Leeuwin-Naturaliste Capes Area Parks and Reserves

Draft Management Plan 2010

Department of
Environment and Conservation

Our environment, our future

Conservation Commission
WESTERN AUSTRALIA

Leeuwin-Naturaliste Capes Area Parks and Reserves

Draft Management Plan

2010

Department of Environment and Conservation

Conservation Commission of Western Australia

VISION

By 2020, the Leeuwin-Naturaliste Capes Area Parks and Reserves will be recognised for their significance in contributing to the way of life, sense of identity and enjoyment of the natural environment by visitors and the local community alike. The complexities in managing such a highly fragmented, linear and geographically isolated set of reserves, and the importance of protecting these areas from intensifying pressures will be understood and accepted.

The Leeuwin-Naturaliste Capes Area Parks and Reserves will continue to be recognised as a biodiversity hot spot for flora, particularly on the Scott Coastal Plain, and for its very high scenic quality, including exceptional coastal scenery along the Leeuwin-Naturaliste Ridge.

The unique cave ecosystems, nationally important wetlands and other natural values will be in better condition than present. This will be achieved by improving ecosystem resilience and facilitating sustainable visitor and resource use. In particular, those values that are unique or of special conservation significance will be conserved. The local community and visitors will have a greater awareness about the function of ecosystems and the means to protect them.

Leeuwin-Naturaliste National Park will continue to be regarded as one of the primary coastal recreation destinations within the State, adding significantly to the regional economy. It will support a wide range of carefully considered and sustainable nature-based recreational activities predominantly based on coast, forest and cave settings. Visitors will continue to find inspiration in, and enjoyment of the area, mostly from day visits to a number of high-quality recreation sites. Management will focus on preserving current visitor experiences and retaining the natural qualities of the area.

The community will identify with the Leeuwin-Naturaliste Capes Area Parks and Reserves, and recognise its conservation, social and economic values are of national significance. A greater understanding of these values will be gained through the Margaret River Eco Discovery Centre and improved interpretative facilities whilst an increasing number of people will support and want to be involved in reserve management.

The importance of the Indigenous heritage of the area, dating back thousands of years, will be promoted by active and ongoing involvement with Aboriginal people.

The vision of this plan is derived from State legislation and policy, and community input. The vision also reflects the key values of the planning area and the importance of sustainably managing those values (see *Key Values* in Section 4).

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 Leeuwin-Naturaliste Capes Area parks and reserves will be managed during the next 10 years.

What to consider

This plan includes issues which may have a number of management options over the life of the plan or where the department has developed a proposal and wants to gauge public opinion. In making a submission, it is important to understand that legislation and policy clearly stipulate the responsibilities and obligations of the department and in some instances this may predetermine how some issues are addressed (e.g. in relation to visitor safety). Nevertheless, it is important to hear from the public about the management of these issues.

Issues and proposed actions that the department and the Conservation Commission would particularly like to seek feedback on during the public comment period of this draft management plan include the proposed:

- key performance indicators mentioned through various sections of the plan
- access and recreation management in the planning area
- fire management
- control of weeds and problem animals

How to make effective comments

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 concern, give support where appropriate and offer information and constructive suggestions are most useful.

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.
- Suggest alternatives to deal with issues where you disagree with the proposed actions.

Where to send your comments

Submissions are welcome for two months after the release date of the draft management plan and can be made online at: **http://www.dec.wa.gov.au/haveyoursay** or by writing to:

Planning Coordinator
Leeuwin-Naturaliste Capes Area Parks and Reserves Draft Management Plan
Department of Environment and Conservation
Locked Bag 104, Bentley Delivery Centre
BENTLEY WA 6983

Alternatively, submissions can be sent to: planning@dec.wa.gov.au

How your comments will be considered

All submissions will be summarised according to topics. The management plan will be reviewed in 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 *will* be amended if a submission:
   (a) provides additional 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
   (e) indicates omissions, inaccuracies or a lack of clarity.

2. The draft management plan *will not* be amended if a submission:
   (a) clearly supports proposals in the plan
   (b) makes general statements and no change is sought
   (c) makes statements already in the plan or were considered during the plan preparation
   (d) addresses issues beyond the scope of the plan
   (e) is one amongst several widely divergent viewpoints received on the topic but the text/strategies in the plan are still considered the preferred option
   (f) contributes options that are not feasible (generally because of conflict with existing legislation, government policy, lack of resource capacity or lack of research knowledge to make decisions)
   (g) is based on unclear, factually incorrect information
   (h) provides details that are not appropriate or necessary for inclusion in a document aimed at providing management direction over the long term.

EXECUTIVE SUMMARY

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

The process of preparing this management plan began as a response to changing community expectations, intensified land use within the region and the need to review the existing *Leeuwin-Naturaliste National Park Management Plan 1989-1999*. The opportunity was taken to expand the planning area to include other national parks and nature reserves along the Leeuwin-Naturaliste Ridge, including those that were created as a result of recommendations in the *Forest Management Plan 2004-2013* (FMP). Important conservation reserves on the Scott Coastal Plain that are not covered by a specific area management plan have also been included in this management plan.

As specified in the CALM Act, this plan provides a statement of policies and guidelines proposed to be followed and a summary of operations proposed to be undertaken. Once finalised, this management plan will provide effective and relevant guidelines to conserve the values of the parks and reserves of the Leeuwin-Naturaliste Ridge, and guide the management of any additions to the conservation estate that may occur over the life of the plan.

This management plan should not be viewed in isolation but as an integral part of management regimes that occur in adjacent and related areas (e.g. D'Entrecasteaux and Blackwood River national parks, adjacent Crown reserves and surrounding private property).

This management plan will replace the *Leeuwin-Naturaliste National Park Management Plan 1989-1999*. The FMP will complement this plan. Where there is conflict between the FMP and this plan, this management plan takes precedence. This will ensure a more comprehensive approach to managing the area.

The department and Conservation Commission recognise that effective management of the planning area depends on the support, cooperation and participation of the community and therefore seek to ensure there is ample opportunity to be involved - in the preparation of the management plan and in the ongoing management of the area. Strategies in this draft plan have been developed by taking into consideration comments received from the community and other key stakeholders. This included input from the community advisory committee, submissions to a publicly released issues paper, 'Have Your Say' brochures, and consultation with key stakeholders. There is now more opportunity to provide information, express your opinion or suggest alternatives on how the planning area should be managed during the next 10 years.

Once finalised, the Conservation Commission and department will seek to achieve the plan's objectives by taking the actions specified, dependent upon, to some extent, the provision of necessary resources. Reports by the Conservation Commission will show the progress of the implementation of the plan, which will make it clear if any actions have not been progressed and for what reason.

This draft management plan is a values and issues based document, with background information presented to provide context to management decisions. The term of the final management plan will be 10 years, or until superseded by a new management plan. The final management plan may be reduced in size and have an emphasis on objectives and strategies.

Changes in the planning area

Leeuwin-Naturaliste National Park, the only reserve within this draft management plan with a current management plan, has been managed according to the *Leeuwin-Naturaliste National Park Management Plan 1989-1999* (Department of Conservation and Land Management [CALM] 1989) for the past 20 years. In this time, there have been a number of changes that have led to differences between the existing plan and this proposed replacement. Changes have also occurred elsewhere in the planning area, including:

- legislative changes or changes in policy
- a significant increase in knowledge of the values of the planning area
- an increase the demand and use of the planning area.

These changes are summarised below and reflected throughout this management plan.

Legislative or policy changes

- Introduction of the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999 and Amendments*, which provides protection for threatened species and communities.
- Changes to the CALM Act in 2000 have replaced the National Parks and Nature Conservation Authority with the Conservation Commission as the controlling body for terrestrial conservation reserves in WA. The Conservation Commission has responsibility for submitting management plans to the Minister and developing guidelines for monitoring and assessing the implementation of management plans. Consequently, management plans are now outcome-based in terms of performance assessment, and include Key performance indicators against which the Conservation Commission assess performance.
- The Australian and State government's Regional Forest Agreement (RFA) promoted the cessation of timber harvesting in 100 per cent of all old-growth forests and the protection of these areas in a comprehensive, adequate and representative reserve system, including the creation of new national parks within the south-west. The FMP was gazetted to implement this agreement. Several changes in land purpose and vesting are being implemented as part of the previous management plan for Leeuwin-Naturaliste National Park.
- Development of the updated Policy Statement No. 19 *Fire Management* which includes 12 scientific principles which place a greater emphasis on burning for biodiversity and fire ecology.

Knowledge of the values of the planning area

- Increased knowledge of the values of the planning area, particularly knowledge of subterranean fauna. Vegetation surveys were undertaken by Gibson *et al*. (2001) and Lyons *et al*. (2000) as part of an audit for the Warren Bioregion and regional mapping undertaken for the RFA. Several new threatened communities and species have been identified (e.g. populations of the critically endangered white-bellied frog [*Geocrinia alba*]). The planning area is increasingly recognised for its high flora species richness.
- Wetlands within the planning area have been identified as nationally important and contain an area proposed for nomination under the Ramsar Convention on Wetlands.
- Knowledge has been gained with regard to diseases and their effects on the planning area. Other threats, such as the potential for acid-sulfate soils, have also been identified.

State and Federal processes have also contributed to the improvement of knowledge, such as:

- An Interim Biogeographic Regionalisation of Australia in 1995 and subsequent biodiversity audit of WA's bioregions in 2003.
- Climate change studies undertaken by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and other organisations since 1999.
- 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 the negative impacts of bushfire on societal values, but also to conserve biodiversity. A review of fire in ecosystems of south-west WA was undertaken in 2003.
- The Environmental Weed Strategy for WA (CALM 1999a) rates weeds according to specific criteria to aid in determining priority for control.
- The '*Western Shield*' program (1996 to present) is the largest wildlife conservation program in Australia, involving aerial and ground baiting of more than 3.5 million hectares of department-managed land targeting the fox and feral cat.
- Salinity and natural resource management planning between 1996 and 2004 has advanced our understanding of landscape processes and threats.

Increased demand and use of the planning area

- There has been a shift in visitor behaviour and recreational use, as well as rapid population growth and intensified land use within the region. Visitation to Leeuwin-Naturaliste National Park has increased significantly (75 per cent over the past decade).
- There is a need to strengthen recreation management to preserve current recreation opportunities, maintain the quality of facilities, to manage new and emerging recreational pursuits (e.g. cycling and increased demand for walking opportunities) and to manage the impacts of visitor use.
- Various site redevelopments and upgrades to accommodate increasing visitor use and to protect the environment have occurred. This includes site development plans for several areas, including Hamelin Bay. Several major access roads were also upgraded and some minor tracks closed for conservation and management reasons.
- Implementation of the Cave and Abseil Permit system.
- There is new research into the impacts of stingray tourism at Hamelin Bay.

- Recognition of the potential impacts of adjacent land use on hydrology and water quality within the planning area. Decreasing rainfall in the south-west has led to increasing local demands for water usage and pressure to extract groundwater for drinking purposes.
- Many areas of coastal erosion have been rehabilitated.

NOMENCLATURE

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

The 'Minister' refers to the Environment Minister administering the *Conservation and Land Management Act 1984* (CALM Act).

The 'department' or 'DEC' refers to the Department of Environment and Conservation.

The term 'Director General' refers to the Director General of the Department of Environment and Conservation. Under the CALM Act, the term Executive Director refers to the Director General.

The 'Conservation Commission' refers to the Conservation Commission of Western Australia, which is the controlling body for the terrestrial conservation reserve system in WA.

The 'planning area' refers to the existing and proposed Crown lands and waters that will be covered by this management plan (see Section 3 *Management Planning Area*).

The 'south-west' refers to the south-west corner of WA between Geraldton and Esperance.

When 'region' is used in this plan, it refers to the 'South West' planning region used by the Western Australian Planning Commission. The 'region' follows the boundaries of the local government authorities of Augusta-Margaret River, Boyup Brook, Bridgetown-Greenbushes, Busselton, Capel, Collie, Dardanup, Donnybrook-Balingup, Harvey, Manjimup and Nannup. The department's regional boundaries for this area are referred to as the 'South West Region'.

ACKNOWLEDGMENTS

This draft management plan was prepared by the planning team for the Leeuwin-Naturaliste Capes Parks and Reserves: Denam Bennetts (draft management plan co-ordinator), Burke Stephens (Technical Officer), Greg Mair, Neil Taylor, Mark Pittavino, David Lathwell, Glenn Willmott, Kim Williams, Peter Hanly and Peter Henderson. The maps were prepared by Aaron Rivers, Holly Smith, Andrew Moore and Jennifer Goldberg.

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

- Departmental staff—in particular Daryl Moncrieff, Paul McCluskey, Stewart Caves, South West Region and Blackwood District staff and other specialist branches within the department
- the department's Corporate Executive
- members of the Conservation Commission.

Many other people, individuals and agency representatives made valuable contributions to the development of this document. The assistance of the Capes Parks Community Advisory Committee is especially acknowledged.

Images have been provided by DEC staff (Redgate Beach and white bellied frog) and Michael James (Calgardup Caves).

The contributions and aspirations of Nyoongar people in caring for country are acknowledged. The term 'Nyoongar' refers to Aboriginal people who live in the south-west corner of Western Australia, between Jurien Bay and Esperance. The word 'Nyoongar' can be spelt in different ways, and spelling in this form should also be seen to encompass the Noongar, Nyungar, Noongah and Nyungah spellings.

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PART A. INTRODUCTION

1. BRIEF OVERVIEW

The planning area (see Section 3 *Management Planning Area* and Map 1) is located in the south-western corner of Western Australia (WA), about 280 kilometres south of Perth near the towns of Dunsborough, Margaret River and Augusta. It comprises 34,942 hectares of reserves that extend about 120 kilometres from Cape Naturaliste to Cape Leeuwin along the Leeuwin-Naturaliste Ridge, and a further 36 kilometres east of Augusta along the Scott Coastal Plain. The reserves range from less than a hectare to more than 21,000 hectares in size. Major factors influencing management of the reserves are their linear shape, fragmented nature and geographic isolation, as well as external influences from semi-rural residential developments and intensified agricultural practices on adjoining lands.

The planning area contains some of WA's pre-eminent natural assets. It contains significant biodiversity values, including a karst system of national and international significance, high flora species richness, centres of endemism and nationally important wetlands that meet criteria for listing under the Ramsar Convention on Wetlands. It is important for species at their range limits, being the northern limit for many south coast plant species and the most southern occurrence for several species of the Swan Coastal Plain.

Scott National Park is particularly recognised for its diverse vegetation, high flora conservation values and high flora species richness, with more than 800 recorded species. Together with Gingilup Swamps Nature Reserve, these reserves comprise the largest remaining areas of remnant vegetation on the western side of the Scott Coastal Plain, rich in wetland area and type. Similarly, Yelverton, Forest Grove and Bramley national parks contain invaluable areas of remnant vegetation on the Leeuwin-Naturaliste Ridge, which is now predominantly cleared. The attenuated nature of reserve boundaries and the relative isolation of the planning area are not conducive to large populations of vertebrate fauna or vertebrate species diversity. However, the planning area is important for a number of specialised animals, including rare snails and frogs, microbiolite formations and cave invertebrate fauna.

A key aim of this management plan is to ensure that significant natural values will be adequately protected. The principal landscape-scale threats to native plants and animals are feral animals, disease caused by *Phytophthora cinnamomi*, weeds and changes to hydrology, particularly groundwater hydrology. Management of fire will be important for biodiversity conservation and in the protection of community assets, especially coastal townsites.

Leeuwin-Naturaliste National Park is one of the primary coastal recreation areas in WA. The coastline supports some of the best surfing conditions in Australia, and is a popular fishing area. The diversity of recreation opportunities, easy access and highly valued visual landscape qualities ensure that it has the highest visitation of any of WA's national parks, with 2.33 million visits each year (data from 2008/09). This represents a 61 per cent[1] increase over the past decade. It is a well-known and iconic tourist destination and is well publicised. A major focus in this management plan is to protect the visual landscape quality of the planning area and to manage the high visitation, recreational succession and potential environmental impacts, particularly in Leeuwin-Naturaliste National Park. Interpreting a range of experiences at major sites will be an important strategy in managing recreational use.

Evidence of Aboriginal occupation of the area dating back 55,000 years can be found in archaeological deposits, making sites such as Devil's Lair cave some of the oldest occupation sites in Australia. Numerous Indigenous heritage sites can be found, particularly along the coast. The area is also valued for its non-Indigenous heritage associated with early settlement, maritime history and timber industry. Cape Leeuwin and Cape Naturaliste lighthouses and Ellensbrook Homestead are iconic landmarks within the region.

The planning area is managed by the department, on behalf of the Conservation Commission, from its regional office at Bunbury and district office at Busselton. A key factor in achieving the objectives of the plan will also be cross-boundary management with adjoining land-holders, the community and local natural resource management (NRM) groups.

[1] Better/changed data collection methods may have influenced the degree to which visitation has increased.

2. REGIONAL CONTEXT

The planning area is located in the Western Australian Planning Commission's (WAPC) South West Region of WA (Map 1), a region that covers about 2.4 million hectares across 12 local government areas. . The planning area is located within the shires of Busselton, Augusta-Margaret River and Nannup.

The region contains many attractions including national parks, forests, beaches, wineries and eco-tourism sites, as well as icon destinations such as Margaret River. Its mild climate and diverse natural interests draw about 3.6 million visitors each year (SWDC 2009), making it the most popular tourist destination in the State outside of Perth. The area is well developed for tourism, being easily accessible and well serviced by an extensive network of roads.

In 2008, there were 152,000 people living in the south-west (SWDC 2009), making it the largest residential population outside of the Perth metropolitan area (WAPC 2005). The shires of Busselton and Augusta-Margaret River are growing at a rate of 5.1 per cent and 4.7 per cent respectively, making them some of the fastest growing local governments within the south-west. Towns such as Margaret River appear to be growing at a particularly rapid rate (6.9 per cent in 2001). Projections of future population growth estimate that the population in the south-west will increase to 165,400 by 2016 and reach 189,800 by 2031 (WAPC 2005).

Most population growth and tourism is focused in coastal areas. Along the Leeuwin-Naturaliste Ridge, this has increased the demand for residential housing and placed pressures on infrastructure, utilities, services and the conservation estate (particularly at the northern end). To this end, WAPC prepared a statement of planning policy for the Leeuwin-Naturaliste Ridge in 1998 (see Section 7 *Legislative Framework*). By identifying settlement patterns and predicted population growth, future pressures on the planning area can be identified and planned for with a view to protecting conservation reserve values.

The region has the most diversified economy of the State's nine planning regions. Extensive mineral wealth has made it a major world producer of alumina and mineral sands. The region's economy is also based on strong agricultural, horticultural and emerging aquaculture industries, timber and forest produce, viticulture and tourism. The gross regional product is estimated at almost $10 billion with the largest contributors to the region's economy being mineral extraction and processing ($2.3 billion), retail ($1,626 million), tourism ($569 million), and agriculture ($550 million) (SWDC 2009).

3. MANAGEMENT PLANNING AREA

The area covered by this management plan includes (see Map 1):

- Leeuwin-Naturaliste National Park (comprises some reserves that are unofficially named)
- Yelverton National Park (unofficially named)
- Bramley National Park (unofficially named)
- Forest Grove National Park (unofficially named)
- Scott National Park
- Un-named national park (Reserve 46400)
- Gingilup Swamps Nature Reserve
- Blue Rock Cave Nature Reserve** (unofficially named)
- Haag Nature Reserve
- Stockdill Road Nature Reserve (unofficially named)
- Walburra Nature Reserve
- Un-named nature reserves (Reserve 26065)
- Un-named reserve that contains the Foul Bay lighthouse (Reserve 44676)
- Timber Reserve 139/25*
- Timber Reserve 60/25*
- Other proposed additions (see Appendix 2).

* Proposed forest conservation area under the FMP (see Section 10 *Existing and Proposed Reserves*).
** Proposed addition to Leeuwin-Naturaliste National Park under the FMP.

Collectively, these reserves cover an area of 34,942 hectares and are referred to as the 'planning area'. It is intended that the proposed additions listed above will come under the provisions of this management plan once the change in land tenure and purpose occurs and the lands become vested with the Conservation Commission.

4. KEY VALUES

Natural

- An area that comprises one of 34 biodiversity hot spots in the world, and one of 15 national terrestrial biodiversity hot spots.
- An area recognised for its endemic vascular plant species richness, particularly Scott National Park, which is also rich in wetland area and type.
- Reserves that contain invaluable remnants of vegetation that were once present along the Leeuwin-Naturaliste Ridge and Scott Coastal Plain, and are now predominantly cleared.
- High concentrations of endemic taxa in Leeuwin-Naturaliste National Park and on the Scott Coastal Plain, with similar concentrations of locally endemic taxa in parks on the Blackwood Plateau.
- Species at the limits of their range, including the northern limit for many south coast plant species and the southern limit for several species of the Swan Coastal Plain. Cape Naturaliste is the only place where the jarrah forest meets the coast.
- The occurrence of threatened and priority flora and fauna, threatened ecological communities (TECs), critical weight-range mammals and species that are endemic, locally restricted, disjunct or relictual.
- Transition zone between tropical and temperate seabird species.
- A karst system of national and international significance, being the most extensive and thickest development of an aeolian limestone formation containing karst features in Australia.
- Caves that support unique subterranean ecological communities of endemic and locally endemic aquatic invertebrate fauna.
- A candidate wetland system for nomination under the Ramsar Convention on Wetlands.
- Nationally important wetlands and wetlands of subregional significance that are important for the maintenance of ecological processes and linkages between ecological systems.
- Regionally significant corridors that provide ecological linkages of contiguous ecosystems.
- Distinctive wetland habitats along the Leeuwin-Naturaliste Ridge, that support a number of rare organisms such as rare snails, freshwater burrowing crayfish, microbiolite formations and cave invertebrate fauna.
- Fossil deposits of considerable importance in understanding mammal extinction, with Tight Entrance cave containing a richer and more diverse assemblage of fossil vertebrates than any other Pleistocene deposit in the western half of Australia.

Cultural

- Confirmed evidence of early occupation by Aboriginal people (55,000 years before present), from archaeological deposits.
- Artefacts in Devils Lair cave that make it one of the oldest occupation sites in Australia, providing a valuable record of past Aboriginal life in the Leeuwin-Naturaliste region.
- Numerous other Aboriginal cultural sites of significance, particularly along the coast.
- Non-Indigenous cultural heritage and historic sites associated with early settlement, the timber industry and the area's maritime history (e.g. Ellensbrook Homestead and Cape Leeuwin, Cape Naturaliste and Foul Bay lighthouses), and the enriched learning experiences they provide.

Recreation

- A significant recreation destination within the State, containing the most visited national park outside the Perth metropolitan area.
- A terrestrial environment that provides opportunities for a wide range of predominantly coast and river-based recreation activities, focusing on day-use at major attractions related to the coast, the forest or caves.
- World-class surfing locations and a wide range of recreational fishing experiences.
- The Cape to Cape Track, one of only two long distance walk tracks in WA.
- Important caving and abseiling sites.
- Areas of high scenic quality, including exceptional coastal scenery along the Leeuwin-Naturaliste Ridge.

Community

- An important area for local communities of the Leeuwin-Naturaliste Ridge, contributing to their way of life, sense of identity and enjoyment of the natural environment.
- Opportunities for community involvement in activities and experiences involved with nature conservation and visitor services.
- Opportunities for involvement of individuals in various committees associated with the management of the planning area.

Education and Research

- Opportunities for visitors to interpret and acquire knowledge regarding natural and cultural values of the planning area.
- An extensive range of interpretation and education programs at the Margaret River Eco Discovery Centre and guided interpretive experiences throughout the planning area.
- Caves and other geological features that give unique insights into a range of scientific pursuits (e.g. palaeoclimatology, archaeology, anthropology and palaeontology) as well as having value for teaching or as reference sites.
- Research already undertaken and accumulated knowledge of the planning area.
- Opportunities for research and monitoring of natural, recreation and cultural values.

Economic

- Icon parks within the State, providing numerous commercial nature-based tourism and recreation opportunities, and the associated economic benefit from tourism expenditure.
- A significant attraction to the region, providing an important backdrop for the tourism, hospitality and commercial industries.

5. PUBLIC PARTICIPATION

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

- Distribution of 'Have Your Say' brochures to encourage individuals and organisations to register their interest in the planning process, and identify issues to be considered during the development of the draft management plan.
- Development and distribution of an 'Issues Paper' to stimulate discussion, and inform and assist the public in participating in the management planning process.
- Expansion of the former Leeuwin-Naturaliste National Park Advisory Committee to form the Capes Parks Community Advisory Committee, which meets regularly to discuss management issues and provide input during development of the plan.
- Public submissions were invited through notices in State and local newspapers during the preparation of this draft management plan.
- Community consultation meetings were held in Busselton, Margaret River, Augusta and Perth.
- Meetings were held with stakeholder groups, including Indigenous groups, and interested individuals.
- Regular updates were issued to keep interested parties informed of developments in the planning process (i.e. a regular newsletter). and
- Consultation with government agencies.

