rated as moderate by the *Environmental Weed Strategy for Western Australia*) is considered to be of paramount importance and a high priority for management. The weed was introduced as an ornamental in gardens within the Collie townsite and has spread along the Collie River and Wellington Reservoir foreshore. Once established, watsonia has the potential to impact heavily on conservation values by creating a monoculture in riparian zones. This is already the case along the upper Collie River where the weed is well established and poses a fire risk when it dries off in summer. The spread of watsonia needs to be managed in this area as there is potential for the weed to use the watercourse as a means to invade the well-preserved lower Collie River.

Another weed of particular importance is bridal creeper (*Asparagus asparagoides*), which is a problem around the Wellington Mill cottages and surrounding watercourses as well as the King Jarrah recreation site. This weed is rated as high by the *Environmental Weeds Strategy for Western Australia* (see Appendix 6) and is listed as one of Australia's 20 weeds of national significance. Although present in few known populations within the planning area, this climbing plant is very competitive and can form a dense canopy, shading out native shrubs, herbs and seedlings. Bridal creeper also forms a tuber mat below the soil surface that limits the availability of moisture and nutrients to other plants, making seedling establishment difficult. As a result, bridal creeper can reduce the number and density of native plant species and in turn affect the animals that depend on them. Biological control of bridal creeper has been attempted within the planning area but its effects are not yet noticeable (R. Brazell pers. comm. 2002).

Victorian tea-tree (*Leptospermum laevigatum*) and arum lily (*Zantedeschia aethiopica*) are also rated as high by the *Environmental Weed Strategy for Western Australia*. The former carries a large seed load and spreads rapidly into disturbed areas following fire. Arum lily is only present in a small population around the Wellington Dam and is part of an ongoing control program that has seen the population decline. The occurrence of silver wattle (*Acacia dealbata*), which is present at the Wellington Dam and at Potters Gorge, is also a concern. Although an attractive feature of the area, particularly when flowering, this species can have considerable potential for further invasion, especially along the lower Collie River. In other forested areas, such as the proposed St John Brook Conservation Park, this weed is forming dense monospecific stands along watercourses and around some recreation sites to the exclusion of other species.

Several trees species at the Wellington Dam quarry have also been identified as introduced plants, although only the Lombardy poplar (*Populus nigra*) has been rated (as low) by the *Environmental Weeds Strategy for Western Australia*. Other species include European ash (*Fraxinus excelsior*), liquid amber (*Liquid amber styraciflua*) and Chinese elm (*Ulmus parvifolia*). These species do not pose a significant risk to the environmental values of the planning area but do provide visitors with shelter and visual appeal whilst picnicking in the quarry. Where a species poses no threat of spreading, they should be retained in their current state.

Other environmental weeds of particular concern are wild lavender (*Lavandula dentata*), tagasaste (*Chamaecytisus palmensis*), St John's wort (*Hypericum perforatum*) and a small population of Monterey pine (*Pinus radiata*), which has originated from the Wellington plantation and is showing signs of invasion into the surrounding bushland (see Appendix 6). Several pine plantations adjoin the planning area, including the Bussell and Mungalup plantations.

Landholders, including the Department, are legally responsible for eradicating plants declared[6] under section 37 of the *Agriculture and Related Resources Protection Act 1976* (declaration 5). However, the Act does preserve the Department's right to decide priorities and the level of control according to resources. The following declared plant species are found within the planning area:

- blackberry (*Rubus fruticosus*) (P1, P4)(also a Weed of National Significance);
- narrow leaf cotton bush (*Gomphocarpus fruticosus*)(P1, P4); and
- variegated thistle (*Silybum marianum*)(P1, P3).

Of these, blackberry is most common within the planning area, especially near the Bussell Plantation and at Honeymoon Pool. The treatment of this weed with herbicides is an issue close to the Wellington Reservoir as there is a risk of contamination. Regeneration with native species following control is necessary to suppress further weed invasion.

19 – Environmental Weeds

Key Points:

- The *Environmental Weed Strategy for Western Australia* provides an integrated approach to environmental weed management.
- Weeds rated as High or Moderate by the *Environmental Weed Strategy for Western Australia* or those deemed to have significant localised impact within the planning area are of high priority for control.
- Thirty-seven species of environmental weeds are recorded within the planning area, most significantly watsonia, bridal creeper and monetary pine.
- Most weed species are introduced as a by-product of adjoining agricultural practices or for ornamental purposes within the Collie townsite.

The objective is to prevent potential species loss and community decline from weed invasion.

This will be achieved by:

1. implementing the Department's commitments to the *Environmental Weed Strategy for Western Australia* and the proposed Environmental Weed Management policy statement (subject to final consultation);

[6] Declared plants are rated from P1 to P5, each with different landholder obligations:
P1 – prohibits the movement of plants and their seeds within the State.
P2 – aims to eradicate the infestation.
P3 – aims to control the infestation by reducing the area and/or density of infestation.
P4 – aims to prevent infestation spreading beyond existing boundaries of infestation.
P5 – infestations on public lands must be controlled.

2. preparing a control plan for weeds that identifies the weed species present, documents the present status, size of infestation, rehabilitation requirements, likely introduction and level of threat of the species, in particular to specially protected fauna and rare flora;
3. implementing the weed control program based to location and availability of resources;
4. liaising with the relevant agencies regarding the spread and possible introduction of weed species, and with Department of Agriculture and adjacent landholders with regard to boundary control programs; and
5. rehabilitating gravel pits as well as past logging landings to reduce competition from weeds and erosion.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
19.1 Changes in the area covered by species rated as High in the *Environmental Weeds Strategy for Western Australia* or in the weed control plan	19.1 Reduction in the area covered by species rated as High in the *Environmental Weeds Strategy for Western Australia* or in the weed control plan	Every 5 years

20. PEST ANIMALS

Pest animals may be either introduced feral species that have become established as wild or naturalised populations, or native species, which for some reason, have altered their natural distribution and population to the detriment of other native species. They have potential for serious impact on natural systems through direct effects such as predation, habitat destruction, pollution of streams, competition for food and territory, introduction and spread of disease, and through environmental degradation. A primary objective of the Department is to achieve the systematic and safe control of pest animals on lands and waters that it manages. The Department's proposed Policy Statement *Management of Pest Animals on CALM Managed Lands* (subject to final consultation) provides guidance for this by identifying State-wide priorities and strategic approaches to management.

The Department also has responsibilities for control of declared animals on the lands it manages under sections 39–41 of the Agriculture and Related Resources Protection Act, viz "a Government Department shall control declared plants and declared animals on or in relation to public land under its control."

Pest animals of the planning area are identified in Table 3.

Table 3 – Pest Animals Recorded in the Planning Area

Common Name	Species	Management Priority
Mammals		
feral pig*	*Sus scrofa*	High
fox*	*Vulpes vulpes*	High
feral cat	*Felis catus*	Medium
rabbit*	*Oryctolagus cuniculus*	Low
house mouse	*Mus musculus*	Low
black rat	*Rattus rattus*	Low
Fish		
redfin perch	*Perca fluviatilis*	Low
rainbow trout	*Oncorhynchus mykiss*	Low
brown trout	*Salmo gairdneri*	Low

Common Name	Species	Management Priority
Birds		
Laughing Kookaburra	*Dacelo novaeguineae*	Low
Invertebrates		
feral honey bees	*Apis mellifera*	Low

* Declared species under the Agriculture and Related Resources Protection Act (as of April 2001)

The expansion of rural residential development on the Swan Coastal Plain may encroach on land adjoining the planning area. Increasingly it will be important to monitor for the establishment of populations of pest animals that are commonly associated with this type of development, particularly the Laughing Turtle-Dove (*Streptopelia senegalensis*) and the variety of escapee parrots and cockatoos.

Pest animals of most significance to the planning area are described below:

Pigs

Feral pigs are the descendants of domestic pigs, which were first brought into Australia by European colonists. They are now established over a wide range of habitats but do require daily access to water, which limits their distribution within these habitats. Consequently most pigs are found along watercourses, around swamps and in dense vegetation often associated with these environments (Caley 1997). In the south-west, pigs rarely move between catchments and hence control can be considered on a catchment basis.

Feral pigs have become a problem in many areas of the planning area, and move frequently into/from neighbouring properties. They have the potential to be very destructive to vegetation, particularly in riparian zones and can reach high population densities. Their habit of wallowing, digging and rooting around the margins of watercourses and swamps can destroy vegetation and fauna habitat, cause erosion, encourage weed invasion and remove food and nesting sites of native animals. In particular to the planning area, feral pigs may have the ability to displace native mammals of conservation significance, such as the quokka, quenda, water rat and woylie (Freegard 2005), and therefore hamper recovery and translocation efforts. Pigs also have the potential to spread *P. cinnamomi*.

Water quality may be significantly affected by the activities of feral pigs as they can increase the turbidity of the water and cause siltation effects downstream. In addition, they may also pose a risk to water quality in public drinking water catchments by excreting water-borne pathogens into water supplies (Freegard 2005). *Giardia* and *Cryptospiridium* have already been identified in pig faeces from water catchments in the Perth metropolitan area.

Feral pigs are illegally transported and released into new areas (or restocked into existing areas) by recreational hunters, a fact that is proven through genetic studies (Hampton 2003). In the planning area, illegal pig hunting compounds the impacts of pigs and can compromise key values. For example, the introduction of hunting dogs and the use of firearms threatens visitor opportunities to recreate in safety. Illegal pig hunters may also spread the disease caused by *P. cinnamomi* by travelling through disease risk areas.

The Department conducts annual trapping and baiting programs as part of its ongoing management of feral pigs. Guidance for management is provided by the draft *Feral Pig Management Strategy* (Freegard 2005), which outlines the approach and priority setting for control of feral pigs according to the protection of specific values. In addition, a threat abatement plan is being developed at a national level following the listing of feral pigs as a threatening process under the Environment Protection and Biodiversity Conservation Act. Ongoing feral pig control efforts should be continued in consultation/cooperation with the WC if the catchment is used as a public drinking water supply.

Foxes

The fox was introduced to Australia in the late 1860s to 1870s to provide suitable hunting opportunities for European settlers. They were first recorded in Western Australia near Eucla in the period 1911–16 and by the early 1930s had reached the south west, north west coast and the south west Kimberley (Gooding 1955; King and Smith 1985). Since their introduction, foxes have been implicated in the decline of many native mammals in the critical weight range (35 gram to 5.5 kilogram) and are a major threat to recovery programs of significant fauna species such as the chuditch, quokka and woylie.

In 1996, the Department initiated the Western Shield program to strategically reduce fox populations. The program involves baiting of land managed by the Department using 1080 poison as well as reintroducing native animals once foxes have been controlled. Baiting is undertaken four times per year and has seen an increase in the abundance of some ground-dwelling mammal species in the critical weight range (mammals with mean adult body weights between 35 g and 5.5 kg), particularly the chuditch. The chuditch regularly occurs in the planning area and its numbers are increasing, a trend that is consistent throughout the jarrah forest belt of the south-west of Western Australia. The survival of other, once widespread, critical weight-range mammal species such as the quenda (*Isoodon obesulus fusciventer*) and common brush-tail possum (*Trichosurus vulpecula*) has also been enhanced through baiting programs. However, it should be noted that baiting does not benefit all native fauna species and integrated management is required for fauna conservation.

The fauna populations of the planning area could also be maintained by sympathetic management of adjoining private property, particularly if they were to control fox populations and minimise the presence of domestic animals.

Rabbits

Rabbits are not widespread throughout the park but their grazing pressure and destabilisation of the soil can have significant localised impacts. Rabbits only appear to reach significant numbers in forest areas where native vegetation has been cleared and annual grasses are prevalent. Rabbit numbers in the planning area seen to correspond to the periodic impact of myxomatosis and, more lately, calicivirus.

Redfin Perch

Redfin perch were originally introduced to Tasmania from Europe in 1862. They were introduced into Western Australia at Albany in the 1890s as a recreational fishing species and spread rapidly throughout some water-bodies and river systems of the south-west. They are now targeted as a recreational species and are reintroduced to river systems by recreational fisherman. Although rapid growers and very fecund, redfin populations tend to 'stunt' within a few years. That is, initially most redfin caught are relatively large, but as they deplete food sources, the size of their offspring decreases reducing their value as a recreational fish.

Impact on Natural Values

Redfin perch are voracious predators that can rapidly invade and dominate a river or dam to the detriment of local species. They are bottom feeders that will consume other smaller animals including marron and gilgies. Their diet also includes many of the fish species native to the south-west. Horwitz *et al.* (1997) stated that redfin perch have resulted in the absence of native fish species such as western pygmy perch (*Edelia vittata*) from remnant pools in sections the Collie River. Earlier reports by Pen and Potter (1992) noted that, despite appreciable predation, indigenous fish species have co-existed with redfin perch in the upper reaches of the Collie River since the early 1900s. They also noted that western pygmy perch had disappeared from nearby river systems now occupied by redfin perch and that under certain extreme conditions, such as a marked depletion in alternative food sources, they could pose a threat to indigenous fish species.

Trout

Brown trout were first introduced into Western Australia from stocks in eastern Australia as early as the 1870s and rainbow trout in the early 1900s, as there is a lack of large native freshwater species suitable for recreational fishing. However, it was not until introductions in the 1930s that trout were successfully introduced in the south-west (Department of Fisheries 2002, Morgan *et al.* 2004). Whilst there is evidence that some of these populations are self-sustaining, trout stocks are largely maintained by restocking as there is an absence of suitable spawning sites (Morgan *et al.* 2004, Arthington and McKenzie 1997).

The Collie River is stocked occasionally with both rainbow and brown trout in a program administered by the Department of Fisheries[7]. In the years from 1991 to 1999, between 45000 and 75000 trout were released (Department of Fisheries 2002).

Impacts on Natural Values

Although many other human pressures impact on aquatic ecosystems (e.g. vegetation clearing, pollution and physical modification of natural habitats), trout still impact on native species directly through predation and also indirectly by competing for food and space (Arthington and McKenzie 1997, Jackson *et al.* 2004). Trout are thought to impact on populations of native fish, frogs, aquatic snails, aquatic insects and crustaceans such as marron and gilgies (Wager and Jackson 1993, Cadwallader 1996, Department of Fisheries 2002, Jackson *et al.* 2004). The presence of rainbow trout coincides with low native fish species diversity in Western Australia (Arthington and McKenzie 1997) and brown trout have been implicated in the decline in a number of threatened fish species Australia-wide, in particular galaxiids and minnows (Arthington and McKenzie 1997, Cadwallader 1996). The impact of trout on native fauna via the spread of pathogens (e.g. from hatchery-produced fish) is unknown.

Subtle differences in habitat preferences mean that trout may be able to co-exist with some native fish species with minimal impact (Department of Fisheries 2002). In the planning area trout have co-existed with native fish species, marron other invertebrates for over 30 years and perhaps a greater threat to these species is posed from other introduced fish species such as redfin perch (Department of Fisheries 2002). However, no systematic surveys have been conducted to assess the affects of trout or redfin perch on native fauna (including native fish) in the area.

Management

Jackson *et al.* (2004) criticised trout management in Australia as being too focussed on providing improved recreational angling opportunities at the expense of management of trout impacts. In addition, management of these impacts, such as declining native species, only occurs after the native species is threatened. They suggest that the benefit to the fishery should be compared to the cost to implementing a threatened species recovery program should it be required, and that fisheries management should include an examination of the impacts, costs and benefits of stockings, and designation of waters where native species management is the priority. Further, an overview of the impacts of introduced salmonids by Cadwallader (1996) recommended that research should be carried out by the agencies responsible for salmonid fisheries on the impacts on threatened galaxiids, pygmy perches and species other than fish, in order to take a more proactive approach to protecting native fauna.

In Western Australia, the Minister for Fisheries recently established a Recreational Freshwater Fisheries Stakeholder Sub-committee to develop a 5-year strategy for the management of the State's south-west recreational freshwater fisheries, including developing future stocking strategies for the recreational trout fishery. The Department of Fisheries is currently in the process of finalising a draft management plan for the translocation of trout into and within Western Australia. This will asses the suitability of river systems across the

[7] The Department, under the Wildlife Conservation Act, is responsible for the protection of native fauna, including fish. The Department of Fisheries is also responsible for the protection and management of native and recreational fish species under the *Fish Resources Management Act 1994*.

south-west for stocking with trout, based on environmental and social factors, native fish distribution and historical trout stocking events. Restocking of trout into the Collie River remains a concern to the Conservation Commission and the Department and would need to consider these factors as well as the value of conservation reserves in protecting native fauna and the ability to adapt decision making based on research and monitoring.

Feral Honey bees

Self-sustaining, wild populations of feral honey bees (*Apis mellifera*) are established throughout most of the south-west, after being introduced from England in 1846 to pollinate plants grown by early settlers for food. Currently, managed apiary sites for the production of honey occur mainly within the Wellington National Park (see Section 40 – Beekeeping).

Impacts on Recreational Values

Visitors to popular recreation sites such as Potters Gorge and the Wellington Dam may encounter feral honey bees on occasions, typically when they seek water during hot weather. On these very few occasions, feral honey bees can become an inconvenience to humans, as a build up in numbers can increase the risk of people being stung.

Impact on Natural Values

Feral honey bees may impact on the natural values of the planning area in the following ways:

1. by competing for tree hollows (Matthews 1984, Oldroyd *et al.* 1994, Paton 1996, Pyke 1999, NSW National Parks and Wildlife Service 2002). Many birds and tree-dwelling mammals use tree hollows for breeding sites and shelter and are already a limited resource without the impact of feral honey bees–once occupied, feral honey bees can remain for 20–50 years. Recent observations by the WA Museum staff show that both Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo are losing nesting hollows to feral honey bees;
2. by competing for floral resources with native species, such as pollen and nectar. Feral and managed hive honey bees can remove 80% or more of the floral resources produced (Scheltema 1981, Matthews 1984, Paton 1993, 1996, 1997, 2000, Sugden *et al.* 1996, Schwarz and Hurst 1997, Gross and Mackay 1998, NSW National Parks and Wildlife Service 2002);
3. by affecting pollination and seed set of native species, due in part to inefficient transfer of pollen or the physical damage to flowers (Scheltema 1981, Matthews 1984, Gross and Mackay 1998, Schwarz and Hogendoorn 1999); and
4. by increasing seed-set in some weeds (Barthell *et al.* 2001, 1994). Barthell *et al.* (2001) suggests that honey bees and weeds may be invasive mutualists in some cases, whereby a close and mutually beneficial association between these different organisms promotes greater success or abundance in both.

Although feral honey bees have existed in the south-west for the last 150 years and consequently most impacts would have already occurred, the removal of feral colonies would still have nature conservation and recreation benefits. However, the feasibility of completely removing feral honey bees is low, as localised eradication would probably be followed by recolonisation from new swarms invading the area (Gross 2001). Temporarily though, feral populations can be eliminated from areas after unfavourable conditions, such as drought or fire, as long as there is not a constant supply of managed hive bees swarming into the wild (Scheltema 1981).

Until an effective means of control is found for feral honey bees, management should focus on controlling the distribution and density of managed hives in areas of highest conservation value or around recreation sites. To this end, managed hives may be excluded from areas where a reduction in honey bee density is feasible (see Section 40 – Beekeeping). Other areas may become available to utilise nectar and pollen resources where impacts are less likely (see Appendix 13).

20 – Pest Animals

Key Points:

- There are a number of pest animals in the planning area that can out-compete, prey on, or alter the habitat for native animals.
- The most significant of these pest animals are foxes and pigs.

The objective is to negate the impacts of pest animals and pest animal control on the key values of the planning area.

This will be achieved by:

1. preparing a priority control plan and program where impacts on ecological values are found to be negative. This will be based on:
    - the existing and potential impact of the species;
    - the efficiency and effectiveness of control measures;
    - location and availability of resources;
    - level of participation of stakeholders; and
    - the capacity for long-term monitoring of the program.
2. complying with the Department's operational guidelines and policies for problem animal control (e.g. the Department's Training Manual for *Safe and Effective Use of 1080 for Vertebrate Pest Control*);
3. continue to undertake appropriate fox control regimes as part of the Western Shield program to protect native fauna, particularly specially protected species;
4. using appropriate control mechanisms to assist in pig control;
5. eradicating feral colonies of honey bees from around recreation sites and where feasible, controlling feral honey bees elsewhere within the planning area;
6. monitoring for the establishment of other introduced species;
7. continuing to permit the stocking of trout into the Collie River subject to research and monitoring that indicates a detrimental affect to native fauna;
8. encouraging the Department of Fisheries to undertake research and monitoring on the impacts of trout on native fauna within the planning area;
9. liaising with landholders, local authorities, the Department of Agriculture and the Department of Fisheries regarding control of pest animals surrounding the planning area;
10. not allowing domestic animals in the planning area except guide dogs and dogs associated with search and rescue operations (see Section 33 – Domestic Animals); and
11. supporting Departmental research programs into the control of feral animals.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
20.1 Changes in the area of vegetation around wetlands and erosion of streambanks as a result of impacts by feral pigs	20.1 The level of damage to stream banks and wetlands from pigs is reduced from 2005 levels	Every 5 years

21. DISEASE

Plant pathogens are a serious problem in the south-west of Western Australia causing the destruction of many species susceptible to disease and the subsequent degradation of plant communities (Shearer 1994, Wills and Keighery 1994). However, plant disease knowledge is still very rudimentary with much more work required on disease occurrence, the disease organism and impacts, the host and its susceptibility and environmental processes that may facilitate spread.

Disease caused by *Phytophthora*

The most significant disease threat to plants within the planning area appears to be the disease known as 'dieback' caused by the microscopic pathogen, the fungal-like water mould; *P. cinnamomi*. It is thought that this pathogen was introduced during European settlement of Western Australia through the soil around roots of plants brought over for cultivation. There are now known to be eight species of *Phytophthora* occurring within the native plant communities of Western Australia. It is recognised that of these species, *P. cinnamomi* is the most damaging. Once infested, susceptible plants are killed and in many cases are eliminated from the site leading to dramatic and permanent changes to native plant communities and their dependent fauna.

Dispersal

The plant pathogen *P. cinnamomi* is able to move autonomously by producing small motile spores that are distributed over long distances through surface and sub-surface water or travel microscopic distances to infect new roots, or by the growth between roots of mycelial threads. The pathogen can be spread in soil and plant material, which can then be transported by vectors such as humans, vehicles and animals. In response to unfavourable conditions such as extended periods of hot dry weather, the pathogen can produce a spore, which is resistant to desiccation that can itself produce further spores or mycelium once conditions are suitable.

Through these dispersal methods, *P. cinnamomi* is continuing to spread through the south-west. The pattern of *P. cinnamomi* distribution is strongly related to the native vegetation community and other site factors such as the presence of watercourses, tracks and roads, with infestation being most common where human activities and use have taken place in the absence of a hygiene regime.

Effects

The effect of *P. cinnamomi* upon the health of plant communities and individual species varies greatly. In many places, lethal root-disease destroys the structure of many native communities, reduces their floristic diversity, decimates their primary productivity and destroys habitat for much dependant native fauna. In some places the pathogen causes little damage at all. Unfortunately in the south-west it is more common to find susceptible communities in vulnerable environments than not.

No simple or single relationship exists between the presence of *P. cinnamomi* and the development of the disease. This is because of the considerable variability that exists within and between native plant species in their responses to the presence of *P. cinnamomi*, and the complex influence of temporal and spatial variation in environmental forces.

However, it is now evident that among the variety of plant communities that occur within areas of the south-west receiving more than 800 mm mean annual rainfall, there are four types of distinctive response to the pathogen as follows:

- *no apparent disease at all* - this includes those areas of karri and wandoo forest which contain no floristic elements of the dry sclerophyll (jarrah) forest type and to plant communities on the calcareous soils of the Spearwood and Quindalup Dune Systems and of the Swan Coastal Plain and pedogenically related landscapes;
- *an extremely destructive epidemic of root rot* - this applies within the highly susceptible understorey elements of the dry sclerophyll forest, in banksia woodland and in heathland on podsols, podsolic and lateritic landform;
- *a variable epidemic* - this applies to the dominant jarrah tree component of the forest with all variants in the response of jarrah are coincident with, or preceded by, mass deaths in susceptible elements of the understorey; and
- *an 'endemic' pathogen* - where *P. cinnamomi* has been long established (some 50 years or more) in sites formerly dominated by jarrah/banksia forest and has been very heavily impacted *P. cinnamomi* behaves in a manner characteristic of endemic pathogen. The forest is often replaced by open woodland of marri/parrot bush (*Dryandra sessilis*).

Each of these circumstances presents a different problem that requires a separate management response.

Broadscale surveys for the occurrence of *P. cinnamomi* were undertaken prior to 1976 using aerial photograph interpretation. More recent surveys within the planning area in 1983 were confined to the proposed Westralia Interim Forest Conservation Area and the area south of Pile Road. At the time of surveying, symptoms of the disease caused by *P. cinnamomi* were expressed primarily in the area bounded by Pile Road, Richards Road and Parkin Road. The surveys also revealed that the occurrence of dieback was absent or uninterpretable in the proposed Westralia Interim Forest Conservation Area. Areas that are considered uninterpretable are those where susceptible plant species are absent or too few to enable the determination of *P. cinnamomi* presence or absence. Due to the high degree of human access to the area the further spread of *P. cinnamomi* is likely to be greater than indicated by previous surveys.

Several sites within the planning area have been designated as Disease Risk Areas under section 82 of the CALM Act. These areas are located in the former Davis and Gervasse blocks and includes the entire proposed Westralia Interim Forest Conservation Area.

Jarrah forests and wetland habitats of the planning area that have been affected by *P. cinnamomi* have many members of the families Dilleniaceae, Epacridaceae, Proteaceae and Xanthorrhoeaceae. These families include *Banksia*, *Dryandra* and *Leucopogon*, which are highly susceptible to *P. cinnamomi*. *P. cinnamomi*-induced death of these plants, which often dominate the jarrah forest understorey, continues to result in the irreversible decline in the diversity of vegetation communities within the planning area. *P. cinnamomi* can also have a major impact on faunal habitats.

Management

Effective management of plant diseases requires accurate identification of both the pathogens and their hosts, as well as the nature and extent of genetic variation, its environmental tolerance and the capacity of the host to resist infection (Podger *et al.* 1996).

Management guidelines for *P. cinnamomi* are described in the Department's Manual: *Phytophthora cinnamomi and disease caused by it* (CALM 2000), Policy Statement No. 3 – *Management of Phytophthora and disease caused by it* (CALM 1998) and the accompanying *Best practice guidelines for the management of Phytopthora cinnamomi.*

Management within the planning area will focus on significant uninfested areas, also referred to as 'protectable areas'[8], and areas already infested areas but with significant residual values. Once identified, management of these area is then based on the following three elements:

1. implementation of practices which ameliorate the damaging effects of *P. cinnamomi* where it has already established;
2. containment or retardation of further autonomous spread at the boundaries of existing infestation; and
3. reduction of the rate of vectored spread and establishment of new centres of infestation.

In protectable areas, management will continue to based on constraining, as far as possible, the human assisted establishment of new centres of infestation. Protectable areas will be managed to ensure their uninfested status and protectability is not compromised. This may include the following:

1. preparing *P. cinnamomi* management plans for new developments such as recreational facilities and planned upgrades, or realignments of management access roads and tracks;
2. applying phosphite (see below);
3. minimising or prohibiting access into these areas; and/or

[8] Protectable areas are areas likely to remain uninfested by the autonomous spread of the pathogen in the medium term.

4. restricting vehicle access to areas designated as Disease Risk Areas and only allowing access for management and approved purposes, through the issue of a Disease Risk Area permit.

Where protectable areas have been identified, priority should then be given to constraining spread into those areas that also have high conservation value.

In 'unprotectable' uninfested areas, infested areas and areas where the spread of the disease remains unknown, standard disease management guidelines will apply.

The chemical 'phosphite' has been shown to reduce the impact of *P. cinnamomi* on many susceptible native plants in the wild. As susceptible priority species, and the habitats of threatened native fauna in the planning area are identified, a program of repeated applications of phosphite may be developed to help protect them. In addition, germplasm from threatened native plants may be collected for cryogenic storage.

Other Diseases

Another disease that occurs widely in the south-west is the naturally occurring *Armillaria* root disease caused by the soil-borne pathogen *A. luteobubalina*. This fungus fruits at the base of infected plants in autumn and spreads predominantly by root to root contact between healthy and infected plants. The range of species susceptible to the fungus is very large and poorly defined (at least 50 families and over 200 species), with very little information on the presence of resistant or tolerant species. The highest impact of the disease is in regrowth karri, marri and jarrah forests as a result of the harvesting and thinning operations which provide stumps that *A. luteobubalina* can readily colonise and then infect saplings and residual trees. Many species that resist infection by *P. cinnamomi* are susceptible to *A. luteobubalina*. There is no observation of this disease in the planning area, although surveys have not been conducted and the disease may exist or be introduced in the future. At present there is no method of controlling the spread of this disease.

The little known and only recently discovered disease, Mundulla yellows, has the potential to affect native plant species, causing a progressive decline, yellowing and then death of the trees. It affects many eucalypt species (23 species in Western Australia are known to be affected), including jarrah and Swan River blackbutt, and possibly sheoaks, banksias and wattles. The disease has been observed to occur across a scattered distribution in Australia, mostly in coastal areas and areas of high disturbance (CSIRO 2000, Handol *et al.* 2002), but has not been observed in the planning area or in other undisturbed native forest. At the time of publication it is unknown how the disease is spread. General hygiene practices for plant diseases should be practised to minimise the risk through human activity of spreading any new diseases into the planning area.

21 – Disease

Key Points:

- *P. cinnamomi* appears to be the most significant pathogen threatening native vegetation and fauna habitat within the planning area. Other pathogens that may occur include *A. luteobubalina*.
- *P. cinnamomi* spreads by producing small spores that are distributed through surface, sub-surface and stream flows as well as transferring between plants via mycelium growth. It can also be spread by humans, vehicles and animals moving infested plant material and soil.
- Several sites within the planning area have been designated as Disease Risk Areas including the former Davis and Gervasse blocks as well as the entire proposed Westralia Interim Forest Conservation Area.

The objective is to protect the natural values of the planning area from the impacts of *P. cinnamomi*.

This will be achieved by:

1. following the guidelines in the Department's manual – *Phytophthora cinnamomi and disease caused by it* (2000) and Policy Statement No. 3 – *Management of Phytophthora and disease caused by it*;
2. managing the human assisted spread of *P. cinnamomi* by progressively mapping and assessing uninfested areas to identify probable protectable areas, and then rationalising and managing access roads and/or tracks into them. Priority for on-ground surveys will be determined by interpretation of aerial photographs revealing uninfested areas and possible protectable areas, knowledge of disease occurrence and spread, risk to conservation values and any proposed development;
3. implementing seasonal road closures to minimise disease spread as necessary;
4. developing *P. cinnamomi* hygiene management plans prior to commencing any operation that requires soil or plant material movement such as the construction of any new roads, firebreaks and tracks;
5. dependent on the scale of infestation, seeking to restrict the movement of *A. luteobubalina* via affected material by establishing quarantine areas;
6. providing the public with information about plant disease, emphasising the need to be clean on entry to uninfested areas and to stay on approved roads and tracks;
7. identifying and treating threatened plants, threatened ecological communities and habitats of threatened native animals with phosphite or other appropriate treatments in areas where they have been given priority for action;
8. encouraging research into the effects that *P. cinnamomi* and other pathogens are having on the plant and animal associations within the planning area; and
9. documenting any outbreaks of new diseases within the planning area (plant or animal).

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
21.1 The number of sampled areas uninfested with *P. cinnamomi* following an operation with an approved disease management plan	21.1 Following identification and mapping, no new human-assisted infestations of disease caused by *P. cinnamomi* in uninfected protectable areas	Every 3 years

22. SOIL AND CATCHMENT PROTECTION

Hydrology

Hydrology of the south-west is characterised by short coastal rivers with greatly fluctuating flow rates and water levels, and a large number of permanent or ephemeral water bodies, including lakes and flats (Commonwealth and Western Australian Regional Forest Agreement Steering Committee 1998). The surface water hydrology in these areas consists of drainage systems that exhibit a distinct westerly to south-westerly trend directed towards the Indian Ocean.

The main drainage system of the planning area is the Collie River, which feeds into the Wellington Reservoir before traversing the forested Darling Scarp and passing across the Swan Coastal Plain to discharge into Leschenault Estuary (see Map 5). It is a large river system characterised by small waterfalls, rapids and intermittent pools, varying in size.

The Collie River catchment encompasses an area of 2823 km^2 and extends nearly 100 km inland towards Darkan. Approximately 677 km^2 of the catchment (24%) was cleared before clearing control legislation was introduced in 1977 (Mauger *et al.* 2001). The catchment is one of the few major river systems that penetrate inland to the central wheatbelt. It experiences streamflow mostly between July and November. A number of major tributaries branch from the Collie River including the Wellesley, Brunswick, Harris and Bingham rivers.

The headwaters of the Wellesley and Brunswick rivers emanate from the high rainfall areas to the western edge of the Darling Plateau whereas the Harris and Bingham rivers have their headwaters in comparatively flat landscapes where annual rainfall is about 600 mm and marri-wandoo woodlands dominate vegetation. The eastern-most reaches of Collie River drain saline land with varied land uses, including agriculture, mining and fragmented native forest. Largely forested catchments such as the Harris and Bingham rivers continue to have lower stream salinities of less than 300 mg/L and feed reservoirs such as the Harris Dam with high quality water.

Wellington Reservoir

The Wellington Reservoir has a water supply capacity of 186 GL used for irrigation but potentially important for industry and as a drinking water supply (see Section 42 – Water Extraction). The water is currently used for irrigation for fodder crops, pasture for dairy cattle, fruit and vegetables.

Historically, the Reservoir was used as a supply of potable water for the Great Southern Town Water Supply Scheme and is still proclaimed under the CAWS Act. At present it is not used as a drinking water supply because of the existing poor quality water. The major influence on water quality within the Reservoir is high salinity levels associated with dryland salinity, caused by extensive land clearing in the upper catchment (see section below on Salinity). Although the Reservoir contains water with a salinity higher than normally acceptable for drinking water purposes, it could still be used if mixed with a better quality source. The WC, as the Water Service Provider, has already been offered an allocation licence for 17 GL of water for public drinking water supplies.

In light of the poor quality water that developed in the Wellington Reservoir during the 1980s, alternative sources of potable water were sought and a replacement dam on the Harris River was constructed. This drains a catchment of dense jarrah-marri forest and provides high quality water. This supply, as well as the 7 GL supply at Mungalup Dam, provides alternative sources of drinking water to the Collie townsite and the Great Southern Town Water Supply Scheme. A source protection plan for the Harris Catchment is in the process of finalisation.

Water Allocation

In view of the poor quality water within the Wellington Reservoir and declining rainfall trend, the Collie Basin has been designated by the State Salinity Strategy as a recovery catchment and it is expected that salinity will reduce to a potable level by 2015 (DoE 2001). Once the water in Wellington Reservoir becomes potable, there is likely to be trading between irrigation water allocations and drinking water allocations, with an expected demand for 12–25 GL of drinking water for local consumption, for the GSTWSS or for the IWSS. In allocating water, its social value is recognised as well as the needs of the environment. Water allocations are determined by the DoE, a process currently underway for the Wellington Reservoir. Management of water quality and drinking water sources is part of water source protection planning, also carried out by the DoE. However, for land vested with the Conservation Commission, and hence where a dual responsibility occurs, the day-to-day management of drinking water catchments is undertaken by the Department and the WC.

Environmental Water Requirements

Water allocation can take into account the requirements of the environment, based on the premise that the environment is a user of water and has a right to adequate water supply for water-dependant ecosystems and to sustain key ecological functions. The amount of water required to maintain ecological processes is known as the environmental water requirement and is determined through scientific investigation and community consultation.

For the lower Collie River between the Wellington Dam and the western edge of the planning area, water is required to sustain the health of riparian vegetation, including fringing sheath twigrush sedgelands and species on granite and sand islands. Sheath twigrush sedgelands are particularly important as they are the only species that provide stabilisation to the lower

embankments. Loss of this vegetation could lead to undercutting of embankments and an increase in sediment loading in the channel bed. Long-term impacts of reduced water flow would include the loss of understorey species (herb strata) that are outcompeted by invasive weed species. This, combined with an increase in recreational use, may allow disturbance opportunists such as kikuyu (*Pennisetum clandestinum*), which is already present in small amounts, to invade.

Sheath twigrush fringing sedgelands are also an important fauna habitat, providing breeding areas and protection from predators. They are especially valuable habitat for fish spawning. Water flow of the river should not be altered as changes in the order of 10 cm or more could result in the loss of this species (Syrinx Environmental Planning 2003).

Water flow, velocity and quality is particularly important in sustaining native fish species such as the western minnow and nightfish. These species undergo a reproductive migration and as such, barriers to movement can impact on the completion of their life history. Hardcastle *et al.* (2003) reported that flood pulses of 3–5 days in duration were required during the period of August to October to provide sufficient fish passage and allow species to traverse obstacles, necessary for successful spawning migrations. This regime would mimic unregulated river systems in the south-west of the State. A major requirement for the maintenance of fish populations in the Collie River is also the presence of permanent water during all months of the year.

The environmental water provision is the amount of water that can be allocated from a resource to meet an environmental water requirement. Environmental water provisions must be maintained before any allocation is made to consumptive use. The guiding principles of how water is allocated are illustrated in the DoE's *Environmental Water Provisions Policy for Western Australia*, which is based on the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ/ANZECC 1996).

Groundwater

The most substantial groundwater supplies occur in the Collie Basin, where the presence of the Collie Coal Measures has resulted in the formation of multi-layered aquifer systems (Rutherford 2000). This is the most significant fresh groundwater resource east of the Darling fault (Rutherford 2000) although it can be acidic and high in iron (Tille 1996).

Groundwater resources are being progressively depleted in the Collie Basin on a local scale by mining activities pumping from borefields and from open cut and underground coal mines (Rutherford 2000). Dewatering from the mines and the disposal of water has resulted in water leaking from the Collie River into underground mines causing pool levels to be lowered, and the creation of perennial pools where the river was once at a seasonally low level (Rutherford 2000, Collie Water Advisory Group 1999). Section 42 – Water Extraction illustrates the extent of licenced groundwater use in the catchment.

Salinity

Salinity of our streams and waterways poses the greatest threat to water quality in the south-west of Western Australia. It occurs when salt stored in the soil profile over thousands of years intersects ground surface as a consequence of rising groundwater levels. Groundwater rise results from reduced water usage, and is caused primarily by the clearing of perennial native vegetation for agriculture purposes (Borg *et al.* 1988). The discharge of saline water at the ground surface eventually drains into streams, rivers and lakes and can degrade riparian habitats and water resources. Reducing the salinity of streams and waterways of the planning area will benefit the environment and in turn improve the water quality of the Wellington Reservoir.

The Collie River receives saline water from cleared agricultural areas within its catchment, particularly in the eastern-most areas around Darkan and West Arthur. This has impacted on the water resource of the Wellington Reservoir, which has a salinity of almost 1000 mg/L

total dissolved salts at the time of publication. This is far higher than the 500 mg/L recommended in the World Health Organisation *Guidelines for Drinking Water Quality* and the 280 mg/L that was recorded when the Reservoir was constructed in 1933. In an attempt to halt this increase in total dissolved salts, the State Government legislated to control the release of land in 1961 and followed this by a ban on land clearing in 1977 (Mauger *et al.* 2001). Despite these actions, salinity levels continued to increase at a rapid rate until about 1990, making the water too saline for human consumption (Figure 1).

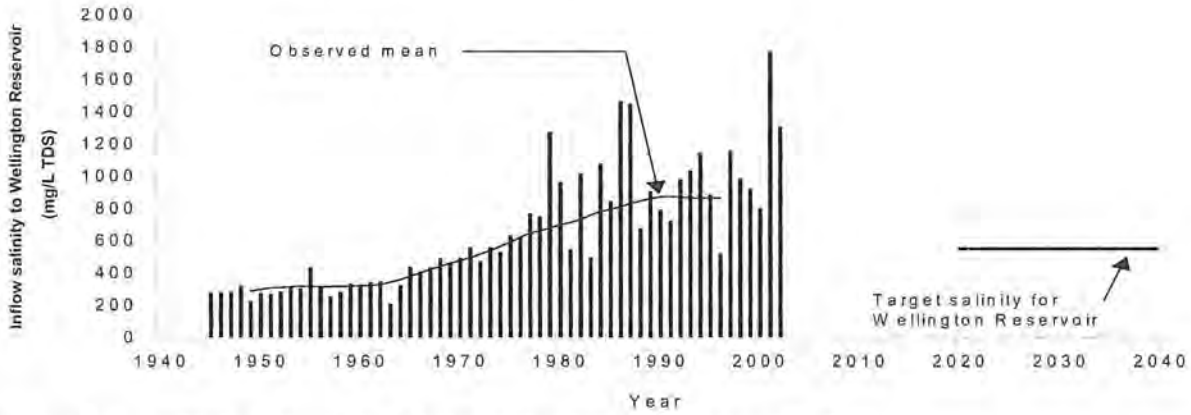

Figure 1 – Salinity Trends of the Wellington Reservoir

(adapted from Mauger *et al.* 2001)

In an attempt to restore the Wellington Reservoir to a potable level, the State Government initiated a recovery program in 1969 with the intention of reducing groundwater discharge and the subsequent seepage of salt into the river system by replanting 6740 ha of trees. By 2000, 184 of the 677 km^2 that was cleared had been replanted to plantations and another 37 km^2 identified as future plantations (Mauger *et al.* 2001). As a consequence of this action, and the fact that groundwater rises associated with land clearing are substantially complete, the rate of increase of salinity in the Wellington Reservoir has been reduced in recent years (Mauger *et al.* 2001).

The State Salinity Strategy (State Salinity Council 2000) set out options for the management of salinity and a target of 500 mg/L to be achieved by 2015. Options for meeting this water quality target include a mixture of upland and lowland revegetation activities in plantations or alleys, groundwater pumping, major river or groundwater flow diversion with engineering works and the protection of remnant vegetation (Mauger *et al.* 2001).

The recovery of the Collie River catchment is outlined in the Collie Salinity Situation Statement (Mauger *et al.* 2001).

Water Quality

The quality of water entering the Wellington Reservoir is fresh to brackish, with moderate levels of salinity and less than optimum levels of oxygen. Large parts of the catchment, particularly to the east of the Reservoir, have been partially cleared for agriculture and horticulture and also support the Collie and Muja power stations. Numerous pine plantations as well as native State forest also exist, the latter supplying fresh water. The use of fertilisers, herbicides and pesticides in the upper catchment as well as timber harvesting operations, may change the water quality within the planning area. High intensity activities, such as mining, also create point sources where discharges and dewatering have the potential to degrade both water quality and quantity. Urbanisation in the upper catchment could also impact on water quality, especially since the Allanson townsite, which adjoins the planning area, is currently unsewered.

Within the forested subcatchments of the planning area, increased silt in watercourses is a consequence of soil disturbance and is primarily a result of turbid run-off from unsealed roads (see section on Erosion below).

The State Water Quality Management Strategy (Government of Western Australia 2001), as its response to the National Water Quality Management Strategy (ARMCANZ and ANZECC 1994), gives guidance for the management of water quality in creek and river systems of the planning area. The administration of water quality protection, and the conservation and management of Western Australia's water resources, is the responsibility of the DoE.

Erosion

The process of soil erosion can be accelerated when the soil surface is disturbed or vegetation removed, resulting in changes in landform, soil structure, nutrient availability and sediment transport to streams and waterways. The construction and use of roads and facilities for public and management purposes can increase soil erosion. Four-wheel driving in the planning area, the use of bicycle and walk tracks, picnic areas and campsites can exacerbate soil disturbance resulting in erosion, compaction and degradation, which in some cases may lead to an increase in turbidity in water resources (see Part E – Managing Visitor Use).

Most of the planning area is undisturbed and of low risk of erosion. However, some areas of concern are:

- the lower Collie River valley, where there is a combination of shallow soils, deeply incised valleys and predominantly high relief. Once disturbed, these soils are highly susceptible to erosion and are at risk of minor landslips;
- disturbed areas surrounding the Wellington Reservoir and areas where riverside camping is prominent;
- banks of the Reservoir;
- disused gravel pits;
- roads, tracks and walk paths located on steep slopes and in areas of shallow soils, such as Lennard Track, Sneaker Road, Goat Road and Sika Circuit; and
- points of concentrated public recreation such as Honeymoon Pool, Potters Gorge and the banks of the lower Collie River.

Whilst the inherent erodibility of soils cannot be changed, the erosion associated with human activities can be contained or prevented by appropriate management. The rotation of campsites to allow for rehabilitation, the hardening of recreation sites and the temporary or permanent closure of tracks are some measures that can reduce the impact of erosion. The careful placement of facilities can also direct visitors away from environmentally sensitive areas. This, combined with education of visitors about the effects of erosion and the use of appropriate codes of practice, guidelines and on-site investigations prior to any changes in land use, can minimise erosive activity.

22 – Soil and Catchment Protection

Key Points:

- Hydrology and water quality of the planning area is vital for the creation and maintenance of the biological systems, the provision of significant recreational opportunities, and the potential for development of a public drinking water supply.
- The main drainage system is the Collie River, which feeds the Wellington Reservoir before traversing the forested Darling Scarp and passing across the Swan Coastal Plain to discharge into Leschenault Inlet.

- Wellington Reservoir is used primarily for irrigation but is important for industry and as a potential drinking water supply. Historically, the Reservoir was used as a supply of potable water, but is currently not suitable for use without mixing because the existing water is too saline. It is expected that salinity will reduce to a potable level within 10 years with the implementation of further catchment recovery techniques. The catchment is still proclaimed under the CAWS Act.
- Erosion hazards are greatest in disturbed areas of the Collie River, particularly along the lower Collie River valley, where shallow soils and steep sloping landscapes occur.

The objectives are:

1. **To protect the quality and quantity of water within the planning area from degradation from recreational use, particularly the lower Collie River and the surface water resource of the Wellington Reservoir; and**
2. **To minimise and, where possible, negate the impacts of soil erosion both inside and outside the planning area.**

This will be achieved by:

1. maintaining environmental water provisions to the lower Collie River below the Dam that are consistent with environmental water requirements as defined by the DoE;
2. ensuring that any proposed developments within the planning area are fully assessed to determine the potential impact on hydrology, landforms, soil structure and biodiversity values;
3. appropriately managing human activities, including the sensitive siting of access routes and facilities, to minimise the exposure of soil to mechanisms of erosion;
4. ensuring that stream buffers are maintained in logged areas in adjacent State forest and disturbed areas are revegetated;
5. effecting those Departmental responsibilities relevant to the Collie River catchment and identified by the Collie River Salinity Situation Statement for implementation within the life of the plan;
6. supporting the DoE to continue monitoring of water quality and quantity along the lower Collie River and meet to review these finings annually;
7. liaising with water agencies, adjoining land owners, Forest Products Commission, local government and other Government departments and authorities to conduct research and ensure that activities within and adjacent to the planning area do not harm the water quality and quantity of the planning area; and
8. ensuring land and water-based activities in the Wellington National Park and on the Wellington Reservoir are managed so that the risks to public health associated with water quality are acceptable.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
22.1 The quantity and sequence of water released from the Wellington Reservoir	22.1 Maintenance of environmental water flows and provisions for the Collie River below the Wellington Reservoir	Every 5 years subject to information provided by the DoE and WC
22.2 Annual flow weighted mean salinity levels in the Collie River below the Wellington Reservoir	22.2 Salinity trend in the Collie River below the Wellington Reservoir to be neutral or decreasing	
22.3 Changes in the area of erosion within the planning area	22.3 Reduction in the area of erosion occurring as a result of human activities	

23. FIRE

Fire is an ecosystem process essential for the conservation of biodiversity. At the same time, it is also a phenomenon capable of threatening biodiversity, human life and property. As a result, the management of fire is integral the Department's activities and a core management responsibility. The challenge for managers is to devise practical and affordable fire regimes that conserve biodiversity at agreed spatial scales, and minimise the adverse impact of wildfires on social, economic and environmental values.

At the initial and highest level, the Department's overall approach to the use of fire, fire suppression and wildfire prevention is determined through legislation (e.g. *Bushfires Act 1954*, *CALM Act* and precedents established under Common Law) and the Department's Policy Statement 19 – *Fire Management*. Fire planning and management in the Department is also guided by a number of scientific principles (Burrows and Friend 1998, Fire Ecology Working Group 1999), which are included in Appendix 7.

This management plan presents an adaptive management approach to fire where management policies and practices are continually improved by learning from the outcomes of operational programs, research (e.g. on fire ecology) and monitoring. This acknowledges a level of uncertainty about what policy and practices are best, but consistent with adaptive management, this plan utilises best available knowledge to implement programs aimed at meeting specific management objectives. Monitoring, regular review and analysis of management outcomes and ongoing research are critical if fire management in the region is to continuously improve.

History

Pre-European settlement

Fire, climate and vegetation have a long association on the Australian continent, one that pre-dates the arrival of humans by millions of years (Churchill 1968, Singh *et al.* 1981, Kershaw *et al.* 2002). Evidence of frequent fires has been documented dating to 2.5 million years ago in the south-west of Western Australia, indicating that fire has been a major evolutionary influence since at least that time (Dodson and Lu 2000, Dodson and Ramrath 2001, Hassell and Dodson 2003), and maybe as early as the mid Miocence, approximately 15 million years ago. The former date coincides with a major climatic change from subtropical to Mediterranean, which is thought to have led to an associated increase in fire, as evidenced by charcoal in sedimentary deposits. Rainforest species characteristic of the subtropical climate of the Tertiary period (approximately 65–1.5 million years ago) were replaced by scleromorphic species with lignotubers, and large persistent woody fruits that were pre-adapted to nutrient deficient soils (Main 1996). These adaptations were ideally suited to the drought and fire conditions that were to become more prevalent.

The relatively recent arrival of Aboriginal people (probably within the last 60 000 years) undoubtedly led to dramatic changes in fire patterns and fire environment (Hallam 1975, Hallam, 2000; Kershaw 1986, Pyne 1991, Hassell and Dodson 2003). Intervals between fire appeared to be much shorter in areas fully occupied by Aboriginal people in contrast to areas of the south-west that were historically unoccupied (e.g. offshore islands) (Hassell and Dodson 2003).

These regimes presumably evolved with the economic and ecological needs of the people (Hassell and Dodson 2003), varying from group to group and for different localities and occasions. Aboriginal people probably utilised fire to their advantage, opening up dense vegetation for ease of access, encouraging new plant growth to improve hunting and foraging opportunities, protection of camping spots and areas of high resource value, and for ceremonial purposes (Hallam 2000). A review of Aboriginal usage of fire for the period 1696–1890 by Abbott (2003) also proposed that in forested areas of south-west Western Australia, Aborigines lit fires, principally in summer, which could be large and burn up to hundreds of hectares at 3–5 year intervals. This would have varied depending on the flammability of sites (e.g. steep south-facing slopes or riparian vegetation in higher rainfall

areas) and prevailing weather. The suggested fire regime appears to be supported by initial studies by Ward *et al.* (2001), who examined fire scars on approximately 159 grass trees at 50 sites throughout the south-west jarrah forests.

Post European Settlement

In 1954, widespread prescribed burning under controlled conditions was introduced (Anon 1969, Crawford and Crawford 2003, Underwood and Christensen 1981), and adopted more widely after the severe wildfires at Dwellingup in 1961 (Armstrong 2004). This application of fire to reduce fuel loads, and consequently reduce wildfire risk, has continued to the current time. Broad-scale fuel reduction became a reality with the use aircraft for of aerial ignition in 1965 (van Didden 1983) and within a few years the aerial burning program was operational in Western Australia, with over 180 000 ha of land deliberately burnt in the spring of 1967.

Since the 1960s, much of the forested region of the south-west has been regularly burnt using aerial and ground burning. Between 1989–2002, approximately 13 100 ha of the planning area or 79% has been burnt. Some of these areas have been burnt several times in order to protect assets whilst others, typically bounded by 'low fuel' areas such as the Wellington Reservoir, remain long unburnt. During this period there have also been a number of wildfires (Table 4).

Table 4 – Wildfire Causes in the Planning Area 1989–2002

Causes[1]					
Lightning (number and area)	Human-induced				Unknown[4] (number and area)
	Accidental[2] (number and area)	Deliberate (number and area)	Escape from prescribed burns[3] ((number and area)	Escape from other burns (number and area)	
1 <1 ha	2 5 ha	13 15 ha	2 2 ha	1 30 ha	7 53 ha

[1] Causes are taken from what is listed in final fire reports. There may be some overlap between some of the causes, particularly prior to 2000 where different classes were used.
[2] Accidental causes include escapes from burns lit by sources other than the Department.
[3] Prior to 2000 some accidental fires may have been escapes from prescribed burns undertaken by the Department.
[4] Unknown causes include 'Causes Not Listed'.

The high number of deliberately lit fires is of particular concern. Historically, areas of forest nearby to the Collie townsite have a high incidence of arson when compared to other areas within the Department's South West Region. The risk of arson ignitions needs to be considered in future management, particularly in fire detection and response times. Education is a key role in combating arson and the Department will co-operate with agencies responsible for public education and law enforcement, such as Fire and Emergency Services and the Western Australian Police Service.

Implications from the historical occurrence of fire in the planning area

Irrespective of the anthropogenic burning patterns of Aboriginal people and early European settlers, environmental conditions have been altered to such a degree over the past 100 years that the application of these historic fire regimes may no longer meet biodiversity conservation objectives. Factors such as the location of private property, towns and cities, cleared land, weeds and contemporary conservation values contribute to these changing conditions. Rather, scientific knowledge should be used to contribute to the development of ecologically-based fire regimes considered at a landscape scale. Knowledge of the critical role of fire in biodiversity conservation has developed in recent years, and the Department now applies fire to not only reduce reduce the risk to life and property but also to conserve biodiversity (Burrows 2002).

Fire Ecology

Fire ecology is the study of the interaction of fire, the biota (plant and animals species), and the habitats in which they live. Knowledge of the impacts of this interaction is integral in

protecting biodiversity, but also human life and property. Fire management in the region continues to evolve in the light of accumulated knowledge of fire science and management experience (Burrows 2004).

A fire regime is a description of fire in terms of its:

- periodicity (how often it occurs on a site);
- intensity (how hot it is);
- season (what time of year it occurs);
- scale (how big it is); and
- its spatial diversity (how patchy it is at both a landscape and local scale).

Knowledge of vital attributes of flora and fauna species and key fire sensitive (fire regime specific) taxa within ecosystems is being used to derive appropriate fire regime parameters (see below).

Ecosystems will be managed by varying the season of burn, frequency and intensity based on vital attributes and life histories of flora and fauna, fire sensitive taxa and vegetation communities. For each fire management unit, a fire regime based on vital attributes (see example of one regime in Figure 2) is devised for the most fire prone (least sensitive) components and to protect those habitats requiring a specific (atypical) fire regime. This typically requires consideration of three landscape components, although this may vary depending on the fire response of flora and fauna species in the area:

- fire prone upland areas;
- fire sensitive habitats (e.g. wetlands, granite outcrops); and
- valley floors (see Section 17 – Native Animals and Habitats).

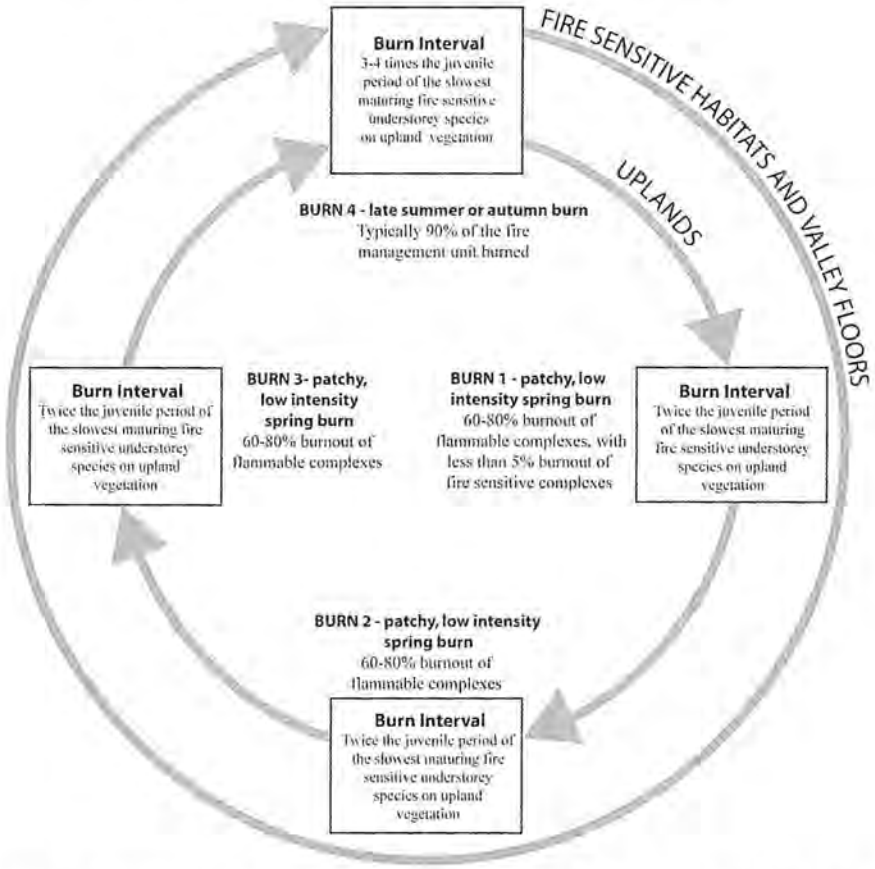

Figure 2 – Example of an Ecological Fire Regime for Managing Ecosystems Based on Vital Attributes

(adapted from Burrows and Friend 1998, and N. Burrows pers. comm. 2005)

Patchiness of the vegetation (e.g. burnt and unburnt areas) is also important as it ensures a variety of post fire seral stages at the local scale. For example, the satellite imagery in Figure 6 (page 168) shows how post-burn patchiness was achieved across a prescribed burn near the intersection of Mowen and Sues roads, approximately 23km east of Margaret River. This enabled the protection of viable quokka habitat in the south of the burn and the regeneration of senescing habitat in the north of the burn.

Managing for Vital attributes

Fundamental to the application of a particular regime is knowledge of the vital attributes of the flora and fauna. The response to fire depends on their vital attributes or 'life strategies', which they have employed to adapt to fire. Determining vital attributes of species will enable regimes to be determined for their conservation.

For many species, reproduction and regeneration are stimulated by fire. For some plant communities, fire is necessary for the maintenance of floristic and structural diversity (Burrows and Wardell-Johnson 2003). Other species however, are vulnerable to fire or have quite specific fire regime requirements (Table 5).

Table 5 – Species Vulnerable to Fire or Extreme Fire Regimes

Fauna	Flora
Require specialised habitats	Killed by fire
Have low fecundity	Have short life spans
Exist as discrete dispersed populations	Long juvenile periods
Have low dispersal capacity	Canopy-stored seed
Require mature late successional state vegetation	Regenerate only from seed ('obligate' seeders)
Prone to predation	

(from Burrows and Friend 1998, Burrows and Wardell-Johnson 2003).

Examples of species with specific fire-regime requirements in the planning area include fauna species such as the quokka (requires specialised habitats) and western ringtail possum (requires careful planning to minimise canopy disturbance). However, no single fire regime is optimal for all species.

Typically, fire sensitive species are confined to more mesic or less flammable environments such as riparian zones and wetlands and granite outcrops where fire is less frequent (See Section 16 – Native Plants and Plant Communities and Section 17 – Native Animals and Habitats). Generally plant communities in the drier, upland areas of the forest are burnt more frequently and display a greater resilience to fire. Extreme regimes, such as sustained, very frequent burning or infrequent but large, intense fires, are more likely to be most damaging to biodiversity values (Burrows and Friend 1998, Burrows and Wardell-Johnson 2003).

Vital attributes of the flora

The flora of the planning area possesses a variety of traits that enable persistence in this fire-prone environment (Gill 1981), including:

- soil protection of buried buds;
- bark protection of aerial buds;
- bud survival and sprouting;
- fire stimulated flowering;
- fire triggered opening of fruits; and
- on-plant seed storage.

The rate at which plant species are able to produce adequate seed for regeneration after fire needs to be considered in determining the minimum inter-fire period. For example, Burrows *et al.* (1995) showed that the majority of understorey plants on upland, high-rainfall jarrah forest sites flower within 3 years of fire. On low lying sites such as gullies and broad valley floors, some species may take 6–7 years to flower after fire but may not set viable seed for 2-

3 years after this (Burrows and Wardell-Johnson, 2003). On the basis of current knowledge, doubling the juvenile period[9] of the slowest maturing fire sensitive species provides a conservative minimum interval between lethal intensity fires (Figure 2) and allows for adequate replenishment of seed banks (N. Burrows pers. comm. 2005). Populations will survive more frequent fires provided the intensity of those fires does not kill the entire cohort of parent plants. Consistent with an adaptive management approach, occasional low intensity fires at shorter intervals should be trialed and survival and recruitment of fire sensitive species closely monitored. This should occur in a mosaic of burnt and unburnt areas, which will allow representatives of local fire sensitive species to survive the low intensity fire or persist in the unburnt patches and provide genetic stock to recolonise burnt areas.

The fire response patterns such as post-fire regeneration strategies, times to first flowering, peak flowering and flowering decline, and disease sensitivity of flora species in the south-west are currently being collated into the Department's FIRERESPONSE database. This information will be used in conjunction with vegetation mapping in making decisions about the desired fire regimes for biodiversity conservation.

Vital attributes of the fauna

Research indicates that the immediate impact of fire on fauna is directly proportional to the scale, intensity, and patchiness of the fire and the interval between fires (Friend 1995, Burrows and Friend 1998, Friend 1999). This impact will also depend on the presence of predators where displaced species have to travel across open ground to find suitable habitat (Friend 1999).

The greater climatic regularity and the uniformity of the landscape and soils of the dry sclerophyll forests appears to have resulted in an invertebrate fauna that is resilient to more regular and frequent fires (van Heurck and Abbott 2003).

For mammals at least, the post-fire response of populations is reasonably predictable and consistent (Figure 3), and could be considered in terms of the their life history characteristics based on shelter, food and breeding requirements, and the scale, intensity and patchiness of the fire (Burrows *et al.* 1999, Friend 1999). Responses are largely dependent on vegetation structure and floristic composition, which simplifies the prediction of fire impacts (Friend, 1999). Friend also noted that the post-fire response patterns of reptiles were less predictable, and that the response of amphibians was extremely variable.

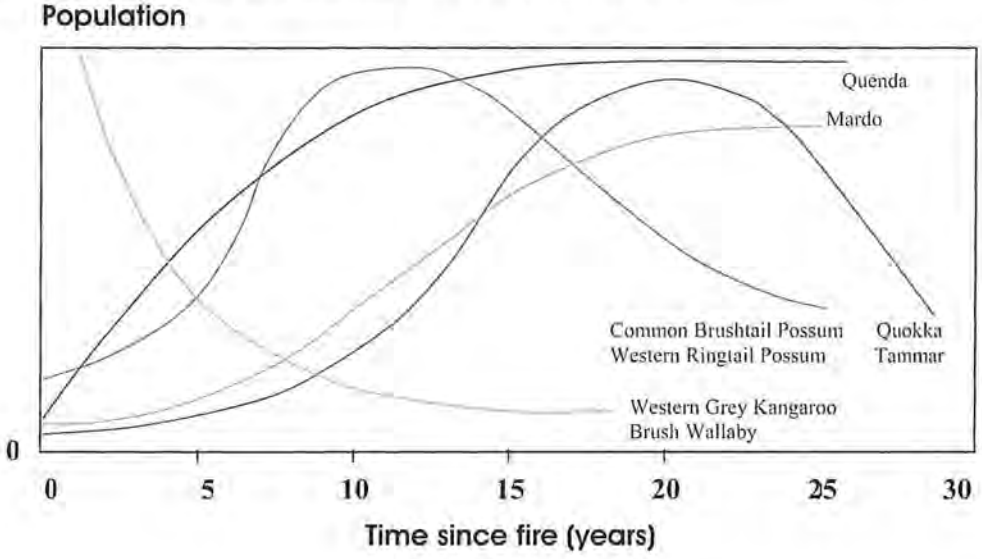

Figure 3 – Idealised Relationship Between the Abundance of Various Mammal Species and Time Since Fire
(source: N. Burrows pers. comm. 2005).

[9] The juvenile period is defined as the time when at least 50% of the population has reached flowering age.

Two mammal species of the planning area that are identified as having particular fire regime requirements are the quokka and western ringtail possum (see Section 23 – Native Animals). Christensen (1997) noted that late successional species such as the quokka and mardo (*Antechinus flavipes*), both found within the planning area, take 10 years or more to recover from the effects of fire. Both these species survive well, however, where fuel reduction burns are employed as their moist habitats tend to burn less frequently and result in a patchwork mosaic of vegetation structure. The intensity of fire is a key factor in the management of the western ringtail possum, whose main habitat of peppermint is susceptible to canopy scorch. The temporary displacement of other arboreal species into their habitat is also an issue following fire.

Riparian zones and wetlands

Some fire regimes, coupled with the impacts of climate change, may have detrimental impacts on some riparian zones and wetlands. Over the past 30 years, winter rainfall in the south-west, particularly early winter from May to July, has declined by 25% (see Section 13 – Climate Change). This has had the effect of a sharp fall in streamflow in the south-west, and the drying out of some wetlands and moist riparian zones, predisposing them to fire. As a result, these areas may burn earlier in spring, and remain drier for longer in autumn months. This has important implications for the protection of inland wetlands and riparian ecosystems. Fire may also impact on water quality in wetlands by increasing the amount of dissolvable and erodible residue finding its way into waterways (Horwitz *et al.* 2003).

The extent or patchiness of fire in riparian zones of the planning area is important for fauna that persist in relatively small, linear habitats along these drainage lines. Large-scale fires that burn entire habitats could be detrimental to some species that utilise these corridors, particularly along the lower Collie River and its tributaries. Too infrequent burning may result in some plant species completing their life cycle and becoming senescent. The impact of fire on tree species is important in riparian areas as the fire-formed tree hollows provide valuable fauna habitat.

Granite Outcrops

The fire frequency of granite outcrops is lower than the surrounding landscape (Hopper 2000, Yates *et al.* 2003). This is because the vegetation is often low in stature and biomass, and is fragmented by areas of sheet rock or boulders that provide a discontinuous fuel bed, thus limiting fire spread. Granite outcrops, such as those scattered along the lower Collie River valley, may therefore act as refuges for rare or fire-sensitive species. However, some species on granite outcrops may also require infrequent fire under certain conditions to regenerate. Hopper (2000) found a high number of fire-sensitive obligate seeders (77%) regenerating post-fire on a granite outcrop in the wheatbelt, and suggested "...intervals between fires measured in decades are likely to be required to ensure an adequate seed bank is available and local extinction is averted." This may also be the case with granite outcrops within the planning area, although intervals of 1-2 decades (i.e. shorter interval) between fire are more probable due to the higher biomass in the forested regions (N. Burrows pers comm.). To decrease the probability of these fire refuges being damaged by large, intense wildfires that sweep onto and over them from the surrounding forest, it is important that these surrounding forests are maintained in a relatively low fuel state.

Fire Management within the Planning Area

Fire management within the planning area will aim to maintain biodiversity conservation values whilst ameliorating the threat of wildfire to life and community assets. Scientific knowledge of fire ecology, based on vital attributes, is being used to determine specific fire regimes, frequency, season, intensity or scale for specific areas within the planning area (see Fire Ecology above). This knowledge is evolving over time, often focusing on threatened species and ecological communities through the preparation of recovery plans, and will enable prescriptions to be developed for conservation purposes. At the time of publication, however, only moderate information is available to guide managers in decision-making.

Therefore, fire management in the interim will focus on:

- management for biodiversity conservation that includes:
  - protection of native plants using current information on vital attributes;
  - protection of threatened species and ecological communities;
  - protection of significant habitats/values that require specific atypical fire regimes;
- community and asset protection; and
- fire research.

The management of ecosystems based on vital attributes across the planning area will eventually revolve around the management of Landscape Conservation Units (LCUs). This will involve the collection and organisation of vital attribute data, and using Geographic Information System modelling to assist in analysing the implications of different fire regimes. Fire management will constantly aim for a negative exponential distribution of age classes in each LCU (see Managing Fire for Biodiversity Conservation below).

Managing Fire for Biodiversity Conservation

Fire planning must encapsulate the spatial and temporal scales important for maintaining biodiversity. Important scales at which fire planning is applied include:

- *landscape scale* (30 000–100 000 ha)—a 'landscape conservation unit' (LCU) is defined as a mosaic of local ecosystems and landforms repeated in a similar form across a wide area (measured in kilometres). In the south-west these are based on amalgamations of vegetation complexes (see Map 6);
- *fire management scale* (500–5000 ha)—a 'fire management unit' is a spatial element within the landscape, and may comprise a sub-catchment, forest block or some other logical mapped management boundary; and
- *vegetation complex scale*— areas within a 'fire management unit' that may be subjected to atypical burn frequencies or intensities (eg. uplands versus wetland vegetation complexes).

Landscape scale

Diversity and variability in fire regimes at the landscape level helps maintain biodiversity (Principle 6, Appendix 7). Mattiske and Havel (2004) identified 26 landscape conservation units (LCUs) in the south-west, based on amalgamations of the 315 vegetation complexes, according to their burning characteristics. The planning area contains two LCUs (Map 6).

The Department will manage fire within the planning area as part of burning program for these LCUs. The fire management objective for the units is to maintain a spectrum of fuel age classes across the LCU. According to the probability of a fire occurring within a given environment from 'natural' ignition sources, with a proportion of the area burnt each time, the area of each fuel age class will eventually accord to a frequency distribution with a negative exponential shape. This is based on research by McCarthy, Gill and Bradstock (2001), Tolhurst and Friend (2001) and van Wagner (1979). Vital attributes of the flora (e.g. time to first flowering and age to senescence) are also used to determine the actual shape of the idealised curve and hence the proportion of each LCU that is required in each age class. A histogram of the age class distribution for the 2004/05 fire season is indicated on Figures 4 and 5. Over time, prescribed burning will be used to approximate the idealised curve for each LCU.

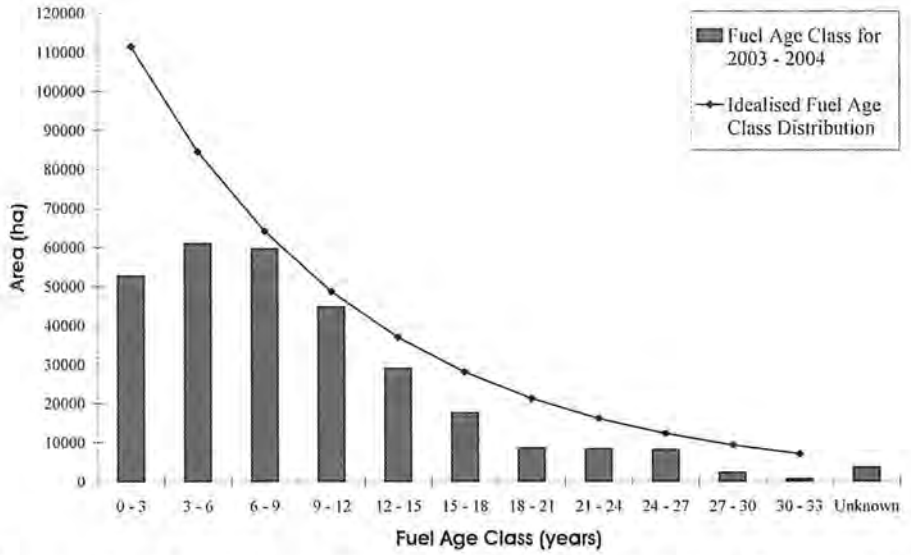

Figure 4 – Fuel Age Class Distribution for the Central Jarrah LCU

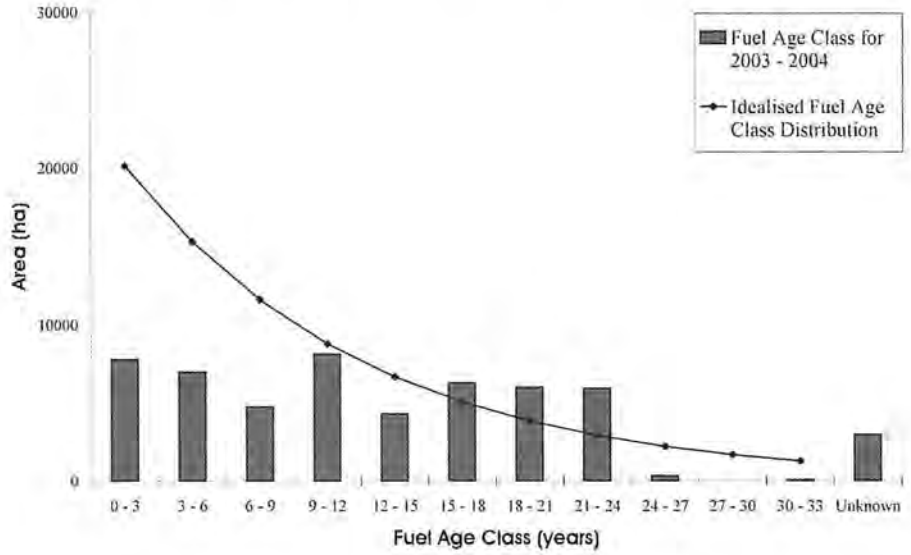

Figure 5 – Fuel Age Class Distribution for the Collie Wilga LCU

Ideally, the maintenance of this fire age-class distribution model for each LCU should maintain the diversity and variability in fire regimes and thereby maintain biodiversity at the landscape level.

Fire management unit scale

Landscape Conservation Units can be subdivided into Fire Management Units (the boundaries of which will vary through time) that represent feasible burning units (usually bounded by roads and tracks that serve as functional fire boundaries). When determining the prescription for when and how a Fire Management Unit will be burnt a fire regime based on vital attributes is devised for the most fire-prone (least sensitive) components that will provide protection to the least fire-prone (most fire sensitive) areas (Armstrong, 2004).

Information gathered at the landscape level is considered along with further local information to develop an 'annual' burn program. This takes into account local factors such as:

- time since last burn of surrounding areas;
- access;

- values to be protected;
- values at risk;
- operational factors influencing the carrying out of a burn; and
- community interest.

The 'rolling three-year' indicative burn program allows sufficient lead-time for planning and preparing annual burn programs and specific burn plans well ahead of the operation, for example to enable surveys for dieback and threatened flora. This program also provides the public an opportunity to see what is being planned for implementation and provide their input into program planning. Programs are updated twice each year on the basis of operational work and new information, such as wildfire occurrence and improving conservation knowledge.

Managing Fire for Species and Communities of Significance

Rare and endangered flora and fauna are protected by legislation in Western Australia. In many cases, it is appropriate to devise and implement fire regimes specific to these taxa to ensure their persistence. For example, the quokka has specific habitat requirements, occupying riparian zones that are in the mid to late seral post-fire stages. Fire is important for both protecting these habitat patches from wildfires and for regenerating these habitats when they senesce some 25-30 years after fire. Low intensity fires applied to the surrounding landscape in spring when riparian systems are too moist to burn are important for protecting these habitats from wildfires, and infrequent summer/autumn burns that burn into the riparian zone are important for regenerating senescing habitat. The scale of fire and the spatial patterning of habitat patches are important for allowing effective operation of habitat sources and sinks to ensure the persistence of subpopulations in the landscape. Inappropriate fire regimes, including long periods of fire exclusion followed by large intense wildfires, risks local extinction of subpopulations, the breakdown of metapopulation behaviour and regional extinctions.

Often, prescriptions for management are developed as part of a flora or fauna recovery plan. Where there is no plan and/or information on fire ecology does not exist, the precautionary[10] approach may apply. For other species and communities of conservation significance (e.g. priority species, endemic, relictual and disjunct species), research should be a high priority. Many of these species are also located in habitats that require special fire management.

Fire for fuel management

In addition to using fire to manage biodiversity, the Department must also consider the risk to human life and damage to other community and asset values. This process is undertaken in a step-wise manner.

Firstly, the requirements to achieve biodiversity conservation objectives are considered. This is followed by a systematic wildfire risk analysis (examining factors such as fuels, fire intensity and behaviour, and suppression capability) to determine the level of threat posed by wildfire to assets and values of the planning area, such as life, property, community assets, fire sensitive ecosystems and other values. The frequency of prescribed burning and the nature of the spatial mosaic to maintain fuel loads at acceptable levels is determined from a knowledge of the rate of fuel accumulation, the nature of the fuel, the climate of the region, and the fire detection and suppression capability. Fire management can then be modified, if necessary, to minimise the risks associated with wildfire. No single fire regime is suited for all flora, fauna and ecosystems (Principle 3, Appendix 7) and, in many cases, applying prescribed burns for biodiversity conservation will achieve community and asset protection as a collateral outcome. Where asset protection coincides with high biodiversity conservation needs, variations in the ecological fire regime (Figure 2) may be required.

[10] The precautionary principle is guided by (1) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment and (2) an assessment of the risk-weighted consequences of various options (Christensen 1998).

Managing Fire for Community and Asset Protection

The existence of towns and settlements, farmland and other developments, as well as the increasing use of natural areas for recreation, requires that community and asset protection be considered in fire management for the planning area.

Identifying fire vulnerable community assets within the planning area, and determining the risk and consequences posed by wildfire to those assets will assist in managing the risk of high intensity wildfires. Risk will be dependent on the potential intensity of the wildfire event (fuel, landform, weather), the likelihood of an ignition event occurring (past fire history) and the capacity to mount an effective suppression response (detection, travel time and access for suppression forces and the quantum of those resources). The risk assessment process aims to:

- provide a framework to analyse the best available information on all factors contributing to the wildfire threat, and allow evaluation of alternative responses;
- provide a standard and repeatable process for decision-making;
- permit objective comparisons between different areas with different problems;
- support the clear and explicit explanation of the rationale behind fire management decisions; and
- provide a rational basis for discussion and conflict resolution in the preparation of plans.

Table 6 shows the asset values in the planning area that need to be considered in a wildfire risk analysis and provides an indication of the level of consequence of a wildfire.

Table 6 – Assessment of the Consequence of Wildfire upon Assets in the Planning Area

Level	Consequence	Description
1	Insignificant	No injuries, low financial loss
2	Minor	First aid treatment, medium financial loss
3	Moderate	Medical treatment required, high financial loss
4	Major	Extensive injuries, loss of production capabilities, major financial loss
5	Catastrophic	Death, huge financial loss

Asset	Consequence	Comment
Fire fighter and public safety	Catastrophic	Loss of life due to wildfire
Recreation sites along the lower Collie River valley, including the camping area at Honeymoon Pool and day-use sites along Lennard Drive	Major	Considerable risk of injury to park visitors with loss of physical infrastructure, which is replaceable at an acceptable cost
Townsites of Collie and Allanson	Major	Considerable loss of community assets is possible with large financial loss and significant disruption to local communities
Built infrastructure including the Wellington Discovery Centre, Wellington Mills Cottages and the kiosk at Wellington Dam	Major	Injury and significant financial loss is possible
Adjoining plantations, private property (including rural subdivisions at Pile and King Tree roads) and CSIRO research plot	Major	Significant financial loss is possible and productive potential will be affected in the medium term
Natural assets, including significant vegetation complexes, specially protected fauna, priority flora and significant habitats and landscape amenity	Moderate	Impact of wildfire on these assets may cause short to medium term loss but recovery, regeneration, translocation or rehabilitation is possible
Essential utilities including powerlines, the Wellington-Harris pipeline, Lennard Tower and the	Moderate	Financial loss may be high and short-term impacts on local communities is possible

Asset	Consequence	Comment
Wellington Dam hydro power station		
Indigenous and non indigenous heritage sites	Moderate	Indigenous heritage is not usually fire vulnerable. Non-indigenous heritage may be lost
Water resource of the Wellington Reservoir	Moderate	Quality and quantity of potable water may be affected as a result of wildfire in the short term.
Recreation sites at Potters Gorge, the Munda Biddi Bike Trail, Bibbulmun Track and other recreation tracks	Minor	Physical infrastructure may be lost, but is readily replaced at an acceptable cost
Apiary sites	Minor	Limited sites and short-term impacts on production capacity and hives

A wildfire risk analysis of the planning area indicates that the lower Collie River valley is a High priority asset, primarily for the protection of campers or day visitors (see Map 7). The risk posed to visitors in this area is greater than areas such as the Collie and Allanson townsites due to the greater distance from fire response centres, the relative inaccessibility of the area and the high number of people that enjoy recreating in the valley. This area will be managed for asset (primarily park visitors and recreation sites) protection but will also aim at achieving a conservation outcome. An evacuation plan will also be prepared for the lower Collie River.

Community Involvement

Engaging with the public is vital if their understanding of the role and effects of fire, the application of planned fire and fire suppression operations are to be understood. For example, there is often a lack of understanding in the community of why particular Fire Management Units are selected for inclusion in an annual burn program. To help overcome this, the Department has made, and will continue to make, its planned burn programs publicly available.

Much of the western and northern boundaries of the planning area intertwine with private agricultural lands, large areas of plantation and parts of the planning area surround or are within close proximity to settlements. It is important in the management of fire to build and maintain constructive and mutually beneficial relationships with neighbours of lands managed by the Department. This can be achieved by continuing dialogue and cooperative ventures to the benefit of both parties, particularly in the context of dealing with a range of cross-boundary management issues, such as fire. In particular, is the comparatively large area of remnant vegetation on private land adjoining the western portion of the planning area, north of the Collie River. This area contributes significantly to the biodiversity conservation values of the planning area and poses a wildfire risk to assets along the lower Collie River valley. In the past, the Department has successfully undertaken prescribed burning on portions of private property and will seek to continue this operation where applicable.

Increasingly, people and facilities are being located closer to or within forested areas, exposing them to the risk of wildfire. This often occurs in advance of the capacity of local communities to deliver an adequate level of fire services. As such, early and better intervention when planning land developments is required. The Western Australian Planning Commission and Fire and Emergency Services Authority brochure: *Planning for Bushfire Protection*, provides guidance for minimising the impact of fire on communities. The document encourages new subdivisions to implement fire protection measures commensurate with the level of bush fire hazard, including hazard separation zones, building protection zones as well as the provision of access and fire services access. Local government is responsible for implementing fire protection measures under this guideline on private lands. However, the Department will apply the guideline for all applications for subdivisions adjacent to the planning area.

Other agencies controlling land adjoining the planning area, such as Main Roads Western Australia, Department of Land Administration, Department of Environment, Shires of Collie,

Dardanup and Harvey, also have a role in fire management. In this instance, cooperation between the Department and the local fire brigades ensures that the reserve can be appropriately managed for fire. Also, while the Department has responsibilities for fire preparedness on non-metropolitan unallocated Crown land, local government is the nominated management agency for bushfire control on unallocated Crown land. Ongoing liaison with these agencies will occur to ensure that wherever possible, coordinated and complementary fire management is achieved.

As well as an effective public liaison, education and awareness program, the enforcement of legislation and compliance management is essential. The Department will co-operate with agencies responsible for public education and law enforcement, such as the Fire and Emergency Services Authority (FESA) and the Western Australian Police Service.

Fire Management Access

A strategic access network for the planning area is outlined in detail within Section 27 – Visitor Access. Strategic roads and tracks will be maintained to ensure safe access for the fire fighting vehicles and to permit effective fire management.

Where appropriate, fires may be contained within management units defined by existing roads, rather than by constructing new firelines around the perimeter of the fire. Where temporary roads, firebreaks or firelines are constructed during fire suppression activities, these should be rehabilitated after the fire event (see Section 39 – Rehabilitation) to minimise the threat of soil erosion, weeds or spread of dieback and unauthorised use of the access.

Fire Research

Fire management and the development of ecologically-based fire regimes within the planning area should take into account all available knowledge and should adapt to new knowledge gained through research, monitoring and experience, including unforeseen events such as wildfires (Principles 9 and 12, Appendix 7). At this point though, it is recognised that the knowledge about the science of fire and its interaction with the biota can be improved.

To improve this knowledge, fire may be planned and used to deliver specific research outcomes. Areas identified for research are classified as 'Conditional Burning Areas':

- *Fire Exclusion Reference Areas* – are areas (generally less than 500 ha) where fire is deliberately excluded to provide a long-term reference site for scientific studies of the effects of different fire regimes on the environment. The fire management objective is to protect these areas from wildfire and exclude fire in perpetuity.
- *Scientific Study Area* – is an area in which scientific study is being undertaken and for the period of that study is not to be burnt or burnt as per the study requirements.
- *No Planned Burn – Management Plan* – is an area identified in a gazetted management plan or draft management plan that has been specifically identified as an area not to be burnt by prescribed fire.
- *Fire Exclusion – Harvesting* – is an area where timber harvesting has been planned and fire should be excluded to allow pre-harvesting operations such as dieback interpretation and flora surveys to be undertaken.
- *Fire Exclusion – Habitat* – is an area identified as having special value as fauna or flora habitat.
- *Fire Exclusion – Silviculture* – is an area that contains regrowth that is sensitive to fire.
- *Fire Exclusion – Cultural* – is an area identified as having indigenous or non-indigenous cultural values that are sensitive to fire.
- *Specified Fire Regimes* – is an area identified in a gazetted management plan or draft management plan that has been assigned a specific fire regime for a specified purpose. Examples may be to achieve ecological diversity using variable rotations (5-20 years) or longer burns of about 10-20 years, or a carefully considered and managed prescribed burning program initiated to promote the maintenance of rare fauna habitat in areas of particular importance for wildlife conservation.

Of particular importance to research is the establishment of Fire Exclusion Reference Areas across the landscape, as this allows for a comparison to fire regimes under prescribed conditions. Therefore, it is proposed that each LCU will contain at least one Fire Exclusion Reference Area, although this may not necessarily be located within the planning area. A public awareness program should be initiated to educate the community of the need to exclude parts from the landscape.

Consistent with principles of adaptive management, fire management will be reviewed and if necessary, adjusted, in response to monitoring results.

23 – Fire

Key Points:

- Fire management within the planning are will focus on biodiversity conservation, community and asset protection and fire research.
- Management for biodiversity conservation will be based on the vital attributes of the flora and fauna and will revolve around the management of LCUs. Fire management will constantly aim for a negative exponential distribution of age classes in each LCU.
- Diversity and variability in fire regimes at the landscape scale help maintain biodiversity. Patchiness of burning is an important factor in providing environmental heterogeneity at a local level.
- Fire sensitive species and ecosystems are most typically associated with wetland and riverine communities and granite outcrops.
- The Department uses fire in a planned way to reduce the severity of wildfire events and in turn provide safety to fire fighters, neighbours and visitors as well as protection of community assets.

The objective is to maintain conservation values while protecting people, property and recreation assets in and near the planning area.

This will be achieved by:

1. continuing to implement fire management for the planning area according to the 'rolling three-year' indicative burn program, which is based on the principles of fire management listed in Appendix 7, Map 7 and all available knowledge, including fire history and the fire response of flora and fauna to particular fire regimes;
2. maintaining a diversity of post fire (seral) stages that approximates the idealised curve for each LCU;
3. continuing to ensure protection of life and property, fire sensitive communities, fire sensitive species, rare and priority flora and other assets;
4. facilitating and participating in Department research on fire ecology, biological indicators and habitat requirements of vegetation communities and consider this in the preparation of a fire plan for the planning area;
5. continuing to liaise with local government, local bush fire brigades, neighbouring landholders and other appropriate authorities to ensure community protection from fire is at an appropriate level;
6. ensuring that an analysis of wildfire potential is incorporated into all risk analyses for work proposed in the planning area, and that appropriate risk mitigation work is undertaken during developments;
7. continuing to liaise with local government authorities and the Western Australian Planning Commission to encourage new subdivisions adjoining the planning area to implement fire protection measures commensurate with the level of bush fire hazard;
8. providing opportunity for the public to have input into the burn program;
9. actively promoting public education and awareness on (1) the damaging effects of inappropriate fire on values of the planning area, (2) fire risk, and (3) safety and survival of people and property;

10. liaising with the DoE and WC to manage fire, where appropriate and compatible with other values and operations, to maximise water quantity whilst maintaining water quality within the Wellington Reservoir;
11. maintaining roads and tracks used for fire management according to the Department's standards; and
12. preparing an evacuation plan for the lower Collie River valley.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
23.1 Fuel age distribution within the LCU	23.1 The fuel age distribution (time since fire) within each LCU approximates, within 5%, the defined frequency distribution model for each LCU	Every 5 years
23.2 The extent of severe wildfires within each LCU	23.2 Area affected by wildfire per annum is less than 5% of the LCU	Annually
23.3 The persistence of biodiversity, measured by changes in indicator species (threatened taxa and fire-regime specific taxa) and fire sensitive ecosystems within each LCU	23.3 No loss or significant decline in fire sensitive ecosystems or populations of indicator species within each LCU	
23.4 The impact of wildfire on life and community assets	23.4 No loss of life or significant community assets	
23.5 Community knowledge about, and involvement in, fire planning	23.5 Community consultation and notification of burn programs through media and community meetings	

PART D. MANAGING OUR CULTURAL HERITAGE

In 1979 Australia adopted the Burra Charter (Australia/ICOMOS 2000), which is a charter for 'the conservation of places of cultural significance', including Aboriginal cultural sites. The Charter provides the basis for heritage conservation and has a series of guidelines for managing cultural heritage.

Under the Environment, Protection and Biodiversity Conservation Act, a new national heritage system was also introduced in 1 January 2004 to strengthen protection for the nation's natural, Indigenous and historic heritage, including statutory protection to listed places (places listed on the National and Commonwealth Heritage lists). Actions that are likely to have an impact on the heritage values of a National or Commonwealth Heritage listed place require approval from the Australian Minister of the Environment and Heritage. The *Register of the National Estate*, which contains a list of places with national estate values, is still maintained as a record of important natural, cultural and Indigenous heritage places, but offers no statutory protection.

In Western Australia, legislation exists to protect both Indigenous and non-Indigenous cultural heritage. The Aboriginal Heritage Act protects sites and objects used by, or traditional to, the original inhabitants of Australia. All Aboriginal sites and objects are protected, including those sites not yet registered with the Department of Indigenous Affairs. Under the Act, it is an offence for anyone to alter in any way an Aboriginal site or object without the relevant Minister's permission.

The *Heritage of Western Australia Act 1990* provides for the registering and protection of places of historic interest as 'heritage places'. Places listed under the Act are afforded statutory protection and must not be damaged or altered unless a permit to do so has been granted by the Heritage Council of Western Australia. The Act also requires local government authorities to maintain an inventory, referred to as the 'Municipal Inventory', of places of heritage significance in their area. The Department's draft Policy Statement – *Management of non-indigenous cultural heritage on lands and waters managed by the Department of Conservation and Land Management* provides further guidelines for managing non-indigenous cultural heritage.

Many places may have some historic interest, but may not have been assessed or are not considered significant enough to be worthy of listing under legislation. However, these places are entered on the Department's 'Recreation and Tourism Information System' (RATIS) database. In the pursuit of best practice in cultural heritage management, it is important that the listed sites contained in all aforementioned registers and databases is considered prior to any management operations. To maintain expertise of Regional and District staff in heritage identification and management training or information days will be held where necessary.

24. INDIGENOUS HERITAGE

The entire Collie River, from its source to the Leschenault Inlet, is considered to be sacred and is a registered mythological site under the under the Aboriginal Heritage Act. The local Noongar people believe that this site is connected to Ngarngungudditj Walgu, who is said to be a mythical being with a 'water snake' or serpentine physical manifestation.

Ngarngungudditj Walgu is thought to have come from the north-east and created the Collie River, the hills of the Collie River valley and the Leschenault inlet, before travelling back up the Collie River to rest at Minninup Pool. For this reason, local Noongar people, have been consulted extensively over management along the lower Collie River valley, and in

particular along Lennard Track (see Section 27 – Visitor Access and Section 28 – Recreational Use – Camping). Five other sites, listed as interim registered sites under the Aboriginal Heritage Act, are located within or adjoining the planning area. More information is required about these sites to be placed on the permanent register.

As the register is not a comprehensive listing of all sites, assessments are necessary prior to any operations where there is potential to inadvertently damage sites. Appropriate approvals under the Aboriginal Heritage Act are required to proceed with any public works[11] that may affect indigenous heritage values.

It is through registered sites and sites of significance to Noongar people that they can rediscover their heritage and develop a reattachment to the land. Aboriginal interpretation of their culture is important within the planning area and should be considered at riverside settings along the lower Collie River (see Section 43– Information, Education and Interpretation). Participation of Aboriginal people in promoting cultural heritage to visitors could be encouraged, and facilitated through the provision of commercial concessions (see Section 31 – Commercial Operations). Further participation of Aboriginal people in the management of the planning area is described in Section 8 – Management Arrangements with Aboriginal People.

There is currently one registered native title claim in the planning area (i.e. WAG6274_98 Gnaala Karla Booja).

Aboriginal Use and Occupation

There is physical evidence that Aboriginal people have occupied the jarrah forest of Western Australia for over 6000 years (Harris and Goode 2002), although it is possible that they may have used the area for much longer. Tilbrook (1983) suggested that at least 13 different socio-linguistic Aboriginal groups existed in the south-west. These groups shared traditions and a common language, albeit with local variations, and are collectively known as Noongars. The word Noongar, or its linguistic equivalent, is identifiable as the word for indigenous person from the region, even though they may have different vocabularies. Aboriginal occupation of the Collie area is thought to have encompassed two distinct socio-linguistic communities: the Kaneang and the Willman, whose boundaries intersected at the Collie River (Goode and Rundin 2002, Tindale 1974).

Occupation of the jarrah forest was transient, with family groups migrating seasonally from the coastal plain in the winter months, when travel and camping on the coast were difficult due to large areas of inundation. At these times it is thought that Aboriginal people dispersed into smaller groups and moved inland, possibly along the Collie River (Martinick 1994). During summer, Aboriginal people would exploit food resources on the coast such as fish, waterfowl, turtle, frog and a variety of vegetable foods. In winter, they moved to the jarrah forest where game such as kangaroo, wallaby, possum, bandicoot, quenda and emu were plentiful and vegetable foods, especially yams, became available.

Noongars employed a mobile lifestyle, moving in a pattern that coincided with the availability of resources and tribal boundaries. Family groups usually travelled along defined paths of easiest access through the forest, known as *bidi* (Goode and Rundin 2002). These were often located along river systems such as the Collie River where seasonal food supplies were more abundant and pools offered a supply of potable water. It is likely that these and surrounding areas would have been used for camping, hunting, collecting plant food and producing wooden utensils (Harris and Goode 2002).

Noongar people used a deep understanding of the land, its attributes and behaviour to make it easier to acquire food, medicines and the requirements for life. In particular, fire was used to create successional changes in vegetation, thus affecting the productivity of an area for hunting and gathering and ease of movement (Hallam 1975). Noongar people lived and cared

[11] A public work may include buildings or fixed structures, roads, railways, bridges, water bores or well or any major earthwork.

for the land with one basic and important understanding – people were in no way separate from the environment.

24 – Indigenous Heritage

Key Points:

- There is evidence that Aboriginal people have occupied the jarrah forest of Western Australia for over 6000 years, although it is possible that they may have used the area for much longer.
- The entire Collie River from its source at the Leschenault inlet is a registered mythological site under the under the Aboriginal Heritage Act. Five other sites are interim registered under the Act. This act protects all Aboriginal sites including those sites not yet registered with the Department of Indigenous Affairs.
- The hunting, gathering and camping lifestyle of Aboriginal people is an important part of their culture.
- The planning area is an important place for Aboriginal people and they have a strong desire to be involved in future management.
- There is currently one registered native title claim in the planning area (WAG6274_98 Gnaala Karla Booja).

The objective is to protect the Aboriginal cultural heritage and cultural resources of the planning area.

This will be achieved by:

1. complying with provisions of the Aboriginal Heritage Act and other relevant legislation prior to commencing any potentially damaging operations;
2. on an ongoing basis, consulting with local Aboriginal people and relevant site registers/databases, and, where necessary, prevent damage to culturally significant places and objects;
3. incorporating interpretation of Aboriginal cultural heritage into the communication plan of the planning area (see Section 43 – Information, Education and Interpretation); and
4. consulting with local Aboriginal people to identify areas for Aboriginal cultural and ceremonial purposes based on traditional occupation and use.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
24.1 The number of registered heritage places protected	24.1 No disturbance of a registered place without formal approval	Annually

25. NON-INDIGENOUS HERITAGE

European settlement and occupation of the region occurred in 1829 when Dr Alexander Collie and Lieutenant William Preston explored the area and located the mouth of the Collie River at the Leschenault Inlet (Williams 1979, Staples 1979). Further exploration of the Collie River occurred a year later when Lieutenant Governor Sir James Stirling travelled approximately 26 km up the river before proceeding overland and past Mt Lennard. In this expedition, the land abounding the rivers and foothills of the ranges was recognised as having potential as agricultural land. By the late 1880s, the area around Collie was recognised for its coal resources (Hocking planning and architecture 1995) and by 1897 the town of Collie was declared and contained a population of approximately 300 people (Dames and Moore 1987). The town grew to be one of the most important mining towns in the State, supplying coal for power production in railways, shipping and in 1961, for the generation of electricity. Exploration and mining for coal and other mineral resources still continues today.

Over the years, there have been several mining companies in the Collie coal basin, with the earliest, Collie Commercial Coal Mining Company, commencing operation in the early 1890s

(Stedman 1988). Underground mining ceased in 1994, being replaced by large open cut mines. Following the discovery of coal and the development of transport facilities to service the coal mines, the increased infrastructure stimulated the timber industry, accelerating demographic growth and diversifying enterprise (Williams 1979). People came to the area seeking employment and by the 1940s timber production around Collie employed 310 people (Hocking planning and architecture 1995). Sawn timber was produced in abundance, with many timber mills established in the surrounding district, particularly adjacent to railway sidings. The major mills in the region were Lyalls (now Bunnings), McCluskeys (now Jones), Worsley (now Millars), Harris River (now Bunnings) and Buckinghams. These mills provided timber to the underground mines and wooden sleepers for railways locally and overseas. Two mills, Sotico (previously Bunnings) and Saunders began operation in the 1930s and 1940s and are still in operation today. Several smaller, transient mills, known as 'spot mills', were also used throughout the forest to cut timber into a manageable size. Formation alignments of old rail routes used to transport logs from the forest to saw mills can be found in the planning area. In particular, the former Gervasse forest block contains a number of spot mills, an old townsite and other remnants of forestry operations, such as log ramps and saw pits.

In 1931, construction began on the Wellington Dam as part of the unemployment strategies undertaken during the Great Depression. The Dam was the headworks for the Collie Irrigation Scheme and at the time of its construction, was the largest dam in Western Australia. In 1945 it was proposed to raise the height of the wall to increase capacity and the dam was consequently emptied and the original rock wall replaced with concrete. To meet increasing demand, the dam wall was raised a further 15 m in 1955, to reach 34 m and a current capacity of 186 GL. Local, regional and State communities value the Dam and surrounding environment for its historic significance and as a place to visit for water recreation, walking and picnicking activities.

The history of European settlement in the region has given rise to several notable places of historic significance, although there are no places within the planning area that are listed under legislation or the *Register of National Estate*. Nevertheless, interpretation of these places can assist in maintaining a sense of place and informing visitors about an area (see Section 43 – Information, Education and Interpretation).

25 – Non-indigenous Heritage

Key Points:

- The Department manages non-indigenous cultural heritage according to the Heritage of Western Australia Act and the Environment Protection and Biodiversity Conservation Act. In addition it is guided by the draft Policy Statement – *Management of non-indigenous cultural heritage on lands and waters managed by the Department of Conservation and Land Management* and the Burra Charter.
- European settlement and occupation of the region occurred in 1829 when Dr Alexander Collie and Lieutenant William Preston explored the area and discovered the mouth of the Collie River at the Leschenault Inlet.
- Collie grew to be one of the most important mining towns in the State, supplying coal for power production in railways, shipping and the generation of electricity. The introduction of railways, mines and timber mills bought people to the area seeking employment and were the impetus for the establishment of infrastructure and development of small business.

The objective is to conserve the non-indigenous cultural heritage of the planning area.

This will be achieved by:

1. protecting and maintaining non-indigenous sites of cultural heritage significance according to State and Commonwealth legislation and the Burra Charter;

2. identifying where possible, areas of non-indigenous cultural heritage based on historical occupation and use;
3. progressively updating and collating information on cultural heritage sites located in the planning area and maintain a current register of sites on the Department's RATIS database;
4. consulting registers listed in the draft Policy Statement and consider any cultural heritage management requirements prior to undertaking any operations or works;
5. conducting training and/or information days when required to maintain expertise of South West Regional and Wellington District staff in heritage identification and management; and
6. incorporating information and interpretation of non-indigenous cultural heritage into the communication plan of the planning area where this is appropriate to the management of the site and resources permit (see Section 43 – Information, Education and Interpretation).

PART E. MANAGING VISITOR USE

It is recognised that the public conservation estate managed by the Department has the capacity to provide a significant portion of the public's growing demand for outdoor recreation and tourism, in particular 'nature-based' tourism. In doing so the conservation estate contributes significantly to the social, psychological, physical and economic wellbeing of the community. In relation to the latter, an assessment of the economic value of recreation and tourism was undertaken for the southern forests between Manjimup and Walpole (Carlsen and Wood in prep.). This assessment found that:

- 80% of visitors rated the natural environment as the primary reason of their visit;
- 90% visitors activities were nature-based; and
- 95% of visitors ranked the forest as important in attracting them to the region.

Visitor expenditure in this area was found to be in the order of $89 per person per day.

Even though the Bunbury-Wellington planning region, which includes forests of the planning area, was not included in this study, it features many of the same characteristics listed above. Consequently, it is possible to apply the same criteria to give an indication of the economic value of recreation and tourism in the region, based on a conservative spend profile of $60 per person per day (far less than the $89 in the original study). Economic value is therefore calculated by multiplying the number of overnight visitors to the region per year (468 200[12]) by the spend profile per person per day (estimated at $60), the average length of stay in the region (3.7 days) and the expenditure attributed to national parks and forests (88%). This gives an economic value of the planning area of approximately $91 million. As a consequence, the proposals in this management plan and the Department's subsequent management activities are important to the wellbeing of the regional economy.

The number of visitors to the State's reserve system has increased markedly over the past decade, from 4.8 million visits in 1992–93 to over 10.2 million in 2002–03. The reason for such significant human interest is simple: the estate managed by CALM covers an area of more than 24 million ha of lands and waters protecting unique landscapes, geological formations, plants and animals, and cultural sites. Conserving these lands and waters for future generations, and managing them for use by the present one, is a complex process. Firstly, public expectations for recreation and tourism are as diverse as the environments the Department manages. Secondly, whilst the public conservation estate brings many benefits to the community as well as the environment, the desire to interact with these unique environments can lead to unacceptable impacts on the natural environment. This part of the management plan addresses these issues, and at the same time ensures that visitors gain an appreciation and understanding of the area's values which should, in turn, foster an appreciation and understanding of conservation.

The Department's re-drafted Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation) (CALM 2003) outlines the Department's principles, operational guidelines, procedures and administrative controls in relation to facilitating recreation and tourism on the public conservation estate. This management plan follows these policy guidelines where applicable.

The Department is also obliged to protect water quality as part of managing recreation and tourism within the planning area. Guidance for managing recreation in existing and proposed public drinking water supply areas is provided for by the DoE's *Water Quality Protection Policy 13 – Policy and Guidelines for Recreation within Public Drinking Water Source Areas*

[12] Visitation data is calculated for 2004 and supplied by Tourism Western Australia. It is current as of February 2005.

on Crown Land.

In addition, it must be noted that the State Water Strategy, released in February 2003, recognises that the primacy of water quality in drinking water supply catchments will be used to guide catchment management decisions (Government of Western Australia 2003c). This means that in a catchment where a public drinking water source exists, or may be developed, it is important to ensure, through the application of appropriate catchment protection measures, the long term quality of any drinking water source within the State.

26. RECREATIONAL OPPORTUNITIES

Regional Recreational Context

The planning area is located in Tourism Western Australia's South West Region, the most visited area of the state. It is situated near the main travel route from Perth, which is about a two-hour drive away, and is close to the major population centres of Bunbury and Collie. It also has links to the Ferguson and Preston river valleys, where visitors currently enjoy many wineries and scenic drives. The planning area itself contains attractions such as the Wellington Dam and reservoir, Wellington Discovery Forest, King Jarrah, the scenic Lennard Drive, the Potters Gorge day-use area and popular camping sites such as Honeymoon Pool. The Wellington Reservoir itself was originally used to supply the GSTWSS but was made available for non-motorised water sports in 1990 due to unacceptable water quality, and is now the primary attraction for visitors and a focal point for recreation.

Most recreational activities offered within the region focus on water bodies such as reservoirs, lakes and rivers, or in the surrounding forest. Some water bodies, such as Stirling, Harris, Beela and Sampson Brook dams and the Wellington Reservoir, are proclaimed as public drinking water source areas under the Metropolitan Water Supply, Sewerage and Drainage Act or the CAWS Act. These reservoirs operate as part of an integrated water supply system that supplies towns of the south-west of the State, the Perth metropolitan area, Kalgoorlie and towns along the Mundaring-Kalgoorlie pipeline.

In proclaimed catchments, restrictions are placed on recreational activities to protect water quality for drinking purposes. In sources proclaimed under the Metropolitan Water Supply, Sewerage and Drainage Act, a reservoir protection zone of 2 km width from the top water level, that excludes public use and access around the water body, is mandatory. At the time of printing there are no provisions for a similar zone to be created in sources proclaimed under the CAWS Act, although the Act's by-laws are under revision to achieve consistent by-laws for metropolitan and country sources. Certain recreational activities, especially those associated with direct human contact with the water, such as swimming, are not supported by the DoE, the WC, and the Department of Health, and may therefore be restricted or prohibited when the Reservoir becomes a drinking water supply. Other activities, such as camping, non-motorised boating, fishing and marroning may also be restricted or prevented under the CAWS Act by-laws where the water source is a strategic resource and the Reservoir becomes a drinking water supply. As a consequence, visitors have been displaced from public drinking water catchments and seek opportunities elsewhere within the region, increasing pressures on existing facilities. The planning area receives some of these visitors.

Some recreational opportunities have become limited or restricted across the region. White water canoeing is one activity that is available along the lower Collie River but elsewhere is restricted to the Murray River and portions of the Harvey River. Flat water canoeing is also available along the Murray River and at the Harvey Dam. The planning area is one of two areas within the region where flat water canoeing exists in the absence of motorised boating. Camping areas are widespread throughout the region but there is a high demand and shortage of designated sites in river settings, with the exception of Lane Poole Reserve. Activities associated with river settings, such as marroning and fishing, exist across the region but have reached their capacity in many river systems. South of the planning area, opportunities for recreation in river settings are restricted to sites along the Margaret River, St John Brook and Blackwood River.

Outside the planning area, there are few designated walking tracks within the region, particularly in the Stirling-Harvey catchment. The most recognised walk track that traverses the region is the Bibbulmun Track, which stretches almost 1000 km from the outskirts of Perth to Albany on the south coast. Other forms of track use, such as horse-riding, occur across the region on an ad hoc basis.

Forested catchments such as Waroona Dam, Logue Brook Dam, Glen Mervyn Dam, the upper Murray River and Stockton Lake are not proclaimed public drinking water supply areas and currently offer opportunities for waterskiing and power boating, which are not available within the planning area. In developing viable water sources for the IWSS and GSTWSS, some of these water bodies and other areas used for recreation, may be desired as public drinking water sources in the future, placing additional pressures on the planning area. Visitor pressures may also come from overflow from nearby areas such as the Lane Poole Reserve. Where a water body is proposed as a future drinking water source, a publicly consulted DWSPP would be developed by the DoE to determine the existing risks and what action would be needed to address those risks to make it suitable for the supply of drinking water.