PART B. MANAGEMENT DIRECTIONS AND PURPOSE

6. VISION

The draft vision for the Leeuwin-Naturaliste Capes Parks and Reserves is that:

By 2020, the Leeuwin-Naturaliste Capes Area Parks and Reserves will be recognised for their significance in contributing to the way of life, sense of identity and enjoyment of the natural environment by visitors and the local community alike. The complexities in managing such a highly fragmented, linear and geographically isolated set of reserves, and the importance of protecting these areas from intensifying pressures will be understood and accepted.

The Leeuwin-Naturaliste Capes Area Parks and Reserves will continue to be recognised as a biodiversity hot spot for flora, particularly on the Scott Coastal Plain, and for its very high scenic quality, including exceptional coastal scenery along the Leeuwin-Naturaliste Ridge.

The unique cave ecosystems, nationally important wetlands and other natural values will be in better condition than present. This will be achieved by improving ecosystem resilience and facilitating sustainable visitor and resource use. In particular, those values that are unique or of special conservation significance will be conserved. The local community and visitors will have a greater awareness about the function of ecosystems and the means to protect them.

Leeuwin-Naturaliste National Park will continue to be regarded as one of the primary coastal recreation destinations within the State, adding significantly to the regional economy. It will support a wide range of carefully considered and sustainable nature-based recreational activities predominantly based on coast, forest and cave settings. Visitors will continue to find inspiration in, and enjoyment of the area, mostly from day visits to a number of high-quality recreation sites. Management will focus on preserving current visitor experiences and retaining the natural qualities of the area.

The community will identify with the Leeuwin-Naturaliste Capes Area Parks and Reserves, and recognise its conservation, social and economic values are of national significance. A greater understanding of these values will be gained through the Margaret River Eco Discovery Centre and improved interpretative facilities whilst an increasing number of people will support and want to be involved in reserve management.

The importance of the Indigenous heritage of the area, dating back thousands of years, will be promoted by active and ongoing involvement with Aboriginal people.

The vision of this plan is derived from State legislation and policy, and community input. The vision also reflects the key values of the planning area and the importance of sustainably managing those values (see *Key Values* in Section 4).

7. LEGISLATIVE FRAMEWORK

Legislation

The CALM Act was proclaimed in 1985, establishing the department and two controlling bodies in which lands managed by the department were vested. In 2000 amendments to the CALM Act replaced these controlling bodies with the Conservation Commission.

The CALM Act governs the declaration and management of protected areas and in the process imposes certain obligations relating to management planning for these areas. Sections 54-56 of the Act specify:

- 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 plan.

- Management objectives for various categories of land (see Section 9 *Land Tenure and Classification* for the categories of land with the planning area).

In relation to management plans for the lands vested in it, the functions of the Conservation Commission under section 19(1)(g) of the CALM Act (see Section 12 *Performance Assessment*) are:

- To develop guidelines for monitoring and assessing the implementation of the management plans by the department
- To set performance criteria for assessing the performance of the department in carrying out and complying with management plan(s).
- To assess the performance of the department in carrying out and complying with management plan(s).

The procedure to make an amendment to a gazetted management plan is governed by section 61 of the CALM Act and involves a public consultation process.

The 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 assessment, permits, licences, contracts, leases, offences and enforcement.

The department is also 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.

There are a number of other Acts affecting the department's activities or conferring specific powers on the department. These and other statutory provisions of relevance to the planning area are referred to throughout this plan where relevant. Of most importance to this plan are:

- *Aboriginal Heritage Act 1972*. Under this Act the department is required to report Aboriginal heritage sites and ensure that sites are protected.
- *Bush Fires Act 1954*. This management plan is required to conform to this Act and satisfy the Fire and Emergency Services Authority (FESA) that adequate fire protection will be provided. Under section 34 (1a)(a) of the Act, management plans require 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.
- *Environmental Protection Act 1986*. This Act 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. Significant development proposals may be referred to the Environmental Protection Authority (EPA) under the auspices of this Act.
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This Act contains provisions relating to the protection of nationally-listed threatened species and ecological communities, listing of key threatening processes, heritage protection and will also apply to areas that become listed under the Ramsar Convention on Wetlands.
- *Heritage of Western Australia Act 1990*. This Act provides for the registration and protection of places of historic interest on land as 'heritage places'.
- *Native Title Act 1993*. This Act requires native title claimants and representative bodies to be advised when a management plan is being prepared or major public works undertaken.
- *Planning and Development Act 2005*. This Act allows WAPC to prepare planning strategies for the State. Such planning strategies are prepared to coordinate and promote regional land use planning and land development, and guide State Government departments, authorities and local government. For the Leeuwin-Naturaliste Ridge area, WAPC and the local Shires prepared the Leeuwin-Naturaliste Ridge Statement of Planning Policy (LNRSPP)(see *Policies* below).

The CALM Act does not derogate any of the powers of the *Mining Act* 1978, the *Petroleum and Geothermal Energy Act 1967* or any other Act relating to minerals or petroleum, or any government agreement within the meaning of the *Government Agreements Act 1979*.

In addition to legislative specifications, this management plan also conforms to other policies and policies of the department.

Policies

Government and departmental policies specifically mentioned in this management plan relate to the management of department-managed land for matters such as weeds, fire, disease, rehabilitation, recreation and tourism,

community involvement, flora, fauna, visual landscape and visitors. These policies are referred to in the appropriate sections of this plan.

Leeuwin Naturaliste Ridge Statement of Planning Policy (LNRSPP)

Rapid population growth and pressure for change in the Leeuwin-Naturaliste region, combined with competing land use demands, have prompted WAPC, the Shire of Augusta-Margaret River and Shire of Busselton to prepare the LNRSPP. The LNRSPP recognises the need to protect the unique ecological, social and landscape values and character of the policy area. The policy was prepared in 1998 to provide a strategic planning framework for the next 30 years. This management plan will have regard for this policy.

Obligations and agreements

Australia is a participant or signatory to a number of important conservation agreements, many of which affect management of the planning area, including the following:

Japan–Australia Migratory Bird Agreement (JAMBA), China–Australia Migratory Bird Agreement (CAMBA) and Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

Australia's treaties with Japan and China came into force in the 1980s to protect migratory birds within these countries. In 2007, Australia also entered into a similar agreement with the government of the Republic of Korea. Together these three agreements provide for bilateral cooperation for key staging areas for migratory shorebirds in the East Asian-Australasian Flyway. The agreements also give a strong foundation for the conservation efforts of the East Asian-Australasian Flyway Partnership (DEWHA 2009a). Nearly 80 bird species are listed in these agreements, including several that inhabit the planning area.

The Commonwealth EPBC Act provides statutory protection for migratory birds listed under these agreements. Under this legislation, any action that has, will have, or is likely to have a significant impact on a matter of National Environmental Significance (such as migratory species listed under international treaties) is required to undergo an environmental assessment and approvals process, thereby assisting Australia in meeting its international obligations.

Bonn Convention

Australia is a contracting party to the 'Convention on the Conservation of Migratory Species of Wild Animals' (Bonn Convention), which came into force in 1992. Under this convention countries are expected to protect species that regularly migrate across international boundaries. Migratory species listed under the convention are also protected under the EPBC Act. Several migratory bird species can be found in the planning area.

Ramsar Convention on Wetlands

Australia is a contracting party to the Ramsar Convention on Wetlands, which came into force in 1971. The Ramsar Convention on Wetlands is an international treaty that focuses on the conservation of internationally important wetlands through national action and international cooperation. The Ramsar Convention on Wetlands created a 'List of Wetlands of International Importance' where countries can nominate wetlands to be placed on the list. Areas that are listed under the Ramsar Convention on Wetlands are provided statutory protection under the EPBC Act. One candidate site within the planning area, the tributaries of the lower Blackwood River, is proposed for nomination (see Section 21 *Ecological Communities*). Provisions are included for the management of this area to meet the management criteria of the Ramsar Convention on Wetlands (Ramsar Convention Bureau 2002, 2006). The department plays a lead role in identifying and producing supporting documents for nomination of sites under the Ramsar Convention on Wetlands and conducts community consultation in the nomination process.

National Wetlands Program

The *National Wetlands Program* was established in 1989 in response to growing concern for wetland conservation in Australia, and in recognition of the need to act more strategically and cooperatively in implementing Australia's obligations under the Ramsar Convention, JAMBA, CAMBA and ROKAMBA. The program was established to undertake a comprehensive inventory of Australia's nationally important wetlands known as *A Directory of Important Wetlands in Australia*. Within the planning area, there are three nationally important wetlands – the Gingilup-Jasper Wetland System, the Cape Leeuwin System and the lower Blackwood River and its tributaries.

Burra Charter

In 1979 the Australia International Council on Monuments and Sites (ICOMOS) adopted a charter for the conservation of places of cultural significance, now known as the *Australia ICOMOS Burra Charter 1999* (Burra Charter). The charter has been widely adopted as the standard for heritage conservation practice in Australia and applies to all types of places of cultural significance including natural, Indigenous and historic places with cultural values.

7. Legislative framework

Key points

- Any listing of areas under international treaties, agreements or conventions within the planning area will be covered under this management plan.

The objective is to ensure obligations under national and international treaties, conventions and agreements are met.

This will be achieved by:

1. Implementing national and international obligations, conventions and agreements.
2. Progressing and finalising the nomination of the candidate site (tributaries of the lower Blackwood River) as a wetland of international importance under the Ramsar Convention on Wetlands.
3. Consulting with key stakeholders in the development of documents to support the proposed nomination of the candidate site for listing under the Ramsar Convention on Wetlands.
4. Ensuring that this management plan is consistent with Australia's obligations under the Ramsar Convention on Wetlands and with the Australian Ramsar management principles.

8. MANAGEMENT ARRANGEMENTS WITH ABORIGINAL PEOPLE

There is a strong interest by Nyoongar 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.

A memorandum of understanding (MOU) is in place between the department and the South West Aboriginal Land and Sea Council, which under the Native Title Act, is the representative body for native title claimants in the south-west of the State. This MOU sets out principles and guidelines under which access and cooperative management agreements between the department and Aboriginal people may be established within the existing provisions of the CALM Act. During the preparation of this draft management plan, the native title representative bodies, as well as the native title claimants, were contacted and notified of the management planning process.

9. LAND TENURE AND CLASSIFICATION

Land tenure describes the form of right or title to land and is usually designated private (freehold) land or Crown land. In WA, the security of tenure of Crown reserves created under the *Land Administration Act 1997* varies, depending upon whether the reserve is 'class A' or 'other than class A' (unclassified). This system determines the degree of difficulty involved in changing the tenure of Crown land. Changes to a class A reserve require the agreement of both Houses of Parliament. Changes to an unclassified reserve require approval at Ministerial level.

Management of land by the department is carried out according to government policies and as specified in management plans submitted by the controlling bodies and approved by the Environment Minister.

Land categories

Section 5(1) of the CALM Act lists 10 categories of land to which the Act applies. The three categories relevant to the planning area are national park, nature reserve and timber reserve. Table 1 provides a description of the reserve category, purpose and management objective for these categories. The management objective for timber reserves of the planning area has effect until they have been formally reclassified in the manner proposed in this plan.

Table 1. Reserve category, purpose, class and management objective

Reserve category	Purpose	Class	Management objective
Nature reserve	Conservation of Flora and/or Fauna*	Either class A or other than class A (unclassified)	Maintain and restore the natural environment, and protect, care for, and promote the study of, Indigenous flora and fauna. Preserve any feature of archaeological, historic or scientific interest
National park	National park*	Mostly class A	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
Timber reserve***	Various, including conservation, recreation, water catchment protection and timber production on a sustained yield basis, as well as other purposes prescribed by the regulations, which may include beekeeping	** Equivalent of unclassified	Achieve the optimum yield in production consistent with the satisfaction of long-term social and economic needs

* Created under the Land Act, Land Administration Act or any other Act for the purpose specified.
** Created under the CALM Act, which has no classification.
*** Timber reserves of the planning area are proposed to be classified as 'forest conservation area'. The purpose of these areas will be conservation, recreation and water catchment protection, as well as other purposes prescribed by the regulations (see *Land Classification* below).

Land classification

A strategy for the conservation of natural and cultural values and the facilitation of sustainable resource use is the implementation of a classification scheme over lands to which the CALM Act applies, to designate appropriate levels of access and types of activities that can occur. Section 62(1) of the CALM Act provides for the classification of land into various categories, one of which is forest conservation area. This is the only land classification that applies to the planning area.

The primary objective for managing forest conservation areas is biodiversity conservation. Therefore, they will not be available for timber production, but other productive activities that do not involve timber harvesting, such as apiculture, may be allowed. Two forest conservation areas are proposed in the planning area (see Section 10 *Existing and Proposed Reserves*).

10. EXISTING AND PROPOSED RESERVES

In 1976, the EPA endorsed a series of recommendations pertaining to Crown land throughout the State. In particular to the Cape Naturaliste to Cape Leeuwin area, it recommended the consolidation of Leeuwin-Naturaliste National Park into a single class A reserve for the purpose of national park, and the addition to the park of unallocated Crown land and various other Crown reserves. These recommendations were supported by the National Parks Authority (1978) and the Leeuwin-Naturaliste Working Group (1982) and were later adopted in the *Leeuwin-Naturaliste National Park Management Plan 1989-1999*. A process to implement most of these recommendations was completed in June 2010 (see *Existing Reserves* and *Proposed Additions* below).

Tenure recommendations in the FMP provided for the creation of other parks and reserves that now form the planning area as well as several reserve additions through proposed changes in land tenure, purpose, vesting and boundaries. The primary reason behind these reserve proposals was to contribute toward a comprehensive, adequate and representative reserve system for the protection of biodiversity (see Section 15 *Biogeography*).

Analysis undertaken as part of this management plan has identified more reserve additions based on:
- location – proximity and connectivity to other conservation reserves

- size and shape
- the presence of threatened or priority species and ecological communities
- biological and biophysical diversity
- the degree to which the proposed addition assists in the management of threatening processes
- compatible land use benefits.

The tenure of existing reserves and proposed additions that comprise the planning area is described below and summarised along with proposed tenure changes, in Appendix 2.

Existing reserves

Leeuwin-Naturaliste National Park

Leeuwin-Naturaliste National Park is recognised as a primary recreation destination and an area of high conservation and visual landscape value. It forms part of the most complex system of caves and other karst features in the south-west, the primary reason for which it was originally created. The park is also located in a region of rapid change and intensifying land uses on adjoining lands, which have the potential to impact on park values. Management will therefore focus on protecting its key values and addressing a number of cross boundary management issues such as fire, visual landscape and off-reserve conservation.

Consistent with previous tenure recommendations, 33 of the 36 reserves that comprised Leeuwin-Naturaliste National Park were consolidated on 30 June 2010 into one core reserve (Reserve 8428) for the purpose of 'national park' (see Appendix 3). Those reserves not consolidated into the park include reserves 14779, 44658 and 44660. The latter two contain the Cape Naturaliste and Cape Leeuwin lighthouses, and because of their particular purposes, it is not practical to include them with Reserve 8428. Reserve 14779 is remote from the main body of the park and is proposed to be added to Scott National Park. Communication towers within the park have been excised and reserved as CALM Act section 5(1)(h) reserves (see Section 41 *Utilities and Services*).

Until the reserves were consolidated, the national park was highly fragmented because of previous changes in reserve purpose and vesting as well as numerous additions and excisions. It was made up of 36 separate reserves with a variety of purposes which varied in size from 0.2 hectares to 3,156 hectares and were originally gazetted between 1902 and 2004. Consolidation of the reserves, as well as the inclusion of proposed additions (see below), is desirable to:

- gain a consistency of purpose and class
- help facilitate management of the park as an integrated unit, which is particularly important for fire, weed and feral animal control
- reduce the number of internal enclaves
- create easily identifiable and manageable park boundaries.

The seaward boundary of the park was previously defined by the high water mark in parts and the low water mark in other parts, which led to difficulties in managing the inter-tidal zone and beaches. For consistency, the seaward boundary is now the high water mark.

Where roads or activities undertaken within the park traverse reserve boundaries, these areas will generally be signposted. Where reserve boundaries are ill-defined, proponents of activities adjacent to the park will be required to check with the department for possible cross-boundary issues and if necessary, demarcate the on-ground location of the boundary before works being undertaken. Similarly, the department will determine the on-ground location of boundaries where works on the conservation estate are proposed. In circumstances where a road abuts the boundary of the planning area, the road will not be included within the planning area. These requirements will apply throughout the planning area.

Rationalising the park boundary to include caves on adjoining lands may have benefits for cave conservation, by affording them statutory protection under this management plan and subsequent regulation under the Cave and Abseil Permit System (see Section 31.4 *Caving*). This is particularly important where caves are located within the Park boundary but also for cave entrances located on adjoining lands. A case in point is Sussex locations 4171, 4172, 4174 and 4309, where the Park boundaries should be reviewed to incorporate caves and cave entrances not available for tourism or tourism infrastructure. The portion of Sussex location 4172 east of Caves Road should also be consolidated into the Park.

Yelverton, Bramley and Forest Grove national parks

Yelverton (729 hectares), Bramley (3,892 hectares) and Forest Grove (1,379 hectares) national parks were gazetted in December 2004[2] in accordance with tenure recommendations in the FMP. The parks are provisionally named.

The parks vary north to south along the Leeuwin-Naturaliste Ridge and were selected during the RFA process for their vegetation types/ecosystems, for their poorly reserved vegetation complexes and for their high biophysical naturalness. The parks contain rare and restricted habitats as well as species at their range limits, and are significantly different in terms of species composition to reserves on the Scott Coastal Plain. They are also recognised for their flora species richness.

Forest Grove National Park comprises some 310 hectares of old-growth forest, representing about 22 per cent of the park, and provides a link between national parks adjoining the Blackwood River and Leeuwin-Naturaliste National Park. Bramley National Park is important for forest and river-based recreation opportunities.

Along the eastern boundary of Yelverton National Park is 389 hectares of timber reserve proposed to be classified as forest conservation area (see *Timber Reserves 139/25 and 60/25* below). Similarly, 408 hectares of timber reserve to the south of Bramley National Park is also proposed as a forest conservation area. Both areas have conservation values and a high community attachment, despite previous timber extraction. These areas were excluded from the adjoining national parks because of high prospectivity for titanium minerals.

The creation of the reserves in 2004 raised concerns about the lack of multiple-use State forest in close proximity to populated areas such as Margaret River, and the pressure that this may place on the new reserves for firewood collection and recreational use, particularly in Bramley National Park. Extensive roading from old forestry tracks, the spread of *P. cinnamomi* and illegal dumping of rubbish are also major issues for management. This management plan will focus on protecting the conservation values of these reserves, rationalising access and confining recreational use to Bramley National Park. The latter will require a more intense level of recreation management.

Reserve 46400

Reserve 46400 was originally gazetted in 2000 as a class A reserve for the purpose of 'national park'. The reserve was formerly freehold land and was jointly purchased by the State and Federal governments in December 2000 for its important conservation values, particularly due to the presence of the critically endangered white-bellied frog. The reserve provides for a strategic ecological corridor between the Blackwood River and Leeuwin-Naturaliste National Park. Recreational use of the reserve is limited.

Protecting frog populations by rationalising vehicle access and appropriately managing fire will be the focus for future management. The reserve is un-named and an appropriate name should be selected over the life of the plan in consultation with the community.

Scott National Park

Scott National Park (3,273 hectares) is a class A reserve originally gazetted in 1959 to protect jarrah/marri woodlands on the banks of the Blackwood River and to buffer the adjoining Blackwood and Scott river systems. Various additions and excisions have occurred over time and the park was expanded to encompass nearby swampy flats.

Scott National Park is important in maintaining the diversity of a wide range of species that are under extreme pressure in the highly developed portions of the south-west. It is well known botanically for its high proportion of endemic and declared rare flora. It also contains woodlands typical of the area and many plant species at their western range limits. The park also comprises a large area of relatively undisturbed habitat that has high fauna conservation value and acts as a repository for fauna that reflect changing climatic conditions in the south-west. Together with Gingilup Swamps Nature Reserve, it comprises the largest remaining remnants on the western side of the Scott Coastal Plain. For these reasons, and because much of the area is seasonally inundated and hence has limited access, the department will continue to manage Scott National Park primarily for conservation purposes. However, this management plan does recognise the importance of river-based recreation opportunities and provides for this to continue.

[2] . Bramley, Yelverton and Forest Grove national parks were established under the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004*.

Gingilup Swamps Nature Reserve

Gingilup Swamps Nature Reserve (4,326 hectares) is an unclassified reserve originally gazetted in 1970. The reserve contains important remnant vegetation on the Scott Coastal Plain, protecting the headwaters of the Scott River, wetlands of national significance and downstream water quality. Botanically, the area is potentially as rich as Scott National Park and is valuable in conserving interesting flora and fauna. The reserve also buffers D'Entrecasteaux National Park to the east.

The department will continue to manage this reserve for conservation purposes and seek reservation of adjacent unallocated Crown land and other reserves along the Scott River to enhance links to Scott National Park. The department will also seek to change the classification of the Reserve to class A. Management will be integrated with D'Entrecasteaux National Park[3].

Blue Rock Cave Nature Reserve

Blue Rock Cave Nature Reserve (16.2 hectares) is a class A reserve gazetted in 1902 for the protection of cave systems. This reserve was incorporated into Leeuwin-Naturaliste National Park in June 2010 (see *Leeuwin-Naturaliste National Park* above).

Other nature reserves of the Leeuwin-Naturaliste Ridge

Nature reserves of the Leeuwin-Naturaliste Ridge include Stockdill Road Nature Reserve, Hagg Nature Reserve, Walburra Nature Reserve and an un-named Nature Reserve (Reserve 26065).

Stockdill Road Nature Reserve comprises two reserves, Reserve 39465 and Reserve 1394, which cover a combined area of 56.42 hectares. The nature reserve is recognised for its wetland values, the presence of karri and the variety of birds and mammals. Reserve 39465 (15.9 hectares) is a Class A reserve gazetted in 1986, while Reserve 1394 (40.47 hectares) was gazetted in 1970 and is unclassified.

Hagg Nature Reserve (9.26 hectares) is unclassified, and was gazetted in 1981 to protect the Albany pitcher plant (*Cephalotus follicularis*) and is particularly important for the protection of threatened, south-west endemic freshwater crayfish.

The un-named Reserve 26065 (55 hectares) is unclassified and was originally gazetted in 1961. Walburra Nature Reserve (Reserve 20258) is a Class A reserve of 21.5 hectares, and was originally gazetted in 1929.
The reserves are particularly important for flora conservation and for the protection of invertebrates. Their small size increases edge effects from adjoining land uses and limits their vertebrate faunal value. Weeds and disease caused by phytophthora are major threats, and fire will be important in regenerating populations of Albany pitcher plant.

All of the above-mentioned nature reserves are vested with the Conservation Commission for the purpose of 'conservation of flora and fauna'. Consequently, management will focus on protecting the natural values of these areas. This management plan also proposes that the reserves become Class A. Reserve 39465 and Reserve 1394, which comprise Stockdill Road Nature Reserve, should be amalgamated.

Un-named Reserve (Reserve 44676)

Reserve 44676 (0.05 hectares) is an unclassified reserve gazetted in 2000 for 'navigation, communication, meteorology, survey and conservation'. The reserve is associated with the Foul Bay lighthouse, which is not in operation, and is an enclave within Leeuwin-Naturaliste National Park. Due to its particular purpose, it is not practical to include this reserve into Leeuwin-Naturaliste National Park.

Timber reserves 139/25 and 60/25

Timber Reserves 139/25 (389 hectares) and 60/25 (408 hectares) are unclassified timber reserves, originally gazetted in 1959 and 1923 respectively. Timber harvesting in the reserves has occurred.

Under the FMP, it is proposed that timber reserve 139/25 and a portion of timber reserve 60/25 be classified as 'forest conservation area' (see Map 2). This is consistent with previous recommendations in the RFA. Only part of timber reserve 60/25 is proposed as forest conservation area. The remainder of the reserve is either

[3] The *Shannon Park and D'Entrecasteaux National Park Management Plan 1987-1997* guides management for D'Entrecasteaux National Park. A revised management plan is expected to be released in the near future.

inundated by Ten Mile Brook Reservoir or adjoins Bramley National Park. Given the small size of the latter, it should be incorporated into the national park. Extraction of water from Ten Mile Brook Reservoir would require a Water Removal Permit (see Section 44 *Water Resources*).

Proposed additions

Proposed tenure changes and additions are listed in Appendix 2. The decision to include the reserve additions as listed in Appendix 2 in the conservation estate is based on an assessment of the conservation values and management requirements of the area. Any such additions will require the agreement of the land manager or land-holder and will be subject to usual government consideration and approval.

Most of the additions are to Leeuwin-Naturaliste National Park, where there are 27 proposed reserve additions. 21 of these were incorporated into the park in June 2010 and another six are under consideration. These six reserves should be considered for addition to Leeuwin-Naturaliste National Park (Reserve 8428) when appropriate. Unmade and surveyed roads, which are entirely within the planning area, should also be incorporated into the existing reserves of the planning area.

For conservation reasons, future reserve additions should consider extending the boundaries of Gingilup Swamps Nature Reserve to the coast, especially on the western side, and establishing and enhancing ecological connections between Augusta and Scott National Park, and between Boranup Forest and Forest Grove National Park (especially around McLeod Creek). However, further negotiations and final agreement will be required before any changes to vesting are made.

Private property adjoining existing reserves of the planning area may also improve management, assist in avoiding enclaves or more fragmentation of reserves, or add to conservation, recreational and landscape values if consolidated into the conservation estate. Subject to an assessment of values and their availability, consideration should be given to their acquisition and addition to existing reserves of the planning area.

In the event that any of the proposed additions are added to existing reserves of the planning area, these areas will be managed in accordance with this management plan. Other additions will be managed to be consistent with this management plan, or if necessary the plan will be amended to apply to them.

10. Existing and proposed reserves

Key points

- The planning area comprises various existing reserves and proposed additions (See Section 3 *Management Planning Area*). The purpose of existing reserves includes national parks, nature reserves and timber reserves.
- Recommendations for changes in land purpose and vesting were made in the *Leeuwin-Naturaliste National Park Management Plan 1989-1999* and the FMP. Several of these are outstanding.
- Fragmentation and intensifying land use on adjoining lands means that cross-boundary management, off-reserve conservation and engagement of adjoining land-holders is critical in protecting key values.
- Any Crown or other lands within the planning area that become conservation estate within the life of the plan will be covered under this management plan.

The objective is to protect conservation reserves of the planning area by providing maximum security of tenure, class and purpose.

This will be achieved by:

1. The department and Conservation Commission initiating all land category (purpose and vesting) changes for which they are responsible (as per appendices 2 and 3).
2. Incorporating surveyed but unmade roads into existing reserves of the planning area.
3. Where proposed additions identified in this management plan are incorporated into existing reserves, managing these areas in accordance with this management plan. Other additions will be managed to be consistent with this management plan, or if necessary the plan will be amended to apply to them.
4. Incorporating the north-west portion of timber reserve 60/25 into Bramley National Park.
5. Continuing to make acquisitions as property becomes available, and subject to an assessment of its values.
6. Where reserve boundaries are ill-defined, requiring proponents of activities potentially affecting the conservation estate to check with the department for possible issues. If the department considers it

necessary, proponents will be required to demarcate the on-ground location of the boundary before works being undertaken. Similarly, the department will determine the on-ground location of boundaries where works on the conservation estate are proposed.

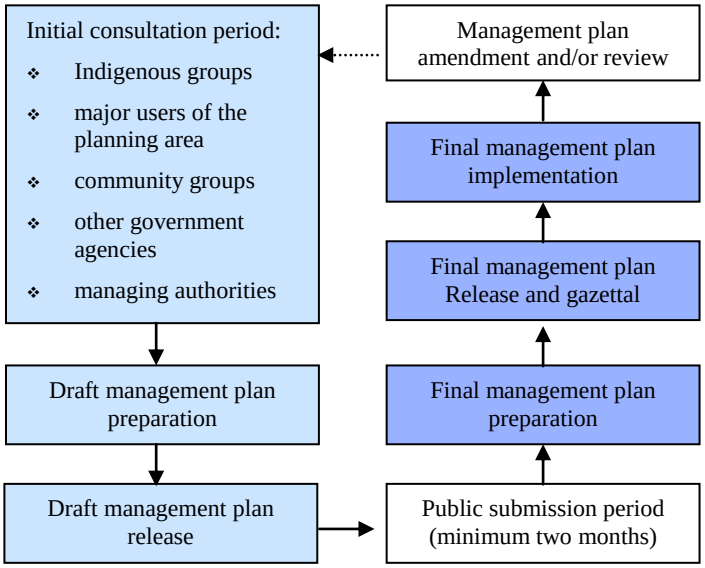
7. Reviewing the boundaries of Leeuwin-Naturaliste National Park in the vicinity of caves and cave entrances with a view to incorporating them into the park where appropriate.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
10.1 Tenure actions for which the department and Conservation Commission are responsible	10.1 Complete all tenure actions for which the department and Conservation Commission are responsible within the life of the plan	After 5 years

11. MANAGEMENT PLANNING PROCESS

The department initiates the preparation of management plans according to State-wide priorities and in consultation with, and on behalf of, the Conservation Commission. The Conservation Commission issues draft plans for public comment and provides final plans for approval by the Environment Minister. The process of producing a management plan is as follows:



12. PERFORMANCE ASSESSMENT

The Conservation Commission has responsibility to assess the implementation of this management plan, and will measure the overall performance and the effectiveness of it by assessing the Key Performance Indicators (KPIs) as listed in Appendix 1, and other parameters 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. KPIs are the minimum set of indicators that identify major trends and impacts on values. In the case of this plan, it specifies measures and targets, 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 the success of the department's management in meeting targets specified in the KPIs. The frequency of these reports will depend upon the requirements of each KPI, the satisfactory establishment of baseline information against which to assess any unforeseen changes to environmental conditions. 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 actions 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 function under section 19(1)(g)(iii) of the CALM Act. The Conservation Commission will make the results of the assessment available to the public.

The department will invite public comment on any proposed amendments to management of the planning area, where they are contrary to this management plan.

13. ADMINISTRATION

The planning area is part of the department's Blackwood District of the South West Region. The day-to-day implementation of the final management plan will be the responsibility of the District Manager, Blackwood District, who coordinates the operational management of reserves in the planning area.

14. TERM OF THE PLAN

The management plan for the Leeuwin-Naturaliste Capes Area Parks and Reserves will guide management of the planning area for a period of 10 years from the date the final management plan is gazetted. During this time, amendments to the final management plan are allowed under section 61 of the CALM Act. If an amendment is necessary, the proposed changes will be released for public comment.

At the end of the 10-year period, the management plan may be reviewed and a new management plan prepared. The new management planning process requires full public consultation and approval from the Environment Minister. In the event that the plan is not reviewed and replaced by the end of the 10-year period, this plan will remain in force.

PART C. MANAGING THE NATURAL ENVIRONMENT

This chapter describes biodiversity values, the major threats to these values, and actions proposed by the department to mitigate the threats. Primary factors influencing the department's management of biodiversity values are:

- the linear shape of Leeuwin-Naturaliste National Park, and to a lesser degree Scott National Park, and the isolation of reserves from other areas of remnant vegetation
- semi-rural land developments that may impact upon surface water flow and water quality in Leeuwin-Naturaliste and Scott national parks
- control of exotic species (environmental weeds and introduced and problem animals)
- disease caused by *Phytophthora cinnamomi*
- management of fire to achieve biodiversity conservation objectives and the protection of life and community assets.

Conservation of the existing biodiversity remains a primary objective of this management plan. Off-reserve conservation on adjoining lands and cross-boundary management are important in achieving this objective (see Section 15 *Biogeography*).

15. BIOGEOGRAPHY

The Interim Biogeographic Regionalisation for Australia (IBRA) provides a planning framework for selecting a comprehensive, adequate and representative (CAR) reserve system of protected areas, to conserve Australia's biodiversity (Thackway and Cresswell 1995). The benchmark reservation level for a CAR terrestrial reserve system is for 15 per cent of each bioregion, and any subregions within it, to be protected in the public conservation estate (CALM 2003).

In addition to using scientifically-based CAR criteria, areas that serve as buffers to marine or terrestrial reserves, protect threatened species or otherwise assist with conservation management are also commonly included in parks and reserves. Natural areas with spectacular landforms and scenery subject to high public use may also be included.

Bioregions

The IBRA divides WA into 26 biogeographic regions, based on dominant landscape characteristics of climate, lithology, geology, landforms and vegetation. The planning area lies within the Warren and Jarrah Forest bioregions (Figure 1). Two subregions are recognised within the latter – the Northern and Southern Jarrah Forest subregions, differentiated principally by major variations in climate, geology and understorey species composition. The planning area lies within the Southern Jarrah Forest subregion.

As of June 2006, 12 per cent (572,261hectares) of the Jarrah Forest and 29 per cent (244,215 hectares) of the Warren bioregions are contained within a CAR conservation reserve. Should proposed additions to the conservation estate eventuate, this will increase reservations levels to 16 per cent and 48 per cent respectively, meeting the reservation target for each bioregion. Despite this, additions to the planning area will continue to be important for conservation (i.e. to reduce fragmentation and enclaves, improve reserve shape, minimise the boundary to area ratio and to link reserves via vegetation corridors) (see also Section 9 *Existing and Proposed Tenure*). Such strategies may also be useful in addressing climate change (see Section 16 *Climate*).

Forest ecosystems

In the south-west of the State, the RFA was initiated to provide a framework for managing the area's forests, recognising the need for an in-depth analysis of environmental, social, economic and Indigenous heritage values. 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 forests. Forest ecosystems are identified and described at a finer scale than that used to determine IBRA bioregions.

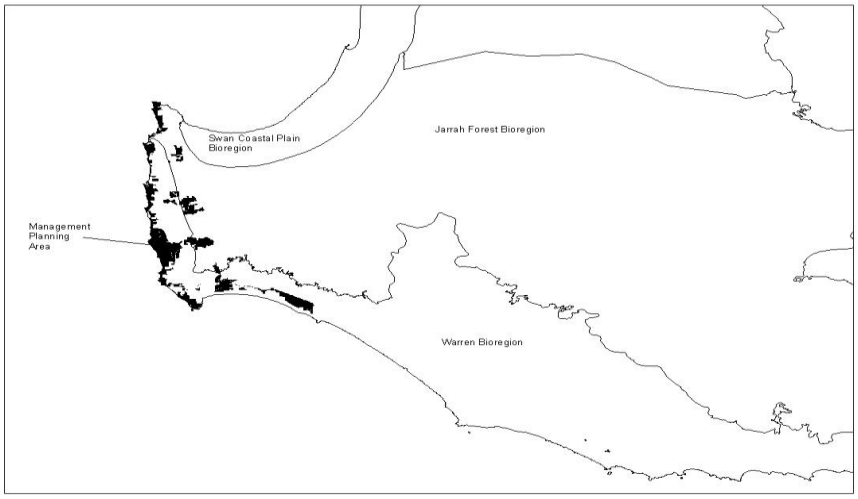


Figure 1. Bioregions in the south-west

The reservation target for forest ecosystems was set at 15 per cent of the pre-1750 extent, except for some rare ecosystems where 100 per cent of the extant distribution was the target. This ensured that viable representatives of each ecosystem were included in the conservation reserve system. To assist in identifying areas for reservation, information was provided at a finer level of detail, including vegetation complexes, species richness, relictual and disjunct species and the presence or absence of mature growth vegetation.

The FMP tenure recommendations added to the conservation reserve system proposed in the RFA. The addition of the reserve proposals in the FMP significantly increased the representation levels of many forest ecosystems.

Nine forest ecosystems occur in the planning area, six of which meet the agreed target for the CAR conservation reserve system (Conservation Commission 2004). Three forest ecosystems (Jarrah Blackwood, Jarrah Leeuwin and Jarrah Woodland) are under-represented in conservation reserves. However, proposed additions will achieve the 15 per cent target for the Jarrah Blackwood and Jarrah Woodland forest ecosystems. Protection of the Jarrah Leeuwin forest ecosystem on private land and informal reserves is required to meet the CAR target. Another forest ecosystem, the Swan Coastal Plain, is located outside the RFA boundary and hence has not been analysed. It occupies 60 hectares of Yelverton National Park.

Cross-boundary management and off-reserve conservation

While the department's management is limited to the public conservation estate, there are often significant biodiversity values on adjoining properties, which may be significant in their own right and/or complementary to the department's management of the conservation estate. The department manages land surrounded by many neighbouring properties, making cross-boundary management important in effectively dealing with a range of issues of mutual interest. To this end, the department prepared a *Good Neighbour Policy* (DEC 2007e), which is aimed at building and maintaining mutually beneficial relationships with neighbours, to deal with a range of cross-boundary management issues such as:

- fencing
- fire management
- weed and pest animal control
- straying stock on department-managed lands
- native animals that affect primary production
- access to and activities on department-managed lands and waters
- off reserve conservation programs and activities
- natural resource management
- neighbour and community input to the department's planning and operations
- the department's environmental protection responsibilities
- communication, contacts and liaison.

The mixture and intensity of surrounding land uses, combined with an already fragmented landscape and the importance of off-reserve conservation, mean the department should take a lead role in promoting biodiversity conservation and covenanting programs on adjoining lands. To this end, the department has introduced several conservation covenants on private land adjoining or in close proximity to the planning area, and also facilitates

the *Land for Wildlife* program. The department liaises with regional NRM groups and community groups, such as the South West Catchment Council. However, issues such as ill-defined boundaries and straying of stock into the planning area are ongoing. The importance of visual landscape and fire management off-estate increases the importance of the department establishing good relationships with its neighbours.

15. Biogeography

Key points

- Proposed additions to the planning area in the Warren and Jarrah Forest IBRA bioregions will meet the CAR criteria for the conservation reserve system, making them two of the most highly reserved bioregions in the State.
- Due to the fragmentation of reserves and high boundary to area ratio, additional reservation could enhance the design of existing reserves and hence add to their conservation values.
- Off-reserve conservation and cross-boundary management are important to achieving the objectives of this management plan.

The objective is to contribute to a comprehensive, adequate and representative conservation reserve system to conserve biodiversity.

This will be achieved by:

1. Acquiring lands to deliver a reserve system that meets CAR criteria.
2. Implementing the tenure recommendations in the FMP.
3. Encouraging and facilitating off-reserve conservation and cross boundary management (e.g. conservation of road reserves, land for wildlife programs, NRM), particularly where it contributes to the CAR conservation reserve system.
4. Using the existing Capes Parks Community Advisory Committee as a basis for enabling more integrated management of values within this area.

16. CLIMATE

The climate of the Leeuwin-Naturaliste coast and inland forested areas is temperate, with distinct wet and dry seasons. The region is renowned for being the wettest part of the State's south-west. Most rainfall occurs between April and October and has averaged 784 millimetres at Cape Naturaliste, 1,056 millimetres at Margaret River and 964 millimetres at Cape Leeuwin for the 1975-2003 period (DoW 2007b). Its coastal setting and the high ridge facing the ocean, strongly influences rainfall distribution (Semeniuk 1997), with inland areas such as Forest Grove National Park receiving considerably more winter rainfall than coastal sites. The Scott Coastal Plain experiences a more temperate climate with mild, warm summers and long, cool and wet winters. Light local rain may occur during summer and autumn.

Observed and projected climate change

Human induced global climate change, or the greenhouse effect, is the result of changes to atmospheric concentrations of greenhouse gases. In the south-west of WA, changes in greenhouse gas concentrations, combined with natural variability, have contributed to an observed decline in rainfall (IOCI 2006), especially in early winter (May, June and July). Annual rainfall decreased by up to 10 per cent in the Cape to Cape region for the period 1975-2003 compared to long-term records (DoW 2007b). This resulted in a decline in streamflows for the same period.

Future climate change projections for the south-west of WA are for continued warming (increased mean annual temperature) and reduced rainfall (IPCC 2007), with slightly less warming in coastal areas. The Indian Ocean Climate Initiative (IOCI 2006) projects a rise in temperature in all seasons in the south-west by 2030 as well as more declines in winter rainfall. Catchments can expect more reductions in runoff. There are also indications that weather events may be more extreme, with more frequent and prolonged droughts. Changes in ground moisture, temperature and vegetation may also lead to more vigorous fire behaviour in traditionally cooler months and therefore more restricted burning seasons, which is likely to have implications for fire management. It is likely that there will be more days of very high and extreme fire danger (Williams *et al*. 2001) and consequently more frequent bushfires. Sea levels are also expected to rise, potentially by 9-88 centimetres by 2100.

Impacts of climate change

The potential impacts of climate change on biodiversity are uncertain and poorly understood, although the south-west of WA is considered to be at considerable risk of significant biodiversity loss (IPCC 2007). Potential direct impacts on biodiversity include changes in animal and plant physiology, changes in life cycle timing, and changes in species distribution and abundance. Indirect impacts may arise from changes in species competition and predation, or through alteration to the nature and intensity of existing biodiversity pressures (e.g. disease, salinisation, density and distribution of weeds, erosion, habitat fragmentation and loss of wetlands).

The combination of direct and indirect impacts resulting from climate change could place considerable stress on ecological systems and result in:

- local species extinctions
- changes to ecosystem composition and processes
- changes in fire behaviour
- a contraction or fragmentation in the range of native species
- the dispersal or migration of species from their current locations to locations having more appropriate conditions.

Some plant and vertebrate species in the south-west require specific local climate conditions that may disappear entirely with as little as 0.5-1 degrees Celsius warming. Modelling by the CSIRO shows that with only 0.5 degrees Celsius warming, the habitats for all frog and many mammal species would be significantly reduced and 15 species of endangered or threatened WA mammals would disappear or be restricted to small areas.

Species most likely to be affected are those:

- with narrow temperature or cool temperature requirements
- with narrow geographic ranges that are closely associated with local environmental conditions
- dependent on relatively high rainfall
- which are unable to evolve in situ.

In the planning area, some wetlands, lakes and ephemerally moist riparian zones could contract or dry out, reducing this vegetation type and predisposing these areas to fire. This in turn may affect the structure of waterways as well as the aquatic ecology and fringing vegetation.

The lowering of watertables and groundwater flow may also affect cave and spring environments and cause subsurface soil acidification problems in areas such as the Scott Coastal Plain. The high degree of landscape fragmentation along the Leeuwin-Naturaliste Ridge may make it difficult for some species to migrate, especially those with narrow temperature range tolerance or those at the upper limits of their range. There are also a number species and communities in the planning area that are endemic, at or near the limits of their range and with restricted wet habitat requirements, and hence may be vulnerable to climate change.

Reduced streamflow and groundwater recharge has also impacted on the availability of water resources for public consumption. As a consequence, water source developments have been accelerated, placing greater pressure on rivers and brooks of the planning area to become available for new public drinking water supplies (see Section 44 *Water Resources*).

Rising sea levels may impact on coastal infrastructure and beach use.

Responses to climate change

Climate change continues to be the subject of intense international, national and State focus. On a national level, 'loss of climatic habitat caused by anthropogenic emissions of greenhouse gases' has been identified as a key threatening process under the EPBC Act. At State level, a climate change and adaptation strategy is being developed to fulfil the State's responsibilities in contributing toward national and international agreements on climate change. The department has begun work on modelling biodiversity response to investigate the potential vulnerability of WA's plants and animals to climate change and develop a climate-biodiversity strategy.

The issue of projecting and responding to climate change is complicated by significant knowledge deficits and uncertainty. It is important that effective monitoring programs be established to support the long-term regional-scale planning necessary to limit future impacts as much as possible. In view of these uncertainties, climate change management strategies need to:

- use adaptive management and monitoring techniques that generate a better understanding of the interaction

between taxa, community resilience and climate conditions
- 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, species dispersal corridors and climate refugia)
- identify key locations which contain biodiversity values important on a regional, state or national scale;
- monitor changes to taxa and community structure and representation over time
- reduce knowledge deficits about climate variability and change
- develop response strategies for significant climate-change related threats that are understood, such as drought.

At the individual reserve level, implementing strategies that create and expand reserves, control introduced animals and weeds, manage fire, and re-introduce or translocate threatened native plants and animals, will help improve the resilience of species and ecosystems and hence decrease their vulnerability to climate change. A system of monitoring sites should also be established to ensure any changes to ecosystem composition and structure is quickly detected, enabling remedial strategies to be developed and implemented in a timely manner.

16. Climate

Key points
- Climate in the south-west of WA is changing as a result of global warming. Annual rainfall decreased by up to 10 per cent in the Cape to Cape region for the period 1975-2003 compared to long-term records, with an associated reduction in streamflow. Future climate change projections indicate this drying trend will continue.
- The south-west of WA is at considerable risk of significant biodiversity loss. In particular, mammals and water dependant species (e.g. frogs) may be affected.
- Reserve creation and the protection of wildlife corridors, feral animal and weed control, fire management and re-introduction programs, could improve the resilience of species and ecosystems, and decrease their vulnerability to climate change.

The objective is to protect key values from the potential effects of climate change.

This will be achieved by:
1. Identifying management priorities and the limit of conservation options for species and communities, by investigating their vulnerability to climate change. In particular, focus on species and communities that are of conservation significance or are likely to be highly vulnerable to climate change.
2. Incorporating the potential for climate change impacts into species recovery plans, such as the collection and storage of genetic material (e.g. seed banks) or strategic reintroduction of species.
3. Limiting non-climate stresses for species and communities vulnerable to climate change.
4. Identifying and protecting climatic refugia.
5. Protecting adequate and appropriate areas within the reserve system and supporting reserve additions to provide buffers, species dispersal corridors and climate refugia (e.g. improving the connection between Boranup Forest and Forest Grove National Park).
6. Engaging with adjoining landowners to ensure species and communities are better able to adapt to climate change (e.g. maintaining remnant vegetation, roadside reserves, vegetation corridors and promoting conservation covenants, *Land for Wildlife* programs and natural resource management).
7. Encouraging research into the sustainability of groundwater dependant ecosystems.
8. Continually reviewing and adapting management in response to new knowledge and understanding of climate change and its impact on biodiversity.

17. GEOLOGY LANDFORM AND SOILS

Geology

The planning area is located within the Pinjarra Orogen geological subdivision (Figure 2), which is largely covered by the Perth Basin but is exposed as the Leeuwin Complex west of the Dunsborough Fault.

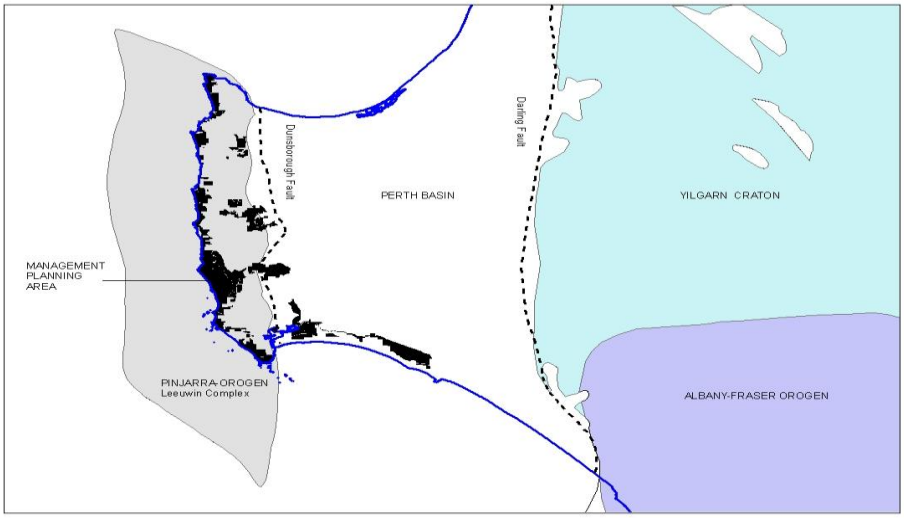


Figure 2. Geology of the planning area

Leeuwin Complex

The Leeuwin Complex is an isolated and elongated ridge extending north-south between Cape Naturaliste and Cape Leeuwin, reaching about 32 kilometres in width. The basement rocks are metamorphosed igneous rocks (granitic and gabbro) from the Proterozoic period (500-770 million years old), which outcrop discontinuously as coastal headlands, and outcrops scattered through the uplands and along river systems. Overlying the basement rock is Tertiary laterite, sand and Tamala Limestone. The latter contains karst features (caves, the Meekadarabee Tufa Barrier) for which the area is renowned. Limestone outcrops and metamorphic rocks are used for rock climbing and abseiling, although environmental impacts and safety issues need to be assessed (see Section 31.1 *Abseiling and Climbing*).

Perth Basin

The Perth Basin is a rift valley about 1,000 kilometres long, covering an area of 45,000 square kilometres, from north of the Murchison River to the south coast. The Basin contains sedimentary rocks, predominantly sands and silts with rare coal and basalt from the Devonian to Cretaceous age, with a surficial covering of younger sediments. The Basin has been faulted into several structural blocks and gently folded. Part of the Basin includes a thick sequence (>2,000 metres) of sediments in the Yarragadee Formation, that was deposited in a riverine palaeo-environment. Rivers draining from Antarctica to the south and India to the west during the Jurassic period (180-140 million years ago) deposited these sands.

Paleontological values

Fossils are common in some cave deposits (i.e. marsupial remains, remains of extinct reptiles and birds). Tight Entrance Cave contains a richer and more diverse assemblage of fossil vertebrates than any other Pleistocene (2 million to 10,000 years ago) deposit in the western half of Australia (Prideaux and Gully unpublished). This and other fauna fossil deposits are significant in increasing the understanding of mammal extinction in Australia.