Visitor Numbers and Trends

Visitors to the planning area undertake a variety of activities including picnicking, swimming, fishing, marroning, white water canoeing, sailing, mountain biking, bushwalking, horse-riding, abseiling, scenic and four-wheel driving and camping. Surveys indicate that the most popular activities are bushwalking, swimming, camping, canoeing and white water rafting, while observations by managers suggest particular growth in recreational activities such as four-wheel driving and mountain biking. Many of these activities are associated with a variety of river and reservoir settings, which are in high demand. Local visitors have undertaken these activities for many years and have strong attachments to the area, particularly informal campsites along the backwaters of the Wellington Reservoir. Nevertheless the DoE and WC believe that many of these activities are incompatible with best practice for water source protection.

Visitation to the planning area displayed an increasing trend over the past 10 years, peaking in the 1999–2000 financial year when the Wellington Reservoir overflowed and up to 145 000 visits[13] were recorded. Observations from park rangers suggest that figures for the planning area underestimate the true number of visits, as road counters used to collect the data are largely confined to Wellington Dam and Falcon roads, and exclude other entry points of potentially high usage, particularly around the Wellington Reservoir. Further monitoring along Connell Road will indicate to managers the popularity of camping sites around the eastern portion of the Wellington Reservoir. Similarly, counters along Lennard Drive, River Road and Tom Jones Drive will provide managers with a tool to assess the level of use at Honeymoon Pool and Potters Gorge camping and day-use areas, as well as the correct use of one way roads.

The main period of visitation is in the summer months between October and April, with peak visitation in April. At these times, and especially during school holidays, holiday weekends and the marron season, recreation sites are filled to their designed capacity and visitors spill out of formal camping areas into informal sites. Spring is a popular time for activities such as scenic driving because of mild weather conditions and wildflower displays. In summer and autumn the Collie River and the Wellington Reservoir are the focus of activity, with water-based recreation prominent. This is also the time when there would be the greatest draw for public drinking water supply purposes. In the winter months, the Dam is a focus for activity, particularly when it overflows. Lookouts, parking areas and roads near the Dam are constantly and heavily used by sightseers. Whilst it is thought that many of these visitors live

[13] A visit is the number of people per day visiting a specific location. The visit figure comprises both recorded numbers of visits from traffic counter devices, surveys and other data sources as well as estimated numbers of visits based on field observation.

locally, visitor surveys indicate that the highest proportion of visitors travel from Perth and are in the in the 40-59 year age bracket.

Due to rising visitor numbers, the capacity which many recreation facilities in the area were designed is frequently exceeded. Damage from vandalism and theft is also common at recreation sites in the planning area.

Planning for future services and facilities is directly linked to the proposed visitor management setting for a given area, and the predicted level and type of visitation. Visitor satisfaction levels are monitored at selected sites throughout the planning area using the Department's standard Visitor Satisfaction Survey. Although limited in the planning area, surveys have enabled trends to be identified and satisfaction levels compared to other areas of the State. This is an ongoing process that can be utilised to plan for visitor management.

Visitor Management Settings

Typically as the use of natural areas such as national parks and conservation parks increases, resource conditions can change until the character of the setting is modified to a point where it no longer has the attributes that originally attracted people to the area. The initial users are then displaced by other people who are more tolerant of the changed resource conditions with the process continuing until perhaps all the opportunities being provided within a natural area are of a similar developed nature. The Department and Conservation Commission proposes the use of 'visitor management settings' to manage recreational succession in natural areas such as national parks and conservation parks.

The provision of visitor services, facilities and experiences in the planning area should be determined in the context of the range of opportunities available in neighbouring parks and forests across the Department's South West Region. The Department and Conservation Commission aims to provide visitors with a wide range of nature-based experiences within this area whilst ensuring that impacts on the environment are managed within acceptable limits. In doing this, visitor management settings have been applied to the planning area. Map 8 shows these settings whilst a description is given in Appendix 8. This description is generalised for use across the whole State and as such the placing of a setting over an area does not necessarily mean the full extent of the setting has to be met. For example, not all the types of access or facilities within a Developed or Recreation setting may be provided within the planning area, such as a visitor centre or built accommodation within a Developed setting or two-wheel drive access and basic shelters in a Recreation setting.

The system of visitor management settings is intended to guide the Department and Conservation Commission in determining what sort of recreation development may be appropriate within the settings. It is expected that this system will prevent the 'natural' sections of the planning area being subjected to incremental development. This application of visitor management settings within the planning area is consistent with the Department and Conservation Commission's Statewide approach.

Within the planning area, portions of the Wellington Reservoir have been designated as Natural-Recreation. These settings are indicative and will be refined for the final management plan once the location of suitable campsites and associated access is determined.

Outside the planning area there are also a number of different settings, such as pine plantations, that have the potential to support recreational use and provide an alternative option that will take pressure off the planning area.

26 – Recreational Opportunities

Key Points:

- The planning area is quickly and easily accessible from the major population centres of Bunbury and Collie and lies near the main travel route linking Perth to the south-west of

the State. It also has links to the Preston and Ferguson river valleys, adding to its tourism potential.

- Visitor surveys indicate that the most popular activities are bushwalking, swimming, picnicking, camping, canoeing and white water rafting while activities such as four-wheel driving, mountain biking, marroning and fishing are also popular.
- Visitation to the planning area is steadily increasing. The planning area may come under additional pressure from visitors displaced from water bodies such as Stirling, Beela and Samson Brook dams, which are situated within proclaimed drinking water catchments and have reservoir protection zones that exclude public access.
- Recreational succession can be minimised by assigning visitor management settings. These settings guide recreation developments for the planning area.
- Wellington Reservoir is a proclaimed public drinking water catchment and was formerly used as a drinking water supply until 1990 when the Reservoir became too saline. Since then it has been used for recreation and is a primary site for visitors. Subject to the success of Government's salinity recovery work for Wellington Reservoir, the source will again be used as a drinking water source by 2017 (or sooner if the currently dry climate circumstances worsen).

The objective is to provide the visitors with a wide range of nature-based experiences whilst ensuring the impacts on the environment and water quality are managed within acceptable limits.

This will be achieved by:

1. ensuring future recreational development is guided by the visitor management settings as shown in Map 8 and criteria in Appendix 8;
2. ensuring land and water-based activities in the planning area and on the Reservoir are managed so that the risks to public, environment and public health associated with water quality are acceptable; and
3. ensuring land and water-based activities in the planning area consider the planned future use of Wellington Reservoir as a drinking water source. This will be based upon the findings of the DoE's DWSPP (expected to be completed in 2005).

27. VISITOR ACCESS

Lands and waters entrusted to the Department are generally open to public use. There are some areas where public access is restricted for reasons of safety, cultural sensitivity, disease control, protection of high conservation values and water quality, or maintenance of roads and tracks.

Demand for access to the planning area comes from a variety of sources:

- visitors who require good quality access to their favourite area;
- local landholders wanting access to their property;
- service providers who require access to maintain infrastructure;
- different recreational users wanting different types of access; and
- managers who require access for management purposes.

The planning area has a high level of accessibility, with public access available to two and four-wheel drive vehicles via sealed and unsealed public roads and tracks. Fully satisfying the demand for access could compromise the values of the planning area. For example, increasing or improving access could lead to incremental changes to visitor management settings, and cause degradation of the environment and cultural values unless there is a concomitant increase in management effort. Therefore access needs to be carefully managed in consultation with visitors and according to the proposed visitor management settings (see Map 9).

The lower Collie River valley and Wellington Reservoir foreshore are already at capacity and access to these areas needs to be controlled. Indicative access tracks to the Wellington

Reservoir are indicated on Map 9. The final location of these tracks requires more detailed site assessment of both tracks and suitable campsites. These will be determined within 1 year of the commencement of the final management plan, which will allow the findings of the DoE's DWSPP to be considered. The activities associated with the different types of access are detailed in Section 28 – Recreational Use. Access to the former Lennard forest block is also a concern as the area is experiencing increased visitor use from a wide range of activities.

Two-Wheel Drive Vehicle Access

Two-wheel drive access to the planning area is focused on ensuring safe and enjoyable access to major developed visitor facilities such as Wellington Dam, Potters Gorge, Honeymoon Pool and popular day-use sites located along Lennard Drive. Facilitating access to the Wellington Dam precinct is a particular focus as this is the main area visited by tourists and an ideal location to provide information on the planning area, its attractions and tourism within the region. The Vehicle Access Strategy for the planning area is listed in Appendix 10 and pictured in Map 9.

Two-wheel drive access to major visitor facilities is provided from the north and the south of the Collie River, thereby enabling convenient access for visitors from the Dardanup and Collie Shires, as well as people travelling from Perth and Bunbury. North of the planning area, the primary access route is Wellington Dam Road, which branches off the Coalfields Road to provide sealed, all weather access to the Wellington Reservoir. This route is the main conduit for visitors from Perth and Collie. From the south, visitors can access the Reservoir via Falcon Road, which branches off Pile/Mungalup Road. Pile/Mungalup Road also provides an alternative route to the Ferguson River valley, the planning area and State forest, primarily for visitors on their way to Collie (see Section 28 – Recreational Use). These roads receive high visitor use and are the primary access routes to the planning area. As a result, they have been recommended for upgrading under the Roads 2020 Regional Road Development Strategy and should be maintained and developed accordingly (see Roads 2020 Regional Road Development Strategy below).

Access from the north and south of the planning area enables roads, such as the scenic Lennard Drive, to be easily reached. Lennard Drive has been designated as a one-way road to preserve its highly valued driving, picnicking and water-based recreational experiences and due to the high costs of upgrading it to a safe two-way road. Scenic drive opportunities are available along this road with visitors able to return to Wellington Dam in a loop via River Road and the Honeymoon Pool camping and day-use area.

Recreation sites such as the Wellington Discovery Forest and King Jarrah can be accessed by two-wheel drive via Wellington Forest Road and King Tree Road respectively. These roads provide a link to Pile and Falcon roads and their sealing would facilitate links to all major recreation developments as well as links to the Ferguson River valley. Two-wheel drive access can also be gained along Lennard Road where several mountain bike tracks originate. The eastern part of Wellington National Park and western part of Westralia Conservation Park can be accessed via Connell Road and Flora Road. Flora Road has the potential to be upgraded, thereby improving access to the upper Collie River (see Section 28 – Recreational Use). From Collie, the main road connecting these areas from the south is Mungalup Road.

Several easements also traverse the planning area, all with associated roading. The Harris-Wellington pipeline runs to the north of the planning area along the eastern side of Wellington Dam Road before traversing the Wellington National Park on its way to the Harris Dam. Several electricity transmission lines intersect the area including the Picton-Collie line along the Coalfields Road, the Muja-Bunbury line near Pile Road and the Muja-Southern Terminal, which cuts across the western edge of the Westralia Conservation Park (see Section 38 – Public Utilities and Services). Thirteen permanent fire appliance refilling points (small dams or wells) also exist for fire management and require access. Many of these are already located along existing two-wheel drive roads. Furthermore, access is also required to a

number of research plots within, or adjacent to the planning area, most significantly the CSIRO Salinity Research Plot off Wights Road. Access is also required for commercial operators who lease areas within the planning area (see Section 31 – Commercial Operators).

Enclaves of private property located within the planning area are accessed via the Coalfields Road and tracks branching from it, as well as Wellington Dam Road, Polo Road, Windy Ridge Road and Beela Road. Mining lease M70/271, which is an enclave within Wellington National Park, requires access along an existing track. This track is to be rehabilitated after use unless it is required for other management purposes by the Department.

Two-wheel drive access to the Wellington Dam precinct is being realigned to improve safety, visitor experience, to allow expansion of parking and to minimise maintenance requirements.

Care needs to be taken at all crossings of streams that flow into the Reservoir and the Collie River upstream of the dam wall. Erosion of roads and tracks can lead to an increase in turbidity of water flowing to the dam, while leakage of fuel and oil can also lead to hydrocarbon contamination of the water body. Increase in turbidity can also mask the occurrence of *Cryptosporidium* and *Giardia* and reduce the effectiveness of treatment.

Roads 2020 Regional Road Development Strategy

The Roads 2020 Regional Road Development Strategy (Main Roads Western Australia 1997) identifies proposed road developments in the south-west (Table 7).

Table 7 – Roads 2020 Regional Road Development Strategy

Road	Development Strategy	Proposal*
Coalfields Road	Improve road geometry to allow for anticipated traffic growth	Improve to a Type 6[14] sealed road standard
		Construct a dual carriageway or 4-lane road
Mungalup Road**	Improve roads to a consistent standard to cater for the mix of tourist and commercial use	Upgrade approximately 4.5 km to Type 4[15] sealed road standard
Pile Road**	Improve roads to a consistent standard to cater for the mix of tourist and commercial use	Realign, widen and seal to Type 4 sealed road standard
Wellington Dam Road**	Improve roads on crests and curves to achieve satisfactory sight distances	Upgrade to Type 5[16] sealed road standard
Falcon Road**	Improve roads to improve sight distances and cater for current traffic and forecast growth	Upgrade to Type 4 sealed road standard

* Road proposal recommendations of the Roads 2020 Regional Road Development Strategy describe proposed road upgrades in terms of eight service levels ranging from Type 1 – unformed roads with minimum construction to Type 8 – dual carriageways.

** Road managed by the Department

Typically, these roads are major traffic routes of strategic importance and are expected to have high usage in the future. For example, Coalfields Road that borders the planning area to the north, is used primarily for regional transportation and is the most heavily used road of the planning area. The Dardanup and Collie Shires recognise the values in Pile, Mungalup and Wellington Dam roads in terms of nature-based tourism and have contributed previously to their maintenance.

When implementing road developments, the Department or Main Roads Western Australia undertake the necessary environmental impact assessments to satisfy the requirements of the Environmental Protection Act, the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and the Wildlife Conservation Act. The Department, in consultation with the Conservation Commission, should also consider the principles of visual landscape

[14] Type 6 roads are sealed roads with extra seal width than Type 5 roads to improve safety, reduce maintenance costs, provide space for a stationary vehicle to stand clear of traffic lanes and to assist cyclists.

[15] Type 4 roads are sealed roads designed to improve road user comfort and safety with higher traffic volumes.

[16] Type 5 roads are sealed roads with extra seal width than Type 4 roads to cater for higher traffic volumes and a high proportion of heavy vehicles.

management where practicable and provide advice to Main Roads Western Australia as to how this can be best incorporated into any developments.

Four-Wheel Drive Vehicle and Trail Motorcycle Access

Ownership of four-wheel drives has increased significantly in recent years and subsequently a growing number of people are enjoying this type of activity. In 1973 there were 2000 new four-wheel drives sold in Australia, a figure that has risen to 180 103 in 2002 (Federal Chamber of Automotive Industry figures). Sales of new four-wheel drive vehicles in Australia have increased by 31% over the last 5 years. The 4WD Association of WA states that there are almost 200 000 four-wheel drives registered in Western Australia alone.

Many four-wheel drive users are attracted to the isolation, peaceful bush settings, scenic driving opportunities and sense of freedom associated with travelling on tracks that, by virtue of the more difficult access, are less visited and offer a different quality of experience. Typically these tracks include scenic viewpoints, rugged landscapes and picturesque settings. Within the planning area four-wheel drive use is most common in the lower Collie River valley, portions of the former Gervasse Block and in the backwaters of the Wellington Reservoir. Trail motorcycle use is particularly evident towards park boundaries in areas such as the Westralia Conservation Park, throughout the former Lennard Block and nearby to adjoining subdivided land. Most tracks are not maintained on a regular basis and use may lead to environmental degradation and the spread of weeds and disease.

Lennard Drive, west of River Road (also known as Lennard Track), is a favourite area for four-wheel driving as is Sneaker, Goat, Goon and Lookout roads and the track along Sailor's Gully (see Map 9). However, heavy use and increasing traffic volumes, combined with steep slopes and erodible soils, is accelerating erosion and has seen the condition of many tracks deteriorate (see segment on Erosion in Section 22 – Soil and Catchment Protection, Erosion). Specific management of these tracks is therefore required to minimise these impacts.

Lennard Track, because of its relatively natural state, steep slopes, sensitive vegetation types and proximity to the Collie River (a registered Aboriginal heritage site) will require specific management to prevent further degradation (see Part C – Managing the Natural Environment and Section 24 – Indigenous Heritage). Currently, the environmental damage caused by the use of the Track (primarily by inappropriate four-wheel drive use combined with camping adjacent to the Collie River) is not sustainable/appropriate and cannot continue. Camping in particular cannot be sustained in the long-term without major site hardening (including engineering works) and a significant change to visitor experiences, which will change the relatively 'undeveloped' nature of the area (see Section – 25 Recreational Opportunities). Since developed sites already exist at Honeymoon Pool, camping along the Track will be discontinued. The local Aboriginal people also desire camping to be discontinued, as it will minimise disturbance to the registered heritage site. However, alternatives for semi-remote camping will be identified elsewhere within the planning area (see Section 28 – Recreational Use–Camping).

To address continued access, Lennard Track will be closed seasonally[17] (on a trial basis) to see if this can protect the environmental values. If not, access may be restricted to a permit system or the Track closed, either temporarily or permanently. To maintain any access, small-scale day-use facilities (e.g. for car parking and river access points), would need to be provided to manage visitor use and minimise impacts on the natural and cultural values. These would be sensitively designed in consultation with local Aboriginal people and constructed to be sustainable and appropriate to the visitor management setting (see Section – 25 Recreational Opportunities).

[17] Gates may be installed on tracks to be closed seasonally. These will remain open at all times except during periods when it is necessary to close the tracks, such as for environmental reasons, fire risk, management operations or emergency purposes.

Co-operative work between the Department, four-wheel drive clubs and Trackcare has also lead to rehabilitation and reinforcement of some of the other eroded tracks. However, with unrestricted use and no routine maintenance, some of these tracks can not be sustained in the long term for four-wheel drive activities and management intervention is needed. Where the values of the land are under threat (e.g. by disease, erosion or loss of vegetation) or an incident has occurred, tracks will be subject to seasonal closure on a trial basis. If these values continue to be threatened, access may be restricted to a permit system or the track will be temporarily or permanently closed to all public use or to selected classes of vehicles. Such roads are indicated in Map 9 and Appendix 10. Some roads may also be designated as being for management purposes only and therefore not available to public access by vehicle. These roads will generally remain open for management operations only, such as for fire management, strategic access for conservation or for evacuation purposes. Signposting and gates will be erected in disease risk areas and areas of restricted use.

In addition to access for recreational use, access to apiary sites must be maintained to support this enterprise. However, the potential risks to water quality from excessive runoff, and the spread of weeds and disease need to be considered in maintaining access routes. It is essential that these roads be maintained according to the relevant standards. Due to water quality concerns, road access close to the Reservoir should, where appropriate, be sealed, be buffered by vegetation and have appropriate drainage. Unmanaged roads can contribute to turbidity, especially if they cross a stream zone, and should be closed (see Appendix 10).

27 – Visitor Access

Key Points:

- Access to the planning area needs to be carefully managed in consultation with visitors to meet the criteria for the proposed visitor management settings and to ensure that environmental and cultural values are maintained. This will make sure that highly valued qualities of the setting, such as remoteness, are preserved and not subject to incremental changes.

The objective is to provide and maintain a range of access types consistent with maintaining or improving the values of the planning area.

This will be achieved by:

1. providing access as shown in Map 9 that is consistent with the criteria for the appropriate visitor management setting;
2. maintaining, upgrading, realigning, closing or rehabilitating roads and tracks as indicated in the Vehicle Access Strategy (see Appendix 10). In addition to those not identified in the Vehicle Access Strategy, rehabilitate tracks that are deemed unnecessary or if there is an adverse impact on the environment;
3. modifying access as required following the identification of protectable areas (see Section 21 – Disease);
4. in consultation with the local Aboriginal people, providing day-use facilities along Lennard Track that are sensitively designed, sustainable and appropriate to the visitor management setting (see Section 28 – Recreational Use, Day-use Facilities);
5. ensuring 'management only' tracks are effectively closed to the public;
6. determining final access routes to the Wellington Reservoir within 1 year of commencing the final management plan;
7. continuing to prohibit vehicles driving off established roads except by authorised persons in exceptional circumstances or to accommodate a particular event or activity. Approval of the District Manager is required;
8. liasing with Main Roads Western Australia where development is proposed in a road reserve adjacent to the planning area to ensure appropriate management with regards to flora surveys, *P. cinnamomi*, weeds, drainage control, visual amenity and rehabilitation;
9. ensuring that stream crossings of tracks are minimised and designed to reduce any possible impacts, including erosion;

10. providing information to users on appropriate four-wheel drive techniques and introduce a code of practice for driving on four-wheel drive tracks; and
11. monitoring the environmental impacts of four-wheel drive and trail motorbike use and take appropriate management action as required.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
27.1 Changes in the condition of Lennard Track and four-wheel drive tracks designated for seasonal closure	27.1 Track condition is maintained or improved from 2005 levels	Annually

28. RECREATIONAL USE

Society's demand for recreation and tourism opportunities in natural areas is reflected in the principal objectives and policies of the Department for managing recreational use. The Department's re-drafted Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation) establishes the following general principles to guide such activity:

- the values of the land as a whole should be maintained, and the natural ecosystems (including landscapes, particular sites, biota) should be able to sustain the form of recreation or ancillary activity that is occurring or proposed;
- recreational activity should be compatible with the vesting purpose of the reserve or the established land use priority. This includes existing categories of reserve, such as State forest, national park and nature reserve, but also includes allowance for new categories that may arise; and
- the widest range of activities consistent with the purpose of vesting should be allowed, but uses that impair other forms of use to an unreasonable extent or place the safety of other users in jeopardy, or are incompatible with appropriate water source protection measures, should be controlled or eliminated. The application of the 'visitor management settings' is often used to assist in this regard (see Section 26 – Recreational Opportunities).

The Department should be capable of providing any necessary degree of supervision of the activity, particularly where reserve values may be impaired, either directly or through the use of concessionaires. If this cannot be done the activity should be restricted, relocated or eliminated.

Recreational use within the planning area is shown in Map 10.

Active Recreational Use in the Planning area

Bushwalking

Bushwalking is an activity that is enjoyed by people of varying ages, interests and levels of physical fitness and mobility. In its various forms, bushwalking can encompass everything from a short, leisurely stroll to a major trek lasting days or even weeks.

The planning area attracts visitors to focal points such as the picturesque lower Collie River valley and Wellington Reservoir. Walkers commonly seek opportunities for half, one and two day walks, which can be carried out over the course of a day or weekend. Half-day or shorter walks in loops from recreation nodes are particularly popular for visitors as they can be combined with other activities such as scenic driving and picnicking. Locations that provide an assortment of these opportunities in the one area, and provide links to suitable accommodation and visitor facilities, are most desirable to walkers.

Several walks and tracks, covering approximately 70 km, are currently in place. These are summarised in Table 8 below and shown in Map 10. Walking is also available along public roads, management only tracks and tracks that are seasonally closed. Appendix 9 describes the Australian standards for walk tracks.

Table 8 – Walk Tracks in the Planning Area[18]

Walk Track	Approximate Length (km)	Visitor Management Setting	Current Status*	Proposed Status	Walk and Cycle Track
Existing Walk Tracks					
Quarry to Wellington Dam wall	0.2	Developed	Class 2	Class 2	No
Wellington Dam to Potters Gorge	1 (one way)	Developed	Class 2	Class 2	Yes
Jabitj Track (Running water track)	5.6 (one way)	Developed	Class 2	Class 2	No
Kurliny Tjenangitj Track (Come and see track)	5.2 (return)	Natural-Recreation	Class 3	Class 3	No
Wellington Discovery Forest (two tracks)	1.1 and 5 (return)	Recreation	Class 3	Class 3	No
Bibbulmun Track	965 (total track length)	Recreation	Class 4	Class 4	No
Sika Circuit	9.3 (return)	Natural-Recreation	Class 4	Class 4	Yes
Tynedale Track (former Bibbulmun Track circuit route)	39.8 (return)	Natural-Recreation	Class 4	Close	No
Lennard Circuit (former Bibbulmun Track circuit route)	24.3 (return)	Natural-Recreation	Class 4	Close	No
Proposed Walk Tracks					
Honeymoon Pool to the Wellington Dam (southern side of the river)	6.2	Recreation	Proposed walk track	Class 3	No
Wellington Discovery Forest Information centre to King Jarrah	5.2	Natural-Recreation	Proposed walk track	Class 4	No

* As defined by the Australian Standards for walk tracks.

Dual use walking and cycling tracks within the planning area exist from Wellington Dam to Potters Gorge and along the Sika Circuit (Table 8 and Map 10). These tracks are located in areas of high visitor demand and use, and provide a variety of recreation opportunities in areas where it is desirable to manage the impacts on the natural environment by confining visitor use to a single track. In the case of the Sika Circuit, dual use is applied to protect riparian vegetation, limit the number of unnecessary tracks and minimise erosion.

The existing network of tracks will be expanded, providing short to medium length walking opportunities by linking areas such as Wellington Discovery Centre and the King Jarrah day-use site. Informal walk tracks also exist along the southern side of the Collie River, linking day-use sites and providing paths for marroning and fishing activities. These paths are numerous in places and in some cases there are several different paths parallel to the River. These are to be consolidated and formalised into a single path with appropriate river access points. Formal access to the portion of the Collie River that runs through the proposed Westralia Interim Forest Conservation Area will also be provided. Walk-in only opportunities providing remote overnight stays for walkers will also be developed nearby to the Wellington Reservoir foreshore (Map 10).

[18] Informal walk tracks are not included in this table.

Opportunities exist for further walk tracks in the planning area, varying in distance, difficulty, accessibility and scenic environment. One opportunity is a two-day walk track that encompasses the Reservoir, connecting the Wellington Dam to the Bibbulmun Track and providing scenic views of the waterbody. This may also link up to canoe-in camping opportunities. A loop walk track around the Reservoir also provides a suitable alternative to the existing Tynedale and Lennard Circuit, which are not well used by visitors as much of their alignment follows roads. Such a track would need to consider water quality protection in its design.

Smaller walk tracks branching from designated access roads can also provide feature stop points along scenic drives, thereby taking advantage of spectacular views. Tracks emanating from recreation sites such as Potters Gorge may also provide the opportunity for the development of interpretive heritage tracks. An opportunity also exists to link the Wellington Dam to the Wellington Discovery Forest via a walk track. Walk tracks in the Wellington Discovery Forest may be expanded according to visitor demand. Such opportunities should be pursued if demand warrants it and resources are available.

The impact of bushwalking on the physical environment, while generally low compared to other recreation activities, can be quite variable depending on soil conditions, landform, vegetation type and intensity of use. Where use levels are high, bushwalking has the potential to lead to the loss of vegetation, spread of weeds and diseases such as *P. cinnamomi*, as well as localised soil compaction and erosion problems. Sensitive sites within the planning area are the riparian vegetation along streambanks, granite outcrops and wetland areas. Other impacts such as the introduction and/or spread of weeds and plant diseases may also occur. Usually these problems can be effectively minimised through the sensitive location and design of paths as well as adopting environmental codes of conduct such as those for the Bibbulmun Track.

28 – Recreational Use – Bushwalking

Key Points:

- Bushwalking enables visitors to experience the natural environment at close quarters.
- Approximately 70 km of walking tracks of three walking track classes (2, 3, 4) exist within the planning area, including the Bibbulmun Track, short interpretative tracks at the Wellington Discovery Forest and the quarry, Sika Circuit, Kurliny Tjenangitj Track and Jabitj Track.
- Although the impact of bushwalking on the environment is generally low, the spread of weeds and diseases such as *P. cinnamomi* can occur.

The objective is to provide a range of bushwalking opportunities appropriate to visitor management settings that do not adversely impact on conservation and landscape values.

This will be achieved by:

1. providing a range of bushwalking opportunities as shown in Map 10 that are consistent with the criteria for each class of track. Matching the class of each track to the appropriate visitor management settings should preserve the character of the setting and the attributes that attract walkers to the area;
2. constructing and locating all tracks in accordance with established planning procedures, environmental controls and standards;
3. introducing management controls including the temporary resting, realignment or closure of tracks where the intensity of walking threatens resource values or the enjoyment of other users;
4. applying the Bibbulmun Tracks 'Caring for Campsites and the Track' code of conduct for bushwalking in the planning area;
5. providing adequate information from which visitors can choose the walk best suited to their needs; and

6. ensuring any new tracks are located at appropriate distances from the Reservoir in accordance with the requirements of any delineated reservoir protection zone.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.1 The satisfaction that visitors express with their visit in relation to the use of dual use trails	28.1 Bushwalkers continue to be satisfied with tracks designated for dual use	Every 5 years

Cycling

Recently there has been extraordinary growth in cycling as a recreational activity, particularly the use of mountain bikes. At the time of writing, over 90% of all bikes sold in Western Australia were mountain bikes, indicating an increased demand for all-terrain cycling (Policy Statement No. 18 – *Recreation, tourism and visitor services*).

Mountain biking brings about considerable health benefits for users, enables closer interaction with the environment than is the case with motorised vehicles, and provides a relatively inexpensive means of accessing and exploring forest areas. Three mountain bike tracks have been developed in the planning area in a cooperative effort between the South West Mountain Bike Club and the Department (see Map 10). These include the Lennard Half Track (6 km) and the Lennard Full Circuit Track (9 km), which are the original focus of Mountain Biking in the south-west of Western Australia, and the Mill Brook Track (11.5 km). These tracks cater for beginners, having areas of easy riding as well as moderately steep sections. The Mill Brook Track is a return track that descends steeply into the valley along Sailor's Gully and, while offering riding of all levels of fitness and ability, is recommended for advanced riders. Connecting to the Lennard circuits is a mountain bike track along Pile Road. All of these tracks travel through jarrah forest and offer spectacular views of the lower Collie River valley. The Department and the South West Mountain Bike Club have developed codes of practice for cycling on the Lennard circuits.

In addition to, and linking to these tracks via public roads, is the Munda Biddi Bike Trail. This is the first long distance mountain bike trail to be constructed in Western Australia. The trail will be 900 km in length and start on the outskirts of Perth (Mundaring) from where it will wind its way through national parks and State forest of the south-west to Albany. It will use a network of bush tracks and old railway lines to link cyclists with many forest attractions and towns including Collie, Jarrahdale, Dwellingup, Donnybrook, Nannup, Manjimup, Pemberton, Northcliffe, Walpole, Denmark and Albany. At the time of publication, the Stage 1 of the trail from Perth to Collie has been completed. The Munda Biddi Bike Trail will connect to prominent features of the planning area such as the Wellington Dam and provide opportunities for camping that meet the needs of cyclists (see Map 10). As Lennard Drive is a one-way road, crossing the Collie River requires a separate two-way trail adjoining Lennard Drive.

Dual use paths for mountain bike use include the track from the Wellington Dam wall to Potters Gorge and the Sika Circuit. The latter would require further upgrading to better facilitate this activity.

Provided this activity is confined to public roads and cycle tracks that are appropriately located, designed and maintained, there are minimal impacts on the natural environment. However, possible environmental impacts include the spread of dieback, destruction of vegetation and soil erosion, which can lead to turbidity in connecting watercourses. Bicycles are also considered vehicles under the *Road Traffic Act 1974* and therefore are not to be ridden within Disease Risk Areas without a permit. Conflicts may also arise with walkers where there is multiple use. Such conflicts may increase in intensity as the popularity of

mountain bike riding increases. Where visitor satisfaction is unacceptable and interactions are occurring, consideration should be given to the introduction of separate facilities or, where segregation is impractical, to confining use to tracks that are specifically designed to be shared.

Bicycle riding, including mountain bike riding, will be permitted in the planning area on specially designated bicycle tracks and public roads, and with due recognition of the requirements of any delineated reservoir protection zone. Riding of bicycles off public roads or designated tracks will not be permitted. Bicycle riding may be permitted as a dual use on tracks designed and maintained for that purpose (see Table 8). Where specific single or dual use is designated, the tracks will be clearly signposted. Cycling events will be considered for approval on a case-by-case basis (see Section 28 – Recreational Use). Commercial bicycle tours and the operation of bicycle hire businesses may be permitted subject to normal licencing and approval processes.

28 – Recreational Use – Cycling

Key Points:

- Most bike sales in Western Australia are mountain bikes.
- Impacts are minimal on well-maintained tracks but may include damage to vegetation, soil erosion, conflict with other users or the spread of disease.
- The long-distance Munda Biddi Bike Trail is proposed to traverse the planning area, providing visitors of a range of age groups and cycling abilities with the opportunity to enjoy the forest environment. This will link to the existing Lennard circuits via public access tracks.

The objective is to provide opportunities for bike riding that do not adversely impact on conservation, landscape and other values.

This will be achieved by:

1. continuing to facilitate cycling on public roads and designated tracks in the planning area (see Maps 9 and 10);
2. upgrading, where resources permit, the Sika Circuit for cycle use;
3. monitoring the impacts of cycling and modify or restrict use if the activity is environmentally or socially unacceptable. Monitoring of this activity can be reviewed in year 5 of the management plan to assess its sustainability;
4. educating cyclists about the impacts on the environment and actions that can be taken to minimise these impacts; and
5. providing adequate information from which visitors can choose the tracks best suited to their needs.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.2 Changes in cycle track condition	28.2 Track condition is maintained or improved from 2005 levels	Every 5 years

Horse-riding

Horse-riding in natural bush settings is a popular recreational activity in the south-west. Riders come to these areas to enjoy the quiet of the bush and its unique scenery, the feeling of being in a remote place, and the challenge of different terrains and distance of rides.

The planning area has a history of recreational horse-riding, mainly on bush tracks and fire breaks/access roads south of the Collie River. In particular, horse-riding activities occur in the former Lennard and Davis blocks, the latter also being a designated disease risk area. Small numbers of recreational riders within the planning area also travel from Coalfields

Road down the Wellington – Harris Dam pipeline to Potters Gorge, and along the Sika Circuit. The Collie River Marathon, which has a horse-riding component, has been undertaken in the Westralia Conservation Park. This area also experiences recreational use from the Collie Pony Club. Other riding groups that are known to use the planning area include the South West Equestrian Club, and members of the Western Australian Endurance Riders Association. The latter have held events in the former Lennard and Davis blocks.

The Department's re-drafted Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation) states that horse-riding by individuals, equestrian clubs and commercial operators may be permitted in national parks and conservation parks where:

1. the activity is a pre-established use when the reserve is gazetted;
2. the environmental and social impacts are considered manageable; and
3. the activity does not conflict with other values, including water quality protection.

In all cases horse-riding must occur on designated tracks or in designated areas. The introduction of designated bridle tracks where demand necessitates will direct use away from biologically, physically and socially sensitive areas. Instead, use will be promoted in areas where soils are more stable, the vegetation is less susceptible to trampling and grazing and the conflict with other users is not as great. Limiting use to more resilient environments will also reduce the spread of weeds and disease, disturbance to native fauna and the siltation and fouling of watercourses (Phillips and Newsome 2002). Riding off designated tracks and public roads and in disease risk areas is prohibited, as is riding along the Reservoir shoreline. Horses are not allowed to swim in the Reservoir.

Currently there are no designated bridle tracks in the planning area. However, a designated bridle track may be considered in the area specified on Map 10, if there is sufficient response to this draft management plan supporting its inclusion. Should demand warrant it, a designated track for horse-riding activities will be identified in the final management plan. In this instance, such a track would be available year-round or seasonally to recreational riders, commercial operators and for special events. Recreational horse-riders will be required to adhere to appropriate codes of conduct and partake in best management practices, such as using weed-free feed and yarding and tethering horses during rest periods. Commercial operators within the planning area will require a licence and must comply with Administrative Instruction 41 – *Guidelines for approving commercial operators licence concessions*. In all cases the track would be subject to an assessment of its ongoing sustainability. In circumstances where action is required to enable a more sustainable use, a permit system may be introduced or the track may be seasonally or permanently closed.

Owing to the environmental sensitivity of the Westralia Conservation Park and the risk of subsiding ground, commercial equestrian operators, individual riders and group horse-riding events will be prohibited. Alternative horse-riding areas, more capable of sustaining large groups of horses, will be identified outside the planning area. The Proprietary Block in nearby State forest may be a local alternative for events such as the Collie River Marathon. Areas surrounding the Harvey Dam may also provide opportunities for one-off endurance horse-riding events.

28 – Recreational Use – Horse-riding

Key Points:

- There is a history of horse-riding within the planning area, particularly in the Lennard and Davis blocks. The latter however, contains designated disease risk areas.
- Landforms of the planning area have an adequate capacity to sustain horse-riding, particularly on designated bridle tracks. These tracks can direct use away from sensitive areas and promote use where soils are more stable, the vegetation is less susceptible to trampling and grazing and the conflict with other users is not as great.
- There are opportunities for public bridle tracks in nearby State forest.

The objective is to permit horse-riding where there is a high demand for this activity, the environment can sustain its long-term use and where the social impacts are considered manageable.

This will be achieved by:

1. permitting horse-riding on a designated bridle track within the area specified on Map 10, subject to sufficient demand warranting this type of activity and ongoing monitoring which assess its sustainability;
2. where horse-riding is permitted, allowing horse-riding events on designated bridle tracks subject to approval of the Regional Manager (see Section 28 – Recreational Use);
3. where horse-riding is permitted, encouraging recreational riders to implement best practice management including:
    - the use of weed-free feed prior to, and during their use of the area; and
    - yarding and tethering horses during rest periods.
4. if a designated bridle track is established, separating paths for horse-riding, cycling and bushwalking as much as practicable to minimise conflicts between different user groups;
5. restricting access to the Reservoir shoreline for horse-riding, and continuing to prohibit horses from swimming in the Reservoir water body;
6. if a designated bridle track is established, develop a code of conduct for horse-riding;
7. if a designated bridle track is established, monitoring the impacts of any horse use and modify or further restrict use if the activity is environmentally or socially unacceptable. Monitoring of this activity can be reviewed in year 5 of the plan to assess its sustainability; and
8. if a designated bridle track is established, developing monitoring systems in conjunction with horse-riding groups.

Hunting

Shooting within the planning area is strictly for the control of pest animals and occurs only as part of an integrated management program. Shooting is not the sole means of control and other, safer and more effective techniques, such as trapping, are being employed more regularly. In particular, a trapping program for pigs within the planning area has been initiated by the Department (see Section 20 – Pest Animals).

Illegal recreational hunting, particularly for pigs, occurs in the planning area. This poses a serious risk to visitor safety and can be detrimental to water quality and public health. The recreational hunting of animals using any kind of weapon, such as a firearm, bows (long and cross), sling, gidgie or any other device which projects an object, is not generally permitted on lands managed by the Department.

28 – Recreational Use – Hunting

Key Points:

- Hunting occurs in the planning area but poses a serious risk to visitor safety and is generally not permitted on lands managed by the Department.
- A trapping or shooting program for controlling pest animals such as pigs may be employed by the Department, on approval of the Executive Director (see Section 20 – Pest Animals).

The objective is to ensure visitor safety and protection of conservation values by appropriately managing hunting within the planning area.

This will be achieved by:

1. prohibiting recreational hunting within the planning area;
2. allowing trapping and shooting within the planning area where the Executive Director has authorised its use by the Department to control pest animals; and
3. prohibit the taking of wildlife in accordance with the Wildlife Conservation Act.

Abseiling and Rock Climbing

Abseiling and rock climbing are popular outdoor adventure sports that occur at the Wellington Dam quarry. This area, which has been formally assessed, is suitable for this activity, providing easy access, approved abseil anchor points and adequate facilities such as toilets and parking. The Wellington Dam quarry offers one of the few opportunities for this type of activity within the region. Other areas, such as granite outcrops, are not suitable as they are fragile and potentially contain high conservation values.

Recreational abseiling and climbing is usually undertaken in very small numbers, often only one or two people. However, commercial operators and other organised groups also use the area. Typically, participants in these groups are inexperienced novices and are under the control of experienced instructors. Instructors have a responsibility to ensure that all members of the group observe safety, environmental and ethical standards. This requires certain minimum standards of experience, competency in instructors and acceptable student to instructor ratios. Consequently, all commercial operators, as well as not-for-profit groups conducting rock climbing and abseiling activities with dependent participants, must be registered under the National Outdoor Leader Registration Scheme or hold current equivalent accreditation[19] and must obtain a permit. Recreational rock climbers in groups of less than five people are not required to book a permit or have an accredited leader. Commercial operators must also obtain a commercial activity licence to operate within the planning area (see Section 31 – Commercial Operations).

Permits may limit the time of use, number of participants and sites where abseiling and climbing may occur. The impact of erosion, the danger of falling rocks and the rights and enjoyment of other visitors will be considered for all permits and site assessments. A fee is required for a permit to allow for regular inspections of the site and the maintenance and testing of abseil anchor points. Information on booking and permit requirements to use the site will be signposted and published in pre-visit information.

28 – Recreational Use – Abseiling and Rock Climbing

Key Points:

- Abseiling and rock climbing opportunities exist at the Wellington Dam quarry but are limited elsewhere within the region.
- Areas considered of high conservation value, such as granite outcrops, or unacceptable visitor risk, are not suitable for abseiling or climbing.
- Commercial operators and organised groups who conduct abseiling and climbing activities on Department-managed lands must book and obtain a commercial activity licence and/or permit. This also applies to recreational users in groups greater than five people.

The objective is to provide opportunities for abseiling and rock climbing within the planning area, which are safe and able to sustain such use.

This will be achieved by:

1. permitting recreational abseiling and climbing at the Wellington Dam quarry. Where recreational group sizes are greater than five people, participants are required to book and obtain a permit;
2. permitting abseiling and climbing in organised groups or with commercial operators at the Wellington Dam quarry where groups have booked and a commercial activity licence or permit is granted; and
3. signposting and publishing in pre-visit information the requirements to book and obtain permits for recreational abseiling and climbing.

[19] The Abseiling Instructors Certificate and Professional Association of Climbing Instructors schemes are currently regarded as equivalent to National Outdoor Leader Registration Scheme.

Special Events

Requests are often made to undertake 'one-off' special events within the planning area. Generally these involve large groups of people who require accommodation, suitable access, an established network of tracks and adequate facilities, such as parking and toilets. In the past, the planning area has hosted special events such as the Kings Cup Regatta, Collie River Marathon, the South-West Car Club Hill Climb, Rally Australia, endurance motorcycle events, orienteering and rogaining events and several triathlon events emanating from Potters Gorge. Presently there is a demand for mountain bike events. Some events, such as the Kings Cup Regatta, attracted thousands of people in 1989.

Special events that present opportunities for nature-based recreation may be permitted in sections of the planning area, subject to approval from the Department and other relevant authorities, such as the DoE and Department of Health. These events must be consistent with the Department's re-drafted Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation), and the DoE's Statewide Policy No. 13 – *Policy and guidelines for recreation within public drinking water source areas on Crown land.* Where requests are made to conduct special events for activities that are inconsistent with these policies, the event must be of national significance and approval is required from the Conservation Commission. Where possible, events should use existing roads and tracks.

The suitability of events will be assessed on a case-by-case basis and considered against the following general criteria:

- protection of flora, fauna and cultural values;
- susceptibility of soils to erosion and disturbance;
- safety and enjoyment of all visitors to the planning area as well as those who partake in the event;
- the availability of suitable facilities such as car parking areas, camping grounds, toilets, and barbeque areas;
- risk to water quality;
- potential to spread disease;
- the overuse of sensitive areas;
- past history of use and compatibility with Departmental operations; and
- location of the event in an appropriate visitor management setting.

Before events are approved, the availability of suitable areas outside the planning area will be considered. This may include nearby areas of State forest and pine plantations. Limits or restrictions may be placed on events to assist in meeting the above criteria. This may result in an alternative location for the event, limitations on the number of events or participants, changes to the conditions of approval or prohibition of the event where its use is deemed inappropriate.

Where an event is approved, general conditions will require proponents to adhere to strict hygiene controls where appropriate to reduce the risk of spreading disease. At the completion of the event, proponents are also required to remove any temporary fixtures or facilities constructed for the event, rehabilitate any areas of site disturbance and remove signage such as markings.

Competitive car rallies and other motor sports are not desirable under national park and conservation park tenure and will not be permitted. This includes the South-West Car Club Hill Climb event. Whilst this activity is an exciting sport for competitors and spectators alike and reaps many social and economic benefits, consideration needs to be given to the level of environmental impact, especially the erosion of tracks. Competitive rallies and similar events may be approved for State forest where there are many highly suitable locations for Rally Australia.

28 – Recreational Use – Special Events

Key Points:

- Requests may be made to undertake 'one-off' special events within the planning area, which require accommodation, suitable access, an established network of tracks and adequate facilities, such as parking and toilets.
- Special events will be assessed on a case-by-case basis and may be permitted in sections of the planning area subject to approval from the Department, other relevant authorities and where necessary, the Conservation Commission.

The objective is to provide for organised special events that offer the opportunity for participants to experience the planning area in suitable locations where its use can be sustained.

This will be achieved by:

1. assessing special events on a case-by-case basis and permitting them where the activity is consistent with the re-drafted Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation). Approval by the Department and other relevant authorities is required. Conditions stipulated by the Department's South West Region, District, and in some cases, the Conservation Commission, may be applied. Applications, including the event status (club, State or national), timing, and the number of competitors and observers expected, should be of sufficient detail to enable thorough evaluation of environmental and social issues;
2. assessing special events on a case-by-case basis and where the activity is inconsistent with the re-drafted Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation), permitting only where the event is of national significance and on approval by the Conservation Commission;
3. ensuring that special events are held only within an appropriate visitor management settings and pose no adverse impact on the environment; and
4. prohibiting competitive rallies and other motor sport events within the planning area including the South-West Car Club Hill Climb.

Water-Based Activities

Information on the health implications of consuming water (following conventional treatment) from reservoirs permitting body contact with the water has not been well-documented (Stewart *et al.* 2002). In Western Australia, many public drinking water source areas have historically been accessible to the public for limited recreation. However, access to Perth's drinking water catchments has been restricted since the 1890s following a major outbreak of Typhoid fever, the exact cause of which is unknown (R. Theobold pers. comm. 2003). There have been no similar outbreaks since and the introduction of effective disinfection and treatment techniques has meant that the incidence of water-borne disease has been prevented. Future drinking water sources are also being sought to meet ever-increasing water demands. In many instances these are the same sources that are currently used for a range of water-based recreational activities. The desire for recreation, in particular swimming, boating, marroning and fishing, may be in conflict when these activities compromise the quality of drinking water sources. Such activities may pose an increased risk to the public health of downstream users and added capital and operating costs for water treatment.

The new *Australian Water Quality Guidelines (*NHMRC and NRMMC 2004) and its *Framework for Management of Drinking Water Quality* provides guidance on the protection of a drinking water source from 'catchment to consumer' including the microbiological, physical, chemical and radiological quality of drinking water. In addition, they also provide the criteria by which the State's water resources are protected before consumption by the consumer. These guidelines and criteria have been developed as a constituent guideline within the *National Water Quality Management Strategy*. The Department of Health, which administers the *Health Act 1911*, requires that drinking water meets these guidelines and is

safe. The DoE is responsible for protecting the State's public drinking water sources and recognises that certain recreation activities can be accommodated in some parts of the catchment but may be significantly constrained or prevented in other parts. These water sources are protected by proclamation as catchment areas, water reserves and underground water pollution control areas (collectively called Public Drinking Water Source Areas) under the Metropolitan Water Supply, Sewerage and Drainage Act and the CAWS Act. The DoE may enforce by-laws under these acts that exclude potentially contaminating activities. The DoE prepares DWSPPs for protecting drinking water sources in Western Australia, a process that is currently being progressed for the Wellington Reservoir and expected to be completed in 2005.

Options for the management of water-based activities in the Wellington Reservoir will be considered through this management planning process and findings of the DoE's DWSPP. This should take into account the social benefits and costs associated with these activities (see Section 42 – Water Extraction) as well as the health risks outlined below.

Risk to Water Quality

The most significant risk to drinking water quality from recreation is direct or indirect contamination with micro-organisms contained in human and animal excreta (NHMRC *et al.* 1996, DoE 2003). Body-contact recreation is a known point-source of faecal contaminations in lakes and reservoirs that permit this activity (Levy *et al.* 1998) and has the potential to cause infection, clinical illness (Dissmeyer 2000) or death if contaminated water is consumed.

A wide variety of bacterial, viral, protozoan and helminthic pathogens excreted in faeces are capable of initiating water-borne infections. The spread of infections by pathogenic agents depends on factors such as pathogen survival in water and the dose required for establishing infections in particular individuals. Many of the pathogens may be of animal origin although there are some exceptions, such as *Shigella sonnei*, which is only excreted by humans (Stewart *et al.* 2002). Generally, however, pathogens from people that find their way into the water are the most significant to consider from a risk point of view. Pathogens that pose a particular threat to public health include *Cryptosporidium parvum*, *Escherichia coli* and *Giardia lamblia*, although there are many others that may exist and presently go undetected. *Cryptosporidium* is perhaps the greatest risk to public health due to its ability to survive extended periods in water environments (including changes in temperature), its resistance to inactivation by conventional disinfection practices and the known health consequences. Viruses also pose a significant risk as the minimal dose required to infect individuals may be as low as a single viable viral particle (Payment, 1993).

Typically, the spread of these pathogens occurs through the ingestion of contaminated water or food, by personal contact, droplet transfer or inhalation of contaminated aerosols. Water may also play a role in the transmission of pathogens that are not faecally excreted. These include opportunistic pathogens that are members of the normal flora of the external human body. Some of these pathogens are natural inhabitants of certain water environments, albeit presumably in lower levels (Sobsey 2002).

Since it would be practically impossible to test water for each of the wide variety of pathogens that may be present, microbiological water quality monitoring is primarily based on tests for indicator organisms, such as faecal coliforms. However, there is no single indicator organism that can universally be used for all purposes of water quality surveillance. At the time of writing the WC monitor indicator organisms (faecal coliforms) in the Wellington Reservoir.

Coarse screening and disinfection of surface water by chlorination is currently the standard treatment of major raw drinking water sources in undeveloped metropolitan catchments in the State. These catchments benefit from long established reservoir protection zones preventing activities that may contaminate water quality. This is possible only because of the current high quality of the raw water. If water-based recreation is allowed to continue on Wellington Reservoir, and the water is used as a drinking water source, additional treatment would most

likely be required. At the least, this would include dissolved air flotation followed by filtration (N. Winsor pers. comm. 2004). However, other more costly treatment may be required (Table 9).

Table 9 – Water Treatment Options for a Variety of Catchment Uses

Treatment	Catchment Use
Rapid gravity filters	Very limited levels of human activity
Coagulation, clarification and filtration (a complex process that removes silt, colour, iron and manganese, and various other matters that may be present in raw water)	Limited human use, limited forestry (no herbicides), limited mining
Membrane filtration (is used in special applications, such as the removal of *Cryptosporidium* oocysts where they are detected in the source water). This treatment option is an alternative to coagulation/filtration	Human use (not in the water body) and limited rural use, moderate forestry (no herbicides or pesticides)
Ion exchange (used to remove nitrate from groundwater caused by agricultural activities)	Limited agricultural, industrial, human use (not in the water body) to be used in conjunction with pretreatment by any/all of the above processes
Activated carbon, often associated with ozone, is used to remove natural and man made organic substances	Agricultural, industrial, human use (including recreational use) to be used in conjunction with pretreatment by any/all of the above processes
Reverse Osmosis, used to reduce Total Dissolved Solids (salts)	Extensive agricultural, industrial (used as a end treatment after other processes)

The costs of additional treatment are considerable (see Section 42 – Water Extraction) and despite sophisticated treatment technologies, this is not a failsafe method of meeting water quality guidelines. National and international experience shows that total reliance on 'end-of-line' treatment only is less effective than catchment protection and treatment in combination to protect consumers' health. The *Australian Drinking Water Guidelines* do not support 'end-of-line treatment' as a sole method of protection, and specify a 'multiple barrier' approach to water quality protection to ensure that the raw source water is the best quality possible. This has two significant outcomes – the amount of treatment required is reduced (as is the cost of water) and, in the event of a breakdown in the treatment process, the quality of the water going to consumers is likely to still meet health guidelines. This 'catchment to consumer' multiple barrier approach is supported by the Government in its 2003 State Water Strategy and 2003 State Sustainabaility Startegy. The DoE, WC and Department of Health are working to implement it in all public drinking water sources in WA.

Water Storage within the Wellington Reservoir

The risk of contamination may be lessened by alternative management practices, including natural purification processes brought about by long-term storage of water. In this instance, the motions of a particular parcel of water, and hence its residence or effective retention time, are controlled by the reservoir dynamics. Accordingly, the movement of a parcel of water is influenced by its location with the reservoir and the reservoir conditions, such as climatic variation of seasons, shape of the reservoir and its size (Petterson 1977). Seasonal differences are an important factor as the surface heating of the water creates a temperature stratification of the water. A thermocline level that defines the difference between the deep cool water and the warmer surface water exists, varying depending on the season. In summer, stratification is greatest and the time taken to transport an affected surface water parcel to the bottom offtake layer may occur through slow internal mixing over a period of months. However, in summer it may be desired to take water from the central offtake layer where the salinity is less. If the thermocline is below this offtake layer then surface mixing readily occurs and the retention time may be days to weeks. Generally the greater stratification and hence greater retention times from the bottom offtake layer occur during the warmer months. The implication of this for the Wellington Reservoir is that the least risk to contamination is

during summer, when most recreation occurs. The greater retention times during this period would also allow an appropriate detection timeframe. Whilst Petterson (1977) undertook the preliminary modelling to determine the water movement within the Reservoir, more detailed information would lead to a greater understanding of the period when recreation could be suitable. Modelling of water movement in the Reservoir is the responsibility of the DoE and WC. The DoE has advised that reliance on retention times is only one barrier and that it should not be relied upon to support activities that may contaminate water given the significant potential risks to public health.

Further to this, the motion of a parcel of water may be affected by the rate of withdrawal and the longitudinal position in the Reservoir. For example, a parcel of water near the dam wall could be discharged in a few days in times of peak withdrawal, whereas several weeks could be required for travel from the Reservoir head. Thus recreation could be permitted further from the dam, particularly in summer when stratification is greatest.

In addition, the risks associated with microbial contamination from water-based recreation need to be placed in context with other chemical and physical risks associated with surrounding land uses and neighbouring townsites. All risks to water quality would be considered in the publicly consulted DWSPP for the Wellington Reservoir, and managed by determining priority classification areas and protecion zones, which guide land use planning in drinking water catchments.