Section 115 of the Mining Act authorises the Director of Geological Survey of Western Australia and his agents to enter upon any land for the purposes of geological research by or for Geological Survey of Western Australia. All additional paleontological research undertaken in the Park must be authorised by the department *(*see Section 48 *Scientific and Research Use*). Excluding approved research activities, damage, disturbance or removal of fossils, without lawful authority, is prohibited under regulation 31 of the *Conservation and Land Management Regulations 2002* (CALM Regulations).

Geoheritage

Geoheritage refers to state-wide and nationally significant geological features that offer important insight into the formation or development of the continent, have high landscape value, can be used for research or teaching purposes, or as a reference site. They are areas that contain distinct geological features that are scientifically valuable and of importance to understanding the Earth (EPA 2007). There is a process for determining whether a feature can be classified as a Geoheritage site and the Geological Survey of Western Australia is developing a formal State Register of State Geoheritage Sites (EPA 2007).

In the planning area, a number of features warrant assessment for geoheritage including Bunker Bay, Meekadarabee Tufa Barrier along the Ellen Brook valley, Skippy Rock and Hamelin Bay (Carter 1987)(Appendix 4). Other sites containing potential geoheritage values have been identified by Semeniuk (1997) as part of the assessment of values for the RFA.

Although unlikely to be affected by low-key recreational use, it is important that potential effects on geoheritage sites are considered in planning for recreational use, site developments and other disturbance activities.

Landform and soils

The planning area covers three major physiographic units—the Leeuwin-Naturaliste Ridge, the Scott Coastal Plain and a small portion of the Blackwood Plateau (Figure 3). Overlying these units are topographical features or landforms, such as valleys, dunes, beaches, ridges, plains and plateaus.

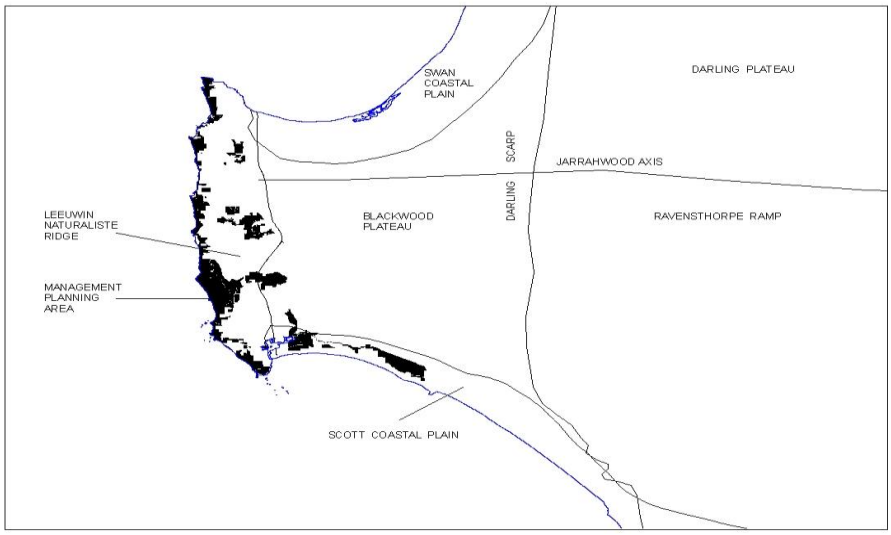


Figure 3. Physiographic units of the planning area

Leeuwin-Naturaliste Ridge

The Leeuwin Naturalise Ridge extends 95 kilometres along the coast between Cape Naturaliste and Cape Leeuwin and varies in width from 7 to 14 kilometres. Towards the coast it is dominated by rocky headlands, interspersed with sand or shingle beaches in the numerous bays, which in places grade into bouldery or rock-strewn sections. Cliffs of granite, gneiss and Tamala limestone rise to a peak elevation of 239 metres, occurring intermittently north of Augusta (Davies 1983).

Inland from the sandy beaches, the coastal belt comprises aeolian (wind blown) Pleistocene and Holocene dune systems. The dunes have encroached over the base rock and calcified within 2-3 kilometres of the coast (up to 6 kilometres in the Boranup area) to form a narrow coastal ridge, rising up to 200 metres above sea level (Davies 1983). The ridge, known as Leeuwin-Naturaliste Ridge, separates the coast from a gently undulating plateau that is between 5 and 15 kilometres wide to the east. It is discontinuous along its length and in some areas (i.e. north of Gracetown) becomes subdued and forms a flat, laterised plateau surface. The Ridge is traversed by short, steep valleys, which have eroded down to the base rock by lower order streams (e.g. Wilyabrup, Ellen and Turner brooks). The Margaret River is the only major river and valley system.

Sandy soils in coastal areas are susceptible to wind erosion if dune vegetation is removed. Soils east of the Ridge are usually duplex soils that are susceptible to water and wind erosion if disturbed.

Leeuwin-Naturaliste Ridge – karst system

The Leeuwin-Naturaliste Ridge karst system is of national and international significance, as it is the most extensive and thickest development of an aeolian limestone formation containing karst features in Australia. Several hundred karst features exist, including dolines, caves, solution pipes, root casts, and subterranean drainage channels.

Caves are some of the more conspicuous karst features of the planning area. There are more than 100 caves of various sizes, most of which are in good condition and all are irreplaceable features of the landscape. Typically they are low, wide, horizontal maze caves developed at the level of the watertable (e.g. Easter Cave and the Labyrinth system) or where water flow has been concentrated into subterranean water-courses just above the impermeable basement rock (e.g. Calgardup, Giants and Strongs caves). The highest concentration of caves occurs in the Boranup area, where there is a supply of water from swamps and small streams to the east. Caves on the seaward side of the Leeuwin-Naturaliste Ridge are limited although sea caves are prevalent along the coast in the Cape Naturaliste area.

Karst and caves of the planning area are valued for many reasons including:
- as habitat for threatened aquatic root mat communities of high conservation significance
- as refugia for species through periods of climatic change
- karst evolution in relatively young limestone. Most karsts in Australia are formed in much older limestone
- as sites containing rare landforms. Straw stalactites and helictites are particularly common in the area, including some of the longest known straw stalactites in the world
- a karst system that is still active and which demonstrates simultaneous erosional and depositional karst forming processes
- as important sites for the study of geology, geomorphology, palaeontology, archaeology and other disciplines
- as culturally important sites
- as 'windows' into understanding regional hydrology and climate change
- as purely recreational areas, both scenic and challenging
- for tourism and associated social and economic benefits (e.g. Giants and Calgardup caves).

Management of cave values require special protection from a number of threatening processes:
- agricultural and horticultural land use within cave catchments[4]
- mining
- land clearing
- development of plantations
- alterations to catchment hydrology, including dam construction and drainage
- residential development and road construction
- visitor pressure
    - erosion and compaction of cave sediments
    - surface impacts (e.g. erosion, siltation, vegetation change)
    - the breakage of speleothems (cave decorations)
    - alterations to the physical structure of the cave
    - damage to native animals and animal habitats
    - alterations to cave hydrology and water chemistry
    - changes to temperature, air movements and air quality
    - the introduction of foreign organic material and pollutants
    - unintentional transport of dirt on visitors' shoes and clothing.

Because the dune limestone is not well cemented, cave chambers, passages and entrances are characterised by collapse. Consequently, subsidence or collapsing ground may be an issue for visitor safety and proposed developments (see Section 33 *Visitor Safety*). Hazard maps exist to identify areas at risk although these need to be reviewed to reflect current knowledge.

Strategies for managing these issues are contained within the relevant sections of this management plan. A key component of management will be to gain more information on the ecological values of the caves and the influence of catchment hydrology, with a particular emphasis on the northern part of Leeuwin-Naturaliste National Park (e.g. around Injidup and Yallingup), where developments may impact on reserve values. Increasing community awareness regarding the importance of caves and karst terrain, and cross-boundary management with neighbours will also be important factors in cave conservation.

The department recognises the wealth of knowledge that exists outside the department in relation to karst management. It regularly receives advice from the Cave Management Advisory Committee on these matters and considers ongoing consultation with this committee and other karst management experts an important facet of management.

[4] The catchment boundary for the caves has not been precisely defined.

Scott Coastal Plain

The Scott Coastal Plain stretches 140 kilometres from the Hardy Inlet to the Darling Fault just west of Windy Harbour, extending about 15 kilometres inland and encompassing Scott National Park and Gingilup Swamps Nature Reserve. It is a low-lying, flat to gently undulating inland plain, characterised by extensive swamps that are poorly drained and seasonally inundated during winter (Semeniuk 1997, Diamond 2002), and created by the interruption of the coastal movement of run-off by the coastal dunes. Relief slopes imperceptibly to the west (Diamond 2002), varying from 0–50 metres above sea level in the south to 100–200 metres in the north and east where it adjoins the Blackwood Plateau (URS 2003). To the south-west of the plain, the Scott River is the only major river system, forming a broad shallow channel that flows into the Hardy Inlet.

Shallow sands and duplex soils of marine and alluvial origin predominate. In depressions, soils typically range from organic rich peat swamps to dark grey loamy sands, underlain by iron hardpan or a hard and massive sheet laterite layer (Tille and Lantzke 1990). Waterlogging is common and soils are generally acidic and of low fertility. In restricted areas there are small ironstone rises, which consist of raised knolls with laterite outcrops and bog iron ore soils that support threatened ecological communities. The high iron content of soils increases the risk of acid-sulfate soils if they are disturbed and exposed to air (see Section 18 *Soil and Catchment Protection*).

Blackwood Plateau

Occurring between the Leeuwin-Naturaliste Ridge and the Darling Plateau is a low, gently undulating plateau some 80-180 metres above sea level known as the Blackwood Plateau. The Plateau is located on a down-faulted block of laterite, sand and Mesozoic rocks of the Perth Basin. It has been intensely dissected in some areas, particularly by major river systems such as the Blackwood River, to form rolling hills, rises and well-developed terraces (up to 200 metres wide). In other areas drainage is less incised.

17. Geology, landform and soils

Key points

- The planning area is part of a complex and poorly understood karst system of national and international significance, the management of which requires specialist input and advice.
- Caves, which form part of the karst system, are irreplaceable features of the landscape, supporting fragile environments and containing TECs. They are also important for archaeology, palaeontology, conservation and recreation.
- Subsidence or collapsing ground is an issue for visitor safety and facility development.
- Coastal dunes are susceptible to wind erosion if vegetative cover is removed (see Section 18 *Soil and Catchment Protection*). Protection of soils against wind erosion and the risk of acid-sulfate soils are a particularly important consideration in this management plan.
- Geoheritage in the planning area has been recognised by listing at State level.

The objective is to protect and conserve the geology, landforms, soils and sites of known geoheritage.

This will be achieved by:

1. Evaluating development and resource exploitation proposals which have the potential to impact on geology, landform and geoheritage values and responding (e.g. approving, providing advice or submissions, referring to the EPA for assessment) if/as appropriate to protect conservation values.
2. Implementing strategies as per Section 31 *Visitor Activities and Use*, to address potential threats to geological and karst values.
3. Considering possible adverse impacts on cave features when undertaking surface management operations, such as fire management.
4. In consultation with the Cave Management Advisory Committee and other relevant experts, identifying caves and other karst features requiring protection and facilitating this as appropriate.
5. Protecting soils against erosion and the risk of acid-sulfate soils (see Section 18 *Soil and Catchment Protection*).
6. Revising and maintaining hazard maps to incorporate new information.
7. Continuing to manage geological features for visitor risk.
8. Protecting potential geoheritage by assessing sites before any proposed works, and preventing or minimising impacts arising from human activities.
9. Enforcing CALM Regulations regarding fossil protection as required.

10. Improving opportunities for increased visitor awareness and appreciation of karst, geoheritage and geological values.

18. SOIL AND CATCHMENT PROTECTION

Surface water hydrology

Two surface drainage basins, the Busselton and Blackwood basins, cover the planning area (Pen 1997) and typically flow towards the ocean (Map 3). The surface hydrology is characterised by short coastal rivers with highly fluctuating flow rates and water levels, and a large number of permanent or ephemeral water bodies, including lakes and wetlands.

Busselton Basin

The Busselton Basin covers an area of 2,560 square kilometres and consists of 26 short riverine systems that discharge directly to the ocean (Pen 1997) (Map 3). Seventeen of these minor watercourses drain the Leeuwin-Naturaliste Ridge between Cape Leeuwin and Cape Naturaliste. Most are considered to be in relatively good condition (Hunt *et al.* 2002) but some are negatively impacted by adjacent land uses and are showing signs of condition decline.

Typically these systems comprise ephemeral, fresh water streams of limited extent, and catchments that traverse areas of lateritic deposits are groundwater fed, particularly during the summer. South of Calgardup, Turner Brook is the only surface watercourse. Veryuica Brook is the only coastal stream that has complete uncleared riparian vegetation and, along with Yallingup Brook, remains the best example of a near pristine coastal creek between Cape Leeuwin and Cape Naturaliste (Pen 1997). The ecological and hydrological impact of farm and in-stream dams is unknown and this knowledge gap represents a concern for management agencies (the department and Department of Water).

The only permanent watercourse is Margaret River, a small river, about 60 kilometres in length with a catchment area of about 470 square kilometres (Cape to Cape Catchments Group 2003). It has its origins in and flows through the forested areas of the Blackwood Plateau and although its catchment has been greatly altered, especially in the middle to lower reaches, it is considered to be in good condition. Along with the Scott River, the Margaret River is the only coastal river in the high rainfall zone that flows through jarrah forest.

Blackwood Basin

The Blackwood Basin comprises the Blackwood River catchment, an elongated west-south-west trending catchment that extends some 300 kilometres inland from Augusta to just east of Kukerin and Nyabing, and covers an area of about 20,000 square kilometres.

The Blackwood River is the largest river, by volume, in the south-west. The average annual discharge of 740 gigalitres is strongly seasonal in nature, being winter dominated and maintained in summer by fresh groundwater seepage or baseflow. This baseflow occurs from groundwater discharge from shallow, superficial aquifers, as well as the deeper Leederville and Yarragadee formations (URS 2003, Baddock 1995, Gerritse 1996). Near the coast the river becomes partially tidal, with estuarine water migrating up to 42 kilometres upstream from the mouth (URS 2003).

Much of the Basin has been cleared for agriculture, especially in the upper catchment, leading to associated environmental impacts (e.g. habitat fragmentation, salinisation, erosion, and eutrophication). Excessive disturbance by humans has also been identified by ANCA (1996) as a potential threat, preventing use of the river by some fauna (e.g. black bittern). Catchment management of feeder tributaries to the Blackwood River, such as McLeod Creek and Chapman Brook, is required to protect rare frogs.

The Scott River is about 30 kilometres long and drains the majority of the Scott Coastal Plain into the Hardy Inlet at its confluence with the Blackwood River. It is a minor, essentially seasonal watercourse that dries into a series of disconnected riverine pools over summer (Seminiuk 1996). Bordered by floodplain, palusplain (seasonally waterlogged flats) and several tributaries, it provides a diversity of habitats for flora and fauna (Seminiuk 1996) and is particularly important for fish habitat (Pen 1997). Other seasonal watercourses in its catchment are poorly defined because of the low relief of the area. Surface flow of the Scott River was 96 gigalitres over the period 1975-2003 (DoW 2007b), and is maintained over summer by baseflow from groundwater (Diamond 2002). Numerous wetlands and occasional permanent lakes (such as Lake Jasper) occur

across the Scott Coastal plain. The clay-rich nature of much of the soil across the Plain also produces large amounts of standing water, providing a temporary seasonal habitat for fauna.

Land use on the Scott Coastal Plain is dominated by agriculture (mostly dairy cattle), with agroforestry and some horticulture. These uses are raising water quality and quantity concerns.

Estuaries

Two estuaries border the planning area. The Hardy Inlet is an intertidal area of about 9 square kilometres, extending about 5 kilometres from the entrance of the channel to the mouth of the Blackwood and Scott rivers. The ecological value of the inlet and adjoining national park is high, reflected in high waterbird usage (see Section 20 *Native Animals*) and significant fish populations (Pen 1997). The inlet is subject to eutrophication and sedimentation from surrounding watercourses because of land use changes.

The Margaret River estuary is about 20 hectares in size, and is connected to the ocean during winter via a 500 metre long channel. The estuary retains a good buffer of riparian vegetation and is considered to be in a relatively natural condition.

Wetlands

Several wetland systems are found within the planning area, mainly as sumplands and damplands of the low-lying Scott Coastal Plain but also occasional lakes (see also Section 21 *Ecological Communities*).

Wetlands of the Scott Coastal Plain have been identified by Pen (1997) as particularly significant, because of their large number and diversity. A number of permanent freshwater lakes, seasonal/intermittent ponds, marshes, swamps and floodplains can be found, varying in size from small (a few hectares) to large (several hundred hectares). The wetlands are maintained by surface flows from drainage lines, watertable rise, ponding/perching of water by near-surface ferricrete and by upward leakage from confined aquifers (Semeniuk 1997). Emergent vegetation is often waterlogged for some of the growing season and there are areas of seasonally flooded forest, woodland swamps and peatlands. In particular, seasonally inundated ironstone deposits support a range of endemic flora species and TECs (URS 2003, CALM 2003).

A large proportion of Scott National Park contains wetlands considered to be in a natural condition with little evidence of disturbance, as well as priority species and populations of declared rare flora. Elsewhere on the Scott Coastal Plain extensive land clearing has degraded many wetlands, such that all remnant wetlands in Scott National Park and Gingilup Swamps Nature Reserve have important representativeness value, particularly those in relatively pristine condition (Pen 1997).

There are a limited number of wetlands in Leeuwin-Naturaliste National Park being mainly small ponds, lakes, swamps or groundwater fed springs. Lake Davies, near Hamelin Bay, is recognised as being the most pristine wetland in the national park (Pen 1997). However, all wetlands in the park are considered important as much of surrounding area has been cleared and/or drained for agriculture. Part of the eastern edge of the Park, along with Forest Grove National Park and Reserve 46400, are within the proposed boundary of a candidate site for nomination under the Ramsar Convention on Wetlands (see Section 21 *Ecological Communities*).

Alteration to wetland water and geochemical regimes through clearing/intensive agriculture in the upper catchment, climate change impacts, drainage of waterlogged areas and discharge of drainage water into receiving waterbodies has already impacted many of these wetlands and has the potential to adversely impact upon others.

Dams

Ten Mile Brook Reservoir (see Map 3), which adjoins the planning area, was created to supply water to Margaret River, Prevelly, Gnarabup and Cowaramup. Three weirs were also constructed on the Margaret River and used to supply the townsite before the construction of the Reservoir. The weirs present barriers to the upstream migration of native fish (see Section 20 *Native Animals*).

A reduction in streamflow caused by the cumulative effect of farm dams on private property has the potential to impact upon biodiversity values of the planning area, particularly threatened frogs, cave invertebrates and other water dependant species. Recognising this, all surface water catchments along the Leeuwin-Naturaliste Ridge have been proclaimed under the *Rights In Water and Irrigation Act 1914* (RIWI Act) (see Section 44 *Water Resources*).

Groundwater hydrology

Groundwater of the planning area is integrally linked to ecological processes on the low-lying Scott Coastal Plain and lower reaches of the Blackwood River, and also cave systems and springs of the Leeuwin-Naturaliste Ridge.

Groundwater on the Scott Coastal Plain is generally shallow (Diamond 2002), varying seasonally within 1-2 metres of the surface (SCPSC 1999). It responds rapidly to high rainfall during winter, rising to its peak in September and reaching its lowest level in March/April. In winter, groundwater rise and rejected recharge commonly inundates surface areas, causing localised ponding and initiating runoff and redistribution of surface and subsurface water (SCPSC 1999). Downward leakage to or upward discharge from the underlying Leederville and Yarragadee aquifers may occur in some areas, although the degree of interconnectivity and its aerial extent are not fully understood. Recharge to groundwater in the superficial aquifer is through direct infiltration by rainfall or by upward leakage from these underlying aquifers. Where areas of clay-silt rich, low porosity and low permeability soils exist, perched groundwater can occur.

The interrelationship between surface and groundwater hydrology on the Scott Coastal Plain is closely linked to the ecosystems and species that occur there. It influences the hydrological regimes of wetlands, rivers and permanently wet tributaries which support many waterbirds, mammals, frogs and endemic fish species, some of which are of conservation significance. Plant species, including declared rare flora, flora associated with wet, moist or seasonally moist soils and Ironstone TECs may also be affected. Local and regional abstraction of groundwater has the potential to create drawdown on the Scott Coastal Plain, and hence impact upon these species and communities, is a particular concern.

Groundwater on the Leeuwin-Naturaliste Ridge is limited. Drainage of limestone karst along the Ridge is complex, with flows running under and across surface divides, and flows emerging in surface catchments different to the one from which they originated (English and Blyth 2000). As a result, the boundaries of karst systems are difficult to determine, although it is thought that cave streams form part of a westward flowing drainage system and are either of groundwater origin or, particularly in the case of temporary streams, a continuation of surface creeks that flow into the karst (English and Blyth 2000). More investigation into the origin, hydrology and geochemistry of groundwater flow is required to ensure that water quality and quantity of cave ecosystems is protected. Where catchments extend over different land tenures, an integrated approach to catchment management involving adjoining land managers is required. The involvement of neighbours to the planning area, the wider community and catchment and NRM groups assists this process.

Establishing baseline data on cave water quality, flow regimes, and water levels is important in understanding the ecological function and processes for cave systems. Baseline data is also essential for predicting any detrimental changes and possibly identifying probable causes, before ecosystem collapse or asset impacts. Information at the time of publication is limited but indicates a reduction in stream levels (English and Blyth 2000), possibly because of declining rainfall and/or changes in surrounding land use (e.g. to plantations and viticulture).

A number of springs and freshwater seepage's occur at the contact between the coastal limestone and the underlying, impermeable basement rock. These are extremely important from a biological viewpoint as they support rare and specialised biota, of which the distribution and degree of groundwater dependence is unknown (see Section 44 *Water Resources*).

Salinity

WA has the largest area of dryland salinity in Australia and the highest risk of increased salinity in the next 50 years. An estimated 4.3 million hectares (16 per cent) of the south-west (mostly agricultural land) has high potential of developing salinity, caused by land clearing and shallow watertables. This is predicted to rise to 8.8 million hectares (33 per cent) by 2050 (National Land and Water Resources Audit 2001).

The risk of salinity in the planning area is generally low, particularly in the Margaret River and minor brooks, creeks and streams along the Leeuwin-Naturaliste Ridge. The Blackwood Basin is categorised as having a high risk of increasing salinity, with 16 per cent of the catchment area having shallow saline watertables (particularly in the upper catchment), a figure set to increase to 45 per cent by 2050. The winter salinity of the Blackwood River itself has increased by about 700 per cent over the past 50 years, because of significant land use changes in the upper catchment. Extraction of groundwater from the Basin may also reduce the minimum summer flows (in the driest years) in the Blackwood River. Potentially, this could lead to an increase in salinity in the two driest

months, when the water quality is freshest. While there is a pronounced decline in salinity downstream of Nannup, the possibility for future increases is a particular concern for the department, especially in relation to the potential impacts on fringing vegetation to the main river system and the habitat it provides.

Approximately 78 per cent of the Gingilup-Lake Jasper Wetland system is also considered to have shallow watertables (Short and McConnell 2001). This, combined with low topography, has lead to the Scott River being identified in the Australian Dryland Salinity Assessment 2000 as an area at the highest risk from dryland salinity (National Land and Water Resources Audit 2001). At present however, the Scott River is relatively fresh, and given the lower salinity of groundwater and soils in the area, it is unlikely to be a short-term problem. Increases in acidity and the associated increase in concentrations of bioavailable metals of environmental significance are of more concern (see *Water Quality*). Observations of groundwater on the Leeuwin-Naturaliste Ridge indicate that salinity is increasing on shallow soils over granite.

Salinisation has significant affects on groundwater dependant ecosystems, TECs, wetland habitats, frogs, and aquatic invertebrates, as well as vegetation and fish species composition (see Section 20 *Native Animals*). Salinised lakes may also have an impact on waterbird breeding. The *State Salinity Strategy* (State Salinity Council 2000) recommends an integrated catchment-scale approach to biodiversity conservation across all land tenures, including seed collection, storage and databasing, protecting fauna from extinction through the retention and protection of remnant vegetation, protection of wetlands and initiating natural diversity and water resource recovery catchments. The Strategy also highlighted the need to change land use practices.

Knowledge of the effects of salinity, acidity, and nutrient and metal content in water on species and communities of the planning area is limited or lacking and requires more study.

Water quality

The *State Water Quality Management Strategy No.1* (Government of Western Australia 2003) gives guidance for the management of water quality within the planning area.

Nutrient enrichment in the Scott and Blackwood river catchments is a significant concern because of the potential for eutrophication of the Hardy Inlet and wetland areas of the Scott Coastal Plain, including Gingilup Swamps (Gerritse 1996, Pen 1997). Nutrient (ammonia, nitrogen and phosphorous) concentrations in the Scott River are particularly elevated, and occasionally produce blue-green algae blooms. Increases in acidity and the associated increase in concentrations of bioavailable metals of environmental significance are also of concern.

Some of the potential impacts of changes in water chemistry are:
- habitat degradation, particularly for fish and invertebrates
- alteration to the oxygen content of water resources within the catchment, leading to a significant threat to the unique floral complexity of the region
- the physical barrier posed to fish migration
- pH, metal and oxygen concentration changes, which can be deadly to sensitive plants and aquatic animals
- toxicity of algae to aquatic life. This can be caused by high ammonia levels, which are exceeded in most sub-catchments of the Scott River
- seagrass decline in the Hardy Inlet, because of elevated nutrient levels and sedimentation.

Increased sedimentation in the Scott River, Blackwood River and the Hardy Inlet are also of concern. This impacts conservation values by:
- covering natural riverbed and estuarine habitats
- changing hydrology and removing pools from the river system
- becoming a sink for pesticides used in horticulture, particularly clay sediment. In the mid-1980s, significant pesticide levels were found in the Scott and Blackwood Rivers (Pen 1997).

More monitoring to obtain a better indication of the distribution of biota and ecosystem health of the Scott-Blackwood-Hardy Inlet system is required. This will allow potential impacts to be assessed. The studies required include but are not limited to water quality, sediment distribution, fish, bird and shoreline vegetation surveys and invertebrate studies.

The surface water quality of the Leeuwin-Naturaliste Ridge is good, although a number of sub-catchments experience high nitrogen levels (Hunt *et al.* 2002). Monitoring of water quality along the Ridge will be a focus of management to establish baseline data for caves, wetlands and habitats of threatened species, and to allow triggers to be identified that will facilitate appropriate management responses.

Erosion

Once the soil surface is disturbed or vegetation removed, erosion is typically accelerated and this can be difficult to reverse. Preventing or minimising soil disturbance is therefore essential, and in the long-term could result in better conservation outcomes as well as a more efficient use of resources. To this end, strategies are incorporated into this plan to manage infrastructure construction, recreational use, commercial operations and fire. Rehabilitation is used as a short-term corrective measure (see Section 38 *Rehabilitation*).

Areas particularly susceptible to erosion include:

- sand dunes and dune blowouts
- coastal headlands and cliffs
- roads, tracks, paths located on steep slopes and shallow soils
- areas of concentrated public use
- banks of watercourses
- disturbed areas surrounding day use and camp sites
- recently burnt areas
- extraction/borrow pits.

Dune systems closest to the coast and exposed to prevailing winds are particularly sensitive, and mobile dune blowouts occur in several locations. The largest of these is situated at Boranup Sand Patch near Hamelin Bay (Davies 1983). While coastal erosion is a natural process and is desirable to maintain some dune areas, some blowouts have been exacerbated by human activity. Davies (1983) identified several areas requiring erosion control and proposed management recommendations for each area, including prioritisation. These have been progressively addressed with Coastcare and Landcare rehabilitation programs, which have been successful in stabilising many of these dune systems. This has been supported by strategic road closures and access management.

Further inland, erosion control off the department-managed estate is important in minimising downstream impacts (e.g. increased sediment flow) on the creeks, rivers, wetlands, and estuarine environments of the planning area. This is particularly important in the Scott and Blackwood river catchments where erosion control measures could prove to be one of the most important strategies for controlling the oxygen levels of water in the Hardy Inlet (Gerritse 1996).

Acid sulfate soils

Acid sulfate soil is the common name given to naturally occurring soils and sediment containing reactive sulphide minerals, predominantly pyrite (an iron sulphide). In an undisturbed (anoxic) state, acid sulfate soils are typically waterlogged or exist in highly anaerobic conditions, are benign and not acidic (WAPC 2003). Therefore, they often go unnoticed and cause no problems. When disturbed and exposed to air (or heavily oxygenated water), they oxidise and produce sulphuric acid, iron precipitates, and concentrations of dissolved heavy metals such as aluminium, iron, cadmium and arsenic (WAPC 2003). This produces highly acidic soils and water that can be toxic to many flora and fauna.

The disturbance of acid sulfate soils can cause significant harm to the environment, impacting on soil, water, biota and air in a process that can be difficult to reverse. In WA, these impacts may occur over long periods of time or peak seasonally, and include:

- soil acidification
- wetland degradation
- localised reduction in habitat and biodiversity, including fish kills and death of other aquatic life
- deterioration of surface and groundwater quality
- invasion by acid tolerant water plants and dominance of acid tolerant plankton species causing loss of biodiversity
- loss of visual amenity
- loss of groundwater for irrigation
- increased health risks associated with arsenic and heavy metal contamination in surface soil, water and acid dust
- long-term damage to infrastructure.

As it relates to the planning area, the main triggers of acid sulfate soils are considered to be groundwater abstraction, short-term dewatering and drainage, infrastructure projects that involve soil disturbance and mining. In some cases, where peat overlying an iron sulphide layer is removed or burnt away, the iron sulphide layer is

completely exposed to air, predisposing the soil to acidification (see Section 25 *Fire*). Consequently, the best strategy for managing acid sulfate soils is to avoid disturbing, compacting or displacing saturated soils at risk, or draining/lowering water in the iron sulphide layer (National Working Party on Acid Sulfate Soils 2000).

The Scott Coastal Plain has been identified as an area that contains acid sulfate soils, although they may also occur elsewhere in the planning area (URS 2003, WAPC 2003) particularly in modern relict wetlands. The risk and potential impacts of acid sulfate soils on the Scott Coastal Plain is considered to be low because it is not likely that vegetation will be cleared or the soil disturbed. However, to protect the key values of Scott National Park and Gingilup Swamps Nature Reserve the department will assess and take necessary actions, for any land use developments or practices that could potentially result in acid sulfate soils becoming a problem. Integrated catchment management involving neighbouring land-holders, local Landcare groups, NRM groups, Department of Water (DoW), local government authorities and the department will be important in this respect.

Sulfate-enriched groundwater at the Beenup mine site on the Scott Coastal Plain is a particular concern as it has the potential to discharge into Scott River and impact on the values of Scott National Park (see Section 37 *Mineral and Petroleum Exploration and Development*). DoW will be limiting licensing and any new groundwater abstractions in this area and have identified the need for more investigation, monitoring and management.

Where a proposed operation in the planning area or surrounding catchment may have a significant effect on the environment, through acid sulfate soil-related impacts, this should be referred to the EPA for assessment. More guidance for the management of acid sulfate soils is provided by DoW's *General Guidelines on Managing Acid Sulfate Soils* (DoE 2003).

18. Soil and catchment protection

Key points

- Understanding and conserving surface and groundwater hydrology of the planning area is critical to the maintenance of ecosystem function, and the flora and fauna that it supports. Cave invertebrate fauna, microbial communities, wetland and ironstone vegetation communities, threatened snail and frog populations, many species of waterbird and endemic fish depend on such hydrological systems.
- Intensive land use changes within the region and competing water use means that an integrated approach to catchment management is required, regardless of tenure, to protect hydrological systems and the biota that depend on them. Collaborating with adjoining land-holders as well as catchment and NRM groups will assist in this process.
- Major river systems are the Margaret, Blackwood and Scott rivers, but numerous other ecologically significant fluvial features exist. Wetland systems of the low-lying Scott Coastal Plain are particularly significant, being rich in wetland area and type, and important for their pristine condition and representativeness. These areas are at risk of acidity, metal toxicity and threatened by water extraction. Nutrient enrichment also has the potential to cause negative impacts.
- Erosion hazards are greatest in disturbed coastal dunes.
- Although the risk and potential impacts of acid sulfate soils on the Scott Coastal Plain is low because it is unlikely that vegetation will be cleared or the soil disturbed, the department will need to assess any land use developments or activities that could potentially impact on the key values of Scott National Park and Gingilup Swamps Nature Reserve
- Knowledge of hydrological processes, especially for cave and spring ecosystems, is limited.

The objective is to protect and conserve the soils and quality and quantity of water within the planning area, particularly in wetland, cave, lake, spring and river/stream systems and ironstone vegetation communities.

This will be achieved by:

1. Assessing the potential effects of department operations and other activities on water quality and quantity, and identifying and implementing strategies to prevent or mitigate adverse impacts.
2. Liaising with relevant authorities (e.g. DoW), adjacent land-holders, catchment groups and NRM groups regarding water and acid sulfate soils. Providing advice and direction as necessary to ensure values of the planning area are protected (e.g. with regard to nutrient loads, acidity and bioavailable metal concentration in the Scott and Blackwood Rivers).
3. Formalising an agreement or process to ensure the department is adequately consulted by other agencies and authorities during the early stages of adjacent land-use planning.

4. Managing, as far as possible, to avoid human disturbance and rehabilitating disturbed areas.
5. Considering the potential for acid sulfate soils in operations and planning (e.g. fire) and avoid disturbing, compacting or displacing saturated soils at risk.
6. Opposing activities that will lower the watertable on the Scott Coastal Plain, causing acid sulfate soils to be exposed.
7. Educating visitors to minimise activities that cause erosion.
8. Referring, through statutory planning processes, proposals that may impact on conservation values of the planning area (e.g. land clearing, extractive industries).
9. Investigating freshwater springs and wetlands for the presence of short-range endemic species, threatened species and TECs.
10. Determining, if possible, the extent of cave and spring catchments, as well monitoring water quality and quantity over time.
11. Undertaking or encouraging others to undertake research into the hydrology and environmental water requirements of the planning area and adapt management accordingly.

Key performance indicators (see also Appendix 1):

Performance measure	Target	Reporting requirement
18.1 Alterations in karst hydrology and the quantity and quality of water in selected caves, wetlands springs and creeks	18.1 Maintenance or increase in water quality and quantity in selected caves, wetlands, springs and creeks	Every 5 years, subject to information provided by DoW
18.2 The extent to which groundwater catchments of cave systems has been defined and spring and wetland areas have been investigated for their biological values	18.2 Identification of groundwater catchments of cave systems, and investigations of spring and wetland areas for their biological values	
18.3 Changes in the area of erosion (particularly coastal erosion)	18.3 Reduction from 2010 levels in the area of erosion occurring as a result of human activities	

19. NATIVE PLANTS AND VEGETATION COMMUNITIES

At a State level, the department has statutory responsibility under the Wildlife Conservation Act for flora conservation, and all flora native to WA is protected under this Act. Threatened flora is also protected under this Act (see *Declared Rare Flora* below).

The Commonwealth's EPBC Act provides a listing of nationally threatened flora species. While threatened species legislation is broadly similar across jurisdictions, there are differing approaches to species listing, and therefore inconsistencies exist between the State and National threatened species lists. The Australian Government and the department are working in partnership to align threatened species listed under the EPBC Act with flora listed under the Wildlife Conservation Act.

Native plants

The south-west corner of WA is internationally recognised as one of the world's 34 biodiversity hot spots, for its exceptionally rich plant diversity and high endemism, and the degree to which these values are under threat. The Busselton to Augusta area is listed as one of Australia's 15 national biodiversity hot spots.

The flora of the planning area contributes significantly to this international and national recognition, containing more than 1,390 described species[5] of vascular plants representing 118 families. The largest families include Papilionaceae (peas) followed by Orchidaceae (orchids), Asteraceae (daisies), Poaceae (grasses), Cyperaceae (sedges) and Myrtaceae (eucalypts and paperbarks). The flora species of the planning area include 25 per cent of all species known from the Warren and Jarrah Forest bioregions, many of which are geographically restricted to this zone.

Non-vascular flora such as mosses and liverworts and other biota such as algae, fungi and lichen have not been well studied within the State. In total, about 500 species of larger fungi have been recorded, mostly from the

[5]Species list derived from Lyons *et al*. (2000) and records of the WA Herbarium.

south-west (Hilton 1982, 1988), although this is estimated to be a low proportion of the fungi taxa present. The south-west also appears to have the greatest diversity and abundance of moss species, although endemism to WA is low (Stoneburner and Wyatt 1996).

Range end flora

The planning area is noted for the occurrence of flora species at (or near) the limit of their distribution. Lyons *et al*. (2000) identified the eastern edge of the Leeuwin-Naturaliste Ridge as the most westerly distribution of many taxa recorded from forest blocks (e.g. *Conospermum caeruleum* ssp. *spathulatum* and *Leucopogon cymbiformis*).

Yelverton National Park, which is in a transitional zone between three bioregions, contains the western limits of *Calothamnus pallidiflorus*, *Pultenaea drummondii* and *P. pinifolia* as well as the southernmost populations of sandy soil species such as *Lepyrodia heleocharoides*, *Phlebocarya filifolia*, *Persoonia saccata* and *Thysanotus glaucus*. The latter are the only significant stands recorded in a conservation reserve (Keighery 1990). The nearby Hagg Nature Reserve is thought to contain the most northern population of the Albany pitcher plant (*Cephalotus follicularis)*, the population here being disjunct from occurrences on the Scott River. The rarely recorded semi-aquatic herb *Centolepis fasicularis*, is the only perennial species of this genus in WA, and is found at its northern limit in the seeps edging creeks in Bramley National Park.

Along the coast, Cape Naturaliste is a natural end point for many flora species of the Swan Coastal Plain and is the northward extension of south coast species such as pineapple-leaved dasypogon (*Dasypogon hookeri*). Unusual leaf-forms of parrot bush (*Dryandra sessilis*) are also known to occur here, the leaf-form principally due to adaptations to prevailing winds. The area between Moses and Sugarloaf rocks has been identified as an important transitional zone on the Leeuwin-Naturaliste coast (G. Keighery *pers. comm.*).

The Scott Coastal Plain, and particularly Scott National Park, is noted as the western limit for many south coast plant species (Marchant and Keighery 1979, Lyons *et al*. 2000), such as *Anigozanthos viridis* and *Hodgsoniola junciformis*. In addition, species with restricted distributions are also known to occur within the vicinity of Scott National Park (Marchant and Keighery 1979). Some species, such as *Hypocalymma sp. nov.* aff. *cordifolium* and *Aotus carinata*, are centred in this area and do not occur in other conservation reserves.

Species richness

The Warren bioregion is important as a centre of diversity for herbaceous perennial species and for the conservation of high rainfall flora (Hopper *et. al*. 1992, Lyons *et. al*. 2000, Hearn *et al*. 2003b). Several areas of high flora species richness[6] have been identified in the planning area, most notably Scott, Leeuwin-Naturaliste and Yelverton national parks.

Gibson *et al*. (2001) noted that the number of flora species in Scott National Park was comparable with areas considered to be high in floral diversity, such as Lesueur National Park (821 species). The diversity of flora in Scott National Park is primarily due its complex system of wetlands, which are highly variable and change rapidly across the landscape, because of subtle topographical differences and the influence of ephemeral hydrology. The result is an array of diverse habitats, numerous vegetation types and subtypes and a high number of species. In addition, the swamps of Scott National Park and Gingilup Swamps Nature Reserve are floristically distinct from those of the eastern Scott Coastal Plain and from the extensive swamps east of Point D'Entrecasteaux (Gibson *et al*. 2001).

Gingilup Swamps Nature Reserve has a similar complexity of vegetation types (a mosaic of wetlands on the flats and *Agonis*-eucalypt woodlands on the uplands) to Scott National Park and could be expected to contain a similar number of species (Robinson and Keighery 1997). The flora may be even richer than is initially apparent as research in this area has focused on low-lying wetlands and has not taken into account the potentially diverse upland vegetation, including *Banksia* woodlands. More research of these areas is warranted to ascertain their significance. Water extraction is a major threat to seasonally inundated vegetation in this area.
Yelverton, Bramley and Forest Grove national parks also have high species richness, with about 520 taxa recorded in Yelverton National Park.

Declared rare flora

The Wildlife Conservation Act provides for the special protection for species of native flora that are likely to become extinct, are rare or otherwise in need of special protection. The Environment Minister declares these

[6] Species richness is the number of species per square kilometre and was based on predictive modelling undertaken for the Comprehensive Regional Assessment.

species as 'declared rare' by notice in the Government Gazette. A permit from the Environment Minister is required before such flora can be 'taken' (includes to gather, pick, pluck, cut, pull up, destroy, dig up, remove or injure flora, or to cause or permit the same to be done by any means).

Twelve species of declared rare flora occur in the planning area (see Table 2).

Table 2. Declared rare flora of the planning area

Common name	Scientific name	Conservation code
Scott River boronia	*Boronia exilis*	R
No common name	*Caladenia excelsa*	R
King Spider orchid	*Caladenia huegelii*	R
Dunsborough spider orchid	*Caladenia viridescens*	R
Ironstone darwinia	*Darwinia ferricola*	R
No common name	*Dryandra nivea* subsp. *uliginosa*	R
No common name	*Grevillea brachystylis* subsp. *australis*	R
Swan hydatella	*Hydatella dioica*	R
Augusta kennedia	*Kennedia macrophylla*	R
Diel's currant bush	*Leptomeria dielsiana*	X
Vasse featherflower	*Verticordia plumosa* var. *vassensis*	R
Naturaliste nancy	*Wurmbea calcicola*	R

* See *Glossary* for definitions of the conservation codes: R (Declared Rare Flora - Extant Taxa), X (Declared Rare Flora - Presumed Extinct Taxa).

Declared rare flora of the planning area are all located in Leeuwin-Naturaliste National Park with the exception of Scott River boronia and *Dryandra nivea* subsp. *uliginosa*, which are found in Scott National Park. Interim recovery plans exist for Scott River boronia and the Dunsborough spider orchid. Declared rare flora also exist outside the planning area on adjoining lands (e.g. road verges and reserves), which also have conservation value.

Priority flora

In addition to declared rare flora, the department also refers to priority flora. These are taxa that may be rare or threatened but for which there is insufficient survey data available to accurately determine their true status. Although priority flora are not gazetted and do not have the same level of legislative protection as declared rare flora, the priority flora list is maintained as a mechanism to highlight flora of special conservation interest and to encourage appropriate management. Taxa are grouped from Priority 1 to Priority 4 (see *Glossary* for explanation, no flora are listed as Priority 5) according to the perceived urgency for further survey. Management direction for priority flora is provided by advice from the department's Species and Communities Branch, and specialised staff in the Region.

There are 35 priority flora species in the planning area. Of particular significance to the planning area are *Philydrella pygmaea* subsp. *minima* and *Melaleuca incana* subsp. *Gingilup*. The only known population of the latter is contained within Gingilup Swamps Nature Reserve (Gibson *et al*. 2001). The northern and eastern parts of this reserve also support large populations of other priority flora – *Tyrbastes glaucescens*, *Melaleuca basicephala* and *Jansonia formosa*.

The highest concentration of declared rare and priority flora species occurs in Scott and Yelverton national parks.

Endemic, disjunct and relictual flora

The Warren bioregion contains a high number of endemic species as well as a high percentage of disjunct and relictual flora. Approximately 4 per cent (72 species) of the flora are endemic to the Warren bioregion, and a further 66 species have distributions extending just beyond its boundary (Lyons *et al*. 2000). Many endemic species occur in swampy habitats or small-scale mesic sites such as granite outcrops and seepage areas (Hopper *et al*. 1992, Lyons *et al*. 2000), with a lesser number occurring in the tall eucalypt forests. The Leeuwin Naturalist Ridge and Scott Coastal Plain are noted as geographical locations containing high numbers of endemic taxa within the Warren bioregion (Lyons *et al*. 2000). On the Leeuwin Naturalist Ridge, endemic species are most likely to occur in the high rainfall areas or in the vicinity of Cape Leeuwin, Cape Naturaliste or Boranup Forest.

Narrow or 'locally endemic'[7] taxa are the most vulnerable to change (climate, hydrological or disease) or catastrophic events such as bushfire. Hearn *et al*. (2003a) identified the Blackwood Plateau as one of three areas in the southern jarrah forest that is a centre for locally endemic taxa. Keighery et al. (2007) also identified Yelverton, Bramley and Forest Grove national parks as rich in species locally endemic to the Busselton-Augusta area.

Concentrations of disjunct[8] taxa occur on the Scott Coastal Plain in Scott National Park and Gingilup Swamps Nature Reserve. A notable feature of the Scott Coastal Plain is the number of species occurring disjunctly here and then on the southern Swan Coastal Plain (Robinson and Keighery 1997).

Climatic gradients along the Leeuwin-Naturaliste Ridge have resulted in numerous disjunct and geographically significant flora populations in Yelverton, Bramley and Forest Grove national parks (Keighery *et al.* 2007). The vegetated creeklines and associated seeps in Bramley National Park for example, contain a variety of geographically significant populations and should be protected from disturbance or alteration. Poole Swamp in Yelverton National Park is of exceedingly high conservation value with many disjunct populations of species that are characteristic of swamps in the Warren bioregion.

Gondwanan relictual species are associated with former ecosystems that have disappeared or retracted to small pockets. In the south-west, there seems to be an association of relictual flora with moist sites such as wetland areas, rivers and the base of granite outcrops (Hearn *et al.* 2003b). The Scott Coastal Plain is highlighted as a centre of relictual flora species.

Vegetation communities

Vegetation communities of the planning area comprise a mosaic of coastal heath, shrubland, woodlands, forest and wetland vegetation types. The variety and distribution of flora coincides with changes in environmental conditions, principally because of variations in climate, topography, soil type, the length of the summer drought and exposure to prevailing winds.

The Leeuwin-Naturaliste coast is characterised by low, windswept closed heath and in more sheltered areas and coastal sands, peppermint (*Agonis flexuosa*) associations. As exposure to prevailing winds and salt spray decreases, heath and shrubland give way to taller forests, peppermint or banksia low open forest and jarrah, banksia or peppermint woodlands. Pockets of tall open forest dominated by karri are scattered throughout the Leeuwin-Naturaliste Ridge, although mostly on more fertile loams toward the higher rainfall south. These populations are disjunct outliers, separated from the main 'karri belt' further east. The largest stands of karri occur in Boranup Forest and are supported by limestone soils in contrast to much of the 'karri belt', where they occur on soils of granite or gneiss origin. The population of karri at Boranup is separated by more than 10 kilometres from the most northern occurrence of karri at Cape Clairault and those of the lower Blackwood River. These populations are biogeographically significant as they define the transition zone between bioregions. Most karri occurs with marri, jarrah and peppermint, grading to jarrah on the fringes and more lateritic soils.

Yelverton, Bramley and Forest Grove national parks and Reserve 46400 comprise laterite and sandy soils and the majority of jarrah/marri forest associations that make up the planning area. They contain many rare and restricted habitats and represent invaluable remnants of vegetation that were once present in the area but are now predominantly cleared, fragmented and/or degraded. Differences in soils, and to a lesser degree rainfall, along a north-south gradient mean that vegetation varies between each park, making each reserve important for conservation. There is also a significant difference in species composition compared to reserves on the Scott Coastal Plain, with these reserves sharing only 51 per cent of their flora. Yelverton National Park contains a particularly diverse range of vegetation types but is the most fragmented and isolated of the parks, being the only substantial inland block of uncleared land between Cowaramup and Geographe Bay. Cape Naturaliste is the only location where jarrah forest reaches the coast.

A rich mosaic of wetland and dune vegetation associations, combined with areas of forest and woodland that vary from pockets to broad zones, dominate the Scott Coastal Plain. Scott National Park is especially important for preserving woodland typical of the area. Wetland, sedgeland and closed heath associations become more extensive towards Gingilup Swamps Nature Reserve.

[7] Locally endemic species have a range of less than 100 km. Not only are endemic species restricted spatially, but many also have restricted habitat requirements.

[8] Disjunct species are those with distinctly separate populations as a result of physical, geological or biological isolation. Populations may be separated by more than 150 km, because of climate or soils, such as for the ironstone species, or due to the occurrence of specific habitats such as granite outcrops, lake or permanent wetlands.

Significant vegetation complexes

Vegetation for most of the south-west was mapped for the RFA at the forest ecosystem, ecological vegetation system and vegetation complex levels. Vegetation complexes are the "finest" scale of classification and provide the basis for reserve planning. Mattiske and Havel (1998) identified 312 vegetation complexes within the RFA boundary. Of the 48 vegetation complexes within the planning area, 32 are considered to be adequately reserved using the current criteria (greater than 15 per cent of pre-European extent in proposed and existing formal and informal reserves). The remaining 16 vegetation complexes are considered poorly represented on the conservation estate and are significant to this management plan (see Appendix 5). Four vegetation complexes – Gracetown Karst (Gk), Kilcarnup (KB), Kilcarnup (KEf) and Wilyabrup (Wew) only occur within the planning area. Scott National Park is noted for its unusual diversity of vegetation complexes.

As significant vegetation complexes of the planning area are not well studied, more focused collection, especially with respect to fire, is required. Ground truthing, and perhaps a finer scale investigation of the vegetation, may be required for more focused site planning.