Swimming

Swimming is one of the most popular outdoor recreational activities in the planning area, particularly at Potters Gorge, the backwaters of the Wellington Reservoir and at Honeymoon Pool. One of the most desired areas for this activity has been at Potters Gorge, where sand has previously been imported to enhance visitor enjoyment. From the point of view of water quality protection for public drinking water supplies, the DoE, the WC and the Department of Health believe that this is a most undesirable area for swimming.

Swimming and other recreation activities in the Reservoir may cause unacceptable microbial contamination of the water if it is used for drinking purposes. Recent research in California focused on modelling the predicted public health consequences of body-contact recreation on a potable water reservoir. This modelling (Stewart *et al.* 2002) inferred that full body contact in a reservoir can increase the annual risk of infection (without subsequent treatment) by up to 41 times and predicted that infections in the community would range up to 5005 annually. In contrast, when full body contact is restricted to the half of the reservoir furthest from the dam offtake, the risk of infection ranged up to 19 times, with predicted infections in the community ranging up to 2345 annually. A study by Rose *et al.* (1987) also found that the occurrence of viruses downstream of bathers to be significantly greater than upstream.

Options for managing swimming within the Wellington Reservoir will be developed over the life of the plan and will consider the findings of DoE's DWSPP. They would include the following options:

- continue to allow swimming in the Reservoir [20] (e.g. if source becomes a secondary source or is subject to high level treatment and where modelling of management options, including treatment, demonstrates acceptable risks to water quality);
- prohibit swimming in the Reservoir–preferred option of the water resource manager, the water service provider, and the Department of Health.

Water quality modelling is needed to make a sound decision on managing water-based recreation (see Section 28 – Recreational Use–Water Storage within the Wellington Reservoir). To achieve this, monitoring will also need to be undertaken, both at times when recreation is and is not occurring.

[20] Subject to water quality monitoring by the WC that indicates an acceptable level of risk to public health resulting from recreational use. Based on this monitoring, management of this activity within the planning area can be adapted.

The offtake of water within the Wellington Reservoir occurs at the dam wall, and consequently swimming in the river downstream is not subject to the same degree of restriction as that upstream of the wall. Redevelopment of traditional swimming holes such as Honeymoon Pool will facilitate safe and easy pedestrian access to the river and cater for disabled visitors. The redevelopment of this area is necessary due to the high frequency and intensity of visitor use, and will include works to prevent the bank from collapsing. Riverbank erosion is a common occurrence along the lower Collie River where visitors seek access to the water for swimming and marroning activities. Careful management in these areas is required to minimise environmental impacts (see Section 28 – Recreational Use– Marroning and Fishing, Bushwalking and Camping).

28 – Recreational Use – Swimming

Key Points:

- Popular swimming areas in the planning area include Potters Gorge, the backwaters of the Reservoir and at Honeymoon Pool.
- Swimming within the Reservoir and at river-based recreational sites can have impacts including damage to riverbanks and riparian vegetation.
- When the Reservoir is used for drinking water purposes, swimming may cause unacceptable microbial contamination of the water.

The objective is to permit swimming in the planning area, unless there is an unacceptable level of risk to public health or visitor safety.

This will be achieved by:

1. in consultation with DoE and WC (and upon completion of the DWSPP), determining the suitability of swimming within the Reservoir for the final management plan;
2. in consultation with the DoE and WC, develop opportunities for swimming away from the Reservoir; and
3. assessing the risk potential and likelihood of unsafe behaviour by visitors and implementing risk management measures, including signage and providing information, to limit that behaviour (see Section 32 – Visitor Safety).

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.3 Water quality in the Wellington Reservoir	28.3 Maintenance of water quality for drinking water purposes to the standards set by the Australian Drinking Water Guidelines as monitored by the Advisory Committee for the Purity of Water	Annually subject to information provided by the DoE and WC

Marroning and Fishing

The Department of Fisheries manages recreational fishing throughout the State in accordance with the Fish Resource Management Act. This provides legislation to regulate size, bag limits, gear controls, closed seasons and licencing. *Conservation and Land Management Regulations 2002* also regulate fishing activities in restricted areas.

Marroning is a popular activity that occurs within the planning area, and in most of the rivers and permanent fresh water lakes in the south-west. Within the planning area it occurs primarily on the shores of the Wellington Reservoir, although considerable marroning also takes place along the Collie River downstream of the Dam wall and upstream of the Black Diamond Pit. At the time of writing, the Wellington Reservoir is a snare-only fishery whilst scoops, dropnets and snare poles may be utilised downstream of the dam wall. A licence is

required in both circumstances. To sustain marron populations into the future, the marron season is currently limited to 16 days from 24 January to 9 February, and size and bag limits are in place. However, illegal marroning out of season undoubtedly occurs.

During the marron season, many people are attracted to the planning area, placing it under heavy fishing pressure. In 2002, 60% of the recreational fishing effort for marron in reservoirs was directed to the Wellington Reservoir. This constitutes 25% of the total fishing effort for marron and resulted in approximately 7500–8000 trips to the area (G. Looby pers. comm. 2003). This has been exacerbated over recent years by the displacement of visitors from proclaimed public drinking water supply areas, such as the Stirling-Harvey catchment. Former visitors to these areas may now seek opportunities in waterways of the planning area. Figures from 2000 indicate that, prior to proclamation of these catchments, 35% of the recreational fishing effort for marron in reservoirs was directed to the Wellington Reservoir, constituting 10% of the total fishing effort. Marroning usually requires direct body-contact with the water, which is of concern to the DoE and WC if the water is to be used as a future potable supply.

Fishing for introduced species such as redfin perch and trout also occurs within the planning area. The trout fishing season is currently from 1 September to 30 April, whilst fishing for redfin perch is permitted year round. The fishery supported by Wellington Reservoir and the Collie River downstream of the dam is particularly important to recreational fishers, as Waroona Dam, Harvey Dam and Logue Brook Dam are the only reservoirs within a day-trip of Perth that are stocked with trout. Some of these areas are also being viewed as potential drinking water supplies, which may further impact on the availability of this activity.

Most fishing in the planning area is undertaken with lures and bait and, like marroning, occurs along the shores of the Wellington Reservoir and lower Collie River below the dam. Trout have been stocked successfully since 1970, when they were introduced by the South West Freshwater Research and Aquaculture Centre. Since this time, regular stocking has created a consistent and worthwhile fishery. Between 1991 and 1999, up to 75 000 fish have been stocked into the Collie River (Department of Fisheries 2002). Stocking of the lower Collie River and Wellington Reservoir will continue over the life of this plan. In 2000, approximately 35% of the line fishing effort that went into dams went into Wellington Reservoir, comprising 10% of all fishing effort. In terms of water quality protection, it is preferable to use lures in the Wellington Reservoir, as fishing with bait has the potential to contaminate the water (see Section 28 – Recreational Use – Risks to Water Quality).

Fishing and marroning within the planning area will continue to be permitted along the Collie River downstream of the Dam wall and upstream of the Black Diamond Pit, subject to restrictions administered by the Department of Fisheries. Controlling access to these sections of the Collie River is important to minimise the disturbance of riverbanks and damage to riparian vegetation, and to reduce the need for further remediation works. Appropriately managed access can minimise the spread of weeds and disease as well as turbidity caused by track run-off. In the past, some marroners and fisherman, along with other users, have contributed to the introduction of new tracks or removing or avoiding barriers. A walk track linking Honeymoon Pool to the day-use sites along Lennard Drive and Wellington Dam will enable the use of a single path parallel to the river, reducing this impact (see Section 28 – Recreational Use). Small paths branching from this will provide access to the water.

The suitability and management of recreational fishing and marroning in the Wellington Reservoir will be determined through the management planning process and a public consultation process (e.g. this management plan). In all cases these activities will be subject to regulations of the Fish Resource Management Act. The following options will be considered:

- continue to allow fishing and marroning in the Reservoir at a suitable distance from the Dam wall (offtake area) and during the marron season. Snare-only marroning will be permitted in the Reservoir. Motor vehicle access to the banks of the Reservoir will be

allowed only during the marron season and visitors will be required to camp in designated nodes (see Section 27 – Visitor Access and Section 28 – Recreational Use – Camping);
- permitting fishing in the Reservoir using bait; and
- permitting fishing in the Reservoir using artificial lures only, similar to Waroona and Logue Brook dams, where it can be used to promote a better quality fishery and reduce the impacts on water quality.

28 – Recreational Use – Marroning and Fishing

Key Points:
- Marroning and fishing on the banks of the Wellington Reservoir and lower Collie River are amongst the most popular recreational activities within the planning area, especially during the open season for marron. Poaching of marron out of season occurs.
- The Wellington Reservoir is particularly significant for marroning. In 2002, 60% of the recreational fishing effort in reservoirs was directed to the area, constituting 25% of the total fishing effort.
- Marroning effort in the Wellington Reservoir has increased due to visitors being displaced from nearby proclaimed public drinking water supply areas with reservoir protection zones, such as the Stirling Reservoir. Similar zones could be imposed around the Wellington Reservoir if it is used as a future public drinking water source.
- Controlling access by marroners and fishers as well as other users is a significant problem.
- Regular stocking of introduced species of fish, such as trout, has created a consistent and worthwhile fishery. The Wellington Reservoir is particularly significant as there are few reservoirs open to fishing that are within a day-trip from Perth.

The objective is to permit marroning and fishing under the Fish Resource Management Act where this does not lead to degradation of the environment or unacceptable levels of conflict between users.

This will be achieved by:
1. permitting fishing and marroning along the Collie River and in the Wellington Reservoir, subject to the Fish Resource Management Act, the Vehicle Access Strategy and the latest available knowledge;
2. over the life of the plan, determining the management of recreational fishing and marroning activities within the Wellington Reservoir; and
3. providing information on behalf of fishers in Western Australia about trout and marron fishing and the methods of reducing environmental impacts.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.3 Water quality in the Wellington Reservoir	28.3 Maintenance of water quality for drinking water purposes to the standards set by the Australian Drinking Water Guidelines as monitored by the Advisory Committee for the Purity of Water	Annually subject to information provided by the DoE and WC

Boating, Canoeing and Sailing

Boating (including canoeing, kayaking and white water rafting) is a popular activity within the planning area. Some people enjoy canoeing from the Allanson townsite down to Potters Gorge, camping along the way, whilst others travel down the lower Collie River. The latter is popular for commercial operators for white water rafting tours, although the inconsistency of

water discharged from the Dam is a constraint. Regattas, such as the King's Cup and dragon boat events, have occurred at Potters Gorge.

Non-motorised boating, principally canoeing and white water rafting, will continue to be permitted along the Collie River downstream of the Dam wall and upstream of the Black Diamond Pit. Opportunities may also exist for licenced commercial operators to undertake canoe, paddle and rowboat hire along these portions of the Collie River (see Section 31 – Commercial Operations).

Options for managing non-motorised boating on the Wellington Reservoir will be developed over the life of the plan and may include:

- development of a canoe trail from Allanson to Potters Gorge that will also include a canoe/walk-in only campsite (see indicative location on Map 10);
- continue to allow non-motorised boating on the Reservoir (e.g. where modelling of management options demonstrates acceptable risks to water quality). The exception to this is for sailing and windsurfing which will be prohibited due to the presence of submerged stumps and logs;
- continue to allow non-motorised boating in the Reservoir at a suitable distance from the Dam wall (offtake area) and during a suitable time period;
- continue to allow non-motorised boating in the Reservoir only for one-off non-motorised boating events (see Section 28 – Recreational Use – Special Events); and
- prohibit non-motorised boating on the Reservoir – preferred option of the water resource manager (DoE), the water service provider (WC), and the Department of Health.

Much of the impact of boating also occurs at the point of access to the water body where erosion of riverbanks, compaction of soil, littering and the removal of stabilising riparian vegetation may occur. Access points need to be carefully selected for environmental reasons, to maintain visitor safety and to reduce visitor conflict over congestion. Current access points for boat/canoe launching are available at Potters Gorge and Honeymoon Pool and will be provided at appropriate locations downstream of the Wellington dam wall. These are to be signposted and marked on park literature. If approved as an activity, suitable boat access points on the banks of the Reservoir would also need to be developed that meet user needs, are safe, are environmentally sustainable and provide an appropriate level of water quality protection.

Motorised boating is generally not permitted on inland waters where its use is not already established. At present, motorised boating is not permitted on the Wellington Reservoir as it poses an unacceptable risk to water quality (principally from fuel pollution), submerged hazards pose a risk to visitors and because it disturbs the natural amenity of the area. This situation will continue. However, it is recognised that it may be necessary for motorised boats to operate on the Reservoir in some circumstances. These may include Departmental and search and rescue operations, scientific research, inspections by Government agencies and for safety purposes during organised non-motorised boating events (see Section 28 – Recreational Use – Special Events). In these instances, approval of the DoE and the District Manager is required and a permit may be issued. The Department of Planning and Infrastructure, under the *Navigable Water Regulations* of the *Marine Act 1982*, control boating activities in terms of vessel and operational safety.

28 – Recreational Use – Boating, Canoeing and Sailing

Key Points:

- Non-motorised boating within the planning area occurs in the Wellington Reservoir and the lower Collie River. Some people enjoy canoeing from the Allanson townsite down to Potters Gorge, camping along the way.

- Motorised boating can have negative effects on other users, fauna, and water quality and may cause bank erosion or sediment disturbance. In the past this type of activity has been prohibited on the Reservoir, and will continue to be prohibited in the future.

The objective is to provide for boating activities that are sustainable and consistent with the protection of values of the planning area.

This will be achieved by:

1. permitting non-motorised boat use along the Collie River downstream of the Dam wall and upstream of the Black Diamond Pit;
2. over the life of the plan, determine the suitability and management of non-motorised boating activities on the Reservoir;
3. providing appropriate access points for boat launching;
4. permitting non-motorised boating events on assessment and approval of the DoE and the District Manager;
5. prohibiting the use of motorised boats on the Wellington Reservoir and other water bodies within the planning area. Exemptions may be granted for Departmental operations, research activities or safety purposes during organised boating events. A permit and/or approval by the DoE and the District Manager will be required;
6. permitting commercial operators to run non-motorised boating tours of the lower Collie River subject to environmental sustainability, visitor safety, maintenance of cultural values and the relevant licencing conditions; and
7. providing information and signs at popular boat launching areas regarding hazards and boating regulations. Alternative boating opportunities in the region should also be identified.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.3 Water quality in the Wellington Reservoir	28.3 Maintenance of water quality for drinking water purposes to the standards set by the Australian Drinking Water Guidelines as monitored by the Advisory Committee for the Purity of Water	Annually subject to information provided by the DoE and WC

Passive Recreational Use in the Planning Area

Scenic Tourist Routes

Driving for pleasure and sightseeing on roads and tracks managed by the Department is a popular recreational pursuit, and particularly popular within the planning area. Much of the experience and enjoyment that visitors gain from the forest environment is derived from two-wheel drive routes in areas of high scenic quality. In preserving the inherent scenic values of all public travel routes, selected roads that have important scenic values and which afford outstanding views of surrounding landscapes may be identified, promoted and managed as scenic drives (see Map 9).

Of special interest is the picturesque Lennard Drive (which includes Lennard Track). This area, distinguished by the Collie River, features deeply incised slopes, attractive views and high quality natural vegetation. Other areas of scenic value include the Wellington Dam Road, where impressive views of the dam wall and Reservoir can be had, and Coalfields Road, which is designated by the Main Roads Western Australia as a scenic Tourist Drive. Linking areas of scenic value enables opportunities for scenic drive loops, which can incorporate existing roads within the planning area. Pile Road, River Road, Wellington Forest Road and King Tree Road all provide opportunities for this type of driving (see Map 9). From the Collie townsite, Flora Road provides an alternative scenic route. Scenic driving

need not be limited to the planning area or to two-wheel drive access, and links to regional routes to areas such as the Ferguson and Preston river valleys should be considered.

All of the major two-wheel drive roads in the planning area are accessible to buses, but there is a need to upgrade several roads, particularly Falcon and River roads, to better cater for this need (see Section 27 – Visitor Access).

Two-wheel scenic driving within the planning area is permitted on public roads and where the activity is consistent with the visitor management setting for the area. A public road is any highway, road or vehicle track that is open to the public. All vehicles within the planning area must be registered under the Road Traffic Act, drivers must possess a current driver's licence and normal road rules apply. Any vehicle registered under the *Control of Vehicles (Off-road Areas) Act 1978* is not permitted to operate in the planning area.

28 – Recreational Use – Scenic Tourist Routes

Key Points:

- Much of the experience and enjoyment that visitors gain from the forest environment is derived from two-wheel driving in areas of high scenic quality.
- Linking public roads and tracks of the planning area that have important scenic value provides the opportunity for scenic drive loops. Popular roads for scenic driving include Lennard Drive and Mungalup, River, Wellington Forest, King Tree, Flora and Palmer roads. These roads can be linked to other scenic travel routes within the region, such as those within the Ferguson and Preston river valleys (see Map 9).
- Roads for scenic driving within the planning area must be consistent with the appropriate visitor management setting.

The objective is to provide a range of scenic and recreational driving opportunities that is consistent with the appropriate visitor management setting and other values of the planning area.

This will be achieved by:

1. maintaining the identified scenic drives and tourist routes and linking these to areas outside the planning area, such as the Ferguson and Preston river valleys; and
2. liaising with tourism associations to disseminate information, particularly promotional material, about the scenic drives and tourist routes throughout the planning area.

Day-use Facilities

Many recreational pursuits within the planning area can be carried out over the course of a single day. These include picnicking, barbecuing, sightseeing, swimming, photography, marroning, fishing and nature study. Existing facilities enable the visitor to enjoy a high quality experience that is both comfortable and safe. Day-use facilities are provided at the Wellington Dam and quarry, Honeymoon Pool, Potters Gorge, Wellington Discovery Forest, Lennard Drive and the King Tree. These are highlighted on Map 10 and described in Appendix 11.

The area around the Wellington Dam wall and quarry, Honeymoon Pool and Potters Gorge are the three major day-use sites, offering a range of facilities including picnic tables, reticulated water and septic toilets. The kiosk at Wellington Dam provides take-away/cafe food and basic provisions. All day-use facilities located in high use areas, such as Honeymoon Pool, Potters Gorge, Wellington Discovery Forest and the Wellington Dam and quarry, have rubbish bins. Potters Gorge and the Quarry also have gas barbecue facilities whereas Honeymoon Pool offers fire rings for open fires and a supply of firewood. Where it is cost effective, options for gas or electric barbeques are preferred as this presents fewer management difficulties (see Section 28 – Recreational Use – Campfires).

The Wellington Discovery Forest is a day-use site designed for education purposes, attracting many school children. To cater for this use the area provides visitor information and facilities for large groups. Smaller day-use areas occur along Lennard Drive, including the Rapids, Long Pool, Big Rock and Little Rock. Picnic tables, barbecues and fire rings are available at these sites, although firewood is not provided. Toilets are also provided at the Rapids. Other small day-use areas exist at specific points of interest, such as at the King Jarrah site, which offers vehicle access and parking facilities as well as information interpreting the site.

Additional day-use facilities are required along Flora Road on the upper Collie River. This road is a popular scenic tourist route and basic facilities such as picnic tables and toilets are needed for visitors wishing to pass through the area. This will minimise the erosion of streambanks and adhoc recreation that may damage riparian vegetation. Similarly, small-scale facilities such as stopping and river access points, would need to be provided to manage visitor use and minimise impacts along Lennard Track. These will be sensitively located and designed in further consultation with the local Aboriginal people and the 4WD Association of WA and constructed to be sustainable in the long-term.

Whilst some provision will be made for rubbish collection in day-use areas, there will be an emphasis on encouraging visitors to take their rubbish home or to approved disposal sites.

Future development of day-use facilities will be in keeping with visitor management settings and be compatible with other values of the planning area.

28 – Recreational Use – Day-use Facilities

Key Points:

- The Department provides recreation sites specifically for day visitors at a number of sites within the planning area including Wellington Dam and quarry, Honeymoon Pool, Potters Gorge, Wellington Discovery Forest, Lennard Drive and the King Tree. Activities include picnicking, barbecuing, sightseeing, swimming, photography, fishing, walking and nature study.
- The impacts of recreational day-use activities within the planning area primarily include the erosion of streambanks and designated sites and damage to vegetation.

The objective is to provide day-use facilities appropriate to the environmental and visitor management setting that encourage visitor enjoyment and understanding of values within the planning area.

This will be achieved by:

1. implementing proposals for day-use sites as per Map 10, as resources permit.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.4 Satisfaction of the local Aboriginal people	28.4 The design of day-use facilities along Lennard Track satisfies the local Aboriginal people	On completion of designs for day-use facilities

Overnight Stays

Many people stay overnight in attractive forest and river/reservoir surroundings on lands managed by the Department. Overnight stays may be catered for by built accommodation or through the provision of camping facilities, some of which attract fees (see Section 29 – Visitor Fees and Charges). The Department's re-drafted Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation) covers accommodation and camping policies in detail.

Built Accommodation

Overnight accommodation, in the form of self contained cabins, is available at the Wellington Mill Cottages, located off Wellington Forest Road. This area contains eight cottages and operates under a lease agreement issued by the Department (see Section 31 – Commercial Operations). It is used extensively by school groups who undertake educational tours of the area.

The concept of providing a more permanent style of tourist accommodation (e.g. cabins and eco lodge accommodation) has been considered previously at Potters Gorge. The potential to provide accommodation of this type that is sustainable and in a setting overlooking a reservoir is not available within the region and would add to tourism in the area. This type of development, either on or adjacent to the conservation estate, is consistent with Departmental objectives provided there is no conflict with the purpose of the reserve, they are located within the appropriate visitor management setting and the requirements for water quality protection are met. Site development would require the Department to discuss options with local Aboriginal people. The National Competition Policy also requires the Department to provide built accommodation on a fully commercial basis.

It must also be recognised that a range of built accommodation is readily available in areas adjacent to the planning area, such as the Ferguson River valley and Collie and Allanson townsites. These areas support a range of accommodation including chalets, farmstays, caravan parks, motels and lodge accommodation. Directing visitors to use facilities outside the planning area may benefit these enterprises and tourism within the region. With the exception of resort style accommodation at Potters Gorge, it is preferred to locate future built accommodation outside the planning area. Potters Gorge is the preferred location of any development should the demand necessitate it as it is easily accessed, lies within a developed visitor management setting and provides unique opportunities for visitors. However the effect of water quality protection requirements on recreational activities associated with this development must also be considered.

Future accommodation developments, including camping areas, may also be managed by concessionaires (see Section 31 – Commercial Operations).

Camping

Camping is a common and popular activity within the planning area, allowing visitors to relax and develop an awareness and understanding of the natural environment. Camping areas and facilities exist at Honeymoon Pool and Potters Gorge, both of which are well patronised by visitors. They offer high quality facilities including two-wheel drive access, parking areas, toilet facilities, reticulated water, rubbish removal, picnic furniture and access to the water for swimming and boating (see Map 10 and Appendix 12). Potters Gorge is a relatively 'developed' recreation facility designed to accommodate special events. Hike-in campsites with limited facilities and services diversify the visitor experience and are available along the Bibbulmun Track. Similar facilities within the planning area will also be provided along Munda Biddi Bike Trail.

There is currently no camping booking system in the planning area and fees are charged to assist in maintaining facilities. In areas where high conservation or water protection values are present, existing camping may be relocated elsewhere, restricted or operate as day-use only.

Some issues of importance to managers with respect to camping are:

- provision of suitable camping areas and facilities (both in terms of environmental impact, site stability and in meeting visitor needs);
- the use of generators;
- managing and maintaining semi remote campsites, particularly surrounding the Reservoir;
- exclusive use of campsites and minimising conflicts with day users;

- lighting of campfires (see Section 28 – Recreational Use – Campfires). This includes both the environmental impact of firewood collection and the risk of bushfires from campfire escapes. The former is likely to become more of a problem as visitor numbers increases; and
- risk to water quality from activities associated with camping;

Increasingly, large organised groups with up to 30 vehicles, as well as various school groups, are seeking places to camp within the planning area. With few suitable planned campgrounds available, large informal campsites have developed. These have had a severe impact on the environment with regards to toilet waste, rubbish disposal, firewood collection, vegetation removal, erosion and soil compaction. Expanding and hardening campsites such as Honeymoon Pool and Potters Gorge, and providing larger camping sites suitable for campers/trailers at the latter, will cater for sustainable group camping, as well as a greater number of individual campers. The expansion of the Honeymoon Pool camping area will be subject to ongoing monitoring of western ringtail possums, which will determine the effect that recreation may have on this species (see Section 18 – Species and Communities of Conservation Significance).

The use of generators at Honeymoon Pool is a particular problem as it disrupts visitors and affects their enjoyment of the site. Prohibiting their use or introducing a curfew for operating times is necessary and will be employed at other sites of the planning area.

A number of informal or 'wild' campsites exist throughout the planning area, particularly vehicle-based sites located adjacent to the Reservoir. Some of these sites have existed for over 20 years and have become traditional camping areas, used by generations of visitors for marroning, fishing and other water-based activities. These informal sites are not maintained and have a high intensity of visitor use, particularly during the marron season. As a result, site degradation, particularly loss of vegetation and scenic quality, erosion and soil compaction are common occurrences at many sites. Increasing motor vehicle access to these sites without appropriate management may exacerbate their expansion and subsequent degradation.

To maintain sustainable opportunities in the long-term, it is proposed to limit camping around the Reservoir to designated campsites in recreation nodes (indicative locations are shown on Map 10). These sites would be located at the required distance (280 m) from the full storage water level as designated under the by-laws of the CAWS Act. These by-laws are currently being reviewed and the required distance may therefore change. Potters Gorge is the only established formal campsite with pre-existing infrastructure that exists within 280 m of the full storage level. It is the Department and Conservation Commission's preference that Potters Gorge be retained as an alternative camping area to Honeymoon Pool, although this will be decided by the DoE who administer the CAWS Act. The preferred option of the DoE and WC is to close this site and provide alternative camping areas away from the Reservoir. If retained, new developments at Potters Gorge would be designed to protect water quality. Where appropriate, pathways from campsites to the waters edge would be provided.

At some informal campsites it may be desirable to restrict access or limit visitor numbers in order to protect the environment or maintain a particular visitor management setting. This may result in some sites being permanently closed. The latter has several advantages, including appropriate maintenance of the sites and the provision of toilet facilities. Campsites that are developed around the Reservoir are to be basic campsites (see Appendix 12). No camping is permitted on the banks of the Reservoir.

Informal campsites also exist along Lennard Track, including one site used frequently by the 4WD Association of WA. These sites offer considerable attractions to visitors and are popular for scenic driving. However, camping in this area presents several issues to managers:

- important conservation and landscape values;

- significant cultural heritage values (see Section 24 – Indigenous Heritage);
- erodible soil types;
- campsite expansion and an increase in the number of informal campsites;
- steeply sloping landscape, limiting areas suitable for camping and increasing the risk of erosion;
- high cost of engineering works required to develop campsites; and
- change towards a more developed visitor management setting if campsite development were to occur.

Consequently, camping along Lennard Track will be prohibited. A more suitable use would be to designate the area as day-use only and promote it as a scenic four-wheel drive route (see Sections 26 – Visitor Access and 27 – Recreational Use–Scenic Tourist Routes). This will be accompanied by basic facilities such as small parking areas and picnic tables. An alternative for a semi-remote basic campsite, accessible only by four-wheel drive, will be developed north of the Collie River.

A proposed walk-in only campsite, which will contain minimal facilities and cater for groups, is to be developed near the Reservoir. This site will be limited to walkers and management only vehicles. The site would be set back at least 280 m from the high water mark (a requirement by-law 36(1) of the CAWS Act to help protect water quality) and would contain sealed toilets (see Map 10). It also has the potential to form part of a canoe trail from Allanson to Potters Gorge.

28 – Recreational Use – Overnight Stays

Key Points:

- Overnight accommodation, in the form of self-contained cabins, is available at the Wellington Mill cottages.
- Designated camping areas for overnight stays have been established at Honeymoon Pool and Potters Gorge. Fees are charged at these sites to partially offset the cost of maintaining these areas.
- Informal (wild) campsites exist throughout the planning area, particularly near the Reservoir. Site degradation particularly loss of scenic quality, erosion and compaction of the soil, loss of vegetation and littering is occurring.

The objectives are:

1. **to provide opportunities for visitors to stay overnight in the planning area in appropriately located and designed built accommodation;**
2. **to provide a range of sustainable camping opportunities in designated areas; and**
3. **to reduce the risk of contamination of water by locating proposed campsites away from the Reservoir's edge, with the exception of Potters Gorge which is a pre-established site.**

This will be achieved by:

1. noting the restrictions of the CAWS Act, providing a range of camping opportunities (i.e. Honeymoon Pool, Potters Gorge, nodes around the Reservoir and a walk-in only site around the Reservoir) and built accommodation in a variety of physical, social and managerial settings;
2. expanding the Potters Gorge camping area using design principles to protect water quality, including the use of sealed toilets and appropriate drainage;
3. prohibiting camping along Lennard Track;

4. ensuring built accommodation is:
    - built to a safe structural standard;
    - environmentally sensitive;
    - ensures a sense of place and reflects vernacular architecture;
    - low maintenance;
    - commercially viable; and
    - fire resistant.
5. investigating opportunities for partnerships with commercial concessionaires to provide built accommodation within the planning area (see Section 31 – Commercial Operations);
6. developing a monitoring system to quantify impacts at campsites at selected sites throughout the planning area. Where the impacts are unacceptable, permanently or temporarily restricting access to these areas;
7. prohibiting the use of or restrict the operating hours of portable generators or battery charging plants at Honeymoon Pool and implementing curfews on the use of generations at this campsite; and
8. charging fees for camping at designated camping sites.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.5 Changes in the area of disturbance zone around campsites	28.5 No increase in the disturbance zone around campsites from 2005 levels	Annually
28.6 Number of trees at selected campsites that are damaged	28.6 Less than 10% of trees damaged around campsites	
28.7 Number of trees at selected campsites with exposed roots	28.7 Less than 10% of trees around campsites with exposed roots	

Campfires

Campfires provide a focal point for social interaction, and to many visitors are a traditional and valued part of their park experience. Within the planning area, fire rings and barbecue plates for campfires are available at campsites such as Honeymoon Pool and Potters Gorge as well as day-use sites along Lennard Drive, including the Rapids, Big Rock, Little Rock and Long Pool. A number of illegal campfires are also lit in informal campsites. Firewood is currently supplied at Honeymoon Pool and Potters Gorge.

The collection of firewood and escapes from campfires is a particular concern for managers. Firewood removal has detrimental effects on natural ecosystems, including loss of vegetation cover, reduction in habitat integrity, the spread of *Phytophthora* and possible changes to the nutrient balance of ecosystems. The area around fireplaces also suffers from vegetation loss and compaction, the accumulation of ash and the failure of groundcover to regenerate where there have been continuous open fires. Sites impacted by open fires and firewood collection can take many years to recover and regenerate. Degradation can already be seen at many campsites including tree stumps from felled trees.

Consequently the collection of firewood is to be prohibited from the planning area. However, specific 'Firewood Collection Areas' will be gazetted in nearby State forest and timber reserves for this purpose (see Section 41 – Forest Produce).

There are significant management costs associated with firewood supply and the Department is investigating the most cost-effective option to supply a source of fuel in the long-term. This may include:

- the Department may continue to provide firewood;

- the Department may provide firewood in designated areas at suitable entry points to the planning area;
- a contractor may provide firewood;
- visitors may be encouraging to bring their own firewood; or
- a combination of the above.

For cooking purposes, gas or electric barbecues will be provided at the most popular recreation sites where this is cost effective and practical. Elsewhere, visitors will be required to supply their own gas for cooking.

Escapes from campfires within the planning area can lead to wildfires (see Section 23 – Fire), which is a significant problem in the backwaters of the Wellington Reservoir. Consequently, campfires within the planning area can only be lit in authorised fire places (i.e. fire rings provided in designated camping sites). Furthermore, campfires will only be permitted after nightfall (6 pm to 9 am) from December to April. Gas-only cooking is an alternative and is permitted at all times.

28 – Recreational Use – Campfires

Key Points:

- Campfires are a valued part of the camping experience. However, the use of firewood can have significant impacts on conservation values within the vicinity of campsites.

The objective is to maintain the use of campfires in designated areas and minimise the impacts associated with firewood collection.

This will be achieved by:

1. managing campfires by:
   - permitting campfires in designated fireplaces (i.e. fire rings provided in designated camping sites) only and, from December to April, only at night;
   - investigating the most cost effective and efficient method to supply firewood and applying this to the planning area;
   - providing fuel, such as gas or electric barbeques, to designated overnight sites and selected day-use sites for cooking purposes where this is cost effective and practical;
   - including information on the environmental impacts of firewood collection in interpretive media and park information; and
   - reducing the collection of firewood within the planning area through public education (see Section 41 – Forest Produce).

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
28.8 Number of wildfires in the planning area attributed to escapes from campfires	28.8 Reduction in the percentage of wildfires per visit that is attributed to escapes from campfires	Every 5 years

29. VISITOR FEES AND CHARGES

The Department currently applies a 'user pays' policy through a system of commercial concessions and the collection of visitor fees. Visitor fees can include camping and day visitor entry fees, fees for permits or fees for services (e.g. guided tours). Revenue raised from visitor fees is used to help maintain and develop visitor facilities or other conservation initiatives. The provision of services and facilities and the protection of values from visitor use creates a considerable cost to the Department. The user pays principle provides an equitable means of raising funds to offset some of these costs.

Camping fees are currently charged at Honeymoon Pool and Potters Gorge and may be introduced at other campsites over the life of this plan. Fees may also be collected from users when a service or opportunity is provided, such as entry to the national park, as long as the benefit to the Department meets or exceeds the cost of collection. In accordance with Government policy, day visitor entry fees may be phased in to Wellington National Park in the future.

29 – Visitor Fees and Charges

Key Points:

- The Department currently applies a 'user pays' policy through a system of commercial concessions and the collection of visitor fees. Visitor fees can include both camping and day visitor entry fees or fees for service.
- Visitor fees can off-set management costs by raising funds to provide and maintain facilities and visitor services.
- Camping fees are charged at Honeymoon Pool and Potters Gorge and may be applied to other campsites in the future.

The objective is to implement an equitable user-pays system for the use of facilities and services.

This will be achieved by:

1. maintaining camping fees at Honeymoon Pool and Potters Gorge, and considering the introduction of camping fees at other campsites where it is practical and cost-effective; and
2. considering adoption of visitor entry fees where it is practical and cost effective to collect them.

30. TOURISM

Tourism is one of the world's fastest growing industries and nature-based tourism is its fastest growing segment (Tourism Western Australia and CALM 1997). Research shows that today's travellers are more environmentally conscious, and are seeking new experiences and more information about the destinations that they visit. The growing demand for nature-based tourism will increase pressure on the natural environment. To be a sustainable land use, the long-term viability of the nature-based tourism industry is dependent on maintaining the integrity of the natural environment, and increased environmental awareness of visitors. In the planning area, nature-based tourism activities are focussed on forest environments, the Collie River, the Bibbulmun Track, proposed Munda Biddi Bike Trail and water bodies such as the Wellington Dam.

Within the region, tourists are also attracted to the many wineries and gourmet food production areas. Numerous bed-and-breakfast establishments, cafes and restaurants and a variety of accommodation types support activities and attractions of the planning area. Tourism attractions and opportunities include forest tours, wildflower tours, wildlife viewing, nature appreciation, sightseeing tours, cultural tours and farm stays. Many of these are regarded as specialised tours catering for niche markets, are seasonal, and run as secondary businesses.

Visitors to local attractions proposed for the region, such as the tourism entrance precinct at Collie, the Collie Tourist Bureaux replica mine, Collie Motorplex and the Western Five (Lake Kepwari) project, may also visit the planning area. The latter is a project involving the disused Western Five mine void, approximately 20 km east of Collie. The void is being filled with water and provides an alternative destination for water-based and lake-side recreation activities. This site is particularly significant as it will take some recreational pressure off the planning area and provide additional water-based opportunities for local people, such as motorised boating and water-skiing.

Some visitors to local attractions may require overnight accommodation within townsites or seek accommodation within the planning area. Research by Tourism Western Australia indicates that approximately half of the visitors to the South West Region stay in commercial accommodation, the most popular of which are hotels, resorts, motels and motor inns. With the exception of resort style accommodation, most types of accommodation are readily available in areas adjacent to the planning area and visitors should be encouraged to use these venues. Opportunities that cannot be catered for elsewhere, such as camping in a forest environment, will be the focus within the planning area.

30 – Tourism

Key Points:

- Nature-based tourism is the world's fastest growing market segment but is increasing pressure on the natural environment.
- Tourism activities within the planning area are focused on attractions such as the Collie River, Wellington Reservoir, Bibbulmun Track, and proposed Munda Biddi Bike Trail. In the nearby area, replica mines, numerous wineries and gourmet food production areas also attract tourists. Infrastructure to support this includes cafes, restaurants and variety of accommodation.
- Other tourism opportunities exist for forest tours, wildflower tours, wildlife viewing, nature appreciation, sightseeing tours, cultural tours and farm stays.
- When Wellington Reservoir is required as a drinking water source, some tourism opportunites may be constrained to protect water quality.

The objective is to enhance sustainable nature-based tourism opportunities within the planning area.

This will be achieved by:

1. liaising with local tourism associations to provide input on tourism proposals that may influence the planning area;
2. ensuring tourism developments are designed to minimise environmental impacts and are consistent with visitor management settings for the area; and
3. encouraging major tourism infrastructure off-site, and focusing on the provision of opportunities within the planning area that cannot be catered for elsewhere.

31. COMMERCIAL OPERATIONS

Commercial concessions can help meet the rising demand for high quality recreation and tourism opportunities, facilities and services, whilst ensuring that financial contributions from tourism help the Department meet the costs of managing the natural resource. A commercial concession is a right granted by way of a lease, licence or permit for occupation or use under appropriate conditions, of an area of land or water managed by the Department. The Department's re-drafted Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation) governs conditions for commercial concessions.

Leases are issued when the activity involves significant infrastructure and/or retailing and requires the exclusive use of the land. A lease allows a lessee to occupy a particular area of land and hence provides security to protect significant investments. There are two types of leases issued on Departmental lands:

1. forest leases granted under section 97 of the CALM Act; and
2. leases for other lands and waters covered by the CALM Act, granted under section 100 of the CALM Act. This includes national parks and conservation parks. The length of a lease is usually proportional to the level of investment and the expected return on the investment.

At the time of printing, there are four forest leases issued within the planning area (Table 10).

Table 10 – Leases of the Planning Area

Lease Number	Purpose	Location
1576/97	Broadcasting Communications Site[21]	River Road
1880/97	Tourist, Holiday and Recreation Resort	Wellington Forest Road
2159/97	Kiosk	Wellington Dam Road
1975/97	Collie Power Station – Saline Waste Disposal Pipeline	Former Gervasse Block

Forest leases are granted for a term not exceeding 20 years for the purposes specified in section 56 and section 55 (1) (a) of the CALM Act. The leases in Table 10 were granted prior to the CALM Act amendment in 2000, which allowed a broader use of State forest. Amendments to the CALM Act are proposed so that essential public infrastructure can be catered for. The Department will continue to issue and administer leases for facilities and uses in accordance with the provisions of the CALM Act.

The Wellington Mill Cottage Park (lease number 1880/97) was previously operating under a 20-year lease, due to expire in 2016. However, as of April 2004 the lease was terminated and the future of the site was under consideration.

Given the strong growth in nature-based tourism throughout the region, it is likely that demand for facilities in or near the planning area will increase. To cater for this, as well as preserving the area's natural values, it is preferred that any new commercial operations not listed in Table 10 be located outside, but linked to, the planning area. Such locations may include the Collie townsite, the Ferguson River valley or surrounding private property. These areas have scope for increased accommodation and have potential to cater for a variety of visitors seeking either a different class of facilities or type of accommodation, which is currently unavailable within the planning area. However, it is possible that future built accommodation developments may be considered in appropriate visitor management settings. In particular, there is the opportunity for a visitor centre to be developed at the Wellington Dam. This would provide a focal point for providing information about facilities, park orientation and the natural and cultural values of the area (see Section 43 – Information, Education and Interpretation). These developments would be managed by way of a lease agreement and consider the impacts on water quality and conservation values as well as the visual landscape.

Licences allow tourist operators to enter and use lands and waters managed by the Department. Activities carried out under a licence are generally itinerant and do not require substantial infrastructure. All private tour operators conducting commercial tourist activities on conservation reserves and State forest are required to obtain a licence in accordance with section 101 of the CALM Act. Licencing is a useful tool to monitor and regulate access and use of lands and waters managed by the Department and thereby assist in protection of an areas value. Collection of data can be made a condition of licencing.

Two types of licences are issued, depending on the nature of the activity, the security of the resource, and the risk to participants. E Class licences are issued where there is safety, environmental or management concerns and hence the number of licences needs to be restricted. Generally E Class licences are issued following a formal 'Expression of Interest' process. Alternatively, T Class licences are unrestricted and most commonly apply to low-impact vehicle-based operations. At the time of publication, there are 26 T class licences issued for the Wellington National Park. However, this figure does not take into account recent reserve changes that expanded the national park. As of 19 November 2004, licences are also issued for State forest, although this applies over a much wider area than that considered in this management plan. Therefore it is not possible to determine whether commercial operators in these areas are operating specifically within the planning area.

[21] Lease not for commercial purposes (see Sections 37 – Public Utilities and Services and 41 – Water Extraction)

Opportunities exist to continue to develop appropriate commercial tourism operations. Concessions for activities and services such as vehicle-based tours, white water rafting, canoeing and boat hire, guided walks, accommodation and nature study tours could greatly increase visitor interest in, and attract more visitors to, the planning area. An assessment of these activities based on protecting the values of the planning area, including water quality, should be carried out prior to the issuing of any commercial concession.

The participation of local Aboriginal people in promoting aspects of culture and lifestyle, including reference to medicinal and nutritional uses of native plants and bush tucker is of interest to visitors and offers commercial enterprise opportunities. The interpretation of the planning area from the perspective of Aboriginal people must take place in a manner supported by the local Aboriginal people.

Conditions apply to all licences to minimise the impacts of activities, or to aid in management of the value being appreciated by the public. Managers consider the following factors before issuing licences:

- infrastructure requirements of tour operations (e.g. adequate toilet facilities, access and parking for large vehicles);
- potential impacts to water quality;
- visitor safety;
- competence of group leaders;
- the potential damage to sensitive areas and wildlife; and
- the appropriateness of retail concessions in particular natural environments.

Guidance for the general conditions for tour operators in national parks and conservation parks is provided for in the Department's *Tour Operator Handbook*.

31 – Commercial Operations

Key Points:

- The Department enters into commercial arrangements to help meet the rising demand for high quality recreation and tourism services, while at the same time ensuring that the financial contributions from tourism assist in meeting the costs of managing the natural environment.
- A commercial concession is a right granted by way of a lease, licence or permit for occupation or use (respectively), under appropriate conditions, of an area of land or water managed by the Department. Four forest leases and numerous licences exist within the planning area.
- Opportunities for tour operators include vehicle-based tours, horse-riding, white water rafting, abseiling, canoeing and boat hire, guided walks, provision of and/or management of accommodation, camping and nature study tours.

The objective is to ensure that commercial tourism activities are compatible with other management objectives and to extend the range of services and recreational experiences available in the planning area through the involvement of private enterprise.

This will be achieved by:

1. ensuring all commercial operations operate under a lease, licence or permit agreement with appropriate conditions that:
    - are consistent with other management objectives within the planning area;
    - facilitate park management;
    - provide a service or facility to visitors that the Department would not otherwise be able to provide; and
    - these are to be reviewed as appropriate.
2. encourage and provide incentives for tour operators to acquire quality assurance through

industry accreditation and qualification programs. This will be facilitated, in part, by promoting the Tour Operator Handbook to operators;
3. evaluating proposals for licences and commercial tourism leases according to Departmental policy and permit their establishment where appropriate;
4. identifying the sustainable level of operator use and monitoring the impact of these activities. The collection of data as part of the licence conditions of commercial operators should provide sufficient detail to enable thorough evaluation of environmental and social issues; and
5. developing a policy in conjunction with local Aboriginal people to promote their participation in commercial activities within the planning area.

32. VISITOR SAFETY

In addition to a genuine concern for visitor welfare, the Department has a moral and legal responsibility to consider the personal safety of visitors to the planning area. The Department manages the risks presented to visitors by their activities and by the natural, cultural, and developed environments through a visitor risk management program. The program involves the identification of hazards, assessment of the risks posed by these hazards, implementation of risk mitigation measures and ongoing monitoring. As part of the program, all designated recreation sites are routinely audited to identify visitor risks. The visitor risk management program is guided by Policy Statement No. 53 – *Visitor risk management* (CALM 1986c)

However, many visitors to the planning area deliberately seek out activities because they involve risk, not despite them. These activities include rock climbing and abseiling, mountain biking and white water rafting. Opportunities for risk taking are essential to many people's attraction to the outdoors and visitors are expected to take responsibility for their own safety. The Department and Conservation Commission seek to encourage appropriate visitor behaviour whilst undertaking recreational activities that involve risk.

The most common risks to visitor safety relate to slipping and tripping on uneven ground, stolen hazard signs and damaged recreation structures. Department staff usually attends to these risks during daily maintenance of facilities.

Falling trees or limbs, and collision with submerged obstacles while swimming can pose more serious risks to visitor safety. The latter is important given that fluctuating water levels can vary the water depth over obstacles such as sunken trees and stumps, and river floods can move obstacles to new locations. These risks are managed by:

- removing hazardous trees and lopping limbs in and around all designated recreation areas. This has been undertaken within the planning area and will be an ongoing requirement in the future. Monitoring will determine the need for future tree or limb removal; and
- divers periodically surveying popular swimming holes within designated recreation areas and, where possible, removing submerged obstacles presenting a risk to swimmers. More commonly, appropriate hazard and 'No Diving' signs are placed near swimming holes.

In the event of an incident, the coordination of search, rescue or recovery operations is the responsibility of the Western Australian Police Service. However, where these occur on lands managed by the Department, it is often the Department that organises the initial response.

32 – Visitor Safety

Key Points:
- The Department has a moral and legal responsibility to minimise visitor risk.
- The Department manages the risks presented to visitors by implementation of Policy Statement No. 53 – *Visitor risk management* and the visitor risk program.
- As part of this program, designated recreation sites are routinely audited to identify visitor risks.

- The most common risks to visitor safety relate to slipping and tripping on uneven ground, stolen hazard signs and damaged recreation structures. Falling trees or limbs, and collision with submerged obstacles while swimming can pose more serious risks to visitor safety.
- The coordination of search, rescue or recovery operations is the responsibility of the Western Australian Police Service, although the Department often organises an initial response on the lands and waters it manages.

The objective is to maintain visitor experiences in the planning area by minimising risks to public safety wherever possible.

This will be achieved by:

1. continuing to undertake formal risk assessment of all recreation sites and facilities as part of the visitor risk management program and in addition to that which occurs on a day to day basis;
2. continuing to provide information (including signs where those hazards associated with structures, facilities or natural attractions that are not reasonably obvious) to enable visitors to consider risks and to highlight potentially hazardous areas and activities;
3. adopting codes of safe conduct for popular activities (such as hiking, swimming, canoeing and abseiling) and promoting and publicising them as appropriate; and
4. applying industry standards and utilising appropriate expertise and quality of materials in the design and construction of facilities and structures.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
32.1 Percentage of accidents/incidents and visitor injuries per visit reported annually to the Department	32.1 Maintenance or reduction in the percentage of accidents/incidents and visitor injuries per visit reported annually to the Department	Every 5 years

33. DOMESTIC ANIMALS

Domestic animals such as dogs and cats are important companions for many people and are often considered part of the family. Dogs are frequently taken on day trips and overnight stays, including trips through the planning area. Landholders adjacent to the planning area also exercise their dogs in forest areas bordering their property.

Domestic animals are not usually permitted in national parks or conservation parks although, under the *Conservation and Land Management Regulations 2002*, they are allowed in designated areas. The exception is guide and hearing dogs for visually and hearing impaired visitors and specially trained dogs for search and rescue operations, which may be allowed in all areas.

Within the planning area however, dogs are considered undesirable. For example, it is important to keep dogs out of areas such as Honeymoon Pool, where they pose a risk to threatened fauna species, such as the western ringtail possum. Dogs in this area have also been known to conflict with other visitors, create noise problems, cause personal injury to staff and interfere with the enjoyment of the area by other users. Dogs themselves may be threatened in many parts of the planning area that are poison-baited for conservation purposes (see Section 18 – Species and Communities of Conservation Significance). Locations such as Potters Gorge and the backwaters of the Wellington Reservoir are also unsuitable for dogs as their faeces can foul an area or watercourse and carry disease that can be harmful to wildlife, people, and water supplies for domestic consumption. On other conservation estate within the region, dogs are permitted on beach areas at locations such as the western side of the

Leschenault Peninsula Conservation Park. Other opportunities may also exist on recreation reserves vested in local Shires.

33 – Domestic Animals

Key Points:

- Domestic animals are not permitted within the planning area. Exemptions may be granted for guide dogs, hearing dogs and dogs for search and rescue, which may be allowed throughout the planning area.

The objective is to protect native fauna and visitors from the impacts of domestic animals.

This will be achieved by:

1. prohibiting domestic animals within the planning area. Exceptions to this is for:
    - seeing-eye dogs;
    - hearing dogs;
    - animals required for emergency search and rescue purposes; and
2. providing information explaining Departmental policy on domestic animals and enforcing it as necessary.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
33.1 Number of dogs recorded within the planning area that are not seeing-eye dogs or dogs required for emergency search and rescue purposes	33.1 No dogs recorded within the planning area that are not seeing-eye dogs or dogs required for emergency search and rescue purposes	Every 5 years

PART F. MANAGING SUSTAINABLE RESOURCE USE

Various Departmental policy statements provide management directions for managing sustainable resources including:

- Policy Statement No. 2 – – *Local government authority access to basic raw materials from State forest and timber reserves* (CALM 1993);
- Policy Statement No. 10 – *Rehabilitation of disturbed land* (CALM 1986a);
- draft Policy Statement No. 41 – *Beekeeping on public land* (CALM 1992b);
- Policy Statement No. 54 –*Defence force training on CALM managed lands and waters* (CALM 1996); and
- the former National Parks and Nature Conservation Authority (now the Conservation Commission) *Basic raw materials policy – Government and local government access to conservation estate.*

34. TRADITIONAL HUNTING AND GATHERING

The hunting and gathering of traditional foods by Aboriginal people is an important part of their culture, enabling them to maintain or re-establish their links with the land, share knowledge and partake in traditional practices. Aboriginal people in the region accessed lakes, rivers, estuaries, swamps and forest areas for a range food that included fish, birds, reptiles, frogs and invertebrates (Goode and Rundin 2002).

Section 23 of the Wildlife Conservation Act allows Aboriginal people to hunt for food on lands and waters managed by the Department, excluding nature reserves, with the consent of the Conservation Commission and the Department's Executive Director. Conditions associated with approval include:

- that the use of wildlife is sustainable;
- food is only taken by a cultural group associated with the planning area;
- special provisions for the taking of some species (e.g. specially protected species);
- the activity does not impinge upon the safety of others;
- food taken is not sold; and
- the activity is consistent with other land management objectives.

It is possible that over the life of this plan the rights of Aboriginal people may change, including hunting and gathering. The Department will ensure conformity with any changes to legislation or Government policy during the life of the plan.

34 – Traditional Hunting and Gathering

Key Points:

- As part of their culture, Aboriginal people may seek to hunt or gather from within the planning area.
- The Wildlife Conservation Act allows these customary activities to occur provided certain conditions are in place.
- It is possible that legislation and Government policy may change during the life of this plan.

The objective is to enable the collection of traditional foods by Aboriginal people where it is sustainable and does not pose a threat to the safety of other users.

This will be achieved by:

1. allowing Aboriginal people to hunt and/or gather in the planning area, provided they are from a cultural group associated with the planning area, meet the conditions of approval and have authorisation from the Conservation Commission and the Department's Executive Director; and
2. ensuring that management adapts to and conforms to any legislative or policy changes during the life of this plan.

35. MINING

Mining is the largest industry in the region and has continued to contribute to economic development since coal was discovered in the Collie Basin in the 1880s. In the 2001/02 financial year the industry was worth approximately $1.6 billion, approximating 88% of mineral worth in the south-west (SWDC 2003b). A large variety of mineral resources exist including coal, bauxite, mineral sands, tin, lithium minerals and gold. Bauxite accounts for approximately 68% of the value of production, and in the 2001/02 financial year was valued at $1.08 billion. All bauxite comes from Boddington and is produced at the Worsley refinery near Collie. The production of mineral sands along the Swan Coastal Plain is valued at $304 million. Significant coal deposits worth $252 million also exist in the Collie Basin. Whilst there are three other significant coal deposits in the south-west, the Collie Basin contains the only operating mines and produces all the coal in the State. At the time of writing there is no mineral extraction within the planning area, although gravel has been extracted in the past.

Legislative Framework

Mining[22] on land and waters managed by the Department is subject to the Mining Act, the *Petroleum Act 1967*, the *Environmental Protection Act 1986*, the Wildlife Conservation Act and various State Agreement acts.

State Agreements between developers and the State are generally enacted for major resource projects (such as bauxite, coal and iron ore) that require large capital investments and usually significant infrastructure. These agreements are ratified by Parliament as State Agreement acts. Two such acts apply to the planning area: the Alumina Refinery (Wagerup) Agreement and Acts Amendment Act and the Collie Coal (Western Collieries) Agreement Act. Under these acts, tenements have been granted to Alcoa of Australia Ltd and Westfarmers Coal Ltd (see Mineral Resources and Prospectivity).

The exploration for, and subsequent mining of minerals in Western Australia is primarily administered by the Department of Industry and Resources (DOIR) through the granting of various tenements including prospecting licences, exploration licences and mining leases. The holders of such tenements are required to meet conditions to retain the right to explore and develop. DOIR refers projects that may potentially cause significant environmental impacts to the Environmental Protection Authority under section 38 of the Environmental Protection Act. The Environmental Protection Act takes precedence over most other acts. The Conservation Commission, the Department and individuals can also refer proposals for assessment. During the assessment process, the Department has the opportunity to comment on the impact of the proposals.