Vegetation corridors

Corridors of remnant vegetation that connect areas of the conservation estate are important ecological linkages for the natural movement of wildlife, especially in providing a means of species dispersal to cope with climate change. Several important vegetation corridors have been identified in the planning area:

- Boranup Forest to Blackwood River National Park. This is the main vegetated corridor linking the Leeuwin-Naturaliste coast to the jarrah-marri forest of the Blackwood Plateau.
- Cape Naturaliste to Cape Leeuwin, linking coastal vegetation in a north-south direction.
- Bramley National Park to Cape Mentelle along the Margaret River.
- Vegetation linkages along the Scott River connecting Scott National Park and Gingilup Swamps Nature Reserve.
- Other riverine corridors throughout the planning area.

Strategically important environmental corridors are also recognised in the LNRSPP. Maintaining the integrity of these areas will be given the highest priority in land use decisions.

Management of native plants and vegetation communities

Actual and potential flora management issues identified in this plan include:

- competition with environmental weeds (see Section 22 *Environmental Weeds*)
- inappropriate fire regimes (see Section 25 *Fire*)
- water abstraction (see Section 44 *Water Resources*)
- acid sulfate soils, coastal erosion and adjoining and intensifying land use (see Sections 18 *Soil and Catchment Protection* and 38 *Rehabilitation*)
- climate change (see Section 16 *Climate*)
- recreational pressure, especially along the Leeuwin-Naturaliste coastline (see Section 31 *Visitor Activities and Use*)
- rubbish dumping and rehabilitation of gravel pits (see Section 38 *Rehabilitation*)
- cross-boundary management and off-reserve conservation (see Section 15 *Biogeography*).

These issues are addressed throughout this plan.

19. Native plants and vegetation communities

Key points

- The planning area contains declared rare flora as well as many endemic, relictual and disjunct species. It is also the range limit for many species, including the northern limit for many south coast plant species and the southern limit for several species of the Swan Coastal Plain. Cape Naturaliste is the only place where jarrah forest meets the coast.
- Scott National Park is particularly noted for its high species richness and its concentration of priority flora and under-represented vegetation types. The Scott Coastal Plain in general is a centre for relictual and disjunct species, and along with the Leeuwin Naturalist Ridge, is noted as a geographical location containing high numbers of endemic taxa.
- Populations of karri are important in that they are separated from the main 'karri belt', at their range end and unusual because they occur on limestone.

- Vegetation corridors connecting the conservation estate are important for the natural movement of wildlife and for ecological function.
- Management of exotic species, disease and fire are particularly important in protecting species and communities of the planning area.

The objective is to identify, protect and conserve native plants and vegetation communities.

This will be achieved by:

1. Listing rare flora under the Wildlife Conservation Act and/or EPBC Act.
2. Managing native plants and vegetation communities according to departmental policy.
3. Developing and implementing recovery plans for declared rare flora.
4. Assessing proposed operations for the occurrence of, and potential impacts on, declared rare and priority flora.
5. Identifying native plants and vegetation communities that may require special protection, and implement appropriate strategies to minimise impacts from threatening processes such as climate change, environmental weeds, introduced and other problem animals, disease, inappropriate fire regimes, recreation and rural-residential development.
6. Determining a list of indicator species that would enable the measurement of change caused by threatening processes.
7. Protecting poorly represented vegetation complexes from disturbances that may be detrimental to natural values.
8. Protecting the integrity of vegetation corridors in the planning area by ensuring that any developments are in keeping with the preservation of their ecological function.
9. Managing fire to conserve flora diversity (see Section 25 *Fire*).
10. Liaising with neighbouring land-holders to promote compatible management on adjoining lands.
11. Providing opportunities for visitors to gain an awareness, understanding and appreciation about the importance of native plants and vegetation communities and the impacts of threatening processes.
12. Supporting programs to extend vegetation and flora surveys, particularly in transitional zones, the upland vegetation of Gingilup Swamps Nature Reserve and selected vegetation types in Leeuwin-Naturaliste National Park that are threatened by development pressures.
13. Researching and monitoring, or encouraging the research of, native plants and vegetation communities, their ecology, biology and processes that might affect them (such as susceptibility to disease, response to fire) and adapting management accordingly.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
19.1 The persistence and condition of populations of threatened species	19.1 No loss or decline as a result of management actions	Every 5 years, or as per recovery plans if applicable

20. NATIVE ANIMALS

Generally, vertebrate faunal diversity of the south-west is impoverished when compared to eastern Australia (Commonwealth and Western Australian Regional Forest Agreement Steering Committee 1998). This is attributed to a relatively uniform forested environment, lacking the deeply incised and varied landscapes found in the east. In this instance, the distribution of vertebrate fauna is significantly influenced by north-south temperature and rainfall gradients (Christensen *et al*. 1985). However, on a smaller scale (e.g. for particular reserves or habitats within them) the diversity of fauna can be greater. At this level, the distribution of species is influenced primarily by vegetation/soil factors and landform systems.

The distribution, diversity and abundance of vertebrate fauna in the planning area have declined since European settlement (How *et al*. 1987). Several extinctions have occurred, mostly of critical weight range mammals and of birds that favour long unburnt coastal heath vegetation. However, the planning area still has a high value for fauna conservation because of the variety of landforms and habitats, corridors for migration and high rainfall (CALM, 1992). In particular, the Leeuwin-Naturaliste Ridge is noted as a centre for relictual fauna and as a contemporary refuge for fauna (Commonwealth and WA Regional Forest Agreement Steering Committee 1998). Similarly, Scott National Park is a repository for communities of fauna and habitats that reflect changing climatic conditions. It is also noted as providing a unique habitat for mammals and a breeding ground for water-fowl and other birds.

The planning area functions as a mixing place for species at the marine and terrestrial interface, and is valuable for species at the limits of their geographical range and species with narrow habitat parameters. This includes several endemic fish as well as rare frogs, snails, freshwater burrowing crayfish and relictual underground fauna. Some fauna species exist only in the planning area.

Management strategies addressing the causes of habitat loss or degradation (e.g. environmental weeds, inappropriate fire regimes, disease, inappropriate recreation activities and alterations to hydrology) or direct species decline (e.g. predation and competition with introduced and other problem animals) are detailed throughout this plan as relevant.

The level of knowledge about many native animals in the planning area, particularly the distribution, ecology and conservation status of invertebrates, is incomplete and few comprehensive surveys have been undertaken across the whole of the planning area.

Native animals of conservation significance

Threatened and other specially protected fauna

The Commonwealth's EPBC Act provides a listing of nationally threatened fauna species. Threatened fauna are also listed at an international level in the *IUCN Red List of Threatened Species* (IUCN 2009).

At a State level, the department has statutory responsibility under the Wildlife Conservation Act for fauna conservation, and all native fauna in WA is protected under this Act. The Act provides for the Minister to declare fauna species as 'rare or likely to become extinct' (commonly referred to as threatened) or as 'other specially protected fauna'.

Within the planning area there are 36 species of specially protected fauna (Appendix 6). Eighteen of these are listed as threatened (Table 3) and three, the New Zealand fur-seal (*Arctocephalus forsteri*), peregrine falcon (*Falco peregrinus*) and carpet python (*Morelia spilota imbricata*), are listed as specially protected because while not threatened, they may be poached due to their high commercial value or because they are uncommon. The peregrine falcon is also listed under an international agreement[9].

Table 3. Threatened fauna

Common name	Scientific name
Cape Leeuwin freshwater snail	*Austroassiminea letha*
Forest red-tailed black cockatoo**	*Calyptorhynchus banksii naso*
Baudin's cockatoo**	*Calyptorhynchus baudinii*
Carnaby's black cockatoo**	*Calyptorhynchus latirostris*
Margaret River marron**	*Cherax tenuimanus*
Chuditch, Western quoll**	*Dasyurus geoffroii*
Dunsborough burrowing crayfish**	*Engaewa reducta*
Western mud minnow	*Galaxiella munda*
White-bellied frog**	*Geocrinia alba*
Malleefowl*	*Leipoa ocellata*
Southern giant petrel**	*Macronectes giganteus*
Balston's Pygmy Perch**	*Nannatherina balstoni*
Brush-tail phascogale, wambenger	*Phascogale tapoatafa*
Western ringtail possum**	*Pseudocheirus occidentalis*
Quokka**	*Setonix brachyurus*
Shy albatross**	*Thalassarche cauta*
Atlantic yellow-nosed albatross	*Thalassarche chlororhynchos*
Black-browed albatross**	*Thalassarche melanophrys*

* Species may occur but has not been recorded since 1948. Malleefowl were not uncommon in coastal scrub between Cape Naturaliste and Cape Leeuwin but by 1920 had diminished because of the burning of coastal vegetation (How *et al*. 1987).

** Nationally threatened fauna species listed under the Commonwealth's EPBC Act.

[9] Populations of the peregrine falcon are now higher in Australia than elsewhere in the world, however it is considered endangered on a global scale and is also protected under the international CITES treaty, to which Australia is a signatory. Peregrine falcons are easily disturbed so access to cliffs where the birds nest should be restricted to the public during the breeding season.

Priority fauna

In addition to threatened and other specially protected fauna, the department also maintains a list of priority taxa (see *Glossar*y for explanation). At the time of publication there are 15 priority fauna species within the planning area (see Appendix 6).

Although also found elsewhere outside the planning area, three priority species have been identified by Hearn *et al*. (2003b) as at particular risk – scorpionfly (*Austromerope poultoni*) a Priority 2 species, barking owl (*Ninox connivens subsp. connivens*) a Priority 2 species and black bittern (*Ixobrychus flavicollis*) a Priority 3 species.

Recovery and action plans

The department, often in collaboration with other State and Commonwealth agencies, prepares State recovery plans for the most threatened species. Recovery plans have been prepared for chuditch, Baudin's cockatoo, Carnaby's black cockatoo, forest red-tailed black cockatoo and white-bellied frog. Interim recovery plans exist for Western ringtail possum, quokka and Dunsborough burrowing crayfish.

Commonwealth Recovery Plans are prepared/ to conserve species at the national scale. National Action Plans also exist for several species.

Possible fauna reintroductions

The planning area is thought to have once supported four of the State's rarest birds – the noisy scrub bird (*Atrichornis clamosus*), western whipbird (*Psophodes nigrogularis*) rufous bristle-bird (*Dasyornis broadbenti*) and western ground parrot (*Pezeporus wallicus flaviventrus*). These species are poorly mobile, have low inherent rates of population increase and are habitat specialists, factors that may have contributed to their decline (Yates *et al*. 2003). Despite their disappearance, there is some potential for translocation of the noisy scrub-bird to Gingilup Swamps Nature Reserve.

The bilby (*Macrotis lagotis*) was recorded in Leeuwin-Naturaliste National Park in 1963 but has not been recorded since, and is now considered locally extinct (Abbott 2001a). Anecdotal evidence suggests that Gilbert's potoroo (*Potorous gilbertii*) once occurred, as it is known from fossil evidence. Surveys for the species have not determined its presence. The woylie (*Bettongia penicillata ogilbyi*) was once abundant in the Yallingup-Margaret River area but has not been recorded for more than 50 years (How *et al*. 1987).

Re-introductions or translocations of any species within the planning area will be dependent on the viability of habitat and the level to which threatening processes can be controlled (e.g. fox predation). Reserve size and fragmentation, connections to other conservation reserves and the ability to implement baiting programs limits the potential for translocations, particularly within Leeuwin-Naturaliste National Park. Reserve consolidation and acquisition can enhance reserve design and hence the viability of habitat. These factors should be investigated with a view to rebuilding species diversity.

Mammals

There are 22 native mammals known in the planning area[10], the diversity of which is low compared to other areas such as the semi-arid zone (Abbott 1998). Bat fauna is rich with seven species known to occur. The planning area contains fossil and sub-fossil mammalian fauna, including megafauna and species that are now extinct or no longer inhabit the area. These fossils provide a valuable insight into species composition and abundance before European settlement.

The marked decline in mammalian fauna since European settlement can be attributed to clearing (especially fragmentation of reserves), changed fire regimes, exotic diseases and the introduction of exotic species (How *et al*. 1987). These factors will continue to threaten many species of mammals and birds (How *et al*. 1987).

Most mammal populations in the planning area are small and isolated, and nearly all occur in low densities (How *et al*. 1987). Many of the mammal species that have declined and contracted in range are within a 'critical weight range' (mean adult body weight between 35 grams and 5.5 kilograms), which renders them particularly susceptible to predation by foxes. Populations persist in refugial habitats that may not be the most favourable to them, but are less favourable to predators or other means of decline (Caughley 1994). Typically these habitats include densely vegetated thickets in river, stream and wetland systems. The Leeuwin-Naturaliste Ridge is now a

[10] Species list derived from How *et al*. (1987), Christensen (1985), WA Museum database and *Western Shield* monitoring. This does not include marine mammals such as the New Zealand fur seal, which occupy the intertidal zone.

contemporary refuge for these species, although the diversity and abundance of species is limited to the north where habitat availability is restricted. Critical weight-range mammals of the planning area include four threatened species – Western ringtail possum, chuditch, quokka and brush-tailed phascogale.

The decline in abundance and distribution of the brushtail possum (*Trichosurus vulpecula*) and the Western ringtail possum in near-coastal localities is a particular concern (How *et al.*1987). Research has shown that the numbers of species, although fluctuating, is considerably reduced and some range contraction is still occurring.

The chuditch was once abundant along the coast at Margaret River and was assumed to be plentiful (How *et al.* 1987) although it has only been recorded occasionally in Leeuwin-Naturaliste and Bramley national parks in recent times. The majority of the remaining chuditch populations are in jarrah forests of the south-west, where it has survived while becoming extinct throughout most of its former range. It is now patchily distributed and occurs at low densities. Competition and predation by foxes and feral cats is the primary threat to the species. A recovery plan for the species is in place.

Quokka have not been recorded in the planning area since 1933 although they are thought to persist in densely vegetated areas. More research is required to establish population size, extent of emigration and immigration and the range of habitat types.

The department seeks to recover critical weight range mammals by controlling predators such as foxes and feral cats through the *Western Shield* Program (see Section 23 *Introduced and Other Problem Animals*). This program provides statutory and adaptive management that assists in maintaining and/or increasing native mammal populations.

Marine mammals, such as the New Zealand fur-seal, utilise the rocky bay and beach at Cape Naturaliste as a haul out area. While relatively difficult to access, walkers are known to access haul out areas from the Bunker Bay recreation site. To protect the seals from disturbance, this walk track will be permanently closed and appropriate signage erected.

Birds

More than 139 bird species have been recorded in the planning area, which has been described as a mixing place for birds which have penetrated the forest from the north via the cleared coastal plain, and from the south coast. Generally, the greatest abundance of bird fauna occurs in the open woodland and low open woodlands. Shrublands, heath and sedgelands, appear to be important for honeyeaters, fairy wrens and many diurnal birds of prey. The high open forest environments contain fewer species but the number of individual birds is generally greater, especially in the karri forest. These areas are strongholds of many parrot and cockatoo species, including several endemics. Endemism however, is generally low across the planning area (A. Burbidge *pers. comm.*).

A number of birds in the planning area occur in isolated or disjunct populations from those in similar habitats in eastern Australia, such as the white-naped honeyeater (*Melithreptus lunatus*), spotted pardalote (*Pardalotus punctatus*) and scarlet robin (*Petroica multicolor*) (Christensen 1992). Along the coast and inlets, migratory species protected under international agreements (JAMBA, CAMBA and ROKAMBA) visit the planning area (see Section 7 *Legislative Framework*).

Changes in bird communities as a result of habitat modification are well known. Since the arrival of Europeans, bird populations have undergone substantial changes because of the opening of forest areas for agriculture and viticulture. This has allowed for the expansion in range of many species including the galah (*Cacatua roseicapilla*), eastern long-billed corella (*Cacatua tenuirostris*) and Australian magpie-lark (*Grallina cyanoleuca*). The population and abundance of some species in the planning area has expanded[11] while many others have declined because of reduced habitat (Christensen *et al.*1985, Christensen 1992).

Seabirds

Since the late 19th century there have been major changes in seabird breeding distribution in the tropical to temperate transition zone between the Abrolhos Islands and the Leeuwin-Naturaliste capes. At least eight species have formed new breeding locations well to the south of their historical range and/or have seen marked

[11] Includes Australian shelduck (*Tadorna tadornoides*), black-shouldered kite (*Elanos caeraleus*), Australian kestrel (*Falco cenchroides*), purple swamphen (*Porphyrio porphyrio*), black-faced cuckoo-shrike (*Coracina novaehollandiae*), yellow-rumped thornbill (*Acanthiza chrysorrhoa*), rufous whistler (*Pachycephala rufiuentris*), silvereye (*Zosterops lateralis*) and Australian raven (*Corvus coronoides*).

population increases at their more southerly colonies (Hughes 2003). Population changes have occurred in species such as bridled tern (*Sterna anaethetus*), crested tern (*Sterna bergii*) and the red-tailed tropic bird (*Phaeton rubicauda*), all recorded along coastal sections of the planning area. The latter was first recorded as nesting on Sugarloaf Rock in 1966 and although the population is generally declining, it is one of the most southerly breeding sites for the species in the world. Human disturbance and introduced predators (foxes, cats and domesticated dogs) have prevented the birds from breeding on the mainland. The long-term viability of these populations is difficult to ascertain given their distribution and lack of a reliable food source, but efforts should be made to conserve potential habitats.

The hooded plover (*Thinornis rubricollis*), a Priority 4 species, is a shorebird or wader found almost entirely in the south of the State, including several beaches within Leeuwin-Naturaliste National Park. Nests of the hooded plover are located at ground level and mature birds rely on the tidal zone for feeding during the nesting period. In Leeuwin-Naturaliste National Park, major threats to hooded plovers are from walkers, vehicles and dogs on beaches and predation by foxes and feral cats (Raines 2002).

Vehicles have been identified as a primary threat to hooded plovers, and beach access for vehicles in Leeuwin-Naturaliste National Park is limited to Boranup Beach (north of Reserve Road) and the northern section of Deepdene beach (see Appendix 10). Vehicle access to foredune areas is not permitted. Walkers access many beaches although dogs and horses are not permitted (see sections 31.8 *Horse-riding* and 34 *Domestic Animals*). Baiting to control fox predation of hooded plovers is limited to Boranup Forest because of impracticalities in baiting other areas (see Section 23 *Introduced and Other Problem Animals*).

The department is undertaking research on a number of coastal bird species, including the hooded plover, to find or confirm any active breeding sites, review actions in species management plans, quantify threats, replace, renew and install signage and to raise community awareness.

Waterbirds

The Hardy Inlet, which adjoins the planning area, is an important summer refuge and breeding habitat for waterbirds, particularly black swans (*Cygnus atratus*) and cormorants (*Phalacrocorax varius*). Several northern hemisphere and New Zealand migratory species also occur.

Fringing vegetation in Leeuwin-Naturaliste and Scott national parks provides important roosting habitat for these species. Further east, Gingilup Swamps Nature Reserve is noted for its vast areas of rushland and shrub thickets (especially *Taxandria floribunda*), which are habitat for little bittern (*Ixobrychus minutus*) and one of the few known breeding habitats of the Australasian bittern (*Botaurus poiciloptilus*). On the Leeuwin-Naturaliste Ridge, coastal wetlands such as Quinninup Brook Pools and Devil's Pool support numerous waterbirds. Lake Davies, near Hamelin Bay, is a breeding habitat for three species, one of which, the hoary-headed grebe (*Poliocephalus poliocephalus*), has not been found breeding in wetlands along the south coast (Jaensch 1992a).

Threats to waterfowl of the Hardy Inlet include disturbance to birds during the breeding or moulting seasons (e.g. from recreational use), frequent and excessive burning of *Taxandria floribunda* thickets, groundwater abstraction and agricultural land use within the catchment.

Reptiles

Reptiles are poorly represented in the south-west of WA, possibly because of the prolonged winter, consistently low temperatures and high rainfall. Species are distinct from the arid zone and temperate south-east Australia (How *et al*.1987), although many reptiles with wide distributions in arid Australia extend well into the south-west. Chapman and Dell (1985) noted that there is a hiatus line between Perth and Albany, where only 35 of the 109 species found to the north of this line extended into the extreme south-west. Agamid lizards 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 reptiles and frogs.

For terrestrial snakes and lizards there is a marked division between the Busselton and Margaret River area, and also a difference between these areas and those further south (How *et al*. 1987). This suggests a zoogeographic boundary in the area between Margaret River and Augusta, which is supported by a northward range termination of species such as chain-striped skink (*Ctenotus catenifer*) and *Sphenomorphus australis* and the southern range termination of species such as sandplain worm lizard (*Aprasia repens*), Burton's legless lizard (*Lialis burtonis*), odd-striped ctenotus (*Ctenotus impar*), South western orange-tailed slider (*Lerista* distinguenda) and common dwarf skink (*Menetia greyii*). Some coastal species near Margaret River and Augusta are apparently absent from

the wetter south coast regions but appear further east. Also, several west coast species only extend south to the Leeuwin-Naturaliste Ridge. The greatest diversity of reptiles appears to be towards Cape Naturaliste (How *et al*. 1987).

Coastal dunes, flats, swamps and areas of open vegetation support the greatest number of reptile species. By comparison, few are found in the karri forests (Christensen *et al*. 1985, Christensen 1992).

Amphibians

WA contains 14 of the 26 genera of native Australian frogs and (in terms of species) more than one third of the total fauna of the continent (Tyler *et al*. 1984). The State is particularly rich in burrowing species, which includes 15 of the 25 species in the south-west. There is also a high degree of endemism with no less than 39 species confined to WA.

Eleven species of frog have been recorded within the planning area, all being endemic to the south-west of the State. Habitats favoured by frogs are permanent and fresh, including shallow swampy margins and substantial areas of sedgeland and shrubland/forest.

The white-bellied frog is listed as critically endangered under the Wildlife Conservation Act, endangered under the EPBC Act and is in the Australian and New Zealand Environment and Conservation Council (ANZECC) *List of Endangered Vertebrate Fauna* as 'endangered', although its status is expected to change to critically endangered. It is also listed in Schedule 1 of the *Commonwealth Endangered Species Protection Act 1992*. The species is of particular significance to the planning area as it is locally restricted to the region, occupying a range of only 193 hectares in 1995.

There has been a contraction in range of the species from the north and from the south, leaving a central core around Forest Grove National Park, Reserve 46400 and McLeod Creek. This decline is attributed to agricultural clearing outside the planning area, especially riparian zones, which have reduced the probable original range of this species by at least 70 per cent. Current habitat for the white-bellied frog forms part of a proposed nomination under the Ramsar Convention on Wetlands.

Management of the white-bellied frog has focused on determining the extent of occurrence, protecting creeklines from inappropriate fire and fencing of habitat. Future management will include strategies to protect their habitat against threatening processes such as:

- Feral pigs, which congregate in riparian zones. The species is particularly vulnerable to the impacts of feral pigs because of its extremely localised distribution.
- Extensive and frequent fires, particularly because of their unusual breeding biology.
- Changes in water quality caused by herbicide, pesticide and fertiliser use on adjoining lands and increased salinity and turbidity in waterways.
- Altered surface or sub-surface water flow by removal or changes in vegetation cover in the subcatchment, upstream dams may lead to habitat desiccation or flooding.
- Unnecessary access and recreation. The habitat of these species should be taken into account for all proposed and existing roads and trails (see sections 30 *Visitor Access* and 31.8 *Horse-riding*).

Refuges of the white-bellied frog are vulnerable to climate change and their long-term survival is not assured as temperatures increase and regional climates are affected (see Section 16 *Climate*). Pouliquen-Young and Newman (1999) predicted that the species would disappear completely at a temperature increase of just 0.5 degrees Celsius.

Many of the common frog species in the planning area appear to be tolerant of changes in their natural environment (Christensen *et al*. 1985). However, Jaensch (1993) identified the protection of wetlands and improvement of water quality as major management issues to preserve the suite of frog species present.

Fish

The native freshwater fish of south-western Australia is depauperate (containing only 14 species), highly endemic and lacks many families that are found elsewhere in the world. The region contains the highest percentage of endemic species in Australia, with 10 of the 14 species endemic to the south-west (Department of Fisheries 2002). Seven endemic species are found in the Scott River and two as disjunct populations in the Margaret River (Trayler *et al*. 1996). Elsewhere along the Leeuwin-Naturaliste Ridge, fish species are largely

confined to Devil's Pool, where Jaensch (1992) recorded three species. Freshwater cobbler (*Tandanus bostocki*) is the only endemic species targeted by recreational anglers.

Four fish species in the planning area are on the list of threatened Australian fish compiled by the Australian Society of Fish Biology. These include:

- Western mud minnow (*Galaxiella munda*) (also identified as a vulnerable species)
- Balston's pygmy perch (also identified as a vulnerable species)
- black-striped minnow (*Galaxiella nigrostriata*) (also identified as a Priority 3 species)
- salamanderfish (*Lepidogalaxias salamandroides*).

These species are restricted to the region between Margaret River and Albany and are represented by small populations in specific habitats (Morgan *et al*. 1988), most commonly in the highest rainfall areas. Within the planning area, most of these species are confined to seasonal wetlands on the Scott Coastal Plain. The salamanderfish and black-stripe minnow are almost entirely restricted to ephemeral pools of the southern peat flats, while Balston's pygmy perch, which is also found in these areas, is occasionally found in lakes and rivers.

Western mud minnow is most abundant in the headwaters of streams of major rivers, in peat flats and adjacent forested areas (Morgan *et al*. 1988). Except for Balston's pygmy perch, these species require habitat with a minimum period of inundation each year, and for successful breeding require periods of inundation beyond a particular threshold in at least some years (URS 2003). Maintaining pools and river systems along the Scott River is important to protect these species.

The pouched lamprey (*Geotria australis*), recorded in the Margaret River, is the only fish that is known to migrate in the area, seeking the upper reaches of river systems to breed. This species appears to be in decline, possibly because of the influence of dams and gauging stations, which act as barriers to the upstream migration of adults to their spawning areas. A rock ramp fishway (a series of step pools) was constructed to assist fish to climb over the two-metre rise from the riverbed over the Margaret River Weir. The fishway appears to be working. Pouched lamprey also occur in Rosa Brook and Milyeannup Brook, which connect to the Blackwood River, and anecdotal evidence suggests that it also occurs in the Scott River. While this is possible, there are no records (e.g. WA Museum, Murdoch University) to confirm its occurrence in this area.

The Hardy Inlet functions as a nursery for a number of estuarine fish species. The distribution of the Swan River goby (*Pseudogobius olorum*) and Swan River hardyhead (*Leptatherina wallacei*) has increased substantially because of unnaturally elevated salinities and can be found large distances inland.

Habitat alteration, water abstraction and the introduction of exotic species pose the main threats to fish fauna of the planning area. Water salinity and quality is also important in determining estuary and tributary fish composition (URS 2003).

Invertebrates

Knowledge of invertebrate fauna in the planning area is limited, although there has been some collection and surveying of butterflies.

One butterfly, the heath ochre (*Trapezites* sp. aff. *atkinsi*), is narrowly restricted to the Leeuwin-Naturaliste Ridge, where it breeds on prickle lily (*Acanthocarpus preissii*), which is its larval food source. The plant (and thus the butterfly) is restricted to areas of limestone substrate immediately adjacent to the coast between Bunker Bay and Knobby Head, and is susceptible to coastal development and wind erosion. Another south-west endemic butterfly, the varied haistreak (*Jalmenus inous*), is restricted to coastal areas between Wanneroo and Cape Naturaliste, and near Esperance. It has also been recorded at Moses Rock, which is significant in that it is the southernmost occurrence of the west coast population.

The Cape Leeuwin freshwater snail (*Austroassiminea letha*) is a specially protected species regarded as a Gondwanan relict, and one of only three terrestrial species of its type in WA (Solem *et al.* 1982). It has been collected from several locations along the Leeuwin-Naturaliste coast and is relatively abundant at each site, which often comprises only a few square metres. Typically the species occurs in seepage areas, splash zones by small freshwater streams or rock fissures, where there is moisture throughout the year. Solem *et al.* (1982) recommended a ban on chemical applications on the few hectares immediately involved in the seepage drainage at Turner Brook although the affect on the snails is unknown. A monitoring program to ascertain the status of populations and any possible detrimental effects is being undertaken by the department.

Several geographically restricted crustacean species are found, or are likely to occur in the planning area, including three endemic species of burrowing freshwater crayfish from the *Engaewa* genus – *E. similes*, Dunsborough burrowing crayfish (*E. Reducta*) and Margaret River burrowing crayfish (*E. Pseudoreducta*). These species have well-defined, narrow and largely non-overlapping geographical ranges, confined to areas with year-round cool and wet conditions (Horwitz and Adams 2000). The habitat of *E. reducta* is fragmented and threatened by hydrological change because of damming of watercourses. Haag Nature Reserve is considered to be the stronghold of *E. reducta*, which is poorly represented in the reserve system. Other locally restricted species such as *Totgammarus eximius* and *Cherax glabrimanus* may also occur.

The Margaret River marron or hairy marron (*Cherax cainii*) is predominantly restricted to the upper reaches of the Margaret River (outside the planning area) and is listed as critically endangered under the Wildlife Conservation Act and EPBC Act. Populations of hairy marron are declining and being rapidly displaced by smooth marron (*Cherax tenuimanu*, commonly referred to as marron), which do not occur naturally in the Margaret River and were accidentally introduced to the catchment, probably during the 1980s. Urgent conservation measures are being carried out to protect remaining populations, including possible translocations to the planning area. The department is working with the Department of Fisheries (DoF) to develop and implement an interim recovery plan for the species, with DoF as the lead agency. This program will confirm the status, distribution and management requirements of the species.

Populations of smooth marron are also decreasing across their range, possibly because of declining water quality (caused by salinisation), loss of habitat and overfishing. This is particularly noticeable in the middle and lower part of the Blackwood River.

20. Native animals

Key points

- Mammals, frogs and fish within the planning area show high levels of endemism, with many endemic to the south-west of WA.
- There are 10 species of specially protected fauna known to occur in the planning area, seven are threatened. Another 13 species are listed on the department's priority list. Several taxa are subject to international agreements.
- There is a possibility of reintroducing threatened fauna into the planning area.
- Knowledge of invertebrate species in the area is limited.

The objective is to protect and conserve native animals and their habitats.

This will be achieved by:

1. Providing statutory protection for species by listing them under the Wildlife Conservation Act and/or EPBC Act, subject to the satisfaction of criteria for listing.
2. Managing native animals and habitats according to departmental policies.
3. Protecting fauna and fauna habitats from threatening processes, such as adverse changes to water quality and quantity, the spread of weeds and disease, pest and problem animals, bushfire and human disturbance. Priority should be given to protecting threatened species.
4. Supporting department programs that develop recovery plans for specially protected species and implement these accordingly.
5. Continuing to control feral species (particularly foxes and pigs) through appropriate control regimes. *Western Shield* will continue to be the primary framework to control foxes.
6. Considering the requirements of fauna species within the planning area and, applying fire to maintain or promote biodiversity (see Section 25 *Fire*).
7. Considering the reintroduction of fauna to areas where they are known to have formerly occurred and once threatening processes have been ameliorated. Surveys of prospective areas for the translocation of threatened birds will be undertaken.
8. Monitoring and protecting seal haul out areas from disturbance. This includes closure of the unauthorised walktrail around the coast from Bunker Bay to Cape Naturaliste.
9. Continuing research into coastal fauna species, including the hooded plover.
10. Where disturbances may impact upon hooded plovers, monitoring and protecting (i.e. through fencing of nesting areas) sites during the breeding season. Dogs and horses will not be permitted on beaches (see sections 31.8 *Horse riding* and 34 *Domestic Animals*).
11. Providing opportunities for visitors to increase their knowledge and appreciation of native fauna.
12. supporting and encouraging more research and surveys to increase knowledge of fauna, particularly:

- invertebrates of the karri forest
- the Cape Leeuwin freshwater snail
- fire management with respect to frogs (e.g. white-bellied frog) and wet area habitats
- broad-scale surveys of Scott National Park and Gingilup Swamps Nature Reserve.

Key performance indicators (see also Appendix 1):

Performance measure	Target	Reporting requirement
20.1 Range and population size of critical weight range mammals	20.1 Subject to natural variation, recovery and maintenance of viable populations of critical weight range mammals	As per recovery plans for individual species or in their absence, annually
20.2 Range and number of populations of selected locally endemic fauna species (white-bellied frog and Cape Leeuwin freshwater snail)	20.2 The range and number of populations of selected locally endemic fauna species is maintained or increased, subject to natural variation	

21. ECOLOGICAL COMMUNITIES

An 'ecological community' is a naturally occurring biological assemblage of plants and animals that occur in a particular type of habitat. All ecological communities serve an important ecological function and are intrinsically significant. However, ecological communities that are particularly vulnerable include those with the following characteristics:

- a community that is restricted in extent
- habitats or ecosystems that contain sensitive species
- communities that are threatened (see *Threatened Ecological Communities* below)
- communities that are species-rich or contain aggregations of endemic, disjunct or relictual flora species.

The planning area contains a range of terrestrial ecological communities which support a diverse fauna and flora. Knowledge of some communities is limited although many are fragile and sensitive to disturbance.

Threatened ecological communities

The Commonwealth EPBC Act provides for the legislative protection of threatened[12] ecological communities (TECs) listed under this Act. Under current State legislation, TECs are not afforded special protection (unlike individual flora and fauna), although this is proposed to change if and when the proposed Biodiversity Conservation Act is enacted.

At the time of writing, there are six TECs within the planning area:

- Four different aquatic root mat communities[13] in caves of the Leeuwin-Naturaliste Ridge
- Rimstone pools and cave structures formed by microbial activity on marine shorelines, commonly known as 'Augusta microbial' communities[14]
- Scott River ironstone association.

One community, reedia swamps, may also occur in the planning area although more research is required to confirm its presence.

The department's Nature Conservation Division carries out conservation of TECs through the preparation of recovery plans. At present there is an interim recovery plan for the aquatic root mat communities in caves of the Leeuwin-Naturaliste Ridge and for the reedia swamps.

Possible TECs that do not meet the survey criteria for assessment of TECs are added to the department's priority ecological community list (as Priorities 1, 2 or 3). These three categories are ranked in order of priority for

[12] TECs comprise of four categories: (1) critically endangered, (2) endangered (3) vulnerable or (4) presumed destroyed (in WA only).
[13] Aquatic root mat communities are listed as endangered under the EPBC Act, and endorsed by the Minister for the Environment as critically endangered in WA.
[14] Augusta microbial and Scott River ironstone association communities have been endorsed by the Minister for the Environment as endangered in WA.

survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as TECs.

One priority ecological community, Rottnest Island tea-tree *(Melaleuca lanceolata*, Priority 2) forests and woodlands, occurs in isolated patches along the Leeuwin-Naturaliste coast to its southern extent at Hamelin Bay. Hearn *et al*. (2003b) identified this community as an ecosystem at risk, as all known occurrences are small, and under threat from changed fire regimes, increasing fragmentation, loss of remnants and lack of recruitment. The community has also been favoured as a site for car parks, camping and picnic areas because of their shade value and open understorey (e.g. Bunker Bay and Kilcarnup). Their use for camping, plus the frequency with which they are bisected by roads or tracks, has resulted in a high proportion (about 30 per cent) being heavily disturbed with consequent invasion of exotic species, lack of regeneration and in some instances erosion of soil (Smith 2006). As a precautionary approach, the community should be protected from further disturbance wherever practicable and consideration given to protecting the most intact and larger occurrences from fire.

Another Priority 2 ecological community within the planning area is the low shrublands on acidic grey-brown sands of the Gracetown soil-landscape system. The combination of species within this community appears to be substantially different from other plant communities identified on the Leeuwin-Naturaliste Ridge. It also appears to have a higher proportion of herbaceous and graminoid species than the heathland on granite gneiss downslope and is floristically distinct from the banksia woodland upslope and the tall shrublands on limestone sands that occur nearby (Smith 2005). The community is threatened by trampling from visitors along the Cape to Cape Track, track marking and possibly *P. cinnamomi*.

The *Calothamnus* heath priority ecological community, which is a variant of the granite heath communities, may occur in the planning area although more research is required to confirm its presence.

Aquatic root mat communities

Aquatic root mat communities in the planning area are among some of the richest faunal communities known from groundwater in caves anywhere in the world, unusual for their high species diversity and abundance (English and Blyth 2000). The communities exist in dense root mats formed when tree roots penetrate limestone caves to reach permanent streams. A total of 37 fauna species have been located in the four caves that contain root mat communities, at least half of which are newly discovered (excluding nematodes and rotifers for which the individual species have not yet been identified). At least three amphipods and the syncarid crustaceans that occur in the communities are Gondwanan relicts. Each of these caves contains a distinct community as the species composition and abundance differs significantly. Some of the species appear to be endemic to these cave streams, and some are confined to a single cave.

Aquatic root mat communities require permanent water to survive and the recent drying of some caves along the Leeuwin-Naturaliste Ridge is a concern. English and Blyth (2000) attribute this drying to a reduction in rainfall, and possibly abstraction of water for human uses or increased uptake by plantation trees. Additional impacts may arise as a result of altered water quality, degradation and pollution within the catchment, inappropriate fire on land above the caves and human misuse. Canker disease that causes the death of plants whose roots penetrate the caves is also a concern. Monitoring of root mat communities is required, especially for species composition, physical habitat condition, extent of the root mats and the water level and quality. More taxonomic research is required to determine the presence and significance of aquatic and invertebrate species in other cave systems. This will enable caves of particular importance for invertebrate conservation to be identified and protected.

Augusta microbial community

Microbial communities are stromatolitic, rock-like structures built by micro-organisms. They are narrow endemic communities occurring at the interface of fresh and salt water in coastal limestone of the Leeuwin-Naturaliste Ridge. Although little is known about these communities, they are known to be dependent on fresh water, most likely from springs along the ridge. Consequently, any change in drainage or flow may affect them. In particular, death of microbial communities may result from a loss of fresh water supply. They may also be prone to human disturbance by foot traffic (e.g. at Quarry Bay), and require special protection.

Scott River ironstone association

The Scott River ironstone association comprises distinct shrubland communities that are located upon skeletal soils developed over the massive ironstone of the Scott Coastal Plain. These shrublands are seasonally inundated with fresh water. Some taxa, primarily the characteristic herb layer, rely on inundation in the wetter months. All occurrences, except the long inundated wetlands and dense thickets, have diverse annual flora. The Scott River

ironstone association also contains a number of endemic taxa and taxa that are listed as declared rare or priority flora, and are either restricted or largely restricted to it (Gibson *et al*. 2000). The only other ironstone communities in the south-west occur near Gingin and Busselton (Gibson *et al*. 2000).

Many of the taxa are obligate seeders and hence fire sensitive (see Section 25 *Fire*). Some flora species are susceptible to dieback caused by *Phytophthora* species (see Section 24 *Disease*), which occurs throughout Scott National Park. The management of exotic species, surface and groundwater hydrology and access will continue to be critical for the management of this community.

Significant habitats

Some habitats, such as old-growth forest, wetlands and granite outcrops, are ecological communities that are significant for the diversity of flora and fauna they contain.

Old growth forest

Small, isolated portions of old-growth forest occur in the planning area. Forest Grove National Park comprises 310 hectares of old-growth forest, representing about 22 per cent of the park. Mature forest is necessary to protect the full range of biodiversity values and sustain viable populations of fauna, especially species such as the brushtail possum and a variety of 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 introduced honeybee (*Apis mellifera*) and laughing kookaburra (*Dacelo novaeguineae*), increases the importance of old-growth forest. Disturbance in these areas has the potential to limit the availability of tree hollows.

Wetlands meeting criteria for listing under the Ramsar Convention on Wetlands

The department is considering the nomination of tributaries of the lower Blackwood River for listing under the Ramsar Convention on Wetlands (see Section 7 *Legislative Framework*). The candidate area for nomination (Figure 4) contains permanent and seasonal creeks associated with narrow floodplains that feed into the Blackwood River.

The small creeks are maintained by localised groundwater flow from the Leederville aquifer and, unlike most streams that drain the jarrah forest of the Blackwood Plateau, these freshwater tributaries flow throughout the year and the narrow floodplains remain waterlogged in the dry months. They provide critical habitat for highly adapted plants and animals that are restricted to the area such as the white-bellied frog, orange-bellied frog (*Geocrinia vittelina*) and Reedia Swamps Priority 1 ecological community. Only the white-bellied frog has been found within the planning area (see Section 20 *Native Animals*).

The tributaries of the lower Blackwood River meet the following criteria for listing under the Ramsar Convention on Wetlands:

1. It contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
2. It supports vulnerable, endangered, or critically endangered species or TECs.
3. It supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
4. It supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
5. It regularly supports 1 per cent of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.

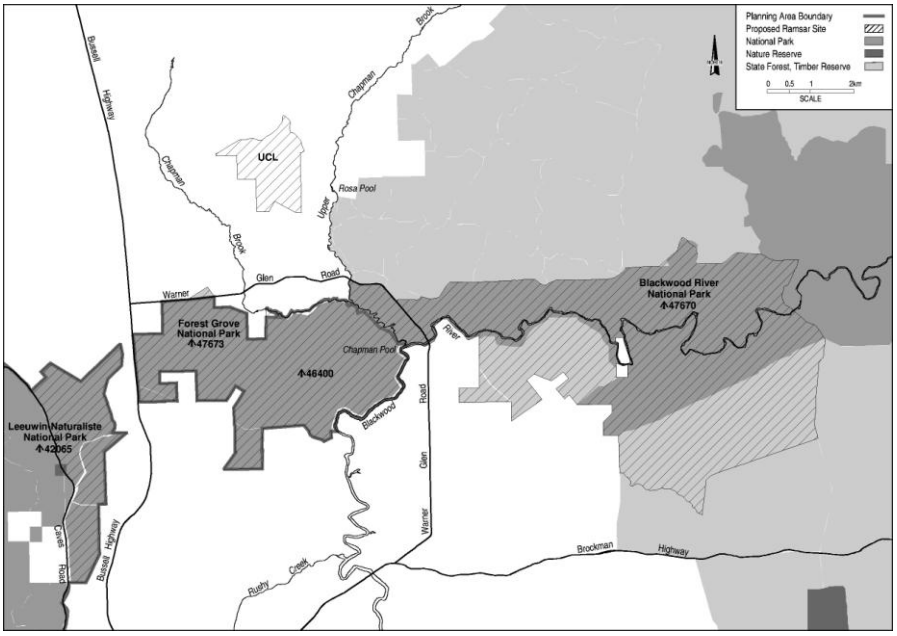


Figure 4. Boundary of candidate site for nomination under the Ramsar Convention on Wetlands

The proposed Ramsar area is located entirely within the conservation estate although there are significant areas adjacent to the current boundaries that provide important wetland values. There is the opportunity for these areas to be incorporated into the candidate area for nomination.

Nationally important wetlands

States and Territories may list wetlands as 'nationally important' in the *Directory of Important Wetlands in Australia*. Three nationally important wetlands – the Gingilup-Jasper wetland system, Cape Leeuwin system and the lower Blackwood River and its tributaries, are located within the planning area (ANCA 1996) (Map 3). The Gingilup wetland system and Scott River have also been identified as wetlands of subregional significance for the maintenance of ecological processes at a subregional scale and because they contain rare or threatened species/ecosystems (Hearn *et al*. 2003b).

The Gingilup-Jasper wetland system (1,600 hectares) lies within Gingilup Swamps Nature Reserve and D'Entrecasteaux National Park[15]. It is considered to be an outstanding example of extensive, freshwater lakes, marshes and shrub swamps on the coastal plain between the Scott and Donnelly rivers. The wetlands within this system include Lake Jasper and associated swamps as well as lakes Wilson, Smith and Quitup and the 500 hectares Gingilup Swamps, which is located in the planning area. The wetland system is considered to be a 'biological reservoir' for freshwater fish, including many endemics, and has important sanctuary value. It is also unique in supporting extensive areas of *Taxandria floribunda* thickets. The system is known to support a number of declared rare and priority plant species and eight wetland frog species.

The Gingilup-Jasper wetland system is largely buffered from influences that commonly degrade water quality and hence much of the wetland, except for those areas fringing adjoining farmland, is of near pristine condition (Pen 1997). Nutrient enrichment, exotic fish species and mining activities are a concern for management (ANCA 1996). Other threats include the disease caused by *Phytophthora* species, feral animals (e.g. rabbits and pigs) and environmental weeds (e.g. pasture grasses).

The Cape Leeuwin system (20 hectares) is located near Quarry Bay in Leeuwin-Naturaliste National Park. It is an elongated swamp on the valley floor that is fed by a series of fresh groundwater seepages and springs to the north. This permanent swamp system of closed sedgeland and shrubland provides habitat for the largest known population of the rare aquatic mollusc, the Cape Leeuwin freshwater snail (*Austroassiminea letha*). This species is only found at five other sites in small, isolated, freshwater seepages along the coast. It has specific habitat requirements, requiring a near permanently moist environment. Water abstraction from the spring may have already caused some drying of the swamp and in 1994 caused the destruction of some swamp habitat and part of the snail population (see Section 44 *Water Resources*). There is also evidence that suggests vegetation at the

[15] A management plan is in place for Shannon and D'Entrecasteaux national parks.

spring has changed gradually, and introduced species such as *Typha orientalis* have become more prevalent (Ninox Wildlife Consulting 1994). Further reduction in spring flow and complete drying of the swamp as well as the loss of detrital habitat through increased flow rates should be avoided.

The lower reaches of the Blackwood River and its tributaries (including Chapman Brook and McLeod Creek) are recognised as a good demonstration of a south-west river, providing excellent examples of relatively unspoiled creeks (ANCA 1996). The river system is known to support a number of rare frogs, secretive waterbirds and a variety of fish species (Pen 1997). The system is also identified as meeting five Ramsar criteria for listing as a wetland of international importance (see above). Salinisation is a threat to the system from the upper Blackwood River catchment while inappropriate fire regimes, on-stream dams, vegetation clearance, exotic plants and feral pigs may reduce the viability of frog populations in the creeks.

Other wetlands

Several small, permanent and well-defined wetlands exist along the length of Leeuwin-Naturaliste National Park (e.g. Lake Davies, Boodjidup-Devils Pool, and Quinninup Falls). These are variously dominated by rushes, mainly *Juncus* species, and are surrounded by belts of low open forest comprising *Melaleuca* and *Agonis* species. These wetlands support highly disjunct taxa, usually found further south and in eastern Australia, and a diversity of invertebrates. Intensive land use changes and water extraction are the greatest threats to these areas.

Yelverton National Park contains intact and diverse wetlands, which are surface expressions of the surficial aquifer. These wetlands are nodes for priority flora and contain numerous species at their range ends. There are few other examples of such wetlands along the eastern part of the Leeuwin-Naturaliste Ridge, with most altered for water use, cleared or undocumented and occurring on private lands.

Granite outcrops

Small, isolated and disjunct granite outcrop communities are interspersed throughout coastal locations of Leeuwin-Naturaliste National Park (e.g. near Sugarloaf Rock) and inland in Bramley National Park. They are significant to the region as they are geographically separated from each other and from the nearest outcrops on the Shannon River. Granite outcrops in coastal or near coastal areas are unusual in that they are associated with limestone, which is uncommon, except for communities on the south coast. The composition of species in coastal areas may also be different because of the north-south climatic gradient and is also likely to be different to Bramley National Park. The community at Sugarloaf Rock for example, is different from the vegetation on other areas of exposed granite further south along the Leeuwin Naturaliste Ridge.

Granite outcrops contain a high diversity of plant life and a high proportion of declared rare flora (Hopper *et al.* 1990). The diversity of microhabitats and soil moisture regimes supported by granite outcrops has 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. Hopper *et al*. (1997) also noted the refugial qualities of granite outcrops in the planning area, citing the potential for arid-adapted species (e.g. populations of *Eucalyptus drummondii*) to penetrate high rainfall areas on the dry slopes of granite west of Margaret River. More surveys of outcrops in the planning area are necessary to ascertain their significance and their response to fire.

Granite outcrop communities are fragile habitats, susceptible to mechanical disturbance, weed invasion, grazing by feral animals, too frequent fire, loss of shrub layer, and disease caused by *P. cinnamomi*. Inappropriate recreation can also result in vegetation loss and soil erosion.

21. Ecological communities

Key points:

- There are six threatened and one priority ecological community within the planning area.
- More investigation is required to determine other communities that may be threatened.
- The department is considering the nomination of tributaries of the lower Blackwood River for listing under the Ramsar Convention on Wetlands.
- There are three nationally important wetlands in the planning area – Gingilup-Jasper Wetland System, the Cape Leeuwin System and the lower Blackwood River and its tributaries, although many wetlands are also ecologically significant communities.
- Old-growth forest in the planning area has significant biological, aesthetic and social values.