Further to this, the former Department of Minerals and Energy, now DOIR, has produced an information booklet, the *Guidelines for Mineral Exploration and Mining within Conservation Reserves and other Environmentally Sensitive Areas* (DOIR 1998). This document sets out the basic procedures and conditions to be applied to applications for mining tenements.

[22] Mining includes exploration, fossicking, prospecting and mining operations.

Government Policy on Mining

The Mining Act has the following implications for lands managed by the Department:

1. Mining, including exploration, fossicking and prospecting, can be undertaken in the following tenures subject to the concurrence of the Minister for the Environment and the consent of both Houses of Parliament. The Conservation Commission provides advice to the Minister for the Environment. The tenures that this applies to are as follows:

    - Class A nature reserves and national parks;
    - other Class A Land Act or Land Administration Act reserves; and
    - Class A conservation parks and State forest and timber reserves in the South-West Land Division[23] (excluding the Esperance and Ravensthorpe Shires).

2. Mining, including exploration, fossicking and prospecting can be undertaken in the following tenures subject to the recommendations of the Minister for Environment and the Conservation Commission. Approval of the Minister for State Development (formerley the Minister for Mines) is also required, as may be an assessment by the Environmental Protection Authority. The tenures that this applies to are as follows:

    - tenures other than Class A reserves (includes forest conservation areas); and
    - Class A conservation parks and State forest and timber reserves outside the South -West Land Division (including the Esperance and Ravensthorpe Shires).

Mining is subject to Government policy applicable at the time. At the time of publication, the State Government's policy is to prohibit mineral and petroleum exploration and extraction in national parks and nature reserves. More specifically, the Government's position is that only applications lodged before 10 February 2001 for access to national parks or nature reserves for mineral or petroleum exploration or production would be considered. If considered, there would be no presumption for approval and if approved, these applications would be subject to a net benefit to conservation concept. Net conservation benefits are determined on a case-by-case basis, but could include land additions and contributions to land management such as weed and/or feral animal control and rehabilitation.

Mineral Resources and Prospectivity

The region has been extensively explored for its mineral resources, particularly the coal resources of the Collie Basin. As a result, several large-scale open cut mining operations exist, including the Muja, Chicken Creek, Premier and Ewington Mines. Within the planning area, exploration focuses on the Westralia Conservation Park and proposed Westralia Interim Forest Conservation Area, which also lies within the Collie Basin. Current exploration activities indicate potential for medium-term development in the gold, bauxite and coal sectors. The geological setting of the planning area is also considered to have a high potential for other minerals such as tin-tantalum-lithium and nickel (URS 2001).

Due to the apparent abundance of bauxite, intensive exploration of all areas with a high potential for bauxite mineralisation has not been necessary and exploration has not been sufficient to identify mineral potential in many areas.

At the time of printing, 11 mining tenements exist in the planning area, covering 4874 ha (see Map 11 and Table 11).

[23] Boundaries for the South West Land Division are defined in Schedule 1 of the Land Administration Act.

Table 11 – Current Tenements of the Planning Area

Tenement	Lease holder	Lease Status	Lease Area (ha)	Target Resource
State Agreement Act				
ML 1SA	Alcoa of Australia Ltd	Granted	3360	Bauxite
M 262SA	Westfarmers Coal Ltd	Granted	12	Coal
Prospecting				
P12/8	K. Potter	Granted	168	Gold
P12/9	K. Potter	Granted	94	Gold
P12/10	K. Potter	Granted	65	Gold
P12/11	K. Potter	Granted	19	Gold
Coal Mining				
CML/12/890	Griffin Coal Mining Company	Granted	27	Coal
CML/12/891	Griffin Coal Mining Company	Granted	12	Coal
Mining				
M12/26	K. Potter	Pending	346	Gold
M12/28	Westfarmers Coal Ltd	Pending	766	Coal
M70/271*	B & J Catalano Pty Ltd	Granted	5	Sand

* At the time of publication, mining tenement M70/271 is not included in the planning area but is proposed to become conservation estate.

Mining lease M70/271, an enclave within the Wellington National Park, has been granted for the extraction of sand (see Map 11). This small area (5 ha) will not be included in the Wellington National Park until mining and rehabilitation is completed. Access roads to the area lie within the national park.

Basic Raw Materials

Basic raw materials, principally gravel, have previously been extracted from the planning area by the Department and surrounding Shires for road making, recreational site development and building uses. Local government make most requests for basic raw materials for use on roads that are enclaves within the planning area.

Access to basic raw materials within the planning area will be permitted in accordance with the Department's Policy Statement No. 2 – *Local government authority access to basic raw materials from State forest and timber reserves* and the former National Parks and Nature Conservation Authority (now the Conservation Commission) Basic Raw Materials Policy – *Government and Local Government Access to Conservation Estate*. Extraction will be permitted where the use of the material assists in the protection and management of the area, a more environmentally acceptable alternative is not available and where the material is used within the boundaries or enclaves of the planning area. To minimise disturbance to conservation areas, alternative sources of basic raw materials, located outside the planning area, are preferred. Where extraction of basic raw materials does occur, natural values of the planning area can be maintained by:

- siting pits only in vegetation communities that are adequately represented and with the lowest conservation values;
- siting pits in areas that are protectable from dieback disease introduction and spread;
- applying best practice management in accordance with the Department's dieback disease hygiene manual; and
- applying best practice rehabilitation following extraction (see Section 39 – Rehabilitation).

Extraction by Shires is regulated under the *Local Government Act 1995* and the Mining Act for individuals. Under the Mining Act, consent from two Houses of Parliament and assessment by the Environmental Protection Authority may be required before extraction of

basic raw materials can take place in Class A reserves (which include national parks and conservation parks). Where it is consistent with the appropriate visitor management setting (see Section 26 – Recreational Opportunities), the need for extracting basic raw materials for use in the planning area can be reduced by sealing major access roads, such as Pile, Mungalup and Falcon roads.

35 – Mining

Key Points:

- Applications to mine in the planning area are subject to the Mining Act, the Petroleum Act, the Wildlife Conservation Act, Environmental Protection Act, State Agreement acts and approval by the relevant Ministers.
- Mining can have considerable impacts upon conservation values. Under the Mining Act, mining in Class A national parks and conservation parks of the South West Land Division can only be undertaken with the concurrence of the Minister for the Environment and the consent of both Houses of Parliament.
- At the time of printing 7.6% of the planning area is covered by mining tenements and 17.1% by State Agreement acts.
- Mining tenement (M70/271) is an enclave within the Wellington National Park and will be incorporated into the park once mining and rehabilitation is completed.
- Basic raw materials, particularly gravel, have previously been sourced from within the planning area.

The objective is to protect the planning area from the impacts of mining and extraction of basic raw materials, whilst being consistent with Government policy.

This will be achieved by:

1. in conjunction with DOIR, evaluating the likely impact of any proposed mineral resource development activities within the planning area (and external areas that may impact upon it) and make recommendations that minimise impacts within the context of Government policy;
2. monitoring, with DOIR, existing mineral exploration and mining activities that impact directly or indirectly on the planning area and requesting DOIR to take any necessary action where conditions are breached;
3. seeking compensation and/or additions to lands and waters managed by the Department for losses incurred due to mineral and petroleum exploration and mining activities.
4. in accordance with Department and Conservation Commission policy, permitting access to basic raw materials from the planning area where:
    - the use of the material assists in the protection and management of the area;
    - a more environmentally acceptable alternative is not available; and
    - the material is used within the boundaries or enclaves of the planning area.
5. ensuring that all sites in which any mining activity occurs are rehabilitated according to the Department rehabilitation standards and guidelines (see Section 39 – Rehabilitation).

36. DEFENCE TRAINING

Defence force, emergency service and other types of training are an acceptable use of some lands and waters managed by the Department. Defence force training is most commonly undertaken by the Australian Army, but can also include occasional Air Force and Navy activity. Activities can range from movements by individual soldiers or small groups practising survival techniques, to major operations involving one or more battalions (in excess of 800 troops). Activities within the planning area have previously included survival and navigation exercises, military training, driver training, leadership and search and rescue training.

Through effective communication between the Department and other agencies, training activities of different sizes can be accommodated without diminishing values of the planning

area or disrupting other visitors. Conditions may be imposed to ensure that environmental damage and the risk and disturbance to other users is minimised. For these reasons, some activity types are not appropriate in certain categories of Department-managed lands and waters, such as national parks and nature reserves.

To allow for continued and sustainable use for defence force and emergency service training, activities will be assessed on an individual basis, so that the particular requirements of each exercise can be considered, impacts assessed and appropriate conditions applied. To facilitate this, the defence force unit or unit training coordinator must make written application to the Regional or District Manager of the Department's South West Region at least 3 months before the proposed exercise. Applications will then be assessed to ascertain whether the proposed activities are appropriate to the physical and natural conditions of the proposed site, the site is not being over-used by repeated exercises and the effects on flora and fauna are acceptable and minimised.

Guidance for the management of defence force and emergence service training within the planning area is provided for by Policy Statement No. 54 – *Defence force training on CALM managed lands and waters* (CALM 1996). In general, the following activities are not acceptable in the planning area:

- camping involving digging or soil disturbance, use of fire, rubbish disposal or construction of temporary toilets;
- group manoeuvres involving large numbers of personnel;
- damaging, cutting or destroying vegetation (e.g. for camouflage or concealment of personnel and equipment);
- carrying and use of firearms, ammunition or pyrotechnics;
- taking vehicles off roads and tracks (e.g. in deployment procedures);
- use of support or transport aircraft or power boats;
- survival training involving collecting and consuming native plants and animals regarded as bush tucker;
- use of domestic animals (e.g. dogs or pack animals); and
- building fortifications, weapons pits or other structures.

36 – Defence Training

Key Points:

- Defence training is an acceptable use of lands and waters managed by the Department but must be carried out in appropriate areas and in an environmentally sensitive manner.
- Activities will be assessed on an individual basis and a written application has to be made to the Department before any training exercise can be carried out within the planning area.

The objective is to allow for defence force and emergency service training where the impacts on the planning area are minimised.

This will be achieved by:

1. continuing to liaise with the defence forces, Government Department's and other organisations likely to conduct training exercises in the planning area to:
    - adopt minimal impact techniques during training exercises;
    - encourage them to seek alternative suitable venues outside the planning area;
2. ensuring that activities are carried out in accordance with Policy Statement No. 54 – *Defence force training on CALM managed lands and waters*;
3. prohibiting training exercises in areas likely to cause unacceptable damage to the environment or risk and disturbance to visitors to the planning area; and
4. maintaining a map of areas suitable for defence force exercises within the Department's Wellington District so that repeated applications can be detected and advice as to alternative areas given.

37. SCIENTIFIC AND RESEARCH USE

The natural and cultural values of protected areas make them desirable sites for research. Research activities are supported where they contribute to the Department and Conservation Commissions understanding of natural or social processes within the area, and where such activities do not threaten or disrupt these processes. This information is of value to the Department in refining management operations within the planning area and to other land managers for other lands within the catchment.

Wildlife research on flora and fauna of the planning area may be undertaken by external researchers who operate under a permit system managed by the Department's Wildlife Branch. It is a condition of the permit system that results are forwarded to the Department. However, research is occasionally undertaken externally that does not require a wildlife research permit (e.g. social research) and goes undetected.

The Department and Conservation Commission hopes to further develop relationships with universities to conduct social research in the region, principally through the Nature-Based Tourism Research Reference Group. This group comprises representatives from the Department and all Western Australian universities. The group assists Regions and Districts of the Department find student university researchers to deliver management solutions to recreation/tourism issues. Projects are usually put forward by field staff and listed on the Department's Naturebase webpage. Something similar for conservation-based research would also be useful.

Within the planning area, the Wellington Discovery Forest Reserve has been specifically set aside for the purpose of scientific research and education. This area comprises the Wellington Discovery Forest (see Section 43 – Information, Education and Interpretation). Research has also been undertaken in several tree species trial plots, all located within the Wellington National Park. These plots trialed the resistance of various tree species to the disease caused by *Phytophthora*. This research is now complete and rehabilitation with native species is required (see Section 39 – Rehabilitation).

For more information on scientific and research to be undertaken by the Department see Section 46 – Research and Monitoring.

37 – Scientific and Research Use

Key Points:

- Protected areas are a valuable resource for a wide range of research projects undertaken in the State.
- The Wellington Discovery Forest Reserve has the purpose of scientific research and education.
- Wildlife research within the planning area requires a permit from the Department's Wildlife Branch.
- The Nature-based Tourism Research Reference Group provides a link between students and the Department in carrying out recreation and tourism research.

The objective is to focus research on projects that will assist in delivering the objectives of this management plan or other Departmental objectives.

This will be achieved by:

1. assisting, wherever possible, external agencies and individuals where their research contributes directly to Departmental strategies, output business plans and the auditing of this management plan;
2. applying a permit system for research proposals from outside the Department that will specify conditions under which work may be carried out and results disseminated;
3. continuing to issue permits for research on wildlife within the planning area as appropriate;

4. proposing nature-based tourism research projects through the Nature-based Tourism Research Group for listing on Nature Base; and
5. investigating the possibility of having a reference group for conservation projects.

38. PUBLIC UTILITIES AND SERVICES

Public utilities and services of the planning area are significant to the State, strategically located to supply power, water and telecommunications to regional population centres of the south-west, and in some cases, the Perth metropolitan area. Several utility corridors traverse the planning area, ensuring the shortest route for these services to other nearby lands, towns and infrastructure (see Map 11).

A telecommunication tower occupying an area of 1.5 ha is located on River Road and utilises one of few high points in the landscape to supply television to the region (see Section 31 – Commercial Operations). An adjacent tower is jointly managed under a memorandum of understanding between the Western Australian Police Service, Fire and Emergency Services Authority and the Department. Historically, this tower was used as a fire tower by the Department, but is currently not operational. The co-location of existing structures on Department-managed lands is permitted if there are no ancillary equipment shelters or ground works associated with the proposal.

The Wellington-Harris pipeline (which connects Wellington and Harris dams) and its associated powerline dissect the Wellington National Park (see Section 42 – Water Extraction). This pipeline enables water to be distributed for use in the Collie and Muja power stations as well as for the GSTWSS. The Wellington Dam is also the location of a disused hydro-electric power station, which is owned by Western Power Corporation and has been in place since the 1960s. At the time of writing, the Corporation is seeking to dispose of the facility though its sale. To enable this to occur, the Department will consider a lease arrangement with the new owner for the power station and associated pipeline.

Several powerlines dissect the area, including the Picton-Collie line along the Coalfields Road, the Muja-Bunbury line near Pile Road, and the Muja-Southern Terminal, which cuts across the western edge of the Westralia Conservation Park. These power supplies are important to the region as they connect the coal-fuelled Collie and Muja stations to Bunbury and the Perth metropolitan area. In doing so they make a significant contribution to the State electricity grid. Power is also provided to lease holders at the Wellington Dam Kiosk, Wellington Mills cottages and the Wellington Discovery Forest. Underground telephone lines also service these areas from the Collie and Ferguson exchanges. A public telephone is to be located in the Wellington Dam kiosk area.

The appropriate location of new corridors and infrastructure, and the ongoing management of existing ones, is necessary to minimise environmental and landscape impacts (see Section 15 – Landscape). This can be achieved in most cases by the application of visual landscape management techniques, which are designed to minimise the loss of visual amenity often associated with these facilities. Rehabilitation and remediation techniques may also be needed to reduce soil erosion and to minimise the introduction of weeds and disease. This can be taxing on Departmental resources, and consequently it is preferred that new utilities and services to the planning area use pre-existing corridors. Where new public services and utilities are proposed, the Department requires that all alternatives are explored and that consideration is given to minimising impacts on the planning area. The location of structures should preferably be directed outside the planning area.

38 – Public Utilities and Services

Key Points:

- Utility corridors allow power, water or telephone services to be provided to enclaves of private property within the planning area, or shorten the route for these services to other nearby lands, towns and infrastructure.

- Impacts of construction and maintenance of these corridors include loss of visual amenity, soil erosion, weed introduction, disease spread and associated access problems.
- Specific sites may be sought within the planning area to provide telecommunications facilities to public or private agencies.

The objective is to minimise the impacts of utilities and services within the planning area.

This will be achieved by:

1. permitting new utilities and services within the planning area where there are no viable alternatives and where they are consistent with other values of the planning area and Government policy. Where possible, new services and utilities should be located outside the planning area in areas where their impacts are minimised;
2. considering a lease arrangement with the new owner of the hydro-electric power station and associated pipeline at Wellington Dam should Western Power Corporation sell the facility;
3. encouraging new utilities and services within the planning area to be developed using existing utility corridors;
4. permitting the co-location of structures on Department-managed lands provided that Department operations are not impeded and there are no ancillary equipment shelters or ground works associated with the proposal;
5. ensuring that land disturbed by the installation and/or maintenance of public utilities is adequately rehabilitated at the expense of the responsible authority. Minimising the impacts of any essential utility corridor that exists or is proposed in or nearby to the planning area by implementing landscape management techniques (see Section 15 – Landscape); and
6. encouraging the prime users of infrastructure and utility corridors to be responsible for management of environmental problems, such as weeds, fire, and the spread of disease.

39. REHABILITATION

Rehabilitation within the planning area can be used following gravel pit working, mining, road works, previous silviculture activities, track closure, recreation site closure or redevelopment, or activities associated with fire suppression. To ensure that rehabilitation works have the greatest degree of success as well as limiting the introduction of exotic (non-local) plants, local native species should be used.

The Department's Policy Statement No. 10 – *Rehabilitation of disturbed land* (CALM 1986a) provides guidelines for the rehabilitation of lands managed by the Department, and is based on the following principles:

- land should be managed as far as possible to avoid disturbance;
- rehabilitation should be the last option in a series of management decisions designed to protect environmental values; and
- rehabilitation should aim to restore original values and help to enhance all potential uses provided the priority uses are not adversely affected.

In cases where other agencies/organisations have been responsible for disturbance within the planning area, it is the Department's policy that the agency is responsible for rehabilitation of these areas to a suitable standard. In such cases, the cost of rehabilitation should also be borne by the agency.

39 – Rehabilitation

Key Points:

- Rehabilitation can be used following gravel pit working, mining, road works, previous silviculture activities, track closure, recreation site closure or redevelopment, or activities associated with fire suppression.

- Use of local native species during rehabilitation ensures the greatest degree of success, and preserves the biodiversity and landscape values of the area.

The objective is to restore degraded areas to a stable condition resembling as close as possible the natural ecosystem function.

This will be achieved by:

1. managing the planning area, as far as practicable, to avoid disturbance;
2. developing a working plan for rehabilitation within the planning area, including allocating priorities for works based on:
    - existing and potential impacts on conservation and visual landscape values;
    - type and extent of the disturbance;
    - likelihood of natural regeneration;
    - availability of resources;
    - level of participation of stakeholders; and
    - the capacity for long-term monitoring.
3. rehabilitating, closing or relocating roads and tracks that have the potential to erode or impact on visual amenity;
4. ensuring the cost of rehabilitation is borne by those responsible for the disturbance;
5. actively involving private and public groups, individuals and local Aboriginal people in rehabilitation programs;
6. ensuring local plant species are used in rehabilitation schemes wherever possible; and
7. monitoring, evaluating and recording progress of rehabilitation programs/projects.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
39.1 Changes in the area of rehabilitated land within the planning area and the number of unnecessary tracks rehabilitated	39.1 Increase in the area of disturbed land rehabilitated, including rehabilitation of unnecessary tracks	Every 5 years

40. BEEKEEPING

Commercial beekeeping is a small but significant industry in Western Australia, with an average annual total income for honey production of approximately $9.3 million and a total worth (including pollination of agricultural and horticultural crops) of approximately $120 million per annum (2002/2003 data) (Manning 1992). Apiarists in Western Australia have traditionally relied on large areas of native vegetation for honey production, and are increasingly dependent on lands managed by the Department as other areas are cleared for urban development and agriculture.

For all apiary sites on Crown land in Western Australia (including land not managed by the Department), the apiarist must obtain a permit from the Department. As of June 2004, there were 3226 permits for apiary sites on Crown land. The majority of permits for these sites are in the jarrah forest between Mundaring and Collie, the sandplains north of Yanchep to Geraldton, the woodlands of the Goldfields and Ravensthorpe Range, and the southern forest between Donnybrook and Walpole. Seventeen per cent (558 sites) are currently on conservation reserves managed by the Department with a further 13% (412 sites) within proposed conservation reserves.

Within the planning area there are 10 registered sites at the time of publication, most of which are located within the Wellington National Park. These sites are at approximately 3 km intervals, a distance set by the industry to minimise honey bee interaction between sites and the potential transfer of honey bee diseases. There are a further four sites within the park that

are currently vacant. These sites were cancelled by apiarists and have been placed into a pool of sites to offer to beekeepers who may need to be relocated from other areas.

Department Policy

General guidance for the management of apiculture on Crown land is provided for by the Department's draft Policy Statement No. 41 – *Beekeeping on public land*, which is under review after a public comment period. Under the draft policy the Department will maintain (and renew) current apiary site permits on all classes (tenures) of land, but permit no additional apiary sites on land currently or proposed to be reserved primarily for nature conservation purposes[24], until a management plan has been prepared. In this instance, the Department and Conservation Commission, through the management planning process, will consider whether access for beekeeping is either retained at the current level, increased, decreased or phased out based on appropriate ecological and management criteria (Appendix 13). Thus the management planning process will identify suitable areas for beekeeping whilst minimising the potential impacts of managed honey bees.

Applying Department Policy to the Planning Area

Whilst it is recognised that feral honey bees are more of a threat to the values of conservation reserves than managed honey bees (see Section 20 – Pest Animals), there is little knowledge about the range of conditions which honey bees leave the hive, and become feral. In the meantime, the Department and Conservation Commission will take a pragmatic and precautionary approach with regards to allowing beekeeping in conservation reserves.

When allowing an introduced pollinator to persist within a conservation reserve, the dynamics between the native pollinators (which includes mammals, birds and insects) and the native flora and dependent fauna need to be considered. The planning area will be assessed using environmental and management criteria, adapted from the draft policy, in terms of the values that may be impacted by honey bees (Appendix 13). Visitation by honey bees and any predicted impact on rare and Priority flora and significant habitats and communities within the planning area will be assessed by Departmental experts, and based on the best available knowledge at the time of publication. As a result, the planning area will be categorised as being either:

- 'suitable' for apiary sites;
- 'suitable but conditional'; or
- 'highly constrained'.

Table 12 shows the Department's management approach for each category.

Table 12 – Categories of Beekeeping within the Planning Area

	Suitable	Suitable but Conditional	Highly Constrained
Maintain the number of apiary sites	Yes	Yes	No
Allow new apiary site/s*	Yes	Yes	No
Additional permit conditions apply**	No	Yes	No
Apiary site/s closed ***	No	No	Yes
Review period	Every 5 years or as new knowledge becomes available	Every 5 years or as new knowledge becomes available	Not applicable

* Providing there is existing access and according to the standard apiary permit conditions.

** Additional conditions to be determined by the District office of the Department and specialist branches. Examples of additional conditions may include seasonal restrictions, hive limits, more regular reviews, increased disease hygiene control and/or regular monitoring of the apiary site.

*** Sites will be relocated, where possible, to a more appropriate site nearby, in negotiation with the apiarist. This may include sites within the planning area that are assessed as suitable or suitable but conditional or on Department-managed lands outside of the planning area.

[24] Lands reserved primarily for nature conservation includes national parks, conservation parks, nature reserves and 5(1)(g) and (h) reserves.

An assessment of the planning area identified one site as suitable and nine that were suitable but conditional (Appendix 13). No sites were highly constrained. Appendix 13 shows additional conditions that should be placed on each permit.

The methodology of categorising the planning area into classes of suitability will have to be adaptive over the life of this plan to ensure that the best available knowledge is used to apply the criteria of Appendix 13. Any change in the categories for beekeeping, criteria or values of the planning area should ideally coincide with the review of apiary permits. Further research is also required to quantify the impacts of managed honey bees on the natural environment.

Sites adjoining the planning area may also impact on its environmental values (Appendix 13). Where these are located on lands managed by the Department the criteria in Appendix 13 should be applied. Where sites are located on other lands and a significant environmental impact to recognised values (e.g. threatened ecological communities) may occur, such proposals could be referred to the Environmental Protection Authority for assessment.

Further information on beekeeping, including the standard conditions for apiary sites, can be obtained from the Department's webpages: http://www.naturebase.net/forest_facts/apiary/index.html.

40 – Beekeeping

Key Points:

- Commercial beekeepers have always relied heavily on large areas of native vegetation, and are increasingly dependent on lands managed by the Department.
- At the time of writing there are 10 registered apiary sites within the planning area.
- The planning area has been assessed as being either suitable, suitable but conditional or highly constrained for apiary sites as per environmental and management criteria in Appendix 13.

The objective is to permit beekeeping activities within the planning area whilst minimising the impacts of commercial honey bees on recreation and native flora and fauna.

This will be achieved by:

1. permitting apiary sites in the planning area in accordance with the draft Policy Statement No. 41 – *Beekeeping on public land* and following an assessment using the criteria in Appendix 13 and application of the approach described in Table 12;
2. prohibiting apiary sites in reserves where there is no history of use;
3. reviewing the suitability of beekeeping in the planning area as per the approach in Table 12 and criteria of Appendix 13 or when new knowledge becomes available;
4. supporting Department research on the impact of beekeeping on native flora and fauna within natural ecosystems of the south-west and adapting management to incorporate new knowledge; and
5. liaising with beekeepers (including the Beekeepers Consultative Committee) and the Department of Agriculture to ensure the most efficient and sustainable use of sites.

41. FOREST PRODUCE

In accordance with section 99A of the CALM Act, the Executive Director can grant a licence to take forest produce[25], from the planning area provided it is:

- to remove exotic trees (e.g. pines), honey, beeswax or pollen (by apiary site permit);
- used for therapeutic, scientific or horticultural purposes; or
- for essential works.

[25] 'Forest produce' includes trees, parts of trees, timber, sawdust, chips, firewood, charcoal, gum, kino, resin, sap, honey, seed, bees-wax, rocks, stone and soil.

Essential works are defined in section 99A(2) of the CALM Act and include works that are required to establish or re-establish access to land or to provide a firebreak (for example, after a storm with fallen trees blocking access). Forest produce that is taken in connection with essential works can be sold, or used by the Department. Introduced tree species located within species trial plots, could be selectively logged from the planning area and sold by the Department as forest produce.

The Forest Products Commission is legally prohibited from harvesting timber for commercial purposes from CALM Act section 5(1)(h) reserves such as the Wellington Discovery Forest Reserve. For a variety of reasons, it is the Department and Conservation Commission's preference that logging or a demonstration of silvicultural activities is not be permitted in this Reserve (see also Section 42 – Information, Interpretation and Education).

The removal of forest produce from the Westralia Interim Forest Conservation Area, which is an area of State forest classified under section 62 (1) of the CALM Act, is prohibited unless:

- it is in accordance with reasons stated above;
- written authorisation is given by the Executive Director under section 103 (2a) of the CALM Act; or
- authorisation is given under Division 1, Part VIII of the CALM Act.

Forest produce, as defined under Division 1, Part VIII of the CALM Act, does not include timber, trees or parts of trees. Executive Director approval to take forest produce from forest conservation areas may be for reasons such as visitor safety and must be in accordance with a management plan. Commercial timber harvesting is not permitted in forest conservation areas.

Harvesting operations within adjacent multiple-use State forest should be compatible with the *Forest Management Plan 2004-2013*, the silvicultural practice in the jarrah forest– *Silvicultural guidelines 1/02* and management of the planning area. Landscape management in particular should be carefully considered in logging proposals and, where possible, incorporated into management prescriptions (see Section 14 – Landscape). To minimise soil erosion, reduce unnecessary visitor access and maintain the visual amenity of the forest environment, disused logging roads should be closed and rehabilitated (see Section 38 – Rehabilitation).

Firewood

State forests have traditionally provided the main source of firewood. Section 128 (1)(d) of the CALM Act and Part 15 of the *Forest Management Regulations 1993* provides for the taking of firewood from designated public firewood areas within State forest and timber reserves. Firewood collection is not permitted within national parks, conservation parks and CALM Act section 5(1)(h) reserves, except for campfires and barbeques in the immediate vicinity of recreation areas and only where they have been signposted for such use. State forest within the planning area is classified as 'interim forest conservation area' and proposed to become conservation park. Therefore, this area will not be available for firewood collection.

As part of its management obligations, the Department will seek to gazette 'Firewood Collection Areas' within the region and these will be clearly signposted and marked on park literature. In the interim, areas for firewood collection can be obtained from District and Regional offices of the Department.

Within the planning area, the Department may source firewood from residue from management operations, product sourced from harvesting operations by licensed contractors (e.g. the removal of trees as a result of 'essential works'), or from the removal of exotic trees.

41 – Forest Produce

Key Points:

- The Executive Director can issue licences under section 99A of the CALM Act to:
  - take forest produce (including trees and associated products) from the planning area for therapeutic, scientific or horticulture purposes;
  - to take and remove exotic trees (e.g. pines), honey, beeswax or pollen;
  - to take or remove forest produce for 'essential works'. Essential works include works that are required to establish or re-establish access to land or to provide a firebreak. Essential works also allow the removal and sale of timber.
- It is the Department and Conservation Commission's preference that logging, including a demonstration of silvicultural activities, is not be permitted in the Wellington Discovery Forest Reserve. Commercial logging by the Forest Products Commission is legally prohibited in the Reserve.
- Removal of forest produce from the Westralia Interim Forest Conservation Area is prohibited unless authorised by the Executive Director or authorised under Division 1, Part VIII of the CALM Act.
- Firewood can not be removed from the planning area, unless areas are signposted for such use. The Department will gazette Firewood Collection Areas in State forest and timber reserves within the region.

The objective is to prohibit the removal of forest produce from the planning area, except where it is in accordance with section 99A or section 103 (2a) of the CALM Act.

This will be achieved by:

1. prohibiting forest produce to be taken from the planning area unless it is accordance with sections 99A or 103 (2a) of the CALM Act;
2. prohibiting the removal of any native forest product for commercial use from the planning area (enforced by the CALM Act);
3. prohibiting commercial and trial logging, including a demonstration of silvicultural activities, from the Wellington Discovery Forest Reserve;
4. gazetting 'Firewood Collection Areas' in State forest and timber reserves within the region and prohibiting this activity within the planning area;
5. promoting areas for firewood collection by clearly signposting them and marking them on park literature; and
6. removing trees that pose a threat to the public or facilities, or that obstruct designated access tracks and using the timber within the planning area wherever possible.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
41.1 Incidence of unauthorised firewood collection within the planning area	41.1 Reduction in the reported incidence of unauthorised firewood collection within the planning area	Every 5 years

42. WATER EXTRACTION

In general, proponents seeking to extract water from the planning area require a licence from the DoE, who administer the *Rights in Water and Irrigation Act 1914*. Such licences specify the amounts and conditions under which water may be taken. Conditions typically cover measurement and monitoring responsibilities of the licensee and specify constraints on the amount taken to ensure environmental impacts are acceptable and downstream flow regimes are maintained to meet environmental and social water needs.

Proponents seeking to extract water from the planning area would also require approval from the land manager (in this case the Department) to access the land for the purpose of extracting water. The Department may, after consultation with the Conservation Commission and with approval from the Minister for the Environment, issue a Water Removal Permit for this to occur. This Permit can place conditions on the proposal (e.g. on the quantity of water extracted). Where infrastructure is required, a lease might also be issued. An assessment by the EPA may be required for projects with potentially significant environmental impacts. An assessment by the Environmental Protection Authority may be required for projects with potentially significant environmental impacts.

The planning area lies within a proclaimed irrigation district under the Rights in Water and Irrigation Act. Westralia Conservation Park and the majority of the proposed Westralia Interim Forest Conservation Area are also proclaimed under the Act as a groundwater catchment, whilst the Ferguson River, in the south-western part of the planning area, is a proclaimed river. A licence is required from the DoE to take water in proclaimed areas or non-artesian groundwater areas proclaimed or prescribed under section 26B of the Act. However, not all water extraction has to be licenced and landholders do have a right to take water (such as a riparian right) for domestic and ordinary use or for watering stock that are not being raised under intensive conditions. Nonetheless, a licence is required to take water in excess of this right, such as for commercial irrigation.

In the upper catchment of the Collie River, outside the planning area, there are 11 surface water licences and 22 groundwater licences held at the time of writing. The largest allocation is 68 GL to South West Irrigation Management Co-operative Ltd to extract water from Burekup Weir, which obtains its supply from the Wellington Reservoir. The WC also hold a licence to store water in the Wellington Reservoir[26] for commercial purposes. Other major surface water allocations are to the WC to supply potable water for drinking purposes, including 30 GL from Harris Dam and 500 kL from Mungalup Dam. Some of this water is allocated to Collie whilst the rest supplies the GSTWSS.

In the planning area, treated water is supplied to the kiosk at Wellington Dam and to the Potters Gorge recreation site via the Wellington-Harris Dam pipeline. At Honeymoon Pool, Wellington Discovery Forest and Wellington Mills cottages, water is supplied from nearby creeklines and river systems. The latter it is untreated and should be boiled before consumption. This applies to other campsites developed in the planning area.

Wellington Reservoir

The Wellington Reservoir is a 1611 ha expanse of open water that has a maximum supply of 186 GL. It has the largest capacity of any dam in the south-west, and is the fourth largest in the State. Water has been extracted from the Reservoir since 1933 and until 1990 was used to supply the GSTWSS, including the Collie townsite. At the time of writing the Reservoir is used primarily for irrigation of the Collie River Irrigation District, which stretches from Benger to Dardanup, comprises 267 km of channels over an area of 16 000 ha, and supplies water to over 470 farms. The Reservoir could potentially be used as potable water for the GSTWSS and/or as part of the IWSS for the south-west of the State. Transportation of water from the Wellington Reservoir is via the Wellington–Harris pipeline, which runs north of the dam.

Improving the water quality of the Wellington Reservoir has several advantages: the community will have safe drinking water, fresh water could be supplied to riverine habitats along the Collie River and it will be more productive for irrigators. However, improving water quality has social and economic implications. The WC has advised that treatment costs for using up to 17 G/L of water from the Wellington Reservoir are approximately $35.9 million, providing water-based recreational activities are not permitted. However, should recreation be permitted in the Reservoir, treatment costs will increase to approximately $53

[26] The waterbody of the Wellington Reservoir is not located within the planning area (see Section 3 – Management Plan Area).

million with an annual operating cost of $3.2 million. The net effect could result in the unit cost of the scheme water increasing from $0.40/kL to $1.00/kL.

Prohibiting water-based recreation from the Wellington Reservoir will have significant social costs attached. Recreational activities play a big part in many visitors' enjoyment of the natural environment and occupy considerable amounts of people's spare time. The value of this, as well as the associated tourism benefits, should not be underestimated. Therefore, any assessment of the worth of the Reservoir needs to consider the social, economic and environmental values of the resource.

In the past, a by-product of water extraction at the Wellington Reservoir has been the source of hydro electricity, although the facility is not currently in operation.

Collie Basin

In 1999, a study prepared by the Collie Water Advisory Group found groundwater flow patterns in the Collie Basin to be highly disturbed because of large-scale groundwater abstraction for mine dewatering and power generation (Collie Water Advisory Group 1999). The study concluded that continued abstraction to the current allocation would adversely affect the recovery of groundwater levels in river pools, albeit to varying degrees. In response to this, the DoE have prepared an environmental water provisions plan to guide long-term pool supplementation schemes. It is possible under these schemes that future demands for water supply to power stations will be met by mine dewatering and surface water from Wellington or Harris reservoirs. This may require upgrading the infrastructure associated with the Wellington Reservoir.

No groundwater abstraction currently occurs in the planning area, although it may be affected by active abstraction in nearby areas.

42 – Water Extraction

Key Points:

- A licence, administered by the DoE, is required to take water in proclaimed areas or non-artesian groundwater areas proclaimed or prescribed under the Rights in Water and Irrigation Act. The entire planning area is proclaimed as an irrigation district. It also contains a proclaimed groundwater catchment and a proclaimed river.
- No water extraction could occur in the planning area without the Conservation Commission permitting access for this purpose to the proponent. An assessment by the Department, the Conservation Commission or the Environmental Protection Authority may be required for proposals to extract water.
- Wellington Reservoir is the largest dam in the south-west and is used primarily for irrigation of the Collie River Irrigation District. The Reservoir is a potential potable drinking water supply for the GSTWSS or for the IWSS for south-west of Western Australia.
- Groundwater abstraction is undertaken within the Collie Basin, primarily to dewater underground and open cut mines and for power generation. As a result, groundwater flow patterns in the Collie Basin have become highly disturbed.
- The DoE will prepare an environmental water provisions plan to guide long-term pool supplementation schemes to manage the effects of groundwater abstraction.

The objective is to protect the water resource of Wellington Reservoir whilst minimising the impact of resource use and ensuring consistency with Government policy.

This will be achieved by:

1. liaising with the DoE to ensure sufficient environmental flows are maintained for portions of the Collie River and its tributaries that flow into the planning area, and that this is supported by an appropriate level of monitoring;

2. subjecting all new infrastructure supporting water extraction on adjoining lands to the strategies of Section 38 – Public Utilities and Services;
3. requesting that the Environmental Protection Authority formally assess any proposals for water extraction where this may adversely affect the values of the planning area; and
4. following an appropriate level of assessment, and approval by the Conservation Commission, the Minister for the Environment and the DoE, issuing a Water Removal Permit for the extraction (taking) of water from the planning area. Where a permit is not issued or the DoE do not grant a licence, water may not be extracted from the planning area.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
42.1 Water quality in the Wellington Reservoir	42.1 Maintenance of water quality for drinking water purposes to the standards set by the Australian Drinking Water Guidelines as monitored by the Advisory Committee for the Purity of Water	Annually subject to information provided by the DoE and WC

PART G. INVOLVING THE COMMUNITY

Various Departmental policy statements provide management direction for involving the community including:

- Policy Statement No. 15 – *Community involvement (Public Participation and Volunteers)* (CALM 1991a);
- (re-drafted) Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation); and
- Policy Statement No. 25 – *Community education and interpretation* (CALM 1988).

Further guidance is provided by the Visitor Interpretation Manual and best principles.

43. INFORMATION, EDUCATION AND INTERPRETATION

The proximity to Perth and regional population centres and its varied attractions make the planning area a potential tourist destination, and an ideal place for community education about the forest environment. Particular features of interest are its distinctive landforms, the scenic lower Collie River valley, the diversity of plants and animals, the Wellington Reservoir and its rich cultural heritage.

An effective and innovative education, information and interpretation program is an essential component of managing visitor use. This is especially so given the continuing growth in visitor numbers and the increased demands for use of the area. Such a program informs the public of the attractions and opportunities available, and assists the community to appreciate and understand the natural and cultural environment. These programs foster a sense of community ownership of the planning area and engender support for its management.

The process of community education consists of three parts, all of which will be employed in the planning area:

Information:	provides details of facilities, activities, features and regulations. Information includes off-site promotion of the planning area, personal contact with park Rangers and brochures.
Education:	provides resources and programs designed specifically for various educational groups. Education includes teacher's resource packs and excursion programs.
Interpretation:	explains natural and cultural features and management activities to enrich visitor experiences. Interpretation includes on-site signs, information shelters, brochures, and guided interpretive activities.

Educational and interpretive opportunities of the planning area are well developed at the Wellington Discovery Forest (including interpretive walk tracks) and are also available in the Wellington Dam precinct. Interpretative information portraying the biology of the jarrah is also available at the King Jarrah recreation site. The primary attractions and facilities of the planning area are detailed in the Department's pre-visit information brochure *Recreation sites in the Wellington District*. Other publications relevant to the planning area are *Munda Biddi Trail – A forest cycling adventure* and *Walk the Bibbulmun Track*. There is a need to develop specific brochures and pamphlets to provide further information about park orientation as well as the values, history and regulations within the planning area. A communication strategy regarding unauthorised firewood collection should be incorporated as part of this program.

An interpretation plan for the planning area is being written to direct the implementation of interpretive projects and tourism initiatives. This will focus on the topics of rivers, forests,

cultural heritage, biodiversity conservation, water quality protection, encouraging family use (including low impact recreation) and the evolution of land use change in the south-west. The interpretation plan will ensure integration and coordination of messages and themes across the various sites and tracks. This may include directional signage, entry statements, information shelters, interpretive signs, exhibits, publications and facilities. In particular, the planning area is suited to the concept of interpretive walk and drive tracks, especially where these involve scenic drive routes (such as Lennard Drive) or where walk tracks link to accommodation facilities or recreation sites (such as at Honeymoon Pool).

Completion of an information bay along Wellington Dam Road will provide initial information to visitors. Linking to interpretive signage outside the planning area should also be considered as visitors rarely see a park as an entity on its own but rather as part of a larger region.

At present there is no visitor centre within the planning area and thus no focal point for information, interpretation and education. In the long-term, the Wellington Dam precinct would appear to be an ideal location for a visitor centre where information could be displayed, questions answered and visitors motivated to learn more about the area and other nature-based opportunities within the region. This area is particularly suitable as it is centrally located within the planning area, has well developed access, lies on main scenic travel routes through the forest and is the most highly visited site within the planning area, especially when the dam overflows.

Aboriginal people have a long and established involvement with the area and interpretation should reflect their culture and values. The Collie River, a primary attraction to the area, is a registered Aboriginal Heritage site and presents an ideal opportunity to communicate local Noongar culture. This can be achieved by completion of the interpretive walk track from Honeymoon Pool to the bridge at River Road. Furthermore, a bush tucker garden will be developed in the Wellington Discovery Forest as part of the education program for school children and other educational groups.

Wellington Discovery Forest

The future use and management of the Wellington Discovery Forest has been the subject of much debate. The discovery forest concept was conceived in 1990 with the aim of raising community awareness of conservation values and the management of multiple-use jarrah forest. It was envisaged by foresters that a small section of the forest could be provided for a demonstration of best practice silviculture by progressively logging small patches of forest over a 300-year rotation. In the early 1990s, a small plot (approximately 10 ha) was selectively logged for demonstration purposes and it was intended that this continue over time. However, no further silviculture activities have been undertaken since. Despite this, successful community education programs have been developed.

The Wellington Discovery Forest was set up before there was consideration of making the area a national park. The area was originally part of State forest No. 25 but was later identified in the *Forest Management Plan 2004-2013* in the proposal to expand Wellington National Park. Debate arose over the potential to use the area for a demonstration of silvicultural activities including the harvesting of trees. This would not have been compatible with the proposed national park purpose. If the Discovery Forest was included in the Wellington National Park, silviculture demonstrations, including logging, would not be permitted.

After extensive community consultation, the Wellington Discovery Forest was included in the *Reserves (National Parks, Conservation Parks and Nature Reserves) Bill 2004* that was introduced to parliament in November 2004 and included the expansion of Wellington National Park. The Bill was subsequently amended in parliament to exclude an area of 684 ha known as the Wellington Discovery Forest from the proposed national park expansion, and instead proposed to reserve it for the purposes of 'scientific research and education'. The

amendment was accepted resulting in the creation of the expanded Wellington National Park and other important national parks, conservation parks and nature reserves. Legislation to create the reserve, known as the Wellington Discovery Forest Reserve, was passed on 8 December 2004. This management plan will therefore provide management direction for the new reserve, giving due consideration to its purpose and current management.

Current Use and Management

At the time of publication, the Reserve is used for community education, providing an excellent opportunity for the community to learn first hand about the complexities of managing the jarrah forest.

The focal point of the area is the Wellington Discovery Centre, which contains four interpretative panels, murals and facilities to cater for large groups. Radiating from the centre is a number of interpretative self-guiding walk tracks such as the Jarrah Trail, Total Forest Trail and the Sense-ational Trail. Opportunities exist to link walk tracks to interpretative sites such as the King Jarrah. Near to the centre, accommodation is available at Wellington Mills cottages.

Most visits to the Reserve are by tertiary, secondary and primary educational institutions (including teacher professional development programs) although visitors pass through the centre on weekends. Since 2000, when the eco-education programs were implemented at the Reserve, approximately 6000 people (including 4900 students) have visited this area. Departmental staff conduct educational programs designed to offer young people a hands-on experience in learning about the forest environment. At the time of writing, 11 eco-education programs are offered including:

- Discovering Wellington Forest – *values of the jarrah forest ecosystem*;
- Threatened Species (back from the brink) – *fauna management and Western Shield program*;
- Ecosystem Explorers – *evolution of the forest*;
- Biodiversity's Base – *invertebrate fauna and the maintenance of forest biodiversity*;
- Djildjit the Noongar Way – *cultural awareness and sustainable natural resource management*;
- The Total Forest Trail – *forest management to meet people's needs*; and
- Geography/ecosystem Biology – *management of the jarrah forest ecosystem*;

Where groups stay overnight, four additional programs are offered:

- Monitoring Marsupials – *a unique opportunity to be part of Western Shield research*;
- Marvellous Macroinvertebrates – *macroinvertebrate fauna and their importance to catchment water quality*;
- Sleeper-cutters Life – *history of the local timber industry*; and
- Sense-ational Night-life – *recognise the interdependence of life forms as the forest comes alive after dark.*

New programs are to be developed to cater for Aboriginal studies incorporating the bush tucker garden. In the long-term, existing programs at the Reserve may be expanded and offered at various destinations within the planning area. There is also the opportunity to expand the Wellington Discovery Centre and provide accommodation/interpretative facilities by incorporating two nearby cottages that are currently leased out by the Department (see Section 30 – Commercial Operations). This would only be considered if the lease was discontinued.

Future Management

The Department and Conservation Commission believe that the Wellington Discovery Forest Reserve can continue to be developed as the focal point for education within the planning area, providing environmental, historical, cultural and management interpretation and education programs. These programs will educate visitors about ecologically sustainable

management of all components of the forest, including flora, fauna, fire, recreation and water as well as settlement of the region and its timber history. In addition, the Reserve will provide information on the adjoining Wellington National Park and will allow areas for long-term study or research projects. In all instances, the integrity of the adjoining Wellington National Park will not be compromised.

The Department and Conservation Commission recognise that there is debate as to whether a small section of the Reserve should be logged to demonstrate the effects of silvicultural activities. However, the Department and Conservation Commission propose that logging, including the demonstration of silvicultural activities, is not permitted for a variety of reasons, including:

- feedback from school teachers who visit the site is that there is little demand for this type of educational activity by school groups. Teachers have also indicated that if they want to see a demonstration of ongoing logging, they would prefer to see it at a real, working coupe. Also, timber production and the multiple use of forests can be demonstrated without the necessity to log trees within the Reserve. In fact, past harvesting activities will allow for education about silviculture for many years to come;
- there are research plots elsewhere in the south-west where silvicultural data is compiled;
- vehicle transport from the Wellington Discovery Centre would be required for school groups to access the demonstration plots. As such, transporting groups to coupes in nearby State forest that are actively logged may provide better educational value and hence be a more appropriate alternative;
- the area is designated as a Disease Risk Area (see Map 9) and therefore soil disturbance should be minimised given its location as an enclave within the Wellington National Park;
- the area lies along scenic travel routes and hence logging activities may affect visual landscape values;
- the area is habitat for threatened and priority fauna; and
- the area is an enclave within the Wellington National Park and therefore may be perceived by visitors as national park.

To aid in making a final decision, the Conservation Commission is seeking public comment through this draft management plan as to whether the proposal to not allow logging within the Reserve is supported.

43 – Information, Education and Interpretation

Key Points:

- The planning area provides an excellent opportunity for the community to learn first hand about the complexities of managing the jarrah forest.
- The Wellington Discovery Forest, within the Wellington Discovery Forest Reserve, is the focal point for education activities and information provision.
- The Wellington Discovery Forest Reserve is managed under the CALM Act for the purpose of 'scientific research and education'.

The objective is to promote community understanding and awareness of the conservation values of the planning area and engender support for its effective management.

This will be achieved by:

1. continue the operation of the Wellington Discovery Forest for scientific research and education purposes;
2. not allowing logging within the Wellington Discovery Forest Reserve;
3. developing and implementing an interpretation and communication plan for the planning area;
4. developing a range of interpretation and education programs, facilities and media that highlight the natural and cultural heritage and management issues;

5. developing information shelters at key access points to orientate and introduce visitors to the planning area;
6. installing signs to orientate visitors within the planning area, inform visitors of one-way roads, to warn of possible danger, and to protect water quality. Water quality management is particularly important at Potters Gorge and at proposed camping sites around the Reservoir where it is critical to send positive messages about the need to protect water quality;
7. liaising closely with other agencies, organisations and individuals (such as tourism agencies, tour operators, schools and museums) to ensure integration of education and interpretation programs, facilitate mutually beneficial partnerships and expand the range of eco tourism experiences offered; and
8. considering the impact of proposed management activities on educational programs.

Key Performance Indicators (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
43.1 Changes in the number of participants in education programs offered within the Wellington Discovery Forest	43.1 An increase in participation, including recurrent participation, in education programs offered within the Wellington Discovery Forest from 2005 levels	Annually
43.2 The number of infringements issued annually and the reported incidence of vandalism in the planning area	43.2 An increase in visitor compliance with regulations and policies within the planning area from 2005 levels	

44. WORKING WITH THE COMMUNITY

Community involvement is an integral component of the Department's operations and the implementation of this management plan. The community, as groups or individuals, are encouraged to be involved in both the planning and management of many of the Department's activities, including volunteer programs.

The community have been involved in drafting this management plan by providing initial comments on their perspective of the issues within the planning area by way of written submissions and participation in issues gathering workshops, public meetings and public displays. In particular, interested community members have been invited to be part of the Wellington National Park Community Advisory Committee, which is advising the management planning team throughout the preparation of this management plan. On completion of the management plan a new advisory committee will be established with the purpose of advising the Department on the implementation of the plan.

Ongoing community support is essential for the successful implementation of this management plan once finalised. The most important step will be to involve the community, local Aboriginal people, local authorities, other Government agencies and the neighbours of the planning area. This will enhance integrated land management, which is particularly important where management issues, such as fire, weeds and visual land management, go beyond the boundaries of the reserves.

Community groups are encouraged to take part in volunteer activities throughout the planning area, such as clean up days and help with maintenance such as erosion control and track maintenance. Not only does the Department benefit from these activities, but the volunteers also gain meaningful and enjoyable experiences in an area of interest. The community benefits from volunteer programs through the added level of environmental management, and

an improved level of services in the form of information and education. Local bushfire brigades, campground hosts and the Friends of the Bibbulmun Track are examples of independent volunteers, working cooperatively in a well-established relationship with the Department, to the mutual benefit of both parties and the community.

The CALM Act provides for the appointment of Honorary Conservation and Land Management officers. Selected volunteers may be appointed under the Act and, after appropriate training, invested with certain powers to enable them to carry out certain functions for the Department. Volunteers may work in areas of land management, heritage, as facilitators of volunteer groups or assist in emergency situations.

The future involvement of Aboriginal people in management of the planning area will be considered in light of the Government determining a policy position (see Section 8 – Management Arrangements with Aboriginal People).

44 – Working with the Community

Key Points:

- The community has been involved in preparing this plan and ongoing community support is essential for the successful implementation of this management plan once finalised.
- The Department supports voluntary activities, which contribute to achieving nature conservation and management objectives, and which build community awareness, understanding and commitments to these objectives.

The objective is to facilitate effective community involvement in management of the planning area.

This will be achieved by:

1. continuing to involve interested local individuals and organisations in conservation and land management programs within the planning area;
2. continuing to liaise with local Aboriginal people, neighbours, land managers, local authorities, relevant Government agencies and other stakeholders to enhance management of the planning area;
3. establishing a new advisory committee to provide advice to the Department in implementing the strategies of this plan; and
4. continuing to support volunteer involvement in the Departmental programs and the maintenance of the Department's volunteer database.

Key Performance Indicator (see also Appendix 1):

Performance Measure	Target	Reporting Requirements
44.1 Changes in the number of registered volunteers and the level of volunteer hours contributed within the planning area	44.1 An increase in the number of registered volunteers and the level of volunteer hours contributed within the planning area	Every 5 years

PART H. MONITORING AND IMPLEMENTING THE MANAGEMENT PLAN

45. ADMINISTRATION

The Department follows a purchaser–provider model to deliver operations on the ground, principally through nine Regional centres that are further sub-divided into Districts. The planning area is in the Wellington District of the South West Region and its operational management is the responsibility of the District Manager, Wellington District.

The implementation of this management plan will be subject to Service Provision Agreements determined annually but forecast over a 3-year period. The preparation of the Service Provision Agreements should involve, where applicable, the recommendations for action within this management plan. Every effort will be made to attract external resources to assist in implementing the plan. Guidance for this is provided by Policy Statement No. 46 – *External funds* (CALM 1992c).

46. RESEARCH AND MONITORING

Research and monitoring are essential components of management, and are required to successfully implement this management plan. They can lead to a better understanding of the values of the planning area, increase knowledge, aid in performance assessment and provide a scientific basis for improving and adapting future management to achieve best practices.

The Department's Science Division undertakes research within the State either with assistance from Regional and work centre personnel or as part of larger State-wide projects. Additional internal research is conducted or facilitated by the Parks and Visitor Services Output, principally through the Visitor Satisfaction Survey, the Visitor Statistics Program, and the Nature-based Tourism Research Reference Group. The latter focuses on developing relationships with universities to facilitate nature based tourism research.

Research Requirements

It is appropriate that research and monitoring involves a wide range of organisations and groups. The involvement of volunteers, educational institutions and individual researchers can reduce research and monitoring costs, thereby helping to provide quality information for the benefit of the broader community.

Departmental research gives priority to:

- describing and documenting Western Australia's biological diversity;
- providing knowledge on how best to conserve the State's biodiversity;
- increasing knowledge of visitor use patterns and profiles (e.g. demographics, level of use of recreation sites, visitor expectations and perceptions).

Allocating priority for research and monitoring may result in conducting programs that have relatively little direct management application to the planning area but significant direct application to the conservation estate and species or communities elsewhere.

Research itself has the potential to adversely impact upon the values of the planning area. Proposals for research should be assessed as to their suitability and be subject to appropriate conditions if necessary.