The objectives are to:

1. **Identify, protect and conserve threatened and other ecological communities of conservation significance.**
2. **Prevent negative changes to the ecological character of wetlands proposed for nomination under the Ramsar Convention on Wetlands.**

This will be achieved by:

1. Identifying and protecting potential TECs and high value wetlands by listing them under appropriate legislation (e.g. the EPBC Act) or the Ramsar Convention on Wetlands.
2. Reducing threats to ecological communities and significant habitats by reducing threatening processes (e.g. environmental weeds, inappropriate fire regimes, introduced animals and disease).
3. Establishing and maintaining regular monitoring of the condition of TECs and the potential impact from threatening processes. Developing appropriate management responses to deterioration in specific indicator measures and set specific criteria thresholds that will trigger these management actions.
4. Assessing proposed developments that may impact on TECs, or other communities of conservation significance. In particular, assess any disturbance activity for its impact on tree hollows.
5. Avoiding where practicable, recreational use in stands of Rottnest Island tea-tree.
6. Maintaining or re-establishing vegetation cover around cave entrances to prevent nutrient and sediment enrichment.
7. Allowing authorised entry to caves containing aquatic root mat communities only by permit. It is acknowledged that one community does exist in Calgardup Cave and measures will be taken to ensure its protection (e.g. by prohibiting access close to the community).
8. Protecting granite outcrops from inappropriate fire regimes, excessive recreational use, weeds and rabbits.
9. Monitoring foot traffic on the Augusta microbial communities at Quarry Bay to determine any detrimental impacts and take remedial action if required.
10. Developing and implementing appropriate fire regimes for TECs and significant habitats (see Section 25 *Fire*).
11. Working with other agencies, private industry and land-holders to ensure extractive land uses (e.g. water extraction) within or adjacent to the planning area do not cause adverse environmental impacts.
12. Investigating or supporting research into the habitat requirements and ecology (including fire ecology) of TECs and other significant habitats. In particular, survey caves for aquatic invertebrate communities on a priority basis determined by their level of threat and undertake surveys to determine the presence of rock outcrop, *Calothamnus* heath and reedia swamps communities.

Key performance indicators (see also Appendix 1):

Performance measure	Target	Reporting requirement
21.1 Thresholds of ecological change that have been identified for Ramsar-listed wetlands	21.1 Thresholds of ecological change are not exceeded for Ramsar-listed wetlands	Every 5 years after candidate site is listed under Ramsar Convention on Wetlands
21.2 The extent to which Rottnest Island tea-tree and potential *Calothamnus* heath and reedia swamps TECs have been defined	21.2 The location of Rottnest Island tea-tree and potential *Calothamnus* heath and reedia swamps TECs will be identified	After 5 years
21.3 The extent to which aquatic invertebrate species composition of caves is determined	21.3 The aquatic invertebrate species composition of caves is determined	

22. ENVIRONMENTAL WEEDS

Environmental weeds are introduced plants that establish themselves in natural ecosystems, modify natural processes and eventually lead to the decline of the communities they invade (CALM 1999a). Environmental weeds displace native plants, particularly on disturbed sites, by competing with them for space, light, nutrients and water. They can also have a significant impact on natural values by altering animal habitats, harbouring pests and diseases and altering fire regimes.

Environmental weed management

The State Weed Plan provides a framework to achieve coordinated, collaborative and effective weed management throughout WA (Department of Agriculture 2001). The implementation of the State Weed Plan will also implement the *Environmental Weed Strategy for WA* (CALM 1999a), which refers to the principles of weed management, and in particular the setting of priorities. 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.

The department's proposed Policy Statement *Environmental Weed Management* (subject to final consultation) is used in conjunction with the *Environmental Weed Strategy for WA* and local knowledge to guide the approach and priority setting for control of environmental weeds on the 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. Due to the number and extent of environmental weeds in the planning area, the focus for management will be the containment and eradication of small sized occurrences of declared and environmental weeds with the aim of protecting high value conservation assets.

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. Eradication is possible for small infestations or new occurrences of weeds, and therefore should be a priority for control. Methods of control include managing introductions and disturbance, herbicides, biological control, manual control and potentially, control through the application of fire. Effective programs encourage the growth of native species through rehabilitation and the suppression of weeds with the overall aim of boosting the area's resilience to further weed invasion. The role of rehabilitation following weed removal is critical to prevent reinvasion.

The local community plays an invaluable role in the early detection, monitoring and control of weeds, and hence strategies to increase community awareness of and support for weed management are identified where relevant throughout this plan.

The department has a legal responsibility for controlling plants declared under section 37 of the *Agriculture and Related Resources Protection Act 1976* (ARRP Act), although the Act does preserve the department's right to decide priorities and the level of control according to resources.

Problem weeds

Many weeds have been introduced from adjacent agricultural land, townsites, public roads or other areas of public use. This is particularly evident in Leeuwin-Naturaliste National Park and especially at Hamelin Bay, which appears to be a 'hot spot' for weed invasion. The spread of some weeds in the Park is exacerbated by high visitor numbers (Hearn *et al*. 2003b). In Forest Grove National Park, several big gravel pits are used illegally for dumping of garden waste and hence is becoming the foci of numerous weeds (Keighery *et al*. 2007). These areas require remedial action. Bramley National Park has a large number of weeds because of past disturbance (roads, gravel, sand pits) and there are numerous weeds around Ten Mile Brook Dam.

At least 154 species of environmental weed (including eight declared plants) are found in the planning area (see Appendix 7 for high and moderate rated weeds), some of which are seriously impacting conservation values. Eleven species are rated as High by the *Environmental Weed Strategy for WA* and one species, *Pelargonium alchemilloides*, is listed on the National Environmental Alert list. Of most concern are bridal creeper (*Asparagus asparagoides*), arum lily (*Zantedeschia aethiopica*) and Victorian tea tree (*Leptospermum laevigatum*). At present, 3 to 4 sites within the planning area are targeted for small and/or initial outbreaks of nominated environmental weed species. This approach will continue over the life of the plan.

Bridal creeper is listed as one of Australia's 20 weeds of national significance[16] and occurs in scattered populations throughout Leeuwin-Naturaliste National Park. Biological control of this weed was attempted in 2001 with limited success. However, the application of rust in 2003 was successful, particularly at Ellensbrook, and will be continued on a larger scale as part of an integrated management program.

Arum lily has established throughout many creeklines and moisture gaining sites in the planning area to the exclusion of native species, particularly at Meekadarabee Cave. While control programs have been undertaken, this species has proven difficult to control and continues to pose a threat. Prevention of this weed invading wetlands at Gingilup Swamps Nature Reserve and the creeklines and uplands of Bramley National Park is a high priority.

Victorian tea tree occurs in localised populations at Injidup and Ellensbrook in Leeuwin-Naturaliste National Park and also in Bramley National Park. Although successful control work has been carried out on some populations, this will need to be continued.

One-leaf cape tulip (*Moraea flaccid)*, scaly sedge (*Cyperus tenuiflorus*) and black flag (*Ferraria crispa* subsp. *crispa*) are other species that are of specific concern within the planning area. One-leaf cape tulip is a particular problem as populations are increasing rapidly, especially around Moses Rock and Cape Naturaliste, and the species is becoming more widespread. *Dolichos sp*. is an issue at the former Jarrahdene Mill, spreading into important frog habitat.

Significant populations of sweet pittosporum (*Pittosporum undulatum*) also occur along the Margaret River adjacent to Bramley National Park and could threaten key values of the area. Paterson's Curse (*Echium plantagineum*) has also been identified and is a concern. In coastal areas, marram grass (*Ammophila arenaria*) and pyp grass (*Ehrharta villosa*) were used in the 1980s to stabilise coastal foredunes, and are now established in many areas. Many native species may also be suitable for rehabilitation in these areas (see Section 38 *Rehabilitation*).

Introduced trees

Non-native *Eucalyptus* species and pine have been planted in Leeuwin-Naturaliste National Park when the area was State forest. Some stands have since been harvested for forest produce and will be rehabilitated with native species. Tuart that persist in species trial plots may be suitable as seedbanks for rehabilitation elsewhere. Provided they do not impact on conservation values, these stands should remain for the period they are useful.

The Ellensbrook homestead contains a number of introduced tree species including Norfolk Island pine (*Araucaria heterophylla*), flame tree (*Brachychiton acerifolium*) and mulberry (*Morus nigra)* that have heritage value and contribute to the setting and history of the area. These species should be retained where they pose no threat of spreading or affecting adjacent conservation values, and be replaced with native species when they mature and senesce. Fig (*Ficus carica*) and Victorian tea-tree, also present at this site, should be controlled.

22. Environmental weeds

Key points

- At least 154 weed species are found within the planning area, most introduced from adjoining agricultural land, townsites, public roads or other areas of public use. Some exotic species have been introduced for protection or experimental purposes, such as marram grass, pine and exotic Eucalypt species.
- Leeuwin-Naturaliste National Park is at a high threat from weed invasion.
- It is preferable to prevent the introduction of environmental weeds through appropriate management, as eradication is rarely feasible.
- The local community plays an invaluable role in early detection, monitoring and control of environmental weeds.

The objective is to minimise the impacts of environmental weeds on key values.

This will be achieved by:

1. Managing environmental weeds according to departmental policy.

[16] Another weed in the planning area that is of national significance is blackberry (*Rubus fruticosus*).

2. Preparing and implementing a prioritised annual weed control plan targeting specific species and areas based on ratings in the *Environmental Weed Strategy for WA* and local knowledge.
3. Monitoring and reviewing the weed control plan.
4. Continuing to undertake (and maintain) weed mapping.
5. Targeting new infestations and areas of recent disturbance for weed control to prevent weeds from permanently establishing themselves. Rehabilitation following control may be required to prevent re-invasion.
6. Ensuring that weed species that pose a threat to significant native flora, fauna and communities are given high priority for control.
7. Using native species in preference to marram grass to stabilise foredunes.
8. Retaining exotic trees deemed to have heritage value providing they pose no threat to adjacent conservation values. These trees will be replaced with native species when they mature and senesce.
9. Rehabilitating gravel pits, past species trial plots and pine plantations to reduce competition from weeds and the effects of erosion.
10. Undertaking and/or supporting research to investigate the inter-relationship of fire and priority weed species to inform fire management (e.g. use fire control plots).
11. Liaising with neighbouring land-holders to facilitate effective, coordinated weed management and where appropriate, use volunteers to assist in weed management.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
22.1 Number and cover of environmental weed species rated as 'High' in the EWS or considered a local priority	22.1 Decrease in the number and cover of species rated as 'High' in the EWS or considered a local priority	Every 5 years

23. INTRODUCED AND OTHER PROBLEM ANIMALS

Introduced and other problem animals are 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. Introduced and other problem animals have potential to seriously impact on natural systems through predation, habitat destruction, competition for food and territory, introduction of disease, and by causing environmental degradation.

A primary objective of the department is to achieve the systematic and safe control of introduced and other problem animals on the lands and waters it manages. The department's proposed Policy Statement – *Management of Pest Animals on CALM Managed Lands* (subject to final consultation) provides guidance by identifying Statewide 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 1976*, viz "A Government department shall control declared plants and declared animals on or in relation to public land under its control".
Introduced and other problem animals of the planning area are listed in Table 4.

Table 4. Introduced and other problem animals recorded in the planning area.

Common name	Species
Mammals	
fox*#	*Vulpes vulpes*
feral pig*#	*Sus scrofa*
feral cat#	*Felis catus*
rabbit*#	*Oryctolagus cuniculus*
black rat	*Rattus rattus*
house mouse	*Mus musculus*
red deer	*Cervus elaphup*
Fish	
redfin perch	*Perca fluviatilis*
mosquito fish	*Gambusia affinis*

rainbow trout	*Oncorhynchus mykiss*
brown trout	*Salmo gairdneri*
goldfish	*Carassius carpio*
Birds	
laughing kookaburra Δ	*Dacelo novaeguineae*
rainbow lorikeet *Δ	*Trichoglossus haematodus*
galah ◄	*Cacatua roseicapilla*
eastern long-billed corella Δ	*Cacatua tenurostris*
Invertebrates	
feral honey bee	*Apis mellifera*
yabby	*Cherax albidus*
marron (Margaret River only)	*Cherax tenuimanus*

* Declared species under the *Agriculture and Related Resources Protection Act 1976* (as of April 2001)

Δ Acclimatised species or 'fauna living in a wild state as a result of being released or escaping from confinement or because it is offspring of fauna that has been released or has escaped from confinement'. These species are considered native to WA and are protected under the Wildlife Conservation Act.

◄ The galah has spread in distribution and is now locally common. It is protected under the Wildlife Conservation Act.

\# These animals are recognised as nation-wide problems and are the subject of threat abatement plans developed through the Commonwealth Department of the Environment, Water, Heritage and the Arts.

Foxes and cats

Foxes are common in the planning area and have been implicated in the decline of many native mammals in the critical weight range (35g to 5.5kg). The feral cat is thought to be responsible for the extinction of small to medium sized ground dwelling mammals and ground-nesting birds on islands and in the arid areas of the State (Burbidge and McKenzie 1989), although documented evidence of their effect on native fauna in the south-west is scarce (Environment Australia 1999, Dickman 1996). Predation by foxes and cats are key threatening processes under the EPBC Act. Five-year threat abatement plans have been prepared for both threatening processes to provide national coordination, with an emphasis on local control programs to ensure recovery of endangered species.

Baiting programs in WA have shown that removal of the fox, or substantial reduction in fox numbers, can result in significant increases in the number of viable native fauna populations. In 1996, the department implemented the *Western Shield* program to control predators such as the fox and feral cat. The program involves aerial baiting of selected lands managed by the department using 1080 poison (sodium fluoroacetate) baits to enable native wildlife population to recover and allow the reintroduction of native animals to former habitats once foxes and cats have been controlled. Sodium fluoroacetate occurs naturally in WA in native *Gastrolobium* plants, which has enabled native animals to develop a natural tolerance to the poison. Unfortunately, the department's baiting program works more effectively against foxes than cats, as cats prefer live bait. However, work is continuing to develop a bait more attractive to cats. It should also be noted that baiting does not benefit all native fauna species and integrated management is required for fauna conservation.

The intensity and frequency of baiting is determined by the size of the area to be baited, its perimeter to area ratio, the location and degree of isolation from human interfaces, and the level of vehicle access to and within the area (CALM 1994). At present, monthly baiting is recommended for all new baiting proposals for areas up to 20,000 hectares. Research is being undertaken as part of Operation Foxglove, to review these frequencies.

Baiting in the planning area will be considered where fauna values have been identified. At present, baiting typically occurs four times a year with additional baiting occurring at private property interfaces. The exception is Leeuwin-Naturaliste National Park where no baiting is undertaken except at Boranup Forest, where it occurs quarterly. Practical difficulties exist in baiting many portions of the Park because of its linear, fragmented shape and high boundary to area ratio. Large buffer zones from adjoining lands are required compared to the area of the reserve and invasion by foxes is high. Without a long-term baiting program involving adjoining land-holders, this makes baiting in many areas of the Park impractical. Instead, baiting should focus on strategic locations within the Park that are sizeable and offer conservation benefits, such as in Boranup Forest. In this instance the frequency of baiting should be increased to a monthly rate. New developments within this and other parts of the planning area should consider requirements for the baiting program so as not to further reduce the area able to be baited.

Baiting in Scott National Park and Gingilup Swamps Nature Reserve should be increased because of the high level of reinvasion of foxes from coastal areas. The strategic nature of Forest Grove National Park and Reserve

46400 in providing an east-west corridor linking to Boranup Forest warrants an increased baiting frequency in line with current research.

Feral pigs

Feral pigs are not well established in the planning area but are a potential problem in wetland areas of Scott National Park and Gingilup Swamps Nature Reserve where access for control is difficult. Feral pigs have not been recorded in Leeuwin-Naturaliste National Park since 2000, which is the only record for that area, although they are likely to infiltrate via inland connections to the Blackwood River where they are prevalent.

Feral pigs can be 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 the planning area, feral pigs are displacing native mammals of conservation significance, such as the quokka, quenda, water rat and woylie (Freegard 2005). Pigs also hamper recovery and translocation efforts (e.g. those of the white-bellied frog) and have the potential to spread *P. cinnamomi*.

Pigs require daily access to water, which limits their distribution to watercourses, swamps and dense vegetation associated with these environments. Feral pigs rarely move between catchments and hence control can be considered on a catchment basis. Guidance for management is provided in 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 EPBC Act. The department conducts annual trapping programs as part of ongoing management and this will continue over the life of this plan. Baiting may also be trialled. Feral pig monitoring indicating the increasing presence of new feral pig populations will trigger more control efforts.

Rabbits

Rabbits were introduced to WA about 1827 and are widespread throughout the planning area, occurring commonly in heath vegetation and coastal dunes of Leeuwin-Naturaliste National Park, and in small populations along boundaries with private property. Their grazing pressure and destabilisation of soil can have significant localised impacts, especially where this is exacerbated by events such as bushfire.
Rabbit numbers in the planning area seem to correspond to the periodic impact of *Myxomatosis* and, more recently, *Calicivirus*. This has been an effective means of control within the planning area and more action by the department has not been necessary. However, controlled baiting or fencing options may be employed where conservation values are threatened (e.g. populations of Dunsborough spider orchid (*Caladenia viridescens*)).

Feral honeybees

Self-sustaining, wild populations of feral honeybees (*Apis mellifera*) are established throughout most of the south-west, as are managed beekeeping sites for the production of honey (see Section 42 *Beekeeping*).

Feral honeybees impact on the natural values of the planning area in the following ways:

- Competing for tree hollows. Many birds and tree-dwelling mammals use tree hollows for breeding sites and shelter, which is already a limited resource. Observations have shown that Baudin's cockatoo and the forest red-tailed black cockatoo are losing nesting hollows to feral honeybees (Hussey 2005).
- Competing with native species for floral resources, such as pollen and nectar. Feral and managed hive honeybees can remove 80 per cent or more of floral resources.
- Affecting pollination and seed set of native species, due in part to inefficient transfer of pollen or the physical damage to flowers.
- Increasing seed-set in some weeds.

Visitors to popular recreation sites may encounter feral honeybees. On these few occasions, a build up in numbers can increase the risk of people being stung.

Feral honeybees have existed in the south-west for 150 years and consequently most impacts have already occurred, however the removal of feral colonies would still have nature conservation and recreation benefits. The feasibility of completely removing feral honeybees is low, as localised eradication would probably be followed by recolonisation from new swarms invading the area (Gross 2001). Until an effective means of control is found

for feral honeybees, management should focus on controlling the distribution and density of managed hives in areas of highest conservation value or around recreation sites (see Section 42 *Beekeeping*).

Exotic fish

Introductions of exotic fish (e.g. trout, mosquito fish, redfin perch and goldfish) into river systems of the planning area present a significant threat to native fish and invertebrate fauna through predation and competition for resources and food (see Section 20 *Native Animals*). The popularity of ornamental fish, such as goldfish, may lead to more releases and the possibility that they will become well established in the future. Besides trout, which are unable to successfully breed in rivers and tributaries of the south-west and are consequently stocked, there is no effective control method that can be applied to exotic fish in the planning area. A primary focus in addressing threats posed by exotic fish is preventing introductions through increased community awareness.

In WA, the Minister for Fisheries established a sub-committee of the Recreational Fishing Advisory Committee in 2004 to develop a five-year strategy for the State's south-west recreational freshwater fisheries, including the development of future stocking strategies for the recreational trout fishery. The department is represented on this committee. As part of this process, DoF is finalising a management plan for the translocation of trout into and within WA. This will assess the suitability of river systems across the south-west for stocking with trout, based on environmental and social factors, native fish distribution and historical trout stocking events. The department and the Conservation Commission will also establish guidelines to assist in their assessment of trout stocking proposals on areas within the conservation estate. The guidelines will be applied with a view to providing information and advice on biodiversity conservation to DoF and other key stakeholders.

At present, the Margaret and Blackwood rivers and Ten Mile Brook Reservoir are occasionally stocked with rainbow and brown trout in a program administered by DoF[17]. Future stocking strategies should consider the presence of hairy marron, pouched lamprey and Western mud minnow in the Margaret River, access to Ten Mile Brook Reservoir for recreational activities and the value of the Scott River for fish habitat.

Other introduced animals

The expansion of rural residential development along the Leeuwin Naturaliste Ridge, particularly to the north, is encroaching on the planning area. Increasingly it will be important to monitor the establishment of populations of introduced species that are commonly associated with this type of development, particularly the ferret (*Mustela furo*), laughing turtle-dove (*Streptopelia senegalensis*) and the variety of escapee parrots and cockatoos. The rainbow lorikeet is one species that has already become established around Cowaramup and is increasing in numbers. The kookaburra is considered to cause only negligible decreases in small bird populations (Long 1981).

Red deer are an emerging problem north of Margaret River and around the Yallingup townsite, where grazing pressure is increasing. Red deer are declared animals in WA, under the provisions of the ARRP Act, and the Department of Agriculture and Food assists in preventing their establishment in the wild.

Marron are endemic to the south-west of the State and consist of two species – *Cherax tenuimanus*, commonly known as hairy marron, and *C. cainii* or smooth marron. Hairy marron are restricted entirely to the Margaret River. It is believed that, while occurring naturally in other river systems of the south-west, smooth marron have been accidentally introduced to the Margaret River, where they are rapidly displacing hairy marron populations (M. de Graaf pers. comm.). To aid the recovery of hairy marron, smooth marron are being removed from portions of the Margaret River on a trial basis (see Section 20 *Native Animals*).

Yabbies compete with or prey upon aquatic fauna and their burrowing activities may alter riverine habitats. Consequently, yabbies represent a threat to aquatic invertebrate populations, including threatened root mat communities. Yabbies may also threaten marron populations through disease (see Section 24 *Disease*).

Domestic animals present a threat to native wildlife, and are discussed in Section 34 *Domestic Animals*.

[17] 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*.

23. Introduced and other problem animals

Key points

- There are a number of introduced and other problem animals in the planning area that out-compete, prey upon, or alter habitat for native animals. The most significant is the fox, although pigs have the potential to seriously impact wetland areas, especially on the Scott Coastal Plain.

The objective is to minimise the impacts of introduced and other problem animals on key values.

This will be achieved by:

1. Controlling introduced and other problem animals according to departmental policy.
2. Developing and implementing a priority control plan for introduced and other problem animals.
3. Maintaining information on introduced and other problem animals including a register of animals, details of distribution, relevant biological information and history of control.
4. Continuing feral predator control as part of the *Western Shield* program, with a focus on fox control in larger areas which have a suitable perimeter to area ratio.
5. Undertaking feral pig monitoring and control within the planning area, with a focus on the protection of the most significant and vulnerable habitats.
6. Eradicating feral colonies of honey-bees from around recreation sites and where feasible, controlling feral bees elsewhere within the planning area.
7. Establishing guidelines to assist in assessment of trout stocking proposals on areas within the conservation estate. The guidelines will be applied with a view to providing information and advice on conservation issues to DoF and other key stakeholders.
8. Based on trials to recover the hairy marron, considering the removal of smooth marron from the Margaret River and translocation of hairy marron.
9. Liaising with relevant agencies and neighbouring land managers to facilitate the effective and coordinated control of introduced and other problem animals.
10. Supporting department research and education programs that are aimed at improving the control of introduced and other problem animals.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
23.1 Populations and area impacted by feral pigs	23.1 No increase in the number of populations or area impacted by feral pigs	Every 5 years

24. DISEASE

Plant diseases

Plant pathogens are a serious problem in the south-west of WA, causing the destruction of many species susceptible to disease and the subsequent degradation of plant communities (Wills and Keighery 1994). The most frequently reported disease groups of the south-western native plant taxa include pythiacious root rots (Phytophthora species), rusts, Armillaria root rots, stem cankers and leaf spots and blights (Shearer 1994). Families most affected by disease are Proteaceae, Myrtaceae, Mimosaceae, Papilionaceae, Haemodoraceae, Goodeniaceae, Epacridaceae, Poaceae and Chenopodiaceae (Shearer 1994). The most significant plant diseases relevant to the planning area appear to be *Phytophthora cinnamomi* and *Armillaria luteobubalina*.

Disease caused by *Phytophthora*

The disease known as 'dieback' is caused by the microscopic pathogen *Phytophthora cinnamomi.* There are eight known species of Phytophthora in WA, of which *P. cinnamomi* is recognised as the most damaging. Once infested, susceptible plants are killed and in many cases eliminated from the site leading to dramatic and permanent changes to native plant communities and their dependent fauna.

Dispersal

P. cinnamomi is able to move autonomously over long distances through surface and sub-surface water, and travel microscopic distances to infect new roots or travel between roots of mycelial threads. The pathogen can be

in soil and plant material that is then 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 that is resistant to desiccation that can itself produce more spores or mycelium once conditions are suitable.

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

Broadscale surveys for the occurrence of *P. cinnamomi* were undertaken in the planning area before 1976. However, these surveys are of limited use to management as they were not comprehensive, even excluding some portions of the planning area. This does not suggest that areas excluded from the surveys are disease free, only that the location and extent of the pathogen in these areas was not determined. The spread of the disease since is also largely unknown, and given the high level of human activity in some areas there is the potential for it to impact a much greater area than this mapping suggests.

Effects

The effect of *P. cinnamomi* upon the health of plant communities and individual species varies greatly. In many cases, lethal root-disease destroys the structure of native communities, reducing floristic diversity, decimating primary productivity and destroying habitat for native fauna. The greatest incidence of the disease is in jarrah forest and banksia woodland, partially due to the environment and historical factors relating to human disturbance. However, in some places the pathogen causes little damage at all. Unfortunately in the south-west it most plant communities are susceptible and vulnerable to infection.

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 *P. cinnamomi*, and the complex influence of temporal and spatial variation in the environment.

However, it