Research Projects in the Planning Area

In the case of this management plan, specific research projects should also assist in meeting the requirements of KPIs. This will include gaining a better understanding of those values identified as being most at risk (sensitive to disturbance) and to management practices most likely to have adverse social and ecological impacts. Consideration of research projects that examine the impacts of unanticipated changes to conditions, such as adjoining land use, should also be given priority. Further research with the planning area may include:

- fire management research depends on preliminary assessments of flora and fauna to determine the burning regime for each fire landscape and management unit (see Section 23 – Fire).
- continuing social research is required to increase current knowledge by determining profiles on visitors to the planning area, the level of use of recreation sites, patterns of usage and visitor perceptions for future management.
- the impact of recreation and facilities on the environment of the planning area should be monitored, including compliance with measures designed to protect water quality. The need for additional facilities will also need to be monitored, taking into consideration population changes in nearby areas, visitor management settings and access.
- social research and monitoring projects should determine if recreation, environmental education and interpretation activities are meeting visitor needs. A particular focus will be on activities within the Wellington Discovery Forest. The impacts of all activities should be monitored, and changes made if any impacts are unacceptable.

Government agencies also have responsibility for monitoring in the planning area. The DoE and the WC, for example, monitor water quality and quantity. In addition, the DoE have conducted research into the environmental water requirements for the lower Collie River (see Section 22 – Soil and Catchment Protection).

46 – Research and Monitoring

Key Points:

- In order to implement this management plan and achieve the objectives contained within, research and monitoring is required to improve understanding of the values of the planning area and aid in performance assessment.

The objective is to increase knowledge and understanding of flora, fauna, natural processes, resources, and visitor use to provide for better management of the planning area and to monitor the impacts of this management plan.

This will be achieved by:

1. identifying and initiating integrated research and monitoring programs, as resources permit and according to priority, that facilitates management of the planning area. Research and monitoring will focus on issues and key values required to report on this management plan, the establishment of baseline information and in assisting the implementation of the Department's Corporate Plan and output business plans;
2. the Department's Regional and District staff liaising with the relevant Output staff to determine research priorities, and documenting these in Service Provision Agreements;
3. providing information gained through research, monitoring and experience to the Department where it can be stored in Regional and District office libraries, updated when required and used, if necessary, to modify management practices;
4. developing and maintaining a database of historical, current and required research on the planning area;
5. incorporating research and monitoring findings into interpretive and educational material where appropriate;
6. encouraging and supporting, wherever possible, external agencies, institutions, volunteers, individuals and other organisations to carry out research and monitoring projects where this contributes directly to the management of the planning area or the

delivery of Departmental strategies and Output business plans;
7. ensuring that research and monitoring activities do not adversely impact on the values of the planning area; and
8. pursuing external funding sources to assist in achieving research and monitoring objectives.

47. TERM OF THE MANAGEMENT PLAN

The management plan for Wellington National Park and Westralia Conservation Park is current for a period of 10 years from the date the final management plan is approved. At the end of the 10-year period, the management plan will be reviewed with full public consultation and then re-submitted to the Minister for the Environment for approval. The CALM Act also specifies that in the event of such a revision not occurring by the end of the management plans specified life-span, the plan will remain in force in its original form, unless it is either revoked by the Minister or until a new plan is approved.

ACRONYMS

DoE	Department of Environment.
CAR	Comprehensive, adequate and representative.
CAWS	Country areas water supply.
CSIRO	Commonwealth Scientific and Industrial Research Organisation.
DOIR	Department of Industry and Resources.
DWSPP	Drinking water source protection plan.
FESA	Fire and Emergency Services Authority.
GSTWSS	Great Southern Towns Water Supply Scheme
IWSS	Integrated Water Supply System
KPI	Key performance indicator.
LCU	Landscape conservation unit.
RATIS	Recreation and Tourism Information System.
RFA	Regional forest agreement for the south-west forest region of Western Australia.
WC	Water corporation.

GLOSSARY

1080	A naturally occurring toxin (sodium fluoroacetate) found in many native south-west Western Australian plants known as 'poison peas' (*Gastrolobium* spp.).
Alluvial	Deposits of earth, sand, gravel, and other transported matter, made by flood or flow events.
Aquatic	Living or growing in or on water.
Aquifer	A layer of rock that holds and allows water to move through it, and from which water can be extracted.
Autonomous	Existing or capable of existing independently.
Biodiversity	The variety of all life forms: the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form; often considered at three levels: genetic diversity, species diversity and ecosystem diversity.
Biogeography	The study of both geography and biology including the relationships between plants, animals, soils, water, climate and humans.
Biotic	Of, or relating to living things; caused or produced by living organisms.
Catchment	The surface area from which water runs off to a river or collecting reservoir.
Conservation	The protection, maintenance, management, sustainable use, restoration and enhancement of the natural environment.
Critical Weight Range Mammals	Mammals weighing between 35 g and 5 kg.
Declared species	Either plants that are declared as weeds or animals that are declared as pests. A list of declared species, with their levels of declaration in various areas of the State is published annually in the Government Gazette pursuant to section 37 of the Agriculture and Related Resources Protection Act.
Dieback	A disease of plants caused by the infection by the soil-borne fungi of the genus *Phytophthora*.
Ecosystem	A community or an assemblage of communities of organisms, interacting with one another and the environment in which they live.
Ecotone	A transitional zone between two communities containing the characteristic species of each.
Eco-tourism	Ecologically sustainable tourism with a primary focus on experiencing and interpreting natural areas that fosters environmental and cultural understanding, appreciation and conservation.

Endemic	Flora or fauna that is confined in its natural occurrence to a particular region.
Environmental weed	An unwanted plant species growing in natural ecosystems, usually an introduced plant.
Eutrophication	The enrichment of water by nutrients, such as compounds of nitrogen or phosphorus. It causes an accelerated growth of algae and higher forms of plant life. These consume more oxygen often leading to an oxygen deficit, which can have a major detrimental effect on fish other aquatic organisms.
Exotic	A species occurring in an area outside its historically known natural range as a result of intentional or accidental dispersal by human activities.
Extant	Still existing.
Fauna	The animals inhabiting an area, including mammals, birds, reptiles, amphibians and invertebrates. Usually restricted to animals occurring naturally and excluding feral or pest animals.
Feral	A domesticated species that has become wild.
Fire regime	The combination of season, intensity, interval, extent and patchiness of fire in a given area over a period of time.
Flora	The plants growing in an area, including flowering and non-flowering plants, ferns, mosses, lichens, algae and fungi (although fungi are strictly speaking not plants). Usually restricted to species occurring naturally and excluding weeds.
Floristic diversity	Diversity relating to plants.
Fungus	Saprophytic and parasitic spore-producing organisms usually referred to as plants that lack chlorophyll but actually a separate kingdom to plants and animals and include moulds, rusts, mildews, smuts, mushrooms, and yeasts.
Genetic	To do with the hereditary units that are composed of sequences of DNA.
Geography	The science of the Earth's form, physical features, climate and population.
Geology	The study the history of the earth and its life especially as recorded in rocks.
Geomorphology	The study of the earth surface features and their formation.
Great Southern Towns Water Supply Scheme	Originates at Collie (source is Harris Dam) and supplies water to farmlands and towns in the Great Southern area of the State. Approximately 4 million m^3 of water is supplied annually to about 40 000 people and 1.6 million ha of farmlands via 2,100 km of water mains, 13 pumping stations and 38 integrated reservoirs/tanks.
Groundwater	All free water below the surface in the layers of the Earth's crust.
Habitat	The place where an animal or plant normally lives and reproduces.
Host	The organism from which a parasite obtains its nutrition or shelter.
Hydrology	The scientific study of the characteristics of water, especially of its movement in relation to the land.
Indigenous	Native or belonging naturally (to a place).
Integrated Water Supply System	Supplies water to Perth, Mandurah and the Goldfields and Agricultural Scheme.
Introduced species	see *Exotic*.
Invertebrate	Animals without backbones, for example, insects, worms, spiders and crustaceans.
Landform	All the physical, recognisable, 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.
Landscape	Appearance or visual quality of an area determined by its geology, soils, landforms, vegetation, water features and land use history.
Landscape character type	A broad scale area of land with common visual characteristics based on landscape.
Lithology	The study and description of the general, gross physical characteristics of a rock, especially sediments composed mainly of broken fragments of pre-existing minerals or rocks that have been transported from their places of origin, including colour, grain size, and composition

Microbes	Micro-organisms, especially bacteria that cause disease
Microbial	Involving or caused by microbes
Motile	Exhibiting or capable of movement
Nature-based tourism	Tourism that is dependent upon the resources of the natural environment and incorporates a range of tourism experiences including adventure tourism, eco-tourism and aspects of cultural and rural tourism
Obligate	Restricted to a single mode of behaviour or environmental condition, such as an obligate aerobe that is dependent on the presence of molecular oxygen to breathe
Organic	Of, relating to , or derived from living organisms
Pathogen	Any organism (bacterium or virus) or factor that causes disease within a host
Potable	Suitable for drinking
Priority species	A Departmental term for flora and fauna species that: a may be threatened but there is insufficient survey data available to accurately determine their true status (Priority 1 to 3). b are adequately known, are rare but not currently threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons (Priority 4). c are conservation dependant (Priority 5).
Protectable area	An area within the vulnerable zone (predominantly the south west) that is free of *P. cinnamomi*, of sufficient size (greater than 4 ha and an axis of 100 m), is positioned in the landscape so that it will not be engulfed by *P. cinnamomi* in the short term (a period of a few decades) and where human vectors of this disease are controllable.
Recreation	Generally considered in this management plan to be the use of the planning area by local and regional visitors as well as visitors from Perth.
Rehabilitation	The process necessary to return disturbed land to a predetermined state, in terms of surface, vegetational cover, land-use and/or productivity
Seral stage	Any stage in the development of a vegetation type between denudation and the stabilisation of a habitat.
Soil erosion	A combination of processes in which soil is loosened, dissolved, or worn away, and transported from one place to another by climatic, biological or physical agents
Species richness	The number of different species in a community or other defined unit
Statute	A law enacted by a legislature
Statutory	Enacted or required by statute
Swamp	A wetland often partially or intermittently covered with water
Taxa	A defined unit (for example, species or genus) in the classification of plants and animals
Temperate	Of mild temperature, the Temperate Zone is the area or region between the Tropic of Cancer and the Arctic Circle in the Northern Hemisphere or between the Tropic of Capricorn and the Antarctic Circle in the Southern Hemisphere
Tourism	Generally considered in this management plan to be visitors from outside the region staying overnight in or adjacent to the planning area
Understorey	The shrubs and plants that grow beneath the main canopy of a forest
Vascular plants	Plants having a specialised conducting system that includes xylem and phloem
Vectors	An organism that transmits a pathogen
Vertebrate	Animals that have a spinal column which includes fish, amphibians, reptiles, birds and mammals
Wetland	Land or areas (as tidal flats or swamps) containing much soil moisture

REFERENCES

Abbott, I. (1992). Prodomus of the occurrence and distribution of insect species in the Forested Part of South-West Western Australia. *CALMScience* 1(4): 365-464.

Abbott, I. (1998). *Detecting areas with high levels of faunal species richness – a preliminary study.* A report prepared for the Regional Forest Agreement, Western Australia. Commonwealth & Western Australian Regional Forest Agreement Steering Committee.

Abbott, I. (2003). Aboriginal fire regimes in south-west Western Australia: evidence from historical documents. In: Abbott, I. and Burrows, N. (eds.). *Fire in ecosystems of the south-west of Western Australia: impacts and management*, 119-146.

Abbott, I., Burbidge, T., Williams, M. and Van Heurck, P. (1992). Arthropod fauna of jarrah (Eucalyptus marginata) foliage in Mediterranean forest of Western Australia: spatial and temporal variation in abundance, biomass, guild structure and species composition. *Aust. J. of Ecology* 17: 263-274.

Abbott, I. and Whitford, K. (2002). Conservation of vertebrate fauna using hollows in forests of south-west Western Australia: strategic risk assessment in relation to ecology, policy, planning, and operations management. *Pacific Conservation Biology* 7: 240-55.

Anon. (1969). *50 years of forestry in Western Australia.* Supplement to the 1968/9 Annual Report. Forests Department.

ARMCANZ and ANZECC (1994). *National water quality management strategy policies and principles – a reference document.* Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, Canberra.

ARMCANZ and ANZECC (1996). *National Principles for the Provision of Water for Ecosystems.* Occasional Paper SWR No. 3. Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, Canberra.

Armstrong, R. (2004). *Ecologically based fire management – integration of multiple land use objectives.* 11th Annual AFAC conference and Inaugural Bushfire CRC conference, October 2004, Perth Western Australia.

Arthington, A.H. and McKenzie, F. (1997). *Review of Impacts of Displaced/Introduced Fauna Associated with Inland Waters*, Australia: State of the environment technical paper series (inland waters), Department of Environment, Canberra.

Australia/ICOMOS (2000). *The Burra Charter: the Australia ICOMOC charter for places of cultural significance.* Australia ICOMOS Incorporated.

Barthell, J.F., Randall, J.M., Thorp R.W. and Wenner A.M. (1994). Promotion of seed set in yellow star-thistle by honey bees: evidence of an invasive mutualism. *Ecological Applications* 11 (6): 1870-1883.

Barthell, J.F., Randall, J.M., Thorp, R.W. and Wenner, A.M. (2001). *Yellow star-thistle, gumplant, and feral honey bees on Santa Cruz Island: a case of invaders assisting invaders.* Fifth California Islands Symposium (2000).

Beard, J.S. (1980). *A New Phytogeographic Map of Western Australia.* Western Australian Herbarium Research Notes 3: 37 – 58.

Beard, J.S. (1981). *Vegetation survey of Western Australia: Swan 1:1 000 000 vegetation series. explanatory notes to sheet 7.* The University of Western Australia Press, Nedlands.

Berti, M.L., Bari, M.A., Charles, S.P. and Hauck, E.J. (2004). *Climate change, catchment runoff and risks to water supply in the south-west of Western Australia.* Department of Environment.

Borg, H., Hordacre, A. and Batini, F. (1988). Effects of logging in stream and river buffers on watercourses and water quality in the southern forest of Western Australia. *Australian Forestry* 51(2): 98-105.

Burrows, N.D. (2002). *Fire regimes for the conservation of biodiversity in south-west forest ecosystems: a concept for discussion.* Department of Conservation and Land Management, Western Australia.

Burrows, N.D. (2004). Fire management strategies for a south west Australian biodiversity hotspot. *TNC, WWF, IUCN Global Fire Partnership Experts Workshop: Sigrisvil, Switzerland, 15-18 May 2004.* Department of Conservation and Land Management, Western Australia.

Burrows, N.D. and Friend, G. (1998). Biological indicators of appropriate fire regimes in southwest Australian ecosystems. In: T. Pruden and L. Brennan (eds). *Fire in ecosystem management: shifting the paradigm from suppression to prescription.* Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahasse.

Burrows, N.D., Ward, B. and Robinson, A.D. (1995). Jarrah forest fire history from stem analysis and anthropological evidence. *Australian Forestry* 58(1):7-16.

Burrows, N.D., Ward, B. and Robinson, A.D. (1999). *The role of indicators in developing appropriate fire regimes.* Proceedings from the Australian Bush Fire Conference, 7-9 July 1999, Albury, Australia.

Burrows, N. and Wardell-Johnson, G. (2003). Fire and plant interactions in forested ecosystems of south-western Western Australia. In: Abbott, I. and Burrows, N. (eds.). *Fire in ecosystems of the south-west of Western Australia: impacts and management*, 225-268.

Cadwallader, P.L. (1996). *Overview of the Impacts of Introduced Salmonids on Australian Native Fauna.* Australia Nature Conservation Agency, Canberra.

Caley, P. (1997). Movement, activity patterns and habitat use of feral pigs (Sus scrofa) in a tropical habitat. *Wildlife Research* 24: 77-87.

CALM (1986a). Policy Statement No. 10 – *Rehabilitation of disturbed land.* Department of Conservation and Land Management, Perth.

CALM (1986b). Policy Statement No. 14 – *Weeds on CALM land.* Department of Conservation and Land Management, Perth.

CALM (1986c). Policy Statement No. 53 – *Visitor risk management.* Department of Conservation and Land Management, Perth.

CALM (1987). Policy Statement No. 19 – *Fire management.* Department of Conservation and Land Management, Perth.

CALM (1988). Policy Statement No. 25 – *Community education and interpretation.* Department of Conservation and Land Management, Perth.

CALM (1989). Policy Statement No. 34 – *Visual resource management on lands and waters managed by CALM.* Department of Conservation and Land Management, Perth.

CALM (1991a). Policy Statement No. 15 – *Community involvement.* Department of Conservation and Land Management, Perth.

CALM (1992c). Policy Statement No. 46 – *External funds.* Department of Conservation and Land Management, Perth.

CALM (1993). *Policy Statement No. 2 – Local government authority access to basic raw materials from State forest and timber reserves.* Department of Conservation and Land Management, Perth.

CALM (1994a). *Reading the remote: landscape characters of Western Australia*. Department of Conservation and Land Management, Perth.

CALM (1996). Policy Statement No. 54 – *Defence force training on CALM managed lands and waters*. Department of Conservation and Land Management, Perth.

CALM (1998). Policy Statement No. 3 – *Management of phytophthora and disease caused by it*. Department of Conservation and Land Management, Perth.

CALM (1999). *Environmental weed strategy for Western Australia*. Department of Conservation and Land Management, Perth.

CALM (2000). *Phytophthora cinnamomi and disease caused by it*. Volumes 1-3. Department of Conservation and Land Management, Perth.

CALM (2000). Administrative Instruction 41 – *Guidelines for approving commercial operators licence concessions*. Department of Conservation and Land Management, Perth.

CALM (proposed) Policy Statement 9 – *Conserving Threatened Species and Ecological Communities* (subject to final consultation). Department of Conservation and Land Management, Perth.

CALM (redrafted) Policy Statement No. 18 – *Recreation, tourism and visitor services* (subject to final consultation). Department of Conservation and Land Management, Perth.

CALM (draft) Policy Statement No. 41 – *Beekeeping on public land.* Department of Conservation and Land Management, Perth.

CALM (proposed) Policy Statement *Environmental weed management* (subject to final consultation). Department of Conservation and Land Management, Perth.

Carlsen, J. and Wood, D. *Assessment of the economic value of recreation and tourism in Western Australia's National Parks, marine parks and forests*. (in preparation).

Caughley, G. (1994). Directions in conservation biology. *J. of animal ecology*, 63: 215-244.

Chapman, A. and Dell, J. (1985). Biology and zoogeography of the amphibians and reptiles of the Western Australian wheatbelt. *Rec. West. Aust. Mus.* 12(1): 1-46.

Christensen, P. (1997). *A review of the knowledge of the effects of key disturbances on fauna in the south-west forest region.* A report to the Commonwealth and Western Australian Governments for the Western Australian Regional Forest Agreement.

Christensen, P., Annels, A., Liddelow, G. and Skinner, P. (1985). *Vertebrate fauna in the southern forests of Western Australia: A survey*. Forest Department of Western Australia. Bulletin 94, Perth.

Churchill, D.M. (1968). The distribution and prehistory of *Eucalyptus diversicolor* F. Muell., E. marginata Donn ex S. M., and *E. calophylla* R. Br. in relation to rainfall. *Aust. J. of Botany* 16: 125-151.

Clark, R.N. and Stankey, G.H. (1979). Determining the acceptability of recreational impacts, an application of the outdoor recreation opportunity spectrum. *Recreational Impact on Wildlands*: Conference proceedings: 32-42. US Department of Agriculture, Portland, Oregon.

Collie Water Advisory Group (1999). *Collie basin water resource management: reconsideration of long and short term strategies*. A report prepared for the Department of Resources Development.

Commonwealth of Australia and the State of Western Australia (1999). *Regional forest agreement for the south-west forest region of Western Australia*. Commonwealth and Western Australian Regional Forest Agreement Steering Committee, Canberra.

Commonwealth and Western Australian Regional Forest Agreement Steering Committee (1998) *Comprehensive regional assessment : a regional forest agreement for Western Australia.* Volume 1. Commonwealth and Western Australian Regional Forest Agreement Steering Committee.

Conservation Commission (2002) *Draft forest management plan.* Conservation Commission of Western Australia.

Conservation Commission (2004). *Forest management plan 2004-2013.* Conservation Commission of Western Australia.

CSIRO (2000). *Diseases and pathogens of eucalypts.* Keane *et al.* (eds.). CSIRO, Victoria.

CSIRO (2001). *Climate change: projections for Australia.* www.dar.csiro.au/publications/projections2001.pdf

Dames and Moore (1987). *The natural and cultural resources of the Wellington Dam recreation and tourism study area.* For Feilman Planning Consultants.

Department of Environment and Heritage (2004). *National Biodiversity and Climate Action Plan 2004-2007.* http://www.deh.gov.au/ biodiversity/publications/nbccap. Accessed February 2005.

Department of Fisheries (2002). *The translocation of brown trout (Salmo trutta) and rainbow trout (Oncorhynchus mykiss) into and within Western Australia.* Fisheries Management Paper No. 156. Department of Fisheries.

Department of Planning and Infrastructure and Fire and Emergency Services Authority (2001). *Planning for bush fire protection.* Western Australian Planning Commission, Perth.

Dissmeyer, G.E. (2000). *Drinking water from forests and grasslands: a synthesis of the scientific literature.* USDA Forest Service, General Technical Report SRS-39.

Dodson, J.R. and Lu, J.J. (2000). A late Holocene vegetation and environmental record from Byenup Lagoon, south-western Australia. *Australian Geographer* 31: 41-54.

Dodson, J.R. and Ramrath, A. (2001). An upper Pliocene lacustrine environmental record from south-western Australia. *Palaeogeography, Palaeoclimatology and Palaeoecology* 167: 309-320.

DoE (2001). *Water facts: water quality and macroinvertebrates.* Water and Rivers Commission 2nd Edition, Perth.

DoE (2003). *Policy and guidelines for recreation within public drinking water source areas on Crown land.* Water Quality Protection Policy No. 13. Water and Rivers Commission, Perth.

DOIR (1998). *Guidelines for mineral exploration and mining within conservation reserves and other environmentally sensitive lands in Western Australia.* Information series 11. Department of Minerals and Energy.

Fire Ecology Working Group (1999). *Management of fire for the conservation of biodiversity : workshop proceedings.* Department of Natural Resources & Environment, Melbourne.

Freegard, C. (2005). *Feral Pig Management Strategy for Departmental Managed Land 2005-2009 (Draft).* Department of Conservation and Land Management, Perth.

Friend, G. (1995). Fire and invertebrates: a review of research methodology and the predicability of post-fire response patterns. In: McCaw, W. L., Burrows, N. D., Friend, G. R. and Gill, A. M. (eds.). *Landscape fires '93 : proceedings of an Australian bushfire conference (1993)* 165-174, CALMScience Suppl. No. 4. Department of Conservation and Land Management, Perth.

Friend, G. (1999). Fire and faunal response patterns: a summary of research findings. In: Friend, G., Leonard, M., MacLean, A. and Sieler, I. (eds.). *Management of fire for the conservation of biodiversity : workshop proceedings.* Fire Ecology Working Group, Department of Natural Resources and Environment, Victoria.

Gill, A.M., Groves, A.H. and Noble, I.R. (eds.) (1981). *Fire and the Australian Biota.* Australian Academy of Science, Canberra.

Goode, B. and Rundin,D. (2002). *Ethnographic survey of the Honeymoon Pool and lower Collie River valley re-development requiring a section 18 application for consent.* A report prepared for the Department of Conservation and Land Management.

Government of Western Australia (2001). *State water quality management strategy, No.1 Framework for implementation.* Government of Western Australia.

Government of Western Australia (2003a). *Hope for the future: The Western Australian State Sustainability Strategy.* Departrment of Premier and Cabinet, Perth.

Government of Western Australia (2003b). *Indigenous ownership and joint management of conservation lands in Western Australia.* Consultation Paper. Government of Western Australia.

Government of Western Australia (2003c) *Securing our water future: a state water strategy for Western Australia.* Government of Western Australia.

Gross, C.L. (2001). The effect of introduced honey bees on native bee visitation and fruit-set in Dillwynia juniperina (Fabaceae) in a fragmented ecosystem. *Biological Conservation* 102: 89-95.

Gross, C.L. and Mackay, D. (1998). Honey bees reduce fitness in the pioneer shrub *Melastoma affine* (Melastomataceae). *Biological Conservation* 86: 169-178.

Hallam, S.J. (2000). *Peoples landscapes in south western Australia in the early 1800s: - aboriginal burning off in the light of Western Australian historical documents.* Talk to the Royal Western Australian Historical Society.

Hallam, S.J. (1975). *'Fire and hearth: a study of aboriginal usage and European usurpation in south-western Australia'.* Australian Institute of Aboriginal Studies, Canberra.

Halse, S.A., Scanlon, M.D. and Cocking, J.C. (2001). *First national assessment of river health: Western Australian program. Milestone report 5 and final report.* Unpublished report to Environment Australia. Department of Conservation and Land Management, Perth.

Hampton, J.O. (2003). *Molecular ecology as an approach for the control and management of feral pigs (Sus scrofa) in south-west Western Australia.* Honours Thesis. Murdoch University.

Handol, D., Stukely, M. and Randles, J.W. (2002). Mundulla yellows: a new tree-dieback threat. *Landscope* 17(4): 41-47.

Harris, J. and Goode, B. (2002). *Report of an archaeological survey at the lower Collie River valley and Honeymoon Pool area.* A report prepared for the Department of Conservation and Land Management.

Hardcastle, K., Rose, T., Pearcey, M and Storey, A. (2003). *Synthesis report: lower Collie River ecological water requirements review: stream morphology, riparian vegetation and fish passage.* A report prepared for the Water and Rivers Commission.

Hassell, C.W. and Dodson, J.R. (2003). The fire history of south-west Western Australia prior to European settlement in 1826-1829. In: Abbott, I. and Burrows, N. (eds). *Fire in ecosystems of the south-west of Western Australia: impacts and management*, 71-85.

Havel, J.J. (1989). Conservation in the northern jarrah forest. In: Dell, B., Havel, J.J. and Malajczuk, N.(eds). *The Jarrah Forest*, 379-399.

Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980). Vegetation complexes of the Darling System Western Australia. In: *Atlas of Natural Resources Darling System Western Australia.* Department of Conservation and Environment, Perth.

Hennessy, K.J., Suppiah, R. and Page, C.M. (1999). Australian rainfall changes, 1910–1995. *Australian Meteorological Magazine* 48: 1-13.

Hennessy, K.J. (2000). *Australian Rainfall Trends*. CSIRO Atmospheric Research, Aspendale, Victoria. Available from: http://www.dar.csiro.au/publications/hennessy_2000b.htm

Hocking planning and architecture (1995). *Municipal heritage inventory*. Undertaken for the Shire of Collie.

Hopper, S.D. (2000). Creation of conservation reserves and managing fire on granite outcrops—a case study from Chiddarcooping Nature Reserve in the Western Australian wheatbelt. *J. Roy. Soc of WA* 83(3):173-186.

Hopper, S.D., Brown, A.P. and Marchant, N.G. (1997). Plants of Western Australian granite outcrops. *J. Roy. Soc of WA* 80:141-158.

Hopper, S.D., van Leeuwen, S., Brown, A.P. and Patrick, S.J. (1990). *Western Australia's endangered flora and other plants under consideration for declaration*. Department of Conservation and Land Management, Perth.

Horwitz, P., Jasinska, E.J., Fairhurst, E. and Davis, J.A. (1997). *A review of knowledge on the effect of key disturbances on aquatic invertebrates and fish in the south-west forest region of Western Australia'*. An unpublished report to the Commonwealth and Western Australian Governments for the Western Australian Regional Forest Agreement.

Horwitz, P., Judd, S. and Sommer, B. (2003). Fire and organic substrates: Soil structure, water quality and biodiversity in far south-west Western Australia. In: Abbott, I. and Burrows, N. (eds). *Fire in Ecosystems of the South-West of Western Australia: Impacts and management*: 381-393.

Hughes, L. (2003). Climate change and Australia: Trends, projections and impacts. *Austral Ecology* 28: 423–443.

Indian Ocean Climate Initiative (2002). Climate variability and change in the south west. Indian Ocean Climate Initiative, Perth.

Jackson, J.J., Raadik, T.A., Lintermans, M. and Hammer, M. (2004). Alien salmonids in Australia: Impediments to effective impact management, and future directions. *New Zealand Journal of Marine and Freshwater Research* 38:447-455.

Kanowski, P.J., Cork, S.J., Lamb, D. and Dudley, N. (2001). Assessing success of off-reserve forest management in contributing to biodiversity conservation. In: Raison, R. J., Brown, A. G. and Flinn, D. W. (eds.). *Criteria and indicators for sustainable forest management*. IUFRO 7 Research Series CABI Publishing. United Kingdom.

Kark, S., Alkon, U., Safriel, U.N., and Randi, E. (1999). Conservation priorities for chukar partridge in Israel based on genetic diversity across an ecological gradient. *Conservation Biology* 13:542-552.

Kershaw, A.P. (1986). Climate change and aboriginal burning in north-east Australia during the last two glacial/interglacial cycles. *Nature* 322: 47-49.

Kershaw, A.P., Clarke, J.S., Gill, A.M. and D'Costa, D.M. (2002). A history of fire in Australia. In: Bradstock, R. A., Williams, J.E. and Gill, A. M. (eds.). *Flammable Australia: The Fire Regimes and Biodiversity of a Continent*, 3-25. Cambridge University Press, Cambridge.

Kershaw, K., Durell, G. and Narrogin District Threatened Flora Recovery Team (W.A.) (2002). *Narrogin District threatened flora management program: annual report 2001*. Department of Conservation and Land Management, Narrogin.

Levy, D.A., Bens, M.S. and Craun, G.F. (1998). *Surveillance for waterborne-disease outbreaks—United States, 1995–1996*. Morbidity and Mortality Weekly Report. 47(SS-5): 1-34.

Majer, J.D. and Abbott, I. (1989). Invertebrates of the jarrah forest. In: Dell, B., Havel, J.J. and Malajczuk, N.(eds). *The Jarrah Forest*, 111-123.

Mauger, G.W., Bari, M., Boniecka, L., Dixon, R.N.M., Dogramaci, S.S. and Platt, J. (2001). *Salinity situation statement: Collie River*. Water and Rivers Commission, Water Resource Technical Series No. WRT 29.

Main, A.R. (1996). Keynote address: conservation. In: Hopper, S. D., Chappill, J.A, Harvey, M.S. and George, A.S. (eds.). *Gondwanan Heritage: Past Present and Future of the Western Australian Biota*. Surrey Beatty and Sons, Chipping Norton, NSW.

Main Roads Western Australia (1997). *Roads 2020 regional road development strategy: South West and Peel Regions*. Main Roads Western Australia.

Manning, R. (1992). *Honey production, economic value and geographical significance of apiary sites in Western Australia*. Department of Agriculture, Perth, Western Australia.

Martinick, W.G. (1994). *The Wellington forest archaeological survey and historical research project*. Report prepared for the Wellington Forest Advisory Group.

Matthews, E. (1984). *To bee or not....? Bees in National Parks*? Australian National Parks Association Magazine, South Australia.

Mattiske, E.M. and Havel, J.J. (1998). *Regional Forest Agreement vegetation complexes*. Department of Conservation and Land Management.

Mattiske Consulting Pty Ltd and Havel Land Consultants (2002). *Delineation of Landscape Conservation Units in Southwest Region of Western Australia*. Unpublished Report for Department of Conservation and Land Management.

McCarthy, M., Gill, A.M. and Bradstock, R.A. (2001). Theoretical fire-interval distributions. *International Journal of Wildland Fire* 10: 73-77.

McKenzie, N.L., Hopper, S.D., Wardell-Johnson, G. and Gibson, N. (1996). Assessing the conservation reserve system in the Jarrah Forest Bioregion. *J. Roy. Soc. of WA* 79:241-248.

Morgan, D.L., Gill, H.S. and Potter, I.C. (1998). *Distribution, identification and biology of freshwater fishes in south-western Australia*. Records of the Western Australian Museum. Supplement No. 56. Western Australian Museum.

Morgan, D.L., Gill, H.S., Maddern, M.G. and Beatty, S.J. (2004). Distribution and impacts of introduced freshwater fishes in Western Australia. *New Zealand Journal of Marine and Freshwater Research* 38: 511-523.

Muench, R. (2001). *Wellington forests visual landscape management study*. Unpublished report for the Department of Conservation and Land Management.

National Health and Medical Research Council and Natural Resource Management Ministerial Council (2004). *National Water Quality Management Strategy, Australian Drinking Water Guidelines 2004*. Document 6 of the National Water Quality Management Strategy.

New South Wales National Parks and Wildlife Service (2002). *Competition from feral honey bees as a key threatening process – an overview*.

Nichols, O.G. and Muir, B. (1989). Vertebrates of the jarrah forest. In: Dell, B., Havel, J.J. and Malajczuk, N.(eds). *The Jarrah Forest*, 133-153.

Olroyd, B.P., Lawley, S.H. and Crozier, R.H. (1994). Do feral honey bees (*Apis mellifera*) and regent parrots (*Polytelis anthopeplus*) compete for nest sites? *Aust. J. of Ecology* 19:444-450.

Paton, D.C. (1993). Honey bees in the Australian environment: does *Apis mellifera* disrupt or benefit the native biota? *BioScience* 43: 95-103.

Paton, D.C. (1996). *Overview of feral and managed honey bees in Australia: distribution, abundance, extent of interactions with native biota, evidence of impacts and future research*. ANCA, Canberra.

Paton, D.C. (1997). Honey bees *Apis mellifera* and the disruption of plant-pollinator systems in Australia. *Victorian Naturalist* 114: 23-29.

Paton, D.C. (2000). Disruption of bird-plant pollination systems in southern Australia. *Conservation Biology* 14: 1232-1234.

Patterson, J. C. (1977). *Alternative recreational use policies for system 6 reservoirs*. A report prepared for the Department of Conservation and Environment, Perth WA.

Payment, P. (1993). Prevalence of disease, levels and sources. In: *Safety of Water Disinfection: Balancing Chemical and Microbial Risks*. International Life Sciences Institute, Washington DC.

Pen, L.J. and Potter, I.C. (1992). Seasonal and size related changes in the diet of perch, Perca fluviatilis L., in the shallows of an Australian river, and their implications for the conservation of indigenous teleosts. *Aquatic conservation: Marine and Freshwater Ecosystems* 2, 243-253.

Phillips, N. and Newsome, D. (2002). The impacts of recreation in Australian protected areas: Quantifying Damage Caused by Horse-riding in D'Entrecasteaux National Park, Western Australia. *Journal of Pacific Conservation Biology* 7:4:256-273. Surrey Beatty & Sons, Sydney.

Podger, F.D., James, S.H. and Mulcahy, M.J. (1996). Review of Dieback in Western Australia. Report to the WA Minister for the Environment: Volume 1. Western Australia.

Pouliquen-Young, O. and Newman, P. (2000). *The implications of climate change for land-based nature conservation strategies*. Final report 96/1306. Australian Greenhouse Office, Environment Australia, Canberra; Institute for Sustainability and Technology Policy, Murdoch University, Perth.

Pyke, G.H. (1999). The introduced honey bee *Apis mellifera* and the precautionary principle: reducing the conflict. *Australian Zoologist* 31: 181-186.

Pyne, S. J. (1991). *Burning bush : a fire history of Australia*. Holt, New York.

Rose, J. B., Mullinax, R.L., Singh, S.N., Yates, M.V. and Gerba, C.P. (1987). Occurrence of Rotaviruses and Enteroviruses in Recreational Waters of Oak Creek, Arizona. *Water Res.*, 23:1375.

Rutherford, J.L. (2000). *Hydrogeology of the Collie 1:250 000 sheet*. Hydrogeological map explanatory notes series report HM 7. Water and Rivers Commission

Scheltema, M. (1981). *To bee or not to bee: honey bee utilisation of national parks in Western Australia*. Perth, Western Australia.

Schofield, N.J., Stoneman, G.L. and Loh, I.C. (1989). Hydrology of the jarrah forest. In: Dell, B., Havel, J.J. and Malajczuk, N.(eds). *The Jarrah Forest*, 179-201.

Schwarz, M.P. and Hogendoorn, K. (1999). Biodiversity and conservation of Australian native bees. In: Ponder, W. and Lunney, D. (eds). *The Other 99%. The Conservation and Biodiversity of Invertebrates*. Royal Zoological Society of New South Wales, Mosman.

Schwarz, M.P. and Hurst, P.S. (1997). Effects of introduced honey bees on Australia's bee fauna. *Victorian Naturalist* 114: 7-12.

Shearer, B.L. (1994). The major plant pathogens occurring in native ecosystems of south-west Australia. In: Withers, P. C., Cowling, W. A. and Wills, R. T. (eds). Plant Diseases in Ecosystems: Threats and impacts in south-western Australia. *J. Roy. Soc. of WA* 77: 113-122.

Singh, G., Kershaw, A.P. and Clarke, R. (1981). Quaternary vegetation and fire history in Australia. In: Gill, A.M., Groves, R.H. and Noble, I. R. (eds). *Fire and the Australian Biota*. Australian Academy of Science, Canberra.

Smith, R. and Sage, L. (2002). *A survey of the vegetation on and around granite rock outcrops in Wellington National Park*. Department of Conservation and Land Management.

Sneeuwjagt, R.J. and Peet, G.B. (1985). *Forest fire behaviour tables for Western Australia*: 3rd edition. Department of Conservation & Land Management.

Sobsey, M.D. (2002). Managing water in the home: accelerated health gains from improved water supply. World Health Organisation, Geneva.

Staples, A.C. (1979). *They made their destiny: history of settlement of the Shire of Harvey 1829-1929*. Shire of Harvey, Western Australia.

State Salinity Council (2000). *Natural resource management in Western Australia – the salinity strategy*. Government of Western Australia.

Stedman, C. (1988). *'100 years of Collie Coal'*. Curtin Printing Services, Curtin University of Technology, Western Australia.

Stewart, M.H., Yates, M.V., Anderson, M.A., Gerba, C.P., Rose, J.B., De Leon, R. and Wolfe, R.L. (2002). Predicted public health consequences of body-contact recreation on a potable water reservoir. *Journal AWWA* 94:84- 97.

Stokes, R.A. and Loh, I.C. (1982). Streamflow and solute characteristics of a forested and deforested catchment pair in south-western Australia. *1st Nat. Symp. On Forest Hydrology*. O'Loughlin, E.M. and Bren, L.J. (Eds.) Inst. Eng. Aust., Nat. Conf. Publ. No. 86/6, 60-66.

Storr, G.M. (1964). Some aspects of the geography of Australian reptiles. *Senck. Biol.* 45: 577-589.

Sugden, E.A., Thorp, R.W. and Buchmann, S.L. (1996). Honey bee-native bee competition: focal point for environmental change and apicultural response in Australia. *Bee World* 77: 26-44.

SWDC (2003a). *Estimated Resident Population - South West Region.* http://www.swdc.wa.gov.au/files/respop/Population%20Trend%20table10.PDF

SWDC (2003b). *Mineral production – south west region.* http://www.swdc.wa.gov.au/files/mineralval/Mining%20Table10.pdf

SWDC (2003c). *Agricultural Production by Shire - South West Region.* http://www.swdc.wa.gov.au/files/shiresval/Agriculture%20Shires%20table0.PDF

Syrinx Environmental Planning (2003). *Riparian vegetation requirements – Collie River.* A report for the Water and Rivers Commission.

Thackway, R. and Cresswell, I.D. (1995). *An interim biogeographic regionalisation of Australia: a framework for establishing the national system of reserves, version 4.0.* Australian Nature Conservation Agency, Canberra.

Tilbrook, L. (1983). *Nyungar traditions.* University of Western Australia: Nedlands.

Tille, P.J. (1996). Wellington-Blackwood land resource survey: land capability assessment for the Wellington-Blackwood survey. Land resources series 14. Department of Agriculture, Perth.

Tindale, N.B. (1974). *Aboriginal tribes in Australia.* Australian National University Press, Canberra.

Tolhurst, K.G. and Friend, G.R. (2001). *An objective basis for ecological fire management.* Australian Bushfire Conference, 3-6 July 2001, Christchurch, New Zealand.

Tourism Western Australia and CALM (1997). *Nature based tourism strategy for Western Australia.* Western Australian Tourism Commission.

URS Australia Pty Ltd (2001). *Assessment of the scientific, economic and community values and the impact of logging on salinity of areas subject to a moratorium on logging.* A report prepared for the Department of Conservation and Land Management.

van Heurck, P. and Abbott, I. (2003). Fire and terrestrial invertebrates in south-west Western Australia. In: Abbott, I. and Burrows, N. (eds.). *Fire in ecosystems of the south-west of Western Australia: impacts and management*, p291-319.

van Wagner, C.E. (1979). Age class distribution and the forest fire cycle. *Canadian Journal of Forest Research* 8: 220-227.

Volis, S., Mendlinger, S., Safriel, U.N. and Orlovsky, N. (1998). Phenotypic variation and stress resistance in core and peripheral populations of *Hordeum spontaneum*. *Biodiversity and Conservation* 7: 799-813.

Wager, R. and Jackson, P. (1993). *Action Plan for the Australian Freshwater Fishes*. Environment Australia, Canberra.

Ward, D.J., Lamont, B.B. and Burrows, C.L. (2001). Grasstrees reveal contrasting fire regimes in eucalypt forest before and after European settlement of southwestern Australia. *Forest Ecology and Management* 150: 323-329.

Western Australian Greenhouse Taskforce (2004). *Western Australian Greenhouse Strategy*. Western Australian Greenhouse Taskforce

Western Australian Planning Commission (1995). *Bunbury-Wellington region plan*. A report prepared for the West Australian Planning Commission.

Western Power (2004). Stage 2 – Questions and Answers. *http://www.westernpower.com.au/html/commercial_partners/*

Wetland Research and Management (2003). *Wellington below – EWR review: Fish community including migration requirements*. Draft report prepared for the Water and Rivers Commission.

Williams, H.W. (1979). *One day in Collie*. Shire of Collie, Western Australia.

Williams, A.A.J., Karoly, D.J. and Tapper, N. (2001). The sensitivity of Australian fire danger to climate change. *Climatic Change* 49: 171-191.

Wills, R.T. and Keighery, G.J. (1994). Ecological impact of plant disease on plant communities. In: Withers, P. C., Cowling, W. A. and Wills, R. T. (eds.). *J. Roy. Soc. of WA* 77: 113-122.

Wykes, B.J. (1983). The Jarrah avifauna and its re-establishment after bauxite mining. School of Biology, Institute of Technology, WA. Bulletin No. 11.

Yates, C.J., Abbott, I., Hopper, S.D. and Coates, D.J. (2003). Fire as a determinant of rarity in the south-west Western Australian global biodiversity hotspot. In: Abbott, I. and Burrows, N. (eds). *Fire in ecosystems of the south-west of Western Australia: impacts and management*, 395-420.

PERSONAL COMMUNICATIONS

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Department of Fisheries

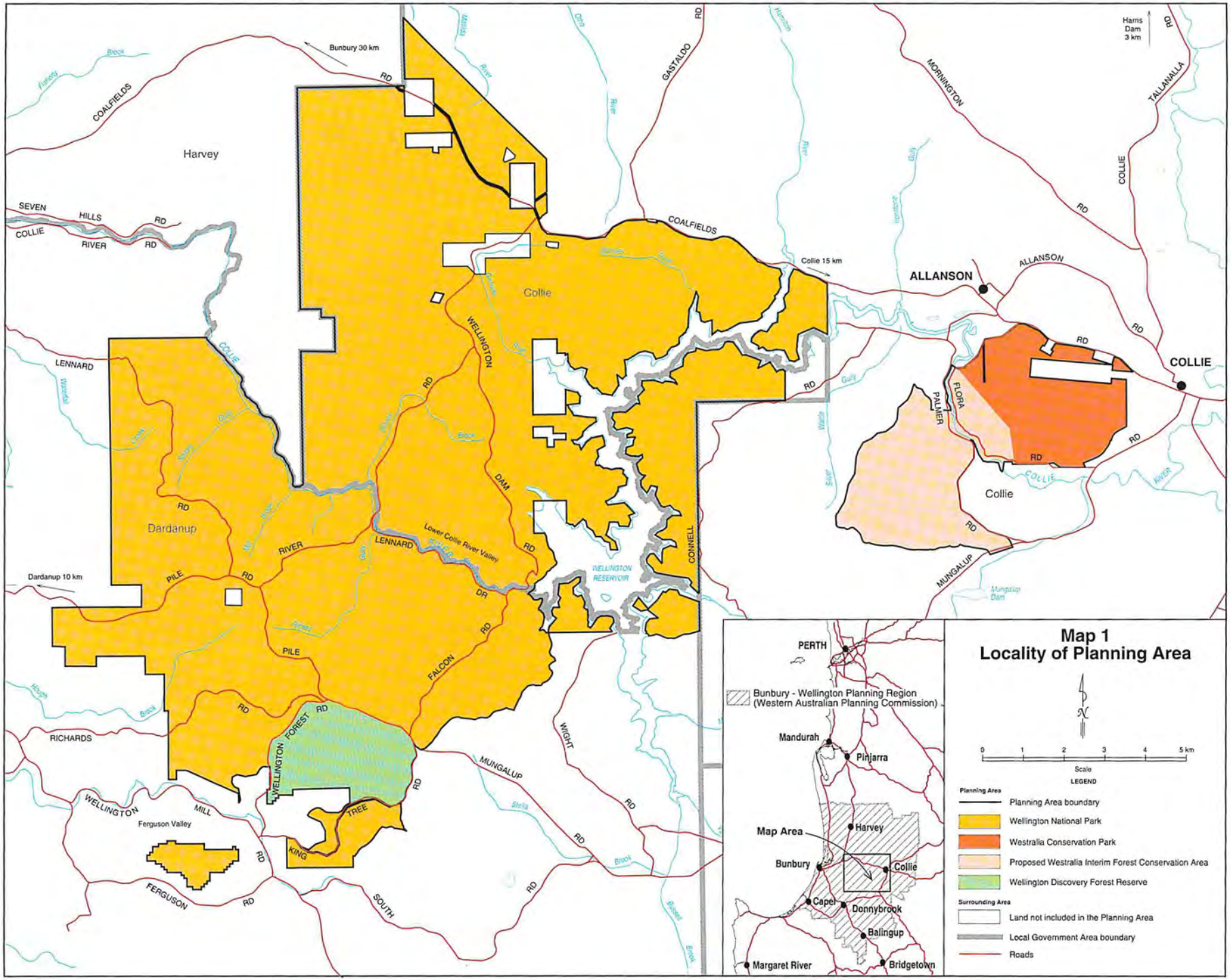
Gaye Looby – Management Officer.

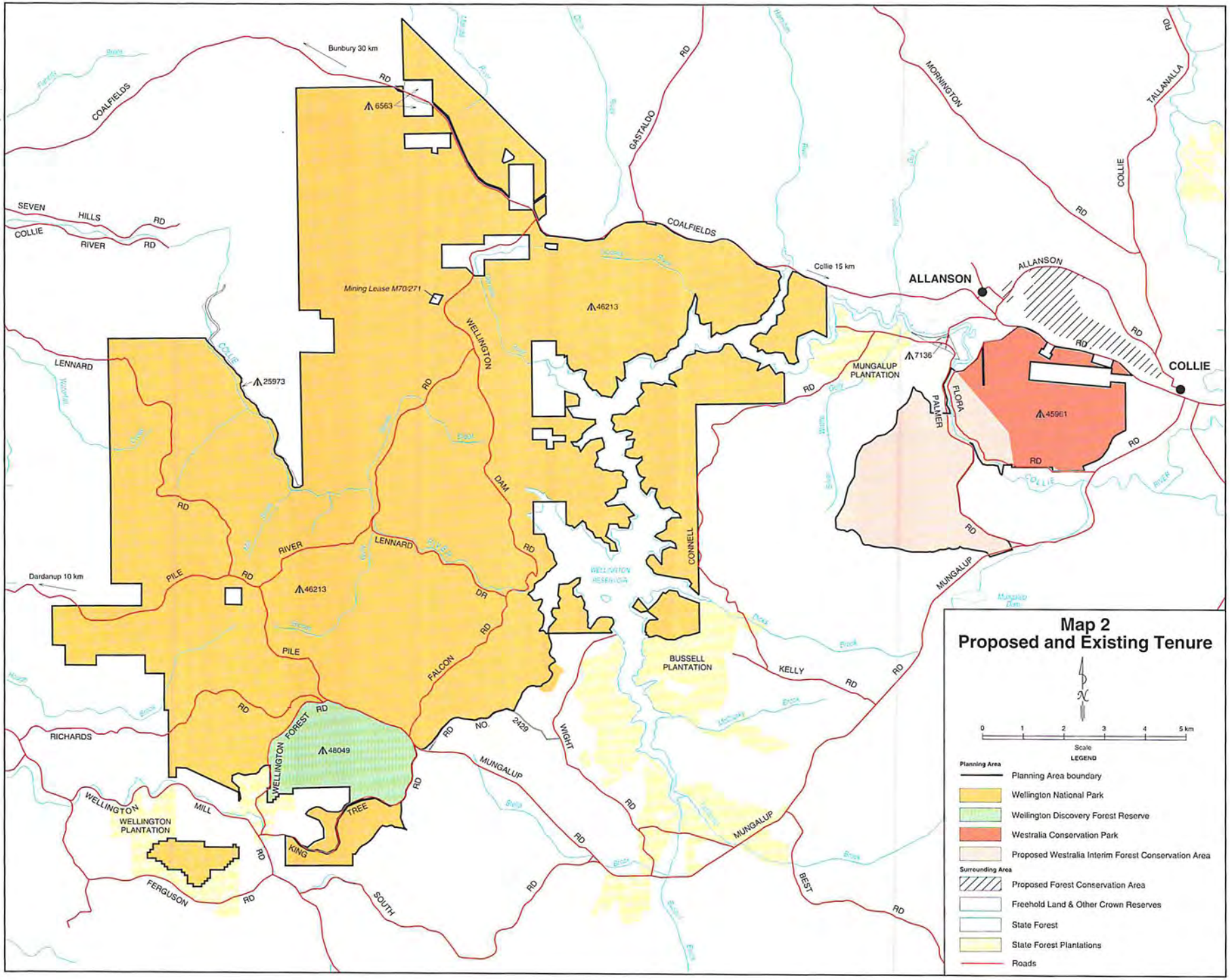
Department of Health

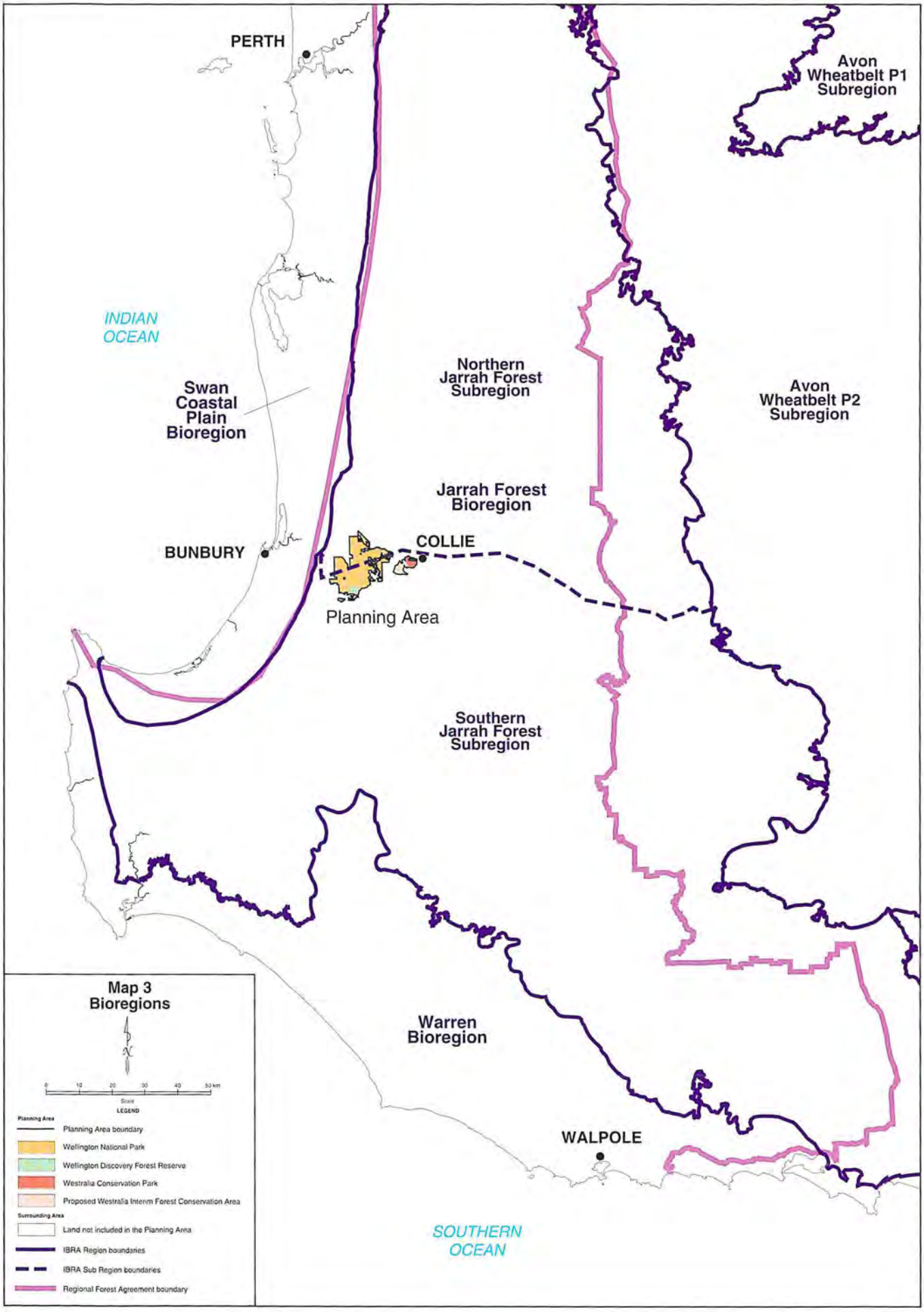
Richard Theobold – Senior Environmental Health Officer.

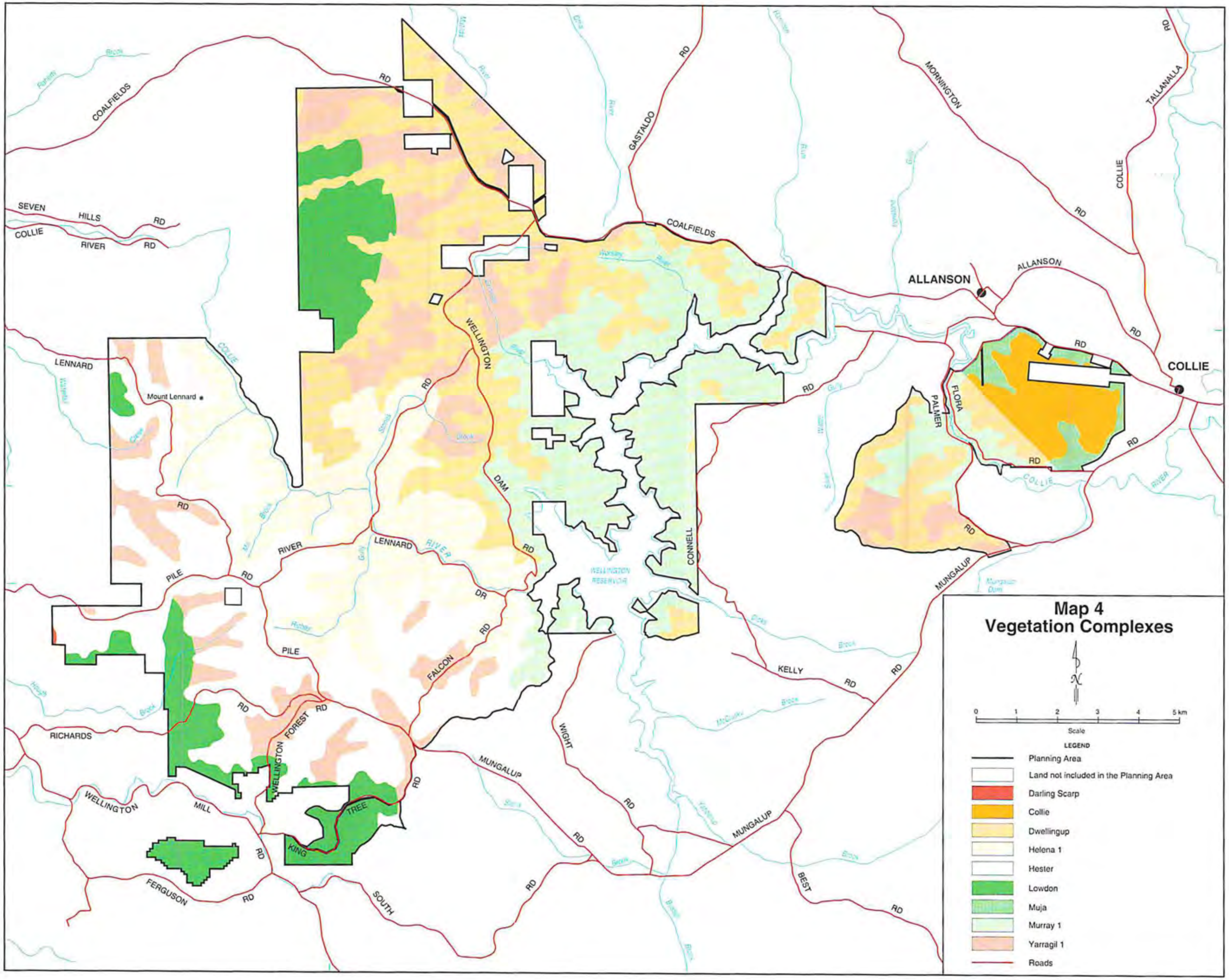
Water Corporation

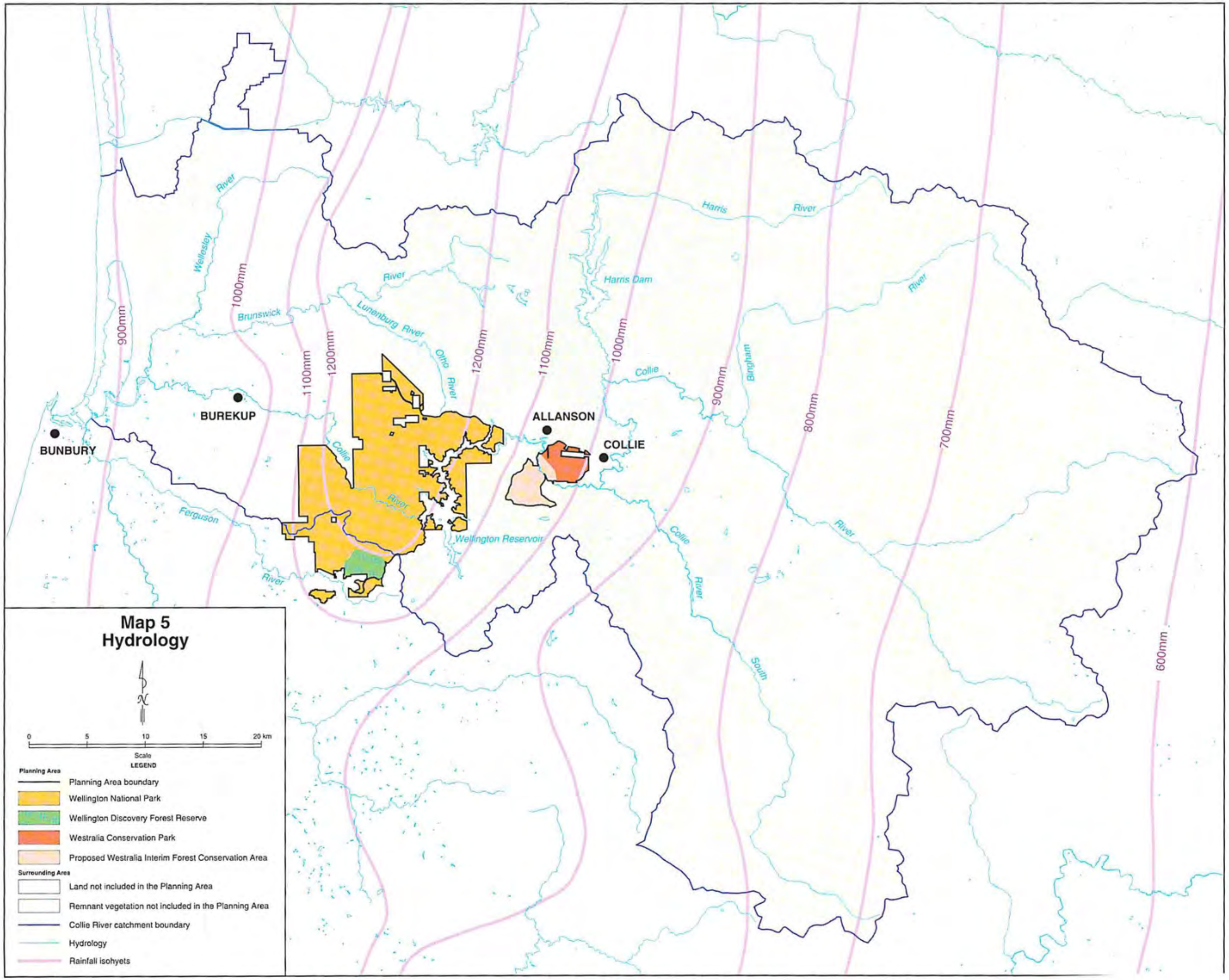
Noel Winsor – Principal Engineer, Water Treatment Design.


Harvey
Collie
Dardanup
Collie
ALLANSON
COLLIE
Bunbury 30 km
Collie 15 km
Dardanup 10 km
Harris Dam 3 km
COALFIELDS RD
SEVEN HILLS RD
COLLIE RIVER RD
LENNARD RD
WELLINGTON DAM RD
Lower Collie River Valley
WELLINGTON RESERVOIR
CONNELL RD
PILE RD
RICHARDS RD
WELLINGTON FOREST
WELLINGTON MILL
Ferguson Valley
FERGUSON RD
KING TREE RD
SOUTH WEST HIGHWAY
MUNGALUP RD
WIGHT RD
GASTALDO RD
MORNINGTON RD
TALLANALLA RD
ALLANSON RD
COLLIE RIVER RD
PALMER FLORA RD
MUNGALUP RD
FALCON DR
PERTH
Bunbury - Wellington Planning Region (Western Australian Planning Commission)
Mandurah
Pinjarra
Map Area
Harvey
Bunbury
Collie
Capel
Donnybrook
Balingup
Margaret River
Bridgetown
Map 1
Locality of Planning Area
0 1 2 3 4 5 km
Scale
LEGEND
Planning Area
Planning Area boundary
Wellington National Park
Westralia Conservation Park
Proposed Westralia Interim Forest Conservation Area
Wellington Discovery Forest Reserve
Surrounding Area
Land not included in the Planning Area
Local Government Area boundary
Roads

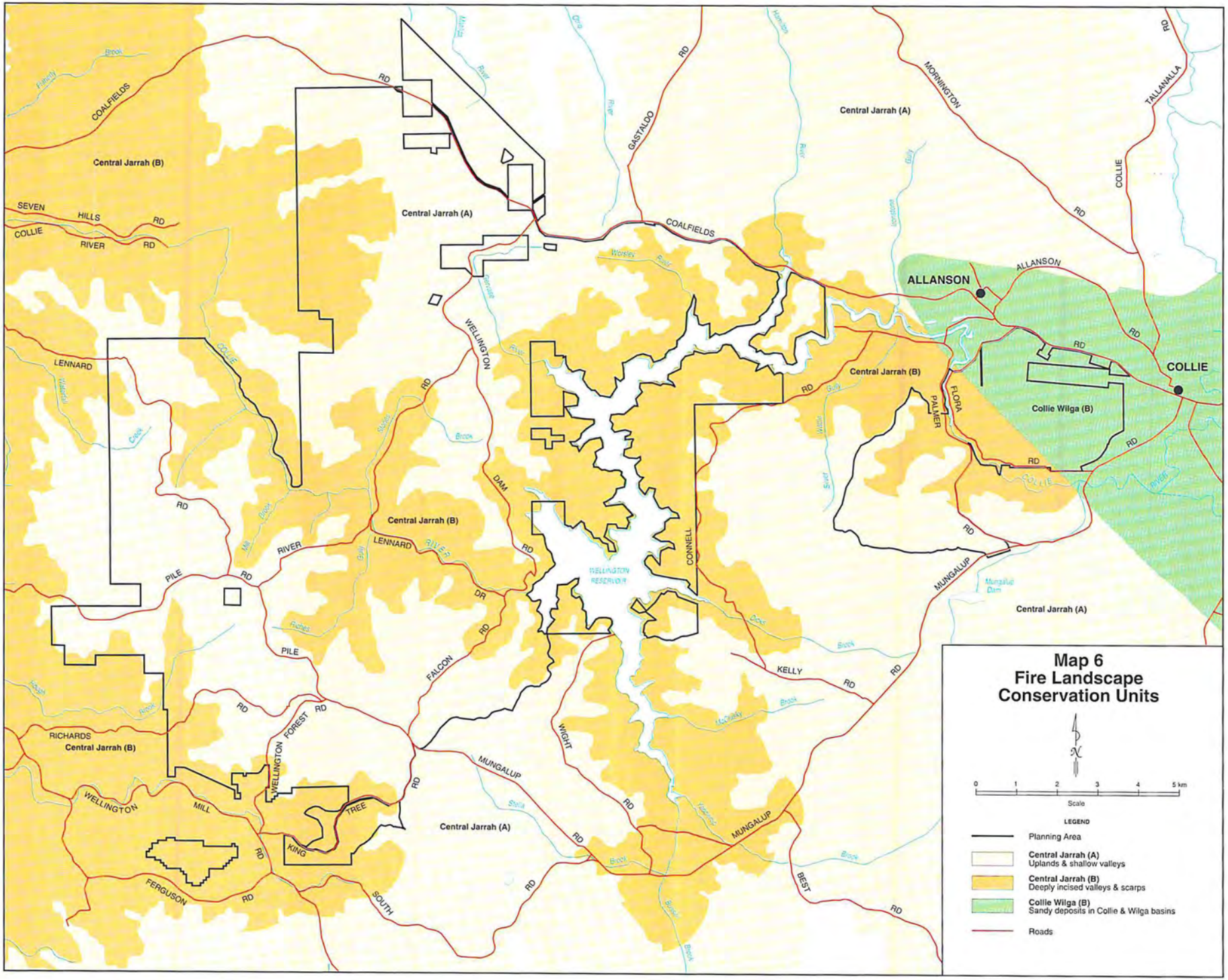

Bunbury 30 km
Dardanup 10 km
Collie 15 km
ALLANSON
COLLIE
COALFIELDS
GASTALDO
MORNINGTON
TALLANALLA
COLLIE
SEVEN HILLS RD
COLLIE RIVER RD
LENNARD
WELLINGTON
DAM
RD
CONNELL
MUNGALUP
PALMER
FLORA
PILE
RIVER
LENNARD
FALCON
WIGHT
KELLY
BUSSELL PLANTATION
MUNGALUP PLANTATION
WELLINGTON FOREST
WELLINGTON PLANTATION
MILL
TREE
KING
FERGUSON
SOUTH
BEST
RICHARDS
NO. 2429
Mining Lease M70/271
6563
46213
25973
48049
7136
45961
Map 2
Proposed and Existing Tenure
N
0 1 2 3 4 5 km
Scale
LEGEND
Planning Area
Planning Area boundary
Wellington National Park
Wellington Discovery Forest Reserve
Westralia Conservation Park
Proposed Westralia Interim Forest Conservation Area
Surrounding Area
Proposed Forest Conservation Area
Freehold Land & Other Crown Reserves
State Forest
State Forest Plantations
Roads

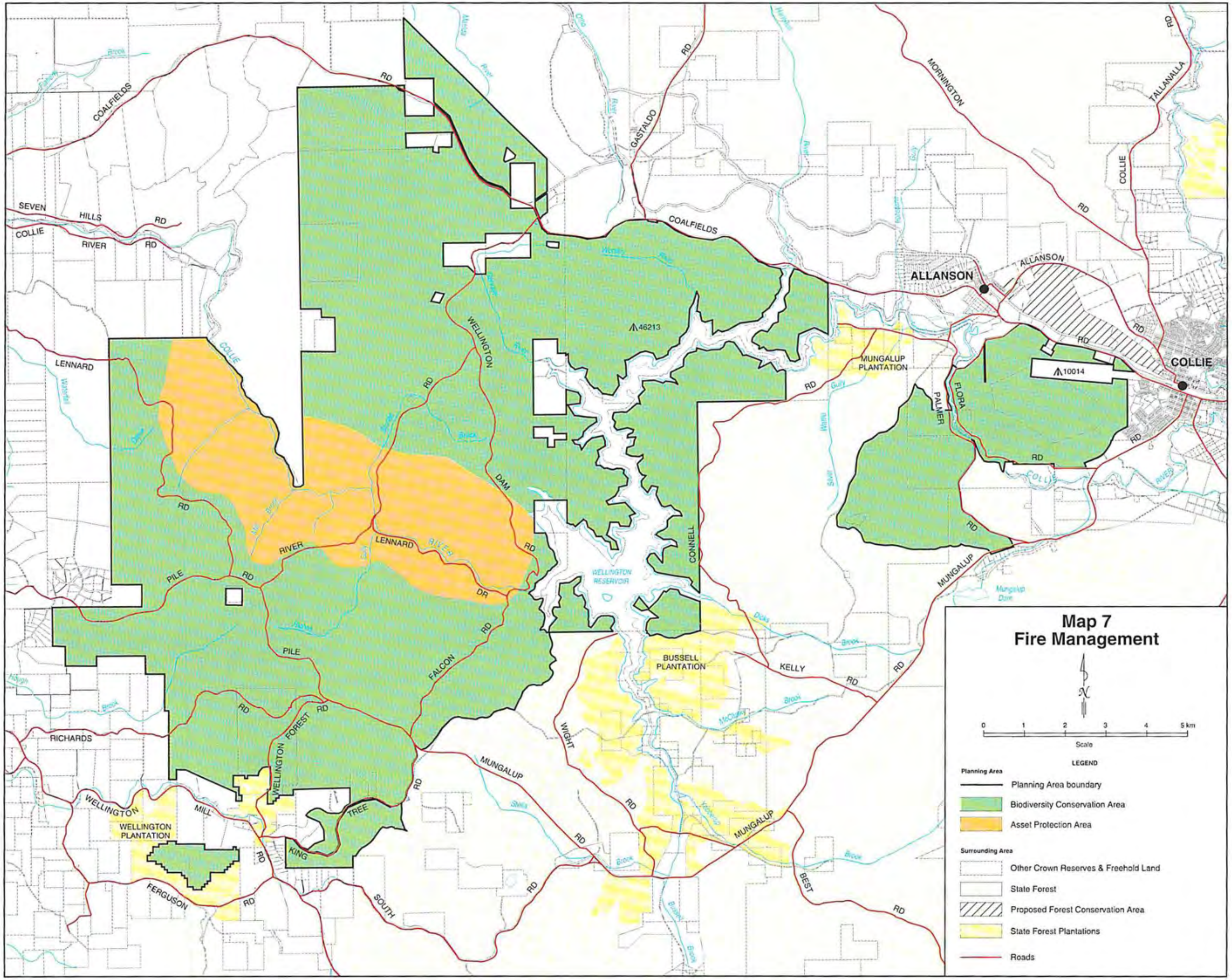

PERTH
Avon Wheatbelt P1 Subregion
INDIAN OCEAN
Swan Coastal Plain Bioregion
Northern Jarrah Forest Subregion
Avon Wheatbelt P2 Subregion
Jarrah Forest Bioregion
BUNBURY
COLLIE
Planning Area
Southern Jarrah Forest Subregion
Warren Bioregion
WALPOLE
SOUTHERN OCEAN
Map 3
Bioregions
0 10 20 30 40 50 km
Scale
LEGEND
Planning Area
Planning Area boundary
Wellington National Park
Wellington Discovery Forest Reserve
Westralia Conservation Park
Proposed Westralia Interim Forest Conservation Area
Surrounding Area
Land not included in the Planning Area
IBRA Region boundaries
IBRA Sub Region boundaries
Regional Forest Agreement boundary


Map 4
Vegetation Complexes
0 1 2 3 4 5 km
Scale
LEGEND
Planning Area
Land not included in the Planning Area
Darling Scarp
Collie
Dwellingup
Helena 1
Hester
Lowdon
Muja
Murray 1
Yarragil 1
Roads
ALLANSON
COLLIE
Mount Lennard
WELLINGTON RESERVOIR
COALFIELDS RD
SEVEN HILLS RD
COLLIE RIVER RD
LENNARD RD
GASTALDO RD
MORNINGTON RD
TALLANALLA RD
COLLIE RD
ALLANSON RD
FLORA RD
PALMER RD
MUNGALUP RD
WELLINGTON DAM RD
RIVER RD
LENNARD DR
PILE RD
FALCON RD
CONNELL RD
KELLY RD
RICHARDS
WELLINGTON MILL RD
WELLINGTON FOREST RD
KING TREE RD
FERGUSON RD
SOUTH RD
WIGHT RD
BEST RD

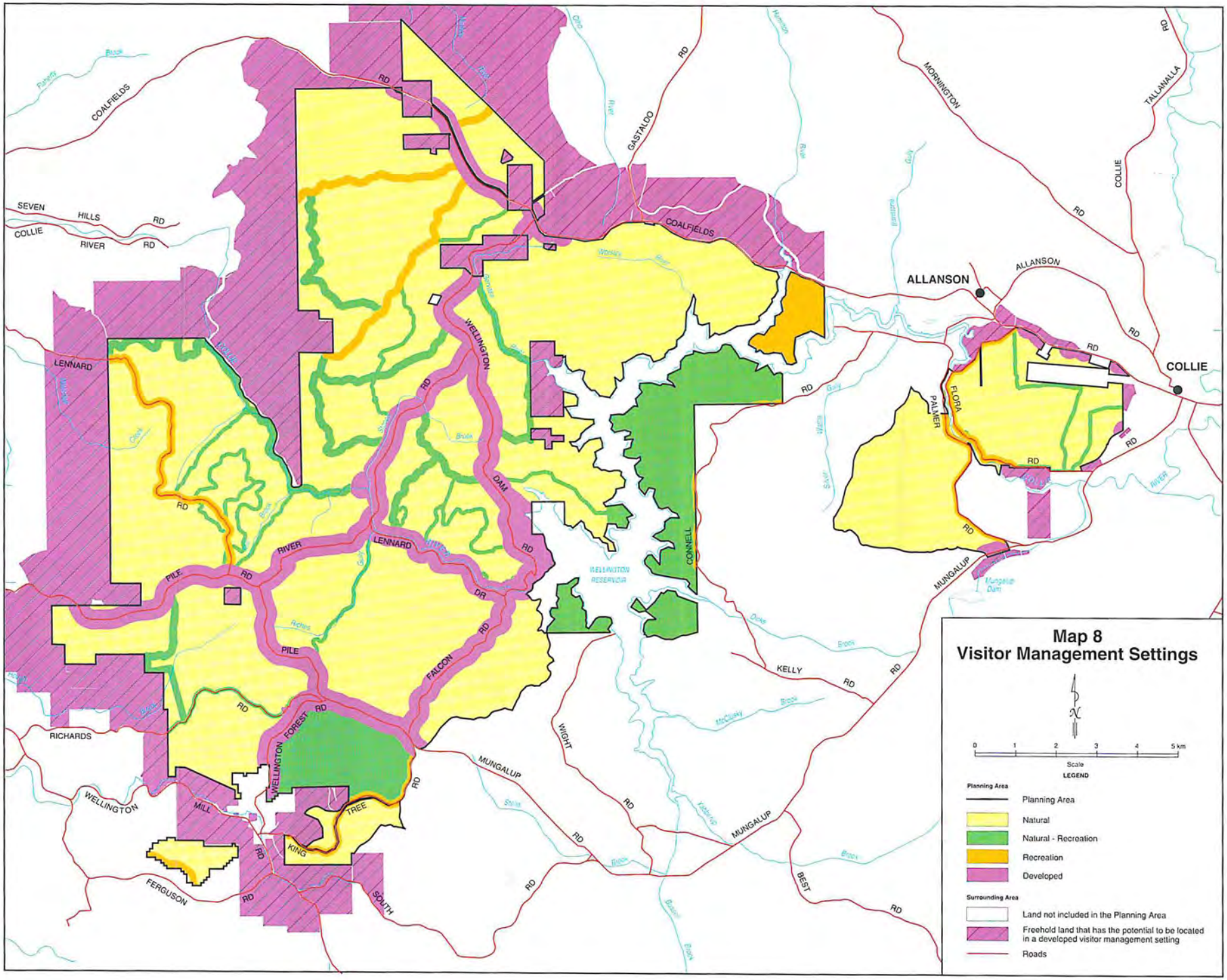


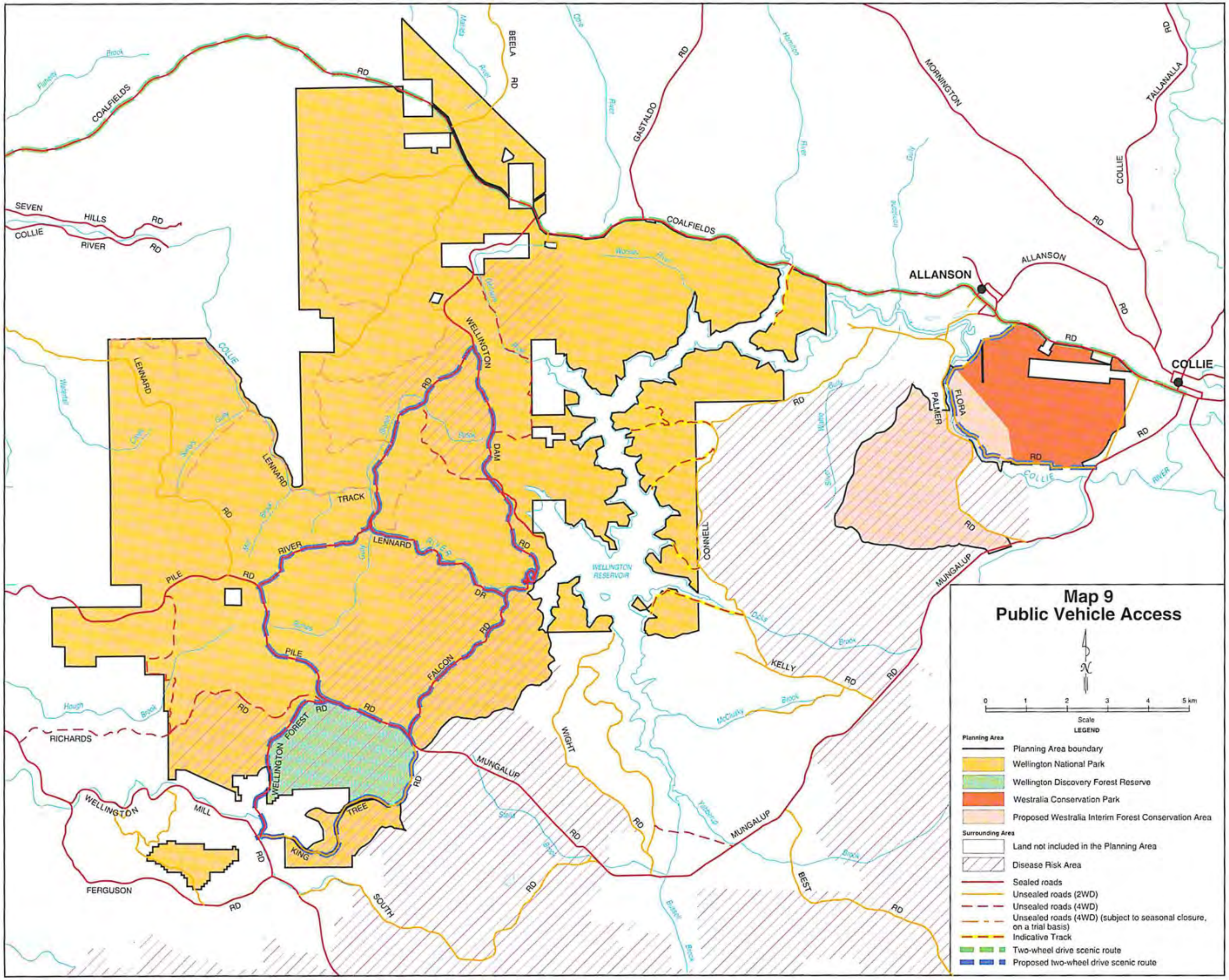
Map 5
Hydrology
N
0
5
10
15
20 km
Scale
LEGEND
Planning Area
Planning Area boundary
Wellington National Park
Wellington Discovery Forest Reserve
Westralia Conservation Park
Proposed Westralia Interim Forest Conservation Area
Surrounding Area
Land not included in the Planning Area
Remnant vegetation not included in the Planning Area
Collie River catchment boundary
Hydrology
Rainfall isohyets
BUNBURY
BUREKUP
ALLANSON
COLLIE
Wellesley River
Brunswick River
Lunenburg River
Otho River
Collie River
Ferguson River
Wellington Reservoir
Harris Dam
Harris River
Bingham River
South Collie River
900mm
1000mm
1100mm
1200mm
800mm
700mm
600mm


Map 6
Fire Landscape
Conservation Units
Central Jarrah (A)
Central Jarrah (B)
Collie Wilga (B)
ALLANSON
COLLIE
WELLINGTON RESERVOIR
COALFIELDS RD
SEVEN HILLS RD
COLLIE RIVER RD
LENNARD RD
PILE RD
RICHARDS
WELLINGTON MILL RD
FERGUSON RD
WELLINGTON FOREST RD
TREE KING RD
SOUTH RD
FALCON RD
DAM RD
CONNELL DR
WRIGHT RD
MUNGALUP RD
KELLY RD
BEST RD
MORNINGTON RD
TALLANALLA RD
GASTALDO RD
FLORA PALMER RD
ALLANSON RD
Scale
0 1 2 3 4 5 km
LEGEND
Planning Area
Central Jarrah (A)
Uplands & shallow valleys
Central Jarrah (B)
Deeply incised valleys & scarps
Collie Wilga (B)
Sandy deposits in Collie & Wilga basins
Roads

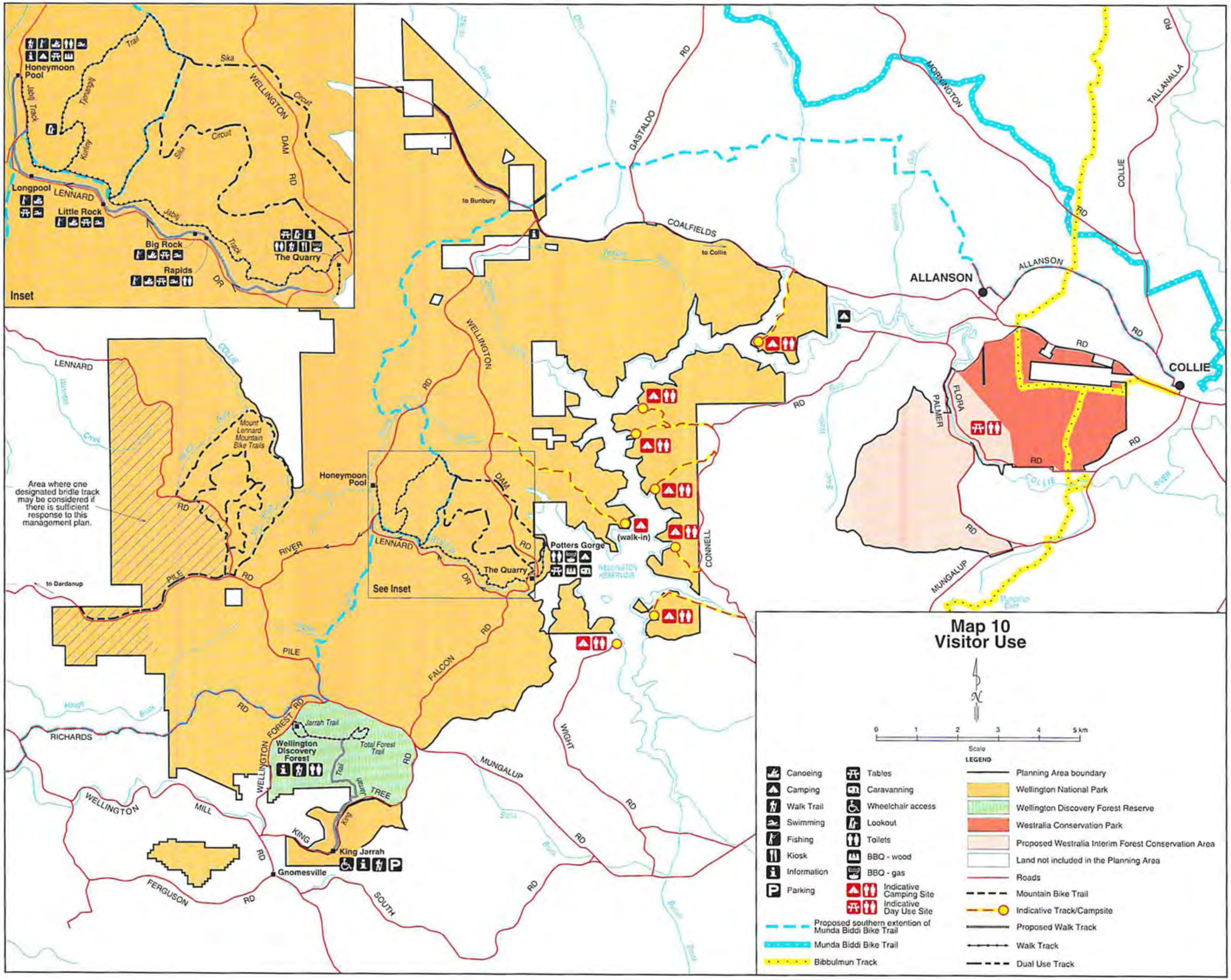


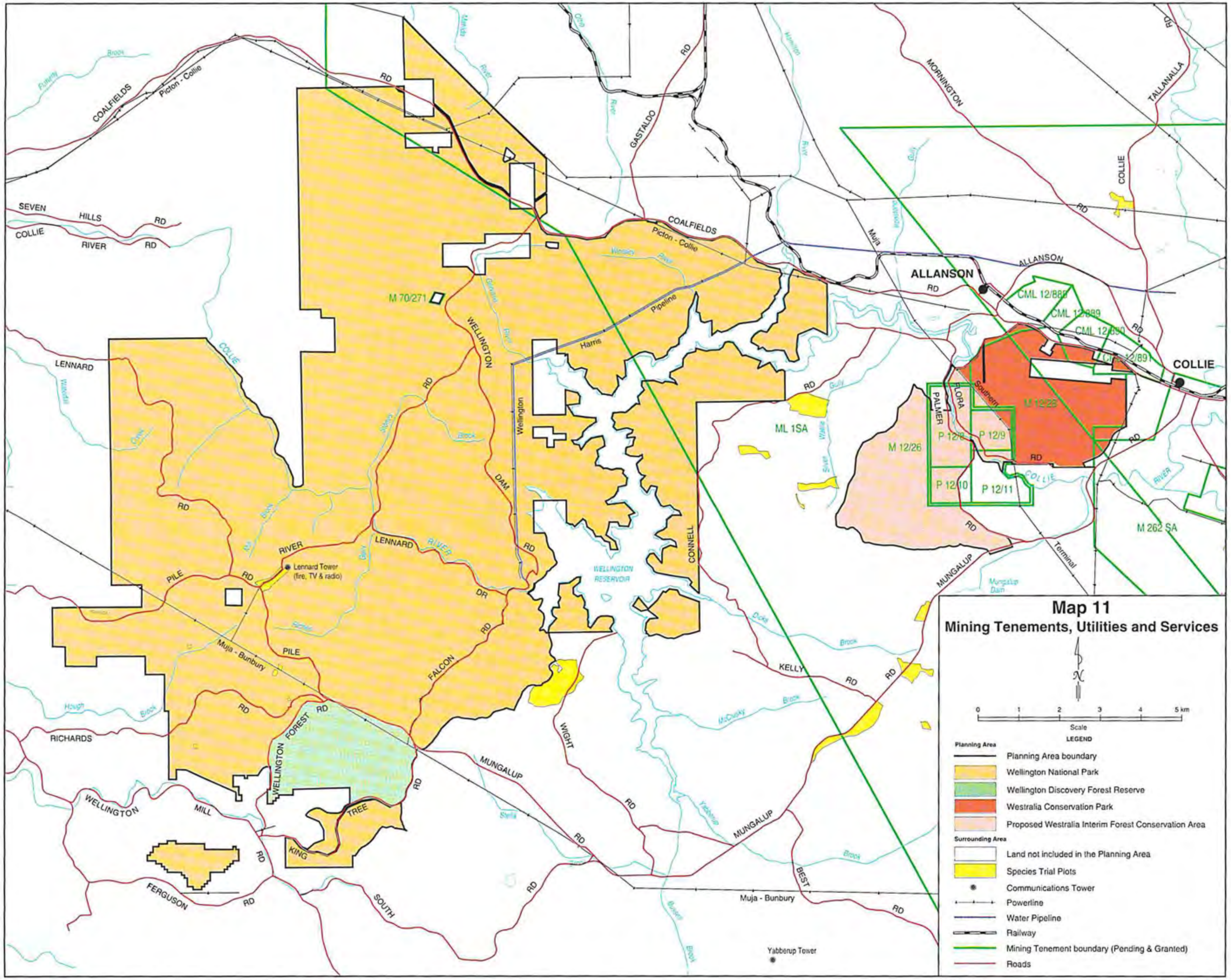
Map 7
Fire Management
0 1 2 3 4 5 km
Scale
LEGEND
Planning Area
Planning Area boundary
Biodiversity Conservation Area
Asset Protection Area
Surrounding Area
Other Crown Reserves & Freehold Land
State Forest
Proposed Forest Conservation Area
State Forest Plantations
Roads
ALLANSON
COLLIE
WELLINGTON RESERVOIR
MUNGALUP PLANTATION
BUSSELL PLANTATION
WELLINGTON PLANTATION


Map 8
Visitor Management Settings
N
0 1 2 3 4 5 km
Scale
LEGEND
Planning Area
Planning Area
Natural
Natural - Recreation
Recreation
Developed
Surrounding Area
Land not included in the Planning Area
Freehold land that has the potential to be located in a developed visitor management setting
Roads
ALLANSON
COLLIE
LENNARD
RICHARDS
WELLINGTON
MUNGALUP
KELLY
COALFIELDS
SEVEN HILLS RD
COLLIE RIVER RD
GASTALDO RD
MORNINGTON RD
TALLANALLA RD
COLLIE RD
ALLANSON RD
WELLINGTON DAM RD
LENNARD RIVER RD
PILE RD
PILE RD
FALCON RD
WELLINGTON FOREST RD
MILL RD
TREE KING RD
SOUTH RD
FERGUSON RD
WIGHT RD
MUNGALUP RD
MUNGALUP RD
BEST RD
KELLY RD
FLORA PALMER RD
MUNGALUP RD
CONNELL RD
WELLINGTON RESERVOIR
Mungalup Dam



Map 9
Public Vehicle Access
Scale
0 1 2 3 4 5 km
LEGEND
Planning Area
Planning Area boundary
Wellington National Park
Wellington Discovery Forest Reserve
Westralia Conservation Park
Proposed Westralia Interim Forest Conservation Area
Surrounding Area
Land not included in the Planning Area
Disease Risk Area
Sealed roads
Unsealed roads (2WD)
Unsealed roads (4WD)
Unsealed roads (4WD) (subject to seasonal closure, on a trial basis)
Indicative Track
Two-wheel drive scenic route
Proposed two-wheel drive scenic route
ALLANSON
COLLIE
WELLINGTON RESERVOIR
COALFIELDS RD
SEVEN HILLS RD
COLLIE RIVER RD
BEELA RD
GASTALDO RD
MORNINGTON RD
TALLANALLA RD
COLLIE RD
ALLANSON RD
WELLINGTON DAM RD
LENNARD RD
LENNARD TRACK
RIVER LENNARD DR
PILE RD
FALCON RD
FOREST RD
WELLINGTON MILL RD
KING TREE RD
RICHARDS
FERGUSON RD
SOUTH RD
MUNGALUP RD
WIGHT RD
KELLY RD
CONNELL RD
BEST RD
PALMER RD
FLORA RD


Map 10
Visitor Use
Inset
Honeymoon Pool
Longpool
Little Rock
Big Rock
Rapids
The Quarry
Sika
Circuit
Trail
Kurliny
Tjirrangi
Jabil Track
LENNARD
WELLINGTON
DAM
RD
DR
to Bunbury
COALFIELDS
to Collie
GASTALDO
MORNINGTON
TALLANALLA
COLLIE
ALLANSON
Potters Gorge
(walk-in)
CONNELL
WELLINGTON RESERVOIR
FLORA
PALMER
MUNGALUP
See Inset
Mount Lennard Mountain Bike Trails
Area where one designated bridle track may be considered if there is sufficient response to this management plan.
to Dardanup
RIVER
PILE
FALCON
RICHARDS
FOREST
Jarrah Trail
Wellington Discovery Forest
Total Forest Trail
King Jarrah
TREE
MILL
KING
Gnomesville
FERGUSON
SOUTH
WIGHT
Scale
0 1 2 3 4 5 km
LEGEND
Canoeing
Camping
Walk Trail
Swimming
Fishing
Kiosk
Information
Parking
Tables
Caravanning
Wheelchair access
Lookout
Toilets
BBQ - wood
BBQ - gas
Indicative Camping Site
Indicative Day Use Site
Proposed southern extention of Munda Biddi Bike Trail
Munda Biddi Bike Trail
Bibbulmun Track
Planning Area boundary
Wellington National Park
Wellington Discovery Forest Reserve
Westralia Conservation Park
Proposed Westralia Interim Forest Conservation Area
Land not included in the Planning Area
Roads
Mountain Bike Trail
Indicative Track/Campsite
Proposed Walk Track
Walk Track
Dual Use Track



Map 11
Mining Tenements, Utilities and Services
COALFIELDS
Picton - Collie
RD
GASTALDO
MORNINGTON
TALLANALLA
COLLIE
SEVEN HILLS RD
COLLIE RIVER RD
ALLANSON
ALLANSON RD
COLLIE
M 70/271
WELLINGTON
Harris
Pipeline
CML 12/888
CML 12/889
CML 12/890
CML 12/891
LENNARD
M 12/28
ML 1SA
M 12/26
PALMER
FLORA
Southern
P 12/8
P 12/9
P 12/10
P 12/11
M 262 SA
Wellington
DAM
CONNELL
WELLINGTON RESERVOIR
Terminal
MUNGALUP
Mungalup Dam
LENNARD RIVER
Lennard Tower (fire, TV & radio)
PILE RD
RIVER
DR
Muja - Bunbury
PILE
FALCON
KELLY
RICHARDS
WELLINGTON FOREST
WELLINGTON
MILL
TREE
KING
WIGHT
FERGUSON
SOUTH
BEST
Muja - Bunbury
Yabberup Tower
0 1 2 3 4 5 km
Scale
LEGEND
Planning Area
Planning Area boundary
Wellington National Park
Wellington Discovery Forest Reserve
Westralia Conservation Park
Proposed Westralia Interim Forest Conservation Area
Surrounding Area
Land not included in the Planning Area
Species Trial Plots
Communications Tower
Powerline
Water Pipeline
Railway
Mining Tenement boundary (Pending & Granted)
Roads

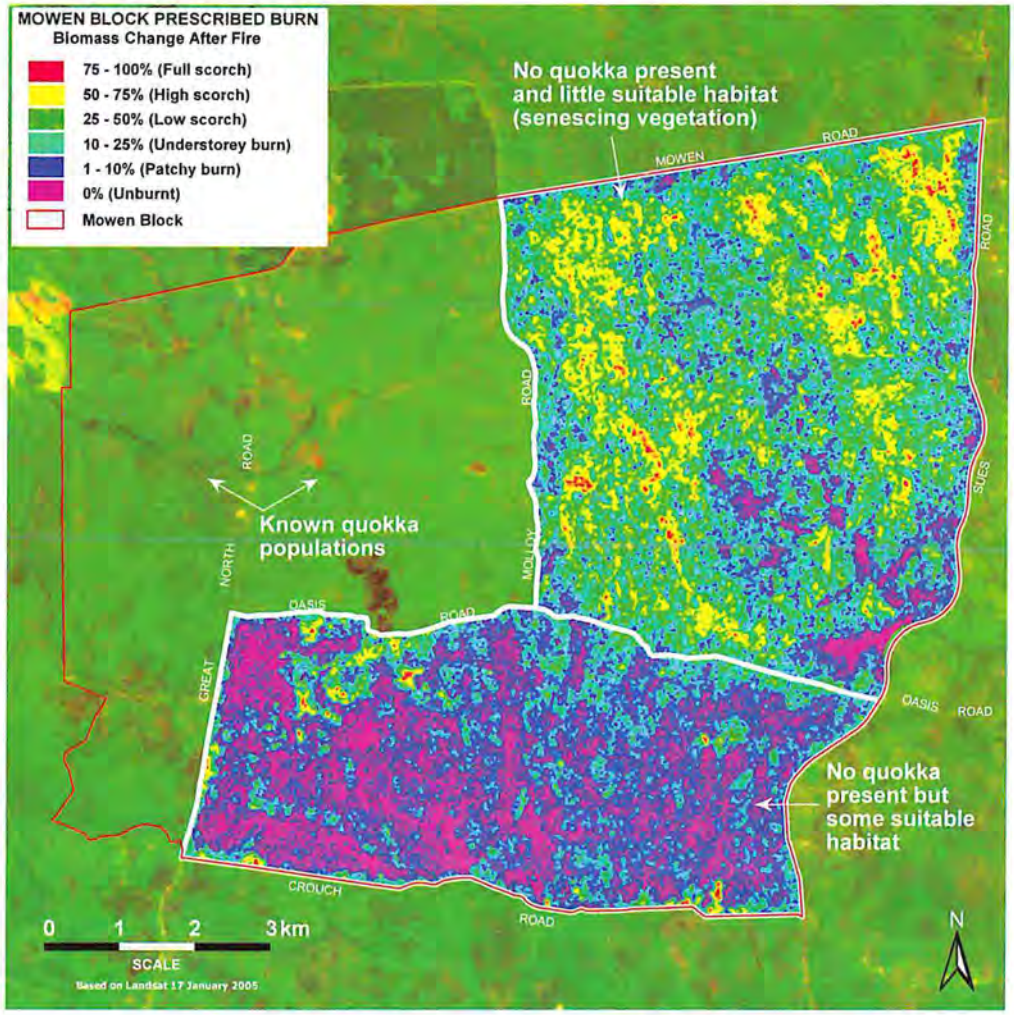


Figure 6 – Satellite Imagery of Prescribed Burning in Mowen Block

The primary purpose of the prescribed burn in Figure 6 was to protect, maintain and enhance biological values and ecological processes within the precinct of Mowen Block, approximately 23km east of Margaret River. A secondary purpose of this burn was to provide strategic protection against damaging wildfire to Mowen Tower, Milesi plantation and the adjoining Butler and Blackwood River national parks.

Pre-burn desktop surveys and subsequent field investigations found that Mowen Block had a number of issues in relation quokka management. In this respect, objectives for prescribed burning in Mowen Block incorporated (1) protection of known quokka populations and 'healthy' quokka habitat from fire and (2) regeneration of unsuitable (senescing) and unoccupied quokka habitat.

The burn was conducted in spring 2004 and achieved the above objectives for management of the various quokka habitat by incorporating the following strategies into the burn prescription:

- excluding, by physical separation, the area west of Great North Road;
- excluding, by physical separation, suitable healthy vegetation for quokkas north of Oasis Road and west of Molloy Road;
- regenerating habitat by applying fire to senescing vegetation north of Oasis Road and east of Molloy Road. At the time of printing, this area does not contain quokkas because of the age, and consequently the structure, of the vegetation; and
- excluding habitat south of Oasis Road by using moisture differentials in fuels between suitable habitat and upland areas. This area does not currently contain quokkas but provides suitable healthy habitat.

The satellite imagery also shows that, by applying different ignition techniques on day of the burn and planning to exclude some areas from fire, a mosaic or patchiness of burnt and unburnt areas was achieved across the landscape and at a local scale (i.e. treatment area), thereby enhancing biodiversity. In the longer term, both burnt and adjoining exclusion areas within Mowen Block will be monitored for quokka activity. When sufficient activity is recorded in the treatment area, current habitat to the west can be prescribed for burning at a point when this habitat needs regeneration.

APPENDIX 1 – PERFORMANCE ASSESSMENT

Key Performance Indicators for the Planning Area

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
Part B. Management Directions and Purpose	Section 9. Proposed and Existing Tenure			
Key values indicated throughout this table	Protect reserves of the planning area with the maximum security of tenure and their gazetted purpose	9.1 Changes in land tenure and purpose	To formally change the land tenure and purpose of the proposed Westralia Interim Forest Conservation Area to Conservation Park (Class A) , within 2 years of impediments to its reservation being lifted	After 2 years
Part C. Managing the Natural Environment	Section 16. Native Plants and Plant Communities			
A rich mosaic of vegetation communities, some which are restricted Networks of rock outcrops, wetlands and forested valley ecosystems Extensive areas of intact fauna habitat and populations of specially protected (including threatened) and priority fauna species Distinct and interesting floral communities, including mature growth vegetation along the lower Collie River A varied landscape with areas of high scenic quality such as well defined and steeply sloping valleys, granite outcrops, mature forest, rivers and a reservoir	Protect the native plants and plant communities of the planning area	16.1 Changes in species composition and structure within granite outcrops of the lower Collie River valley	To maintain species composition and structure within granite outcrops of the lower Collie River valley subject to natural variations	Every 5 years
	Section 18. Species and Communities of Conservation Significance			
	Protect habitats of conservation significance and populations of threatened flora and fauna species from threatening processes	18.1 Changes in the range and population size of critical weight range mammals within the planning area	Subject to natural variation, recovery and maintenance of viable populations of critical weight range mammals within the planning area	As per recovery plans for individual species or in their absence, annually
		18.2 The number of viable populations of rare and priority flora species and the number of individuals within populations	Subject to natural variation, maintenance or increase in the number of viable populations of rare and priority flora species and the number of individuals within populations	
		18.3 Evidence of second generation (F2) progeny from translocated species	The successful establishment of translocated species	
	Section 19. Environmental Weeds			
	Prevent potential species loss and community decline from weed invasion	19.1 Changes in the area covered by species rated as High in the *Environmental Weeds Strategy for Western Australia* or in the weed control plan	Reduction in the area covered by species rated as High in the *Environmental Weeds Strategy for Western Australia* or in the weed control plan	Every 5 years

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
	Section 20. Pest Animals			
	Negate the impacts of pest animals and pest animal control on the key values of the planning area	20.1 Changes in the area of vegetation around wetlands and erosion of streambanks as a result of impacts by feral pigs	The level of damage to stream banks and wetlands from pigs is reduced from 2005 levels	Every 5 years
	Section 21. Disease			
	Protect the natural values of the planning area from the impacts of *P. cinnamomi*	21.1 The number of sampled areas uninfested with *P. cinnamomi* following an operation with an approved disease management plan	Following identification and mapping, no new human-assisted infestations of disease caused by *P. cinnamomi* in uninfected protectable areas	Every 3 years
	Section 22. Soil and Catchment Protection			
	Protect the quality and quantity of water within the planning area from degradation from recreational use, particularly the lower Collie River and the surface water resource of the Wellington Reservoir Minimise and, where possible, negate the impacts of soil erosion both inside and outside the planning area	22.1 The quantity and sequence of water released from the Wellington Reservoir	Maintenance of environmental water flows and provisions for the Collie River below the Wellington Reservoir	Every 5 years subject to information provided by the DoE and WC
		22.2 Annual flow weighted mean salinity levels in the Collie River below the Wellington Reservoir	Salinity trend in the Collie River below the Wellington Reservoir to be neutral or decreasing	
		22.3 Changes in the area of erosion within the planning area	Reduction in the area of erosion occurring as a result of human activities	
	Section 23. Fire			
	Maintain conservation values while protecting people, property and recreation assets in and near the planning area	23.1 Fuel age distribution within the LCU	The fuel age distribution (time since fire) within each LCU approximates, within 5%, the defined frequency distribution model for each LCU	Every 5 years
		23.2 The extent of severe wildfires within each LCU	Area affected by wildfire per annum is less than 5% of the LCU	Annually
		23.3 The persistence of biodiversity, measured by changes in indicator species (threatened taxa and fire-regime specific taxa) and fire sensitive ecosystems within each LCU	No loss or significant decline in fire sensitive ecosystems or populations of indicator species within each LCU	
		23.4 The impact of wildfire on life and community assets	No loss of life or significant community assets	
		23.5 Community knowledge about, and involvement in, fire planning	Community consultation and notification of burn programs through media and community meetings	

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
Part D. Managing Cultural Heritage	Section 24. Indigenous Heritage			
An important area for use by local Aboriginal people for the continuation of cultural activities (and ceremonies) Aboriginal sites and landscapes of mythological, ceremonial, cultural and spiritual significance, particularly the Collie River An important site for non-Indigenous cultural heritage, with evidence of former forestry workers settlements, old cottages, spot mills, formations and built structures such as Wellington Dam as well as a history of recreational use	Protect the Aboriginal cultural heritage and cultural resources of the planning area	24.1 The number of registered heritage places protected	No disturbance of a registered place without formal approval	Annually
Part E. Managing Visitor Use	Section 27. Visitor Access			
A diverse array of nature-based recreational opportunities including recreational driving, cycling bushwalking, canoeing, picnicking, camping, abseiling, fishing and marroning, some of which may not be entirely compatible with water source protection A sense of seclusion whilst in close proximity to major population centres and travel routes to the south-west of the State	Provide and maintain a range of access types consistent with maintaining or improving the values of the planning area	27.1 Changes in the condition of Lennard Track and four-wheel drive tracks designated for seasonal closure	Track condition is maintained or improved from 2005 levels	Annually
	Section 28. Recreational Use			
	Provide a range of bushwalking opportunities appropriate to visitor management settings that do not adversely impact on conservation and landscape values	28.1 The satisfaction that visitors express with their visit in relation to the use of dual use trails	Bushwalkers continue to be satisfied with tracks designated for dual use	Every 5 years
	Provide opportunities for bike riding that do not adversely impact on conservation, landscape and other values	28.2 Changes in cycle track condition	Track condition is maintained or improved from 2005 levels	

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
Long distance walking and proposed cycling opportunities on the Bibbulmun Track and extension to the Munda Biddi Bike Trail A reservoir that provides a tourist attraction to visitors	Permit swimming in the planning area, unless there is an unacceptable level of risk to public health or visitor safety Permit marroning and fishing under the Fish Resource Management Act where this does not lead to degradation of the environment or unacceptable levels of conflict between users Provide for boating activities that are sustainable and consistent with the protection of values of the planning area	28.3 Water quality in the Wellington Reservoir	Maintenance of water quality for drinking water purposes to the standards set by the Australian Drinking Water Guidelines as monitored by the Advisory Committee for the Purity of Water	Annually subject to information provided by the DoE and WC
	Provide day-use facilities appropriate to the environmental and visitor management settings that encourage visitor enjoyment and understanding of values within the planning area	28.4 Satisfaction of the local Aboriginal people	The design of day-use facilities along Lennard Track satisfies the local Aboriginal people	On completion of designs for day-use facilities
	Provide a range of sustainable camping opportunities in designated areas	28.5 Changes in the area of disturbance zone around campsites	No increase in the disturbance zone around campsites from 2005 levels	Annually
		28.6 Number of trees at selected campsites that are damaged	Less than 10% of trees damaged around campsites	
		28.7 Number of trees at selected campsites with exposed roots	Less than 10% of trees around campsites with exposed roots	
	Maintain the use of campfires in designated areas and minimise the impacts associated with firewood collection	28.8 Number of wildfires in the planning area attributed to escapes from campfires	Reduction in the percentage of wildfires per visit that is attributed to escapes from campfires	Every 5 years
	Section 32. Visitor Safety			
	Maintain visitor experiences in the planning area by minimising risks to public safety wherever possible	32.1 Percentage of accidents/incidents and visitor injuries per visit reported annually to the Department	Maintenance or reduction in the percentage of accidents/incidents and visitor injuries per visit reported annually to the Department	Every 5 years
	Section 33. Domestic Animals			
	Protect native fauna and visitors from the impacts of domestic animals	33.1 Number of dogs recorded within the planning area that are not seeing-eye dogs or dogs required for emergency search and rescue purposes	No dogs recorded within the planning area that are not seeing-eye dogs or dogs required for emergency search and rescue purposes	Every 5 years

Key Values	Key Objectives	Key Performance Indicators		
		Performance Measure	Target	Reporting Requirements
Part F. Managing Sustainable Resource Use	Section 39. Rehabilitation			
The largest reservoir in the south-west of the State, with a high social value and an economic value for safe water consumption Considerable mineral potential within the proposed Westralia Interim Forest Conservation Area and the Westralia Conservation Park Commercial nature-based tourism opportunities	Restore degraded areas to a stable condition resembling as close as possible the natural ecosystem function	39.1 Changes in the area of rehabilitated land within the planning area and the number of unnecessary tracks rehabilitated	Increase in the area of disturbed land rehabilitated, including rehabilitation of unnecessary tracks	Every 5 years
	Section 41. Forest Produce			
	Prohibit the removal of forest produce from the planning area except where it is in accordance with section 99A or section 103(2a) of the CALM Act	41.1 Incidence of unauthorised firewood collection within the planning area	Reduction in the reported incidence of unauthorised firewood collection within the planning area	Every 5 years
	Section 42. Water Extraction			
	Protect the water resource and minimise its impact on the values of planning area whilst ensuring consistency with Government policy	42.1 Water quality in the Wellington Reservoir	Maintenance of water quality for drinking water purposes to the standards set by the Australian Drinking Water Guidelines as monitored by the Advisory Committee for the Purity of Water	Annually subject to information provided by the DoE and WC
Part G. Involving the Community	Section 43. Information, Education and Interpretation			
An extensive range of interpretation and education programs at the Wellington Discovery Forest that describe elements of the flora and fauna, cultural heritage and other natural processes A diverse array of natural environments providing research opportunities to increase knowledge associated with vegetation health and distribution, species of flora and fauna and their ecosystems Significant site to consider changing perspective's on forests and forestry and protected areas	Promote community understanding and awareness of the conservation values of the planning area and engender support for its effective management	43.1 Changes in the number of participants in education programs offered within the Wellington Discovery Forest	An increase in participation, including recurrent participation, in education programs offered within the Wellington Discovery Forest from 2005 levels	Annually
		43.2 The number of infringements issued annually and the reported incidence of vandalism in the planning area	An increase in visitor compliance with regulations and policies within the planning area from 2005 levels	
	Section 44. Working with the Community			
	Facilitate effective community involvement in management of the planning area	44.1 Changes in the number of registered volunteers and the level of volunteer hours contributed within the planning area	An increase in the number of registered volunteers and the level of volunteer hours contributed within the planning area	Every 5 years

* Note: where there is a target shortfall for any of the key performance indicators, the Department will investigate the cause and report to the Conservation Commission for action.

APPENDIX 2 – GUIDELINES FOR LANDSCAPE MANAGEMENT

High Quality Visual Landscapes

- Alterations to the naturally established landscape character should be subtle, remaining subordinate to natural elements by borrowing extensively from form, line, colour, texture and scale found commonly in the surrounding landscape.
- Within 1 year of project completion, alterations should achieve a condition that is not visually evident, resulting in little more than natural change.
- Site specific visual landscape factors should be carefully identified and evaluated prior to any management activities such as developing new recreation sites, access tracks or conducting burning regimes.
- Facilities and activities which utilise and yet disturb very little of the natural environment should be encouraged such as walking tracks and small day-use areas.
- Land uses and developments, which do not require particularly scenic environments, should be excluded, this includes mining/quarries, large recreation sites, large car parks, roads, telecommunication towers and powerlines.
- Roads, recreation sites and walking tracks should focus views onto distinctive features by selecting optimum siting and alignment, for example the Potters Gorge day-use area. Scenic views such as that along Lennard Drive are also well exposed to visual development.
- Road design and construction should remain subordinate to landscape elements by utilising minimum design standards; limited cuts and fills, minimum clearing widths, undulating edges, sensitive alignment. River Road south is an excellent example of this.
- Interpretive and explanatory signing should be utilised before and during operations that alter landscape character such as new recreation site development, control burning adjacent to travel routes and walking tracks.
- Where structures are required they should be sympathetic in design, materials and colour to complement surrounding landscape elements and be carefully sited away from major natural focal points, out of viewer sight-lines and where vegetation or landform screening can be used.
- Essential firebreaks should follow natural landform, vegetation, or land use patterns/lines in the landscape.
- Prescribed burning should be carried out employing prescriptions that minimise impact on landscape values.
- Previously disturbed areas within high scenic quality areas should be given the highest priority for rehabilitation until the desired standard of scenic quality is attained. An example of this is the Bussell Plantation, which is viewed from the Potters Gorge recreation site. This site would benefit from rotational harvesting and prompt replanting to preserve its scenic quality.

Moderate Quality Visual Landscapes

- Alterations to the naturally established landscape character should borrow form, line, colour, texture and scale from natural elements and may result in an apparent but not dominant impact found commonly in the surrounding landscape.

Low Quality Visual Landscapes

- Essential but visually depreciative facilities not requiring areas of scenic amenity should be accommodated in these areas first where possible such as gravel pits, quarries, mines, transmission and towers, powerlines.
- Enhancement of scenic quality through rehabilitation works should be considered to upgrade the area to a higher amenity standard.
- Views to disturbed landscapes may require landform and vegetation screening.

APPENDIX 3 – VEGETATION COMPLEXES

Representation of the Vegetation Complexes within the Planning Area

Figures for total area and percentages relate to the boundary of the Western Australian Regional Forest Agreement area and have been obtained from datasets current to March 2004.

Vegetation Complex	Percentage of Pre-1750 distribution within the planning area[27]	Percentage of Pre-1750 distribution represented in proposed and existing reserves[28]		Area (ha) of vegetation complex represented in the planning area[29]	Total extant area (ha) of vegetation complex represented in proposed and existing formal and other reserves	Extant area (ha) of vegetation complex on State forest outside proposed and existing formal and other reserves	Area (ha) of vegetation complex on private land
		Formal reserves	Other reserves				
Collie	5	9	4	530	1 510	6100	230
Dwellingup 1	2	10	5	4060	30470	146010	7360
Helena 1	18	31	4	2900	5650	1600	4210
Hester	13	22	2	4030	7940	14500	1280
Lowden	11	14	0	1790	2390	410	2000
Murray 1	5	27	9	3330	24980	19260	6780
Yarragil 1	3	11	19	2530	23300	36400	5950
Darling Scarp	0*	8	1	0*	2320	930	5870
Muja	2	4	10	240	1480	3310	450

* Less than 1 percent of this vegetation complex is represented in the planning area. Figures are rounded to the nearest percent.
** Less than 5 ha of this vegetation complex exists in the planning area. Figures are rounded to the nearest 5 ha.

[27] The area of Pre-1750 vegetation is based on data layers developed for the Regional Forest Agreement 1999 as updated.
[28] Includes new parks proposed under the *Protecting Our Old Growth Forests Policy* (2001).
[29] Gross area of planning area determined by vegetation boundaries.

Description of the Vegetation Complexes of the Planning Area

Vegetation Complex	Description of vegetation complex	Landform	Soil type
Collie	Open forest of jarrah and marri grading to woodlands of sheoak. Second storey vegetation of woody pear, bull banksia and snottygobble.	Broad lateritic uplands of the Collie Basin. The landscape is has a very low relief (5–25 m), and an elevation ranging from 200–250 m.	Deep sands and yellow-brown sandy gravels found only in the Collie coal basin dominate the area.
Dwellingup 1	Open forest of jarrah and marri.	Mildly undulating lateritic uplands and ridges of the Darling Plateau.	Yellow-brown gravelly and loamy sand with outcrops.
Helena 1	Open forest of marri, jarrah and Swan River blackbutt with some flooded gum on the deeper soils. On the lower slopes and valley floors an understorey of peppermint and albizia (*Paraserianthes lophantha* subsp. *lophantha*) is present. The forest grades to a closed heath and lithic complex on shallow soils associated with granite outcrops.	Steep slopes (greater than 25 degrees) and deeply incised valleys (120–200 m relief) of the lower Collie River. Elevation of 20–100m. Rock outcrops are prominent.	Red and yellow earths on the upper slopes and grey-brown silty loams in the lower slopes and floors.
Hester	Tall open forest to open forest with a canopy of jarrah and marri. The understorey comprises of common species such as grass tree and water bush.	Lateritic uplands and granitic hillcrests of the planning area.	Ironstone duricrust pavements, loamy gravels, sandy gravels and outcrops.
Lowden	Open forest of marri, jarrah and peppermint with some wandoo (*E. wandoo*) and mountain marri (*C. haematoxylon*). Woodlands of flooded gum and swamp paperbark occur on the valley floors.	Moderately steep slopes with a relief ranging from 30–120 m.	Soils are predominantly red and yellow loamy earths and gravels.
Murray 1	Open forest of jarrah, marri and Swan River blackbutt on valley slopes and fringing woodlands of flooded gum and swamp paperbark on the valley floors.	Moderately deep valleys with a relief ranging from 30–120 m.	Soils are predominantly red and yellow loamy earths and gravels.
Yarragil 1	Open forest of jarrah and marri on slopes, with Swan River blackbutt and bullich (*E. megacarpa*) on the valley floors. Second storey consists primarily of sheoak, bull banksia and snottygobble. A shrub and herb storey of *G. wilsonii*, common pinheath (*Styphelia tenuiflora*) and *Adenanthos barbiger* is also typical.	Moderately incised minor valleys in lateritic terrain, characterised by narrow, flat, swampy floors and an elevation of approximately 60 m.	Loamy gravels, sandy gravels with some loamy earths and deep sands.
Darling Scarp	Open forest or woodland of jarrah and marri, with some darling range ghost gum (*E. laeliae*) in the north, and occasional *E. marginata* subsp. *elegantella*, and mountain marri in the south. Low woodlands of rock sheoak are present on or around granite outcrops as well as a closed heath of *Myrtaceae* and *Proteaceae* species and lithic complex.	The Darling scarp vegetation complex can be found on steeply sloping hills of the western edge of the Darling plateau.	Bare rock, skeletal soils and shallow gritty sandy loam on milder slopes. These areas are water shedding and have low water storage capacity.
Muja	Open woodland moonah, swamp banksia and holly-leaved banksia with some Swan River blackbutt on moister sites and *Banksia* spp. on drier sites of valley floors. No second storey is present.	Major valleys within the Collie Basin. These valleys are shallow with gentle slopes.	Sandy gravels and deep sands. Seasonal waterlogging can occur.

APPENDIX 4 – SPECIALLY PROTECTED AND PRIORITY FAUNA

Specially Protected and Priority Fauna in the Planning Area

Species	Common Name	Conservation code			Habitat Requirements	Threatening Processes (applies throughout their range)
Specially Protected Fauna		**WA**	**EBPC**	**IUCN**		
Dasyurus geoffroii	Chuditch	S1	VU	VU	Chuditch occur in a wide range of habitats but are more commonly found in woodland, forest and riparian vegetation. They den in hollow logs, burrows and tree hollows.	Competition from and predation by foxes and cats, land clearing, habitat alteration through the removal of suitable den logs, poisoning, illegal shooting and road traffic.
Setonix brachyurus	Quokka	S1	VU	VU	Densely vegetated wetlands and tea-tree thickets along creek systems and dense heath on valley slopes. Peppermint and *Thomasia* species being dominant vegetation items in their diet.	Fox predation is the primary threat. Altered fire regimes in remnant swamp habitats have also contributed to their decline through increased exposure to fox predation.
Pseudocheirus occidentalis	Western ringtail possum	S1	VU	VU	Western ringtail possums feed, rest and socialise in the canopy, primarily coastal peppermint woodlands and peppermint/tuart associations. They require tree hollows and/or dense canopy for refuge and nesting.	Fox predation is the primary threat. To a lesser degree, habitat loss and/or modification, changing fire regimes, damming, climate change, and coastal development.
Calyptorhynchus baudinii	Baudin's Cockatoo	S1	VU	EN	Heavily forested areas of the south-west, where it feeds on the seeds of eucalypts and various proteaceous species. It is a nomadic species, and breeding mostly occurs in areas south of Donnybrook.	Land clearing and illegal shooting.
Calyptorhynchus latirostris	Carnaby's Cockatoo	S1	EN	EN	Carnaby's Cockatoo moves seasonally through the planning area, feeding in proteaceous heaths and adjacent eucalypt woodlands. Preferred habitats include banksia woodland, trees surrounding watercourses and, since the 1930s, pine plantations.	Land clearing outside the planning area, particularly in the northern and eastern wheatbelt where the species breeds.
Falco peregrinus	Peregrine Falcon	S4			The peregrine falcon is uncommon but very widespread and prefers areas with rocky ledges, cliffs, watercourses or open woodland.	Illegal shooting.
Morelia spilota imbricata	Carpet python	S4			Occurs in a variety of habitats. Often arboreal but will utilise the burrows of other animals for shelter.	Fox predation.

Species	Common Name	Conservation code			Habitat Requirements	Threatening Processes (applies throughout their range)
Priority Fauna		**WA**	**EBPC**	**IUCN**		
Hydromys chrysogaster	Water rat	P4			Water rats occurs along permanent watercourses where there are freshwater molluscs and crustaceans (its main prey) present.	Fox predation and a decline in water quality.
Phascogale tapoatafa	Brush-tailed phascogale	P3			This species occurs in forest and woodland where suitable tree hollows are available.	Fox and cat predation, reduction in trees with suitable hollows and possibly altered fire regimes.
Isoodon obesulus fusciventer	Quenda	P5			The Quenda has persisted in many parts of the forest where there is dense undergrowth, particularly along watercourses and around swamps.	Fox predation.
Bettongia penicillata ogilbyi	Woylie	P5			This species inhabits open forest and woodland, with an understorey that contains plant thickets suitable for sheltering during the day. The woylie has been reintroduced to Wellington and appears to be establishing.	Fox predation.
Macropus irma	Western brush wallaby	P4			The western brush wallaby prefers areas of forest and woodland supporting a dense shrub layer.	Fox predation.
Falsistrellus mackenziei	Western false pipistrelle	P4			This species of bat usually occurs in high rainfall jarrah forest where it roosts in small colonies in tree hollows and forages in the cathedral-like spaces between trees.	Land clearing and logging.
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	P3			This subspecies of the red-tailed black cockatoo is restricted to the forests of the south-west. It requires tree hollows to nest and breed and is totally dependent on jarrah-marri forest.	Land clearing and logging.
Tyto novaehollandiae novaehollandiae	Masked Owl	P3			Inhabits forests and woodlands in the south-west and preys upon small to medium sized mammals	Land clearing and the impacts of logging (i.e. reduction in available tree hollows and vigorous regrowth after logging affects the suitability of the forest for foraging).
Burhinus grallarius	Bush Stonecurlew	P4			Lightly wooded areas near vegetation thickets or long grass suitable for sheltering during the day.	Fox predation, habitat clearing for agriculture and habitat degradation through pastoralism or through removal of leaf litter and fallen logs.
Ctenotus delli	Dell's skink	P4			Dry sclerophyll forest on stony hills and ranges. Mainly found on laterite or clay soils.	Land clearing.
Pachysaga munggai	Cricket	P3			Heathland habitat with occasional eucalypts and abundant leaf litter. Vegetation and leaf litter must be sufficient to provide this ground dwelling species with cover.	Land clearing. Fire is a potential threat as it is a ground dwelling species.
Austromerope poultoni	Scorpion fly	P2			Occurs predominantly in dense understorey vegetation in high rainfall forest.	Altered fire regimes

Conservation Code

WA

Fauna declared under the Wildlife Conservation Act as likely to become extinct or rare, or otherwise in need of special protection:

- S1: Fauna that is rare or likely to become extinct.
- S2: Fauna presumed extinct but might be rediscovered.
- S3: Birds protected under an international agreement.
- S4: Other specially protected fauna.

Priority Flora and Fauna:

Priority 1 flora and fauna species are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation (e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases under threat of habitat destruction or degradation). Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

Priority 2 flora and fauna species are known from one or a few collections or sight records (generally less than five), some of which are on lands not under imminent threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.

Priority 3 flora and fauna species are species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

Priority 4 flora and fauna species are categorised as either Rare, Near Threatened and other species in need of monitoring:

a Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

b Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent (Priority 5), but that are close to qualifying for Vulnerable.

c Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Priority 5 flora and fauna species are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Environment Protection and Biodiversity Conservation Act (EPBC)

Threatened Fauna listed under section 179 of the Environment Protection and Biodiversity Conservation Act:

- EX: Extinct
- EW: Extinct in the wild
- CR: Critically Endangered
- EN: Endangered
- VU: Vulnerable
- CD: Conservation Dependent

World Conservation Union (IUCN)

IUCN Red List categories and criteria have been adopted by the Commonwealth Government under the *Endangered Species Protection Act 1992*.

Extinct (EX):	Taxon that is extinct.
Extinct in the Wild (EW):	Taxon known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.
Critically endangered (CR):	Critically Endangered –facing an extremely high risk of extinction in the wild in the immediate future
Endangered (EN):	Endangered – facing a very high risk of extinction in the wild in the near future.
Vulnerable (VU):	Vulnerable – facing a high risk of extinction in the wild in the medium-term future.

APPENDIX 5 – RARE AND PRIORITY FLORA

Definition of Terms for Rare and Priority Flora in the Planning Area

	Description of term	Taxa	Habitat Description	Threatening processes
Rare Flora	*Extant Taxa* – Taxa that have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection.			
Rare Flora	*Presumed Extinct Taxa* – Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all wild populations have been destroyed more recently.			
Priority One	See definition of Priority flora and fauna in Appendix 4.			
Priority Two	See definition of Priority flora and fauna in Appendix 4.			
Priority Three	See definition of Priority flora and fauna in Appendix 4.	*Acacia oncinophylla* subsp. *oncinophylla*	Open forest associated with the Helena landform and vegetation complex. This species is also recorded in the Perth hills, John Forest National Park and the Canning River watershed. Landform and soil associations that support this type of vegetation are uncommon elsewhere.	Trampling, soil erosion as well as the increased spread of weeds is a concern for these populations. Altered fire regimes may also affect these species.
		Acacia semitrullata	The species is recorded in vegetation of the Yarragil 1 complex, which is well represented within the protected reserve system. It is present throughout the south-west.	
		Tetratheca parvifolia	The species is found in low woodlands or open forest of jarrah and marri over open shrubland and low heath. Soils are often shallow sands over laterite.	Disease and inappropriate recreation activities.
Priority Four	See definition of Priority flora and fauna in Appendix 4.	*Calothamnus graniticus* subsp. *leptophyllus*	This species was recorded at Mt Lennard and in 1946 around the Wellington Reservoir.	Trampling, soil erosion, increased spread of weeds and altered fire regimes are a concern for this species.
		Grevillea ripicola	Numerous populations of *Grevillea ripicola* occur in the Murray 1 vegetation complex, primarily in valley floors along portions of the Collie River that are above the Wellington Reservoir.	Poor water quality and salinisation, altered fire regimes, pest animals such as pigs, the disease caused by *Phytophthora cinnamomi*, and weed invasion, particularly from watsonia.
		Senecio leucoglossus	This species occurs on gravelly lateritic or granitic soils and surrounding granite outcrops in areas of jarrah forest and high open woodlands. It is recorded from the Perth hills to a location near Nannup.	In appropriate recreational activities and feral pigs.
Priority Five	See definition of Priority flora and fauna in Appendix 4.			

APPENDIX 6 – ENVIRONMENTAL WEEDS

Environmental Weeds in the Planning Area

Species*	Common Name	Invasive	Environmental Impacts	EWS Rating
Asparagus asparagoides (WONS)	Bridal Creeper	Yes	Yes	High
Leptospermum laevigatum	Victorian Tea Tree	Yes	Yes	High
Zantedeschia aethiopica	Arum Lily	Yes	Yes	High
Allium triquetrum	Three-cornered garlic	Yes	Yes	Moderate
Anagallis arvensis	Pimpernel	Yes		Moderate
*Gomphocarpus fruticosus***	Narrow leaf Cotton Bush	Yes		Moderate
Pennisetum clandestinum	Kikuyu	Yes		Moderate
Pinus radiata	Monterey Pine	Yes		Moderate
Pseudognaphalium luteoalbum	Jersey cudweed	Yes		Moderate
Senecio diaschides	Ragwort	Yes		Moderate
Solanum linnaenum	No common name	Yes		Moderate
Trifolium subterraneum	Subterranean clover	Yes		Moderate
Watsonia marginata	Watsonia	Yes	Yes	Moderate
Acacia dealbata	Silver Wattle		Yes	Mild
Acacia decurrens	Early Black Wattle		Yes	Mild
Chamaecytisus palmensis	Tagasaste	Yes		Mild
Dittrichia graveolens	Stinkwort			Mild
Ipomoea cairica	Five Leaved Morning Glory	Yes		Mild
Ipomoea indica	Morning Glory	Yes		Mild
Phytolacca octandra	Inkweed			Mild
Bromus hordeaceus	Soft Brome			Low
Cyperus tenuiflorus	Scaly sedge			Low
Hypericum perforatum	St John's Wort			Low
Lavandula dentata	Lavender			Low
Lotus angustissimus	Slender birdsfoot trefoil			Low
Oxalis incarnata	Climbing oxalis			Low
Populus nigra	Lombardy poplar			Low
Platanus x acerifolia	London plane			Low
*Rubus fruticosus*** (WONS)	Blackberry			Low
*Silybum marianum***	Variegated thistle			Low
Trifolium ligusticum	Ligurian clover			Low
Vinca major	Blue periwinkle			Low
Fraxinus excelsior	European Ash			No rating
Freesia alba x leichtlinii	No common name			No rating
Isolepis marginata	No common name			No rating
Liquid amber styraciflua	Liquid amber			No rating
Ulmus parvifolia	Chinese elm			No rating

* Several introduced *Eucalypt* species were also planted previously in species trial plots.
** Declared species under the Agriculture and Related Resources Protection Act (as of 14 December 2000).
WONS Weeds of National Significance

Environmental Weeds Strategy for Western Australia (EWS) Rating

High	Priority for control and/or research
Moderate	Control or research efforts should be directed to it if funds are available in addition to reasonably high level of monitoring
Mild	Monitoring and control where appropriate
Low	Low level of monitoring
Invasiveness	Ability to invade bushland in good to excellent condition or ability to invade waterways. (scored as yes or no)
Environmental Impacts	Ability to change the structure, composition and function of ecosystems. In particular, an ability to form a monoculture in a vegetation community (scored as yes or no).

Based on the *Environmental Weed Strategy for Western Australia (1999)*

APPENDIX 7 – PRINCIPLES OF FIRE MANAGEMENT

This framework is based on the following scientific principles (adapted from Burrows and Friend 1994, Fire Ecology Working Group 1999).

Principle 1
The vegetation and climate of the south-west forest region make it highly prone to bushfire. Fire should be regarded as an environmental factor that has and will continue to influence the nature of south-west landscapes and is integral to land management.

Principle 2
Species and communities vary in their adaptations to, and reliance on, fire. Knowledge of the temporal and spatial scales of fires in relation to the life histories of organisms or communities involved underpins the use of fire in natural resource management.

Principle 3
Following fire, environmental factors such as landform, topography and species' life history attributes, and random events such as climatic events, often drive ecosystems towards a new transient state with respect to species composition and structure. This may preclude the identification of changes specifically attributable to fire.

Principle 4
Fire management is required for two primary reasons, which are not necessarily mutually exclusive: a) to protect and conserve the biota and b) to reduce the occurrence of large, damaging wildfires. The biological impact of a single fire event and the rate of recovery are directly proportional to the intensity and size of the fire.

Principle 5
Fire management should be precautionary and consider both ecological and protection objectives in order to optimise outcomes.

Principle 6
Fire diversity promotes biodiversity. An interlocking mosaic of patches of vegetation representing a range of fire frequencies, intervals, seasons, intensities and scales need to be incorporated into ecologically-based fire regimes if they are to optimise the conservation of biodiversity.

Principle 7
Avoid applying the same fire regime over large areas for long periods of time and avoid seral and structural homogenisation by not treating large areas with extreme regimes such as very frequent or very infrequent fire intervals.

Principle 8
The scale, or grain-size, of the mosaic should a) enable natal dispersal b) optimise boundary habitat (interface between two or more seral states) and c) optimise connectivity (ability of fauna to cross).

Principle 9
All available knowledge, including life histories, vital attributes of the flora and fauna and knowledge of Noongar fire regimes should be utilised to develop ecologically-based fire regimes for a landscape unit or a vegetation complex.

Principle 10
Fire history, vegetation complexes and landscape units should be used to develop known and ideal fire age class distributions.

Principle 11
Wildfire can damage and destroy both conservation and societal values, hence risk management must be based on a systematic and structured approach to identifying and managing the consequences of such an event.

Principle 12
Fire management should adapt to changing community expectations and to new knowledge gained through research, monitoring and experience.

APPENDIX 8 – VISITOR MANAGEMENT SETTINGS CRITERIA

Derived from the Recreation Opportunity Spectrum principles developed by Clark and Stankey (1979), the following settings are proposed to be provided across the planning area.

Visitor Management Settings in the Planning Area

	Visitor Management Setting Class				
	Remote-Natural	Natural	Recreation	Recreation	Developed
	Conservation, low level recreation	Conservation, low level recreation	Conservation, low to medium level recreation, limited resource use	Conservation, medium level recreation, education and interpretation, some resource use	education and interpretation, conservation, multiple-use
Description	Natural areas with minimal evidence of modern human activity. Large, remote areas (8000 ha in temperate areas)	Natural areas with minimal evidence of modern human activity. No size criteria	Predominantly natural areas, with some disturbance and modern human activity apparent at specific sites	Mostly natural areas, but with disturbance and modern human activity apparent at some sites	Concentrated areas of modified environment but with natural or rural background. Human activity conspicuous
Access Access standards and type of transport used for visitors, resource users and protected area managers	Mechanised access in emergency situations only. Walking access is via natural routes formed principally by human use (AS Walking Track class 5 and 6)	Mechanised access in emergency situations only. Walking access is via natural routes formed to a minimum standard (AS Walking Track class 4 to 5)	Public mechanical access on unsealed 4WD tracks. Limited motor boat and commercial horse riding access in designated areas. Formed walk tracks (AS Walking Track class 4). Cycle/mountain bike access on formed tracks	Areas open to 2WD vehicles, motorbikes and motorised boats, with moderate usage levels and defined access limits. Well-built walking track with direction signs (AS Walking Track class 2 to 4). Cycle/mountain bike access on formed tracks	Areas are open to public vehicles or motorised boats, with busy usage and defined access limits. Well-built, signposted walking track may be provided, or occur in adjoining areas (AS Walking Track class 1 and 2). Cycle/mountain bike access on well-built tracks
Site Modification of infrastructure, facilities, amenities and the style of accommodation provided	No site modification and no facilities or structures except for reasons of visitor safety, resource protection and/or management operations. Campsites are not defined ('Wild Camping')	facilities or structures except for reasons of visitor safety, resource protection and/or management operations. Track markers may be used. Campsites are not defined ('Wild Camping')	Minor modification of specific sites. Basic facilities such as toilets may be provided in specific locations. 'Basic Campsites' may be provided	sites. Low-key facilities such as simple carparks, toilets, shelters and picnic areas may be present. 'Camping Areas', 'Basic Campsites' or 'Beach Camping' may be provided.	Modified site, with often a range of facilities. Accommodation facilities, picnic areas, visitor centres and lookouts may be present. 'Camping Grounds' and 'Camping Areas' may be provided

	Visitor Management Setting Class				
	Remote-Natural	Natural	Natural - Recreation	Recreation	Developed
Probable Social Interaction Density of users and degree of social interaction and opportunities for solitude	Interaction between users is minimal, with usually less than two other groups encountered during a day, and no other groups within sight or sound at campsites. Maximum group size of about six to eight people	Little interaction between users, with usually less than about four to six other groups encountered during a day, and usually no more than about two other groups within sight or sound at camp sites. Group size approximately 8-12 people	Moderate interaction between users, with encounters with several other groups likely along access routes and at camp sites. Group size approximately 12-15 people	High level of contact and interaction with other users on roads and in camping and picnic areas, moderate interaction on walking tracks. Groups of more than 15 people may be expected, depending on location	High level of contact and frequent interaction with many other groups. Groups may exceed 20 people
Probable Recreation Experiences	Opportunities for isolation, independence, closeness to nature, tranquillity and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge	Opportunities for isolation, independence, closeness to nature, tranquillity and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge	Opportunities for closeness to nature, tranquillity and self-reliance through the application of outdoor skills in an environment that offers a moderate degree of challenge	Opportunities include closeness to nature and nature appreciation. Moderate levels of social contact and some opportunity to experience tranquillity.	Opportunities for nature appreciation, and for social interaction. Facilities often support presentation of nature or access to nature-based opportunities in nearby areas
Degree of Self-Reliance Level of support services provided	Visitors must be totally self-reliant as support services are inappropriate and are not provided. Commercial tourism and recreation operators not permitted	Visitors must be totally self-reliant, as support services are inappropriate and are minimal or non-existent	Visitors must be largely self-reliant as basic support services are provided in specific locations only.	Self-reliance requirements are generally low where facilities are provided, but outdoor skills will be important in areas away from roads and tracks	Low level of self-reliance due to high level of support services and facilities present
Style of Visitor Management Level of on-site management, site constraints and regulations	On-site visitor management is very low with controls primarily off site. All interpretation is off-site. No track information in brochures. Boundary signage only. Very infrequent ranger presence	On-site regimentation is low with controls primarily off site. Generally boundary signs only. Infrequent ranger presence	Low on-site regimentation. Walking tracks and campsites may be defined. Most interpretation is off-site. Along tracks and at track campsites there may be basic markers and signage with minimal management messages. Infrequent ranger presence	Moderate on-site regimentation, including some signs and barriers. Facilities may be common and clustered. Track signs may include interpretation. Brochures and track guides often available. May be frequent ranger presence.	A high degree of on-site visitor management, including the use of physical barriers to constrain movement of pedestrians and vehicles/boats. Well-developed structures. There may be considerable interpretive signage, materials or activities. Frequent ranger presence likely

APPENDIX 9 – STANDARDS FOR WALK TRACKS

Standards Australia (2001) identified six categories of walking tracks, which can be applied to the planning area.

Standards for Walk Tracks of the Planning Area

Class of walk track	Description of walk track	Visitor Management Setting
Class 1	A broad hard surfaced track suitable for wheelchair use, with a width of 1200 mm or more. An easy walk with the opportunity of large numbers of visitors, including those with reduced mobility to undertake walks that are provided with a high level of interpretation and facilities. Users need no previous experience.	Developed
Class 2	A track with a modified or hardened surface that is well maintained with no intrusions and a width of 900 mm or more. These tracks allow for large numbers of visitors to walk easily in natural environments that are provided with a moderate to high level of interpretation and facilities. Users need no previous experience.	Developed, Recreation
Class 3	A track with a modified surface, sections may be hardened and a variable width but generally less than 1200 mm. The surface is kept mostly clear of obstacles and intrusions and provides visitors with the opportunity to walk in slightly modified natural environments, requiring a moderate level of fitness and where the provision of interpretation and facilities is not common. Users need no bushwalking experience and a minimum level of specialised skills. Natural hazards such as steep slopes, unstable surfaces and minor water crossings.	Recreation
Class 4	A generally distinct track without major modification to the ground. Encounters with fallen debris and other obstacles are likely. This type of track gives visitors the opportunity to explore and discover relatively undisturbed natural environments along defined and distinct tracks with minimal, (if any) facilities. Users require a moderate level of specialised skills such as navigation and first aid and need to be self reliant.	Recreation, Natural – Recreation, Natural
Class 5	This type of track consists of limited modification to the natural surface and alignment may be indistinct in places. Minimal cleaning and debris along the track. This type of track gives visitors the opportunity to explore and discover relatively undisturbed natural environments along defined and distinct tracks with minimal, (if any) facilities. Users require a high level of specialised skills such as navigation and first aid and need to be self reliant.	Natural, Remote – Natural
Class 6	This consists of no modification to the natural environment. This allows for highly experienced walkers to explore remote and challenging natural areas without reliance on managed tracks. Users require previous experience in the outdoors and a high level of specialised skills such as navigation and first aid and need to be self-reliant.	Remote – Natural

APPENDIX 10 – VEHICLE ACCESS STRATEGY

The type of access provided effects the level and type of use of an area. This Appendix details the roads and tracks that will remain open for public or management vehicle access (see Map 9). Vehicle-based access to the planning area has been categorised into the following areas:

- 2WD sealed (public access suitable for all motor vehicles);
- 2WD unsealed (public access suitable for all motor vehicles);
- 4WD unsealed (public access suitable only for four-wheel drive motor vehicles and trail motorcycles. Non motor vehicle access for walkers and mountain bikes is permitted);
- Management only (access for management purposes only (such as for fire management, strategic access for conservation or for evacuation purposes. Non motor vehicle access for walkers is permitted);
- Seasonal closure (public motor vehicle access may be allowed only during certain periods. Generally these periods will be seasonal, with temporary closures occurring during winter).
- Closed (closed to all vehicles).

Roads and tracks shown in Map 9 will remain open to the public. Any roads or tracks not shown on Map 9 or listed in this Appendix will be temporarily or permanently closed or restricted to management only. Other types of access such as walking, boating and horse-riding are discussed in Section 27 – Visitor Access and Section 28 – Recreational Use. All types of access will be consistent with the designated visitor management setting (Map 8).

Some tracks may be created for fire suppression purposes. In these instances, the values of the planning area must be considered by the fire suppression (incident) management team and tracks created or modified during the suppression must be rehabilitated post fire. Only in special circumstances will tracks not be rehabilitated post fire. Where knew knowledge exists or fire management techniques change, and more appropriate track management is indicated, tracks designated for fire management purposes may be temporarily or permanently closed, restricted to management only or relocated to more suitable areas. Where possible, formal agreements should be sought with adjoining landholders to manage track access for fire management purposes.

Vehicle Access Strategy

Access Road	Current Level of Access	Purpose of Access	Proposals
Wellington Dam Road*	2WD sealed	Northern access to Wellington Dam and a scenic tourist route.	2WD sealed, upgrade to Type 5 sealed road standard
River Road (north of the Collie River)	2WD and only sealed for 1 km	Scenic tourist route and access to Honeymoon Pool	2WD and seal
River Road (south of the Collie River)	2WD, sealed and one way	Scenic tourist route and access south from Honeymoon Pool	2WD sealed
Falcon Road*	2WD unsealed	Southern access to Wellington Dam and lower Collie River as well as a scenic tourist route	2WD and seal, upgrade to Type 4 sealed road standard
Pile Road*	2WD and sealed between Dardanup and Falcon Road	Access to Collie, Dardanup and Wellington Dam via Falcon Road and a scenic tourist route.	2WD sealed, upgrade to Type 4 sealed road standard
Coalfields Road*	2WD sealed	Main access route to Collie and a scenic tourist route	2WD sealed, upgrade to Type 6 sealed road standard
Wellington Forest Road	2WD unsealed	Access to Wellington Mills cottages and Wellington Discovery Forest as well as a scenic tourist route	2WD and seal
King Tree Road	2WD unsealed	Access to King Jarrah and a scenic tourist route	2WD unsealed

Access Road	Current Level of Access	Purpose of Access	Proposals
Mungalup Road*	2WD partially sealed	Access to the Westralia Conservation Park, proposed Westralia Interim Forest Conservation Area and Falcon Road.	2WD sealed, upgrade to Type 4 sealed road standard
Goat Road	4WD unsealed	Management access, recreational four-wheel driving	4WD unsealed subject to seasonal closure on a trial basis
Sika Track (Road)	4WD unsealed and partly management only	Vehicle, walk and cycle access to the lookout viewpoint	4WD unsealed and partly management only
Dongara Ridge Road	2WD unsealed	Access to plantation and mountain bike meeting place	2WD unsealed
Richards Road	4WD unsealed	Recreational four-wheel drive link to Wansborough wineries.	4WD unsealed
Centre Road	4WD unsealed	Recreational driving	Close
Parkin Road	4WD unsealed	Recreational driving	4WD unsealed south of Pile Road. Closed north of Pile Road
Arcadia Road		Recreational driving	
Devils Elbow Road	4WD unsealed	Recreational driving	Close to vehicles/ Management only
Lennard Drive	2WD sealed	Access to the Collie River and associated recreation sites as well as a scenic tourist route	2WD sealed
Lennard Drive downstream of River Road (also known as Lennard Track)	4WD unsealed	Recreational driving	4WD unsealed (scenic drive) and subject to seasonal closure on a trial basis
Lennard Road	2WD unsealed	Cycling	2WD unsealed
Riches Road	4WD unsealed	Recreational driving	Close to vehicles/ Management only
	4WD unsealed	Recreational driving	
Dips Road	4WD unsealed	Recreational driving	Close
Gervasse Drive	Closed	Part of Sika Circuit	Close to vehicles
Sneaker Road	4WD unsealed	Recreational four-wheel driving	4WD unsealed subject to seasonal closure on a trial basis
Polo Road	4WD unsealed	Access to private property	4WD unsealed
Goon Road	4WD unsealed	Recreational four-wheel driving	4WD unsealed subject to seasonal closure on a trial basis
Windy Ridge Road	2WD unsealed	Access to private property	2WD unsealed
Boomer Ridge Road	4WD unsealed	Recreational driving	Close to vehicles/ Management only
Harnet Road	4WD unsealed	Recreational driving	
Potters Road	4WD unsealed	Recreational driving	Close
Lullaby Road	2WD unsealed	Recreational four-wheel driving	2WD unsealed
Halo Road	4WD unsealed	Recreational driving	Close
Sky Road	2WD unsealed and partly closed	Access to quarry/gravel pit	
Palmer Road	2WD unsealed	Access to upper Collie River	2WD unsealed
Flora Road	2WD unsealed	Scenic tourist route	2WD unsealed
Black Dicks Road	Closed to vehicles/ Management only	Disease Risk Area	Close to vehicles/ Management only
Connell Road	2WD unsealed	Access to pine plantations, Collie River and the backwaters of the Wellington Reservoir.	2WD unsealed
Bullet Road	2WD unsealed	Strategic fire access	Close to vehicles/ Management only
Beela Road	2WD unsealed	Access to private property and utility corridors	2WD unsealed
Tom Jones Drive	2WD sealed	Access to Potters Gorge	2WD sealed and realign
Lookout Road	4WD unsealed	Four-wheel drive road and walktrack	4WD unsealed
Indicative tracks on Map 9[30]	2WD and 4WD unsealed	Access to Wellington Reservoir and proposed campsites	2WD and 4WD unsealed.

* Proposed for upgrade in the Roads 2020 Regional Road Development Strategy.

[30] Final access tracks around the Wellington Reservoir will be determined for the final management plan.

APPENDIX 11 – DAY-USE FACILITIES

Description of Day-use Facility	Existing Use	Proposed Use and Development
Wellington Dam, Quarry and Kiosk		
The Wellington Dam, quarry and kiosk precinct is a small, relatively developed area that is the focal point of the planning area. The area has been highly modified in the past by dam building activities, a dam construction village and the dam wall itself. It is an ideal site for the provision of information, links to other tourism facilities within the planning area and throughout the region.	Walk and cycle tracks, lookouts, visitor information and interpretation and picnicking, abseiling and sightseeing.	❖ Realign roads and reconstruct existing steps and paths to facilitate easy access, more parking, interpretation and information provision.
Potters Gorge		
Potters Gorge is primarily a day-use site that offers easy access to, and scenic vistas of, the Wellington Reservoir. Located on the foreshore it is a popular site for picnicking and has developed facilities including barbeques, shelters, sealed parking, boat launching ramp, showers and large ablution block. The area also provides seasonal overflow camping from Honeymoon Pool and lies in close proximity to the Wellington Dam.	Picnicking, sightseeing, seasonal overflow camping, and water based activities such as swimming, fishing, marroning and canoeing.	❖ Expand the day-use area and upgrade facilities to cater for a greater number of overnight stays. ❖ Develop vehicle-based camping according to the design principles for water quality protection. ❖ Water-based activities that involve direct body contact with the water will be rationalised over the life of the plan.
Honeymoon Pool		
Honeymoon Pool is a developed day-use and camping area located along River Road. Being located in the valley, the size of day-use and camping areas is restricted. Drainage, erosion and vandalism are also problems.	This area has a history of heavy use for activities such as picnicking, barbecuing, sightseeing, swimming, fishing and marroning.	❖ Redevelopment of day-use area to mitigate visitor impacts on riverbanks. ❖ Temporarily close and/or rehabilitate sites where necessary. ❖ Harden areas of high use that lead to degradation. ❖ Regulate visitor numbers at peak times.
Lennard Drive		
Lennard Drive is a designated scenic tourist route that provides access to a number of riverside recreation sites. These sites are small and the constraints of outcropping granite, deeply incised valley slopes and drainage problems mean that parking space is limited and bank erosion due to informal river access occurs.	These recreation sites are day-use only and offer access to superb pools and rapids for sightseeing, swimming, fishing, marroning and barbecuing.	❖ Seal parking areas at day-use sites
King Tree		
The King Tree recreational site offers visitors the opportunity to view a king jarrah tree. Parking facilities, a picnic area and disabled access are provided.	Sightseeing and interpretation opportunities exist.	❖ Develop walk track links to the Wellington Discovery Forest and other large trees in the area.
Wellington Discovery Forest		
The Wellington Discovery Forest is the largest education and interpretation facility in the planning area. It contains an education centre with a large undercover interpretative area as well as parking facilities, walk tracks, ablution blocks and accommodation. Disabled access is provided.	Education, interpretative bush walking, accommodation and picnicking.	❖ Link walk tracks to other key recreation sites and facilities such as the King Tree. ❖ Develop interpretation of the forest and integrate this with the rest of the planning area.

APPENDIX 12 – CAMPING AREA DEFINITIONS

Camping Ground

Camping grounds will be accessible by two-wheel drive vehicle and have a high level of facilities. They may have built accommodation, group areas and shelters and will generally provide sites for caravans and campervans. Built accommodation may be provided by way of commercial concession. Individual campsites will be defined. Camping grounds will cater for up to 150 people. Camping grounds may be provided in 'Developed' visitor management settings only.

Camping Area

Camping areas will be accessed by vehicle (not necessarily two-wheel drive) and have a relatively high level of facilities, for example fire rings, tables, toilets, water and defined individual campsites. Shelters or huts may also be provided. They may cater for campervans and caravans. Group areas and facilities may also be provided. They may have facilities for up to 80 people. Fires will be permitted only in fire rings provided and wood may be provided to the site. Rubbish collection may be provided. Campground hosts may be used at peak times. Camping areas may be provided in 'Recreation' and 'Developed' settings only.

Basic Campsites

Basic campsites may be accessed by foot and/or vehicle. They will cater for group sizes of up to four vehicles (16 people). Some sites may only cater for one vehicle. They will cater for tents but not campervans or caravans. The extent of the campsite will be defined however individual sites will generally not. The level of facilities at these sites may vary although generally only a fire ring will be provided. Fires may be permitted in fire rings. Fires may be prohibited in some areas. Toilets may be provided depending on the size and popularity of the site. There will be no rubbish collection and minimum impact camping techniques will be encouraged. Basic Campsites may be provided in 'Natural-Recreation' and 'Recreation' settings and the 'Developed' settings if the need arises.

Remote Camping

Remote camping will only be allowed in remote areas accessed by foot. This includes sites along the Bibbulmun Track. Minimum impact camping techniques must be practiced at all times whilst in these areas. Remote camping group sizes generally will be limited to 10 people. No campfires will be permitted. Remote camping will be permitted in 'Remote-Natural' and 'Natural' settings and other settings if the need arises.

Classification and Definitions of Camping Areas

	Camping Area Classification			
	Remote Camping	Basic Campsite	Camping Area	Camping Ground
Visitor management settings				
Developed	Optional	Optional	Yes	Yes
Recreation	Optional	Yes	Yes	No
Natural-Recreation	Optional	Yes	No	No
Natural	Yes	No	No	No
Remote-Natural	Yes	No	No	No
Facilities				
Defined campsites	No	Optional	Yes	Yes
Vehicle access to site	No	Optional	Yes	Yes – 2WD
Resident manager	No	No	No	Optional
Campground host (peak)	No	No	Optional	Optional
Powered sites	No	No	No	Optional

	Camping Area Classification			
	Remote Camping	Basic Campsite	Camping Area	Camping Ground
Water – reticulated	No	No	No	Optional
Water – other eg tank, stream, dam	No	No	Yes	Yes
Fuel stove only	Yes	No	No	No
Fires allowed in container	No	No	No	No
Barbeques or fire rings	No	Optional	Optional	Optional
Firewood supplied	No	Optional	Optional	Optional
Barbeques – gas or electric	No	No	Optional	Optional
Tables	No	Optional	Yes	Yes
Group shelters/ accommodation and areas	No	No	Optional	Optional
Huts for groups(family) - Recreation	No	Optional	Optional	Optional
Huts for groups(family) - Natural-Recreation	No	No	Optional	Optional
Built accommodation – commercial concession	No	No	Optional Recreation – basic only	Optional
Showers –hot and/or cold	No	No	Optional	Optional
Toilets – septic/sewer	No	No	Optional	Optional
Toilets – composting	No	Optional	Optional	Optional
Toilets – pit	No	Optional	Optional	No
Rubbish collection	No	No	Optional	Yes
Visitor centre	No	No	No	Optional
Visitor information	No	Optional	Yes	Yes
Camping fees payable	Optional	Optional	Optional	Optional
Site limit	10 people	4 vehicles (16 people)	80 people	150 people
Kiosk or shop	No	No	Optional	Optional
Sense of	Remoteness	Adventure	Comfort	Comfort and security
Social interaction	Low	Low to moderate	Moderate to high	High

Legend
Yes = facility or service should be provided
No = facility or service will not be provided
Optional = facility or service may be provided but is not essential

APPENDIX 13 – COMMERCIAL APIARY SITE ASSESSMENT

Criteria and Approach for Assessing Commercial Apiary Sites within the Planning Area

	Suitable	Suitable but Conditional	Highly Constrained
Approach	Maintain or increase numbers of apiary sites in these areas. Standard permit conditions would apply	Maintain or increase numbers of apiary sites in these areas. Additional permit conditions would apply such as increased hygiene control and seasonal, site location and access restrictions. Research and monitoring at these sites may be required	Close, and relocate where possible, any current apiary sites in these areas. Prevent any new apiary sites in these areas
Environmental Criteria			
1. Threatened and other conservation significant flora within a 2 km radius	No rare, priority 1 or 2 flora present that are visited by honey bees	Rare, priority 1 or 2 flora present that are visited by honey bees and impacts are seasonal or undetermined[1]	Rare, priority 1 or 2 flora present that are visited by honey bees and impact is predicted to be year-round[1]
	No priority 3, 4 or 5, endemic, disjunct or relictual flora present that are visited by honey bees	Rare, priority 1 or 2 flora present that are visited by honey bees but no predicted impact[2] Priority 3, 4 or 5, endemic, disjunct or relictual flora that are visited by honey bees present[3]	
2. Significant communities within a 2 km radius	No threatened ecological communities (TECs)	TEC present and impacts are seasonal[1] TEC present but no predicted impact[2]	A TEC present and impact is predicted to be year-round[1]
3. Threatened fauna and other significant habitats (i.e. habitats for fauna adversely impacted by honey bees) within a 2 km radius	No mature growth forest or other known habitat of hollow nesting threatened fauna present	Mature growth forest or other known habitat of hollow nesting threatened fauna is present[4]	
	No fauna watering points at fauna breeding centres and re-introduction sites present		Fauna watering point at fauna breeding centres and re-introduction sites present[5]
	No other significant habitats or communities present	Other significant habitats or communities are present that are seasonally impacted[6]	Other significant habitats or communities are present that are impacted year-round

	Suitable	Suitable but Conditional	Highly Constrained
Management Criteria			
1. Previous use	A conservation reserve that has authorised historic use of commercial beekeeping		A conservation reserve that has no authorised historic use of commercial beekeeping
2. Access	Public or suitable management vehicle only access is available		There is no public or suitable management vehicle only access or current access is being closed
	No gazetted wilderness present	'Candidate' wilderness only	Gazetted wilderness present
3. Recreation sites or dwellings within a 500 m radius	No built accommodation/ camping/day-use site present		Built accommodation/ camping/day-use site present
4. Tracks and trails within a 200 m radius	No walk trail present (Class 1 or 2)	Walk trail (Class 1 or 2) present but only used infrequently or proposed walk trail (Class 1 or 2)	Walk trail present and used frequently (Class 1 or 2)
5. Disease control	Low risk of *P. cinnamomi* spread	*P. cinnamomi* present or area identified as protectable from *P. cinnamomi* spread but there is an existing site[7]	Area identified as protectable from *P. cinnamomi* spread are there are no existing sites[7]
6. Apiary sites within 3 km radius	No other apiary sites present		Apiary site present
7. Feral honey bee management within 2 km		Feral honey bee control program in place[8]	
8. Weed management within a 2 km radius	No high or moderate environmental weeds present that are considered to have an increased seedset due to honey bees	High or moderate rated environmental weeds that are considered to have an increased seed set due to honey bees but flower seasonally[9]	High or moderate rated environmental weeds that are considered to have an increased seed set due to honey bees and flower year-round[7]
9. Other management concerns	No impact on Departmental operations or the requirements of other authorities controlling Crown land or Government reserves	An impact on Departmental operations or the requirements of other authorities controlling Crown land or Government reserves that can be managed	An impact on Departmental operations or the requirements of other authorities controlling Crown land or Government reserves that can not be managed

Notes

[1] Impacts are seasonal or undetermined (see Guidance for Additional Conditions – A). Where impacts are predicted to be year-round, the area will be considered to be highly constrained.

[2] Visited by honey bees, but no predicted impact. These flora and TECs are still of high conservation significance and a precautionary approach is warranted (see Guidance for Additional Conditions – B).

[3] As with note 2 above, priority 3, 4 or 5, endemic, disjunct and relictual flora are of conservation significance and a precautionary approach is warranted. In addition, although populations of these species may be widespread and impacts on these populations may not threaten the existence of the species, there still may be some populations that should be afforded higher protection (e.g. the population may be (1) at the species' range end, (2) the largest viable population or (3) genetically significant) (see Guidance for Additional Conditions – C).

[4] If there is a current apiary site and there are feral honey bees present, then use can continue year-round. However, mature growth forest and other significant habitats for hollow nesting fauna and will be targeted for feral honey bee control (see Additional Conditions – D). For new sites within mature growth forest see Guidance for Additional Conditions – E.

[5] Native fauna breeding centres and fauna re-introduction sites often have watering points. Commercial beekeeping in the vicinity may disturb the animals from drinking.

[6] No other significant habitat or community likely to be impacted by honey bees has been identified during the planning process however, they may be identified during the life of this management plan.

Other significant habitats may be identified due to:

- new research/information;
- changes in threat status of fauna; and/or
- changes in resource availability – for example, directly after a fire, when competition between species such as honey possums and honey bees would be at its highest.

[7] Standard disease control conditions will apply. The soil dryness index may be used to restrict vehicle access to the sites. There should be no new sites established in areas that are protectable from *P. cinnamomi* (or designated Disease Risk Areas).

[8] There may need to be seasonal restrictions (see Guidance for Additional Conditions – D) when a feral honey bee control program is in place.

[9] High or moderate environmental weeds are a high priority for the Department to control (see Guidance for Additional Conditions – F).

Guidance for Additional Conditions

A. Seasonal restriction based on flowering period of flora. Site must be available for a minimum of 1 month. Placement and number of hives also may be restricted.

B. Placement (at least 100 m from populations) and number of hives may be restricted. Monitoring of representative samples for health of adult populations and seedling recruitment or TEC to ensure there is no decline due to apiary management, taking into account other factors such as drought, disease, fire, environmental weeds and other disturbances. If unacceptable impacts are shown or observed later, then treatment will be the same as A.

C. There may be a need to review populations within the planning area to determine whether these populations are significant to the conservation of the species. If deemed significant then treatment will be the same as A.

D. When a feral honey bee program is in place, then use of the site will be restricted during periods when the queen is may swarm, such as spring or a suitable method to restrict the queen should be implemented.

E. For new sites in mature growth forest where there are no feral honey bees present, a condition may be that if during the period of the permit, feral honey bee hives are located within 2 km of the site, the site will be temporarily restricted until the feral honey bees are controlled.

F. Seasonal restriction based on flowering period of environmental weed however, only until the environmental weed has been successfully eradicated.

Assessment of Current Apiary Sites within the Planning Area

Apiary sites within the planning area were assessed against the environmental and management criteria and categorised as suitable, suitable but conditional or highly constrained. The table below shows the result of the assessment and indicates criteria that require additional conditions. Some of these additional conditions have been included as guidance and should be seen as a minimum set.

	Environmental Criteria								Management Criteria							Additional Conditions
Apiary Site No.	Rare and Priority 1, 2 Flora Visited			Other Conservation Flora Visited	TEC			Fauna Habitat (e.g. Mature Growth)	Wilderness		Recreation Sites	Class 1 or 2 Walk Trail	Disease Risk	Weed Management		
	Impact Year Round	Impact Seasonal	No Predicted Impact		Impact Year - Round	Impact Seasonal	No Predicted Impact		Candidate	Gazetted				Impact Seasonal	Impact Year - Round	
Suitable																
3858																
Suitable but Conditional																
2654				X				X						X		C, D, F (Jul-Nov)
2655								X					X			D
2656								X					X			D
3009														X		F (Apr - Nov)
3220								X								D
3826				X				X								C, D
4637				X												C
4814								X								D
5346								X								D
Sites within 2 km of Planning Area*																
3010*																
3008*																
5863*																

* Sites located within a 2 km radius of the planning area require a separate assessment as they may affect adjoining conservation estate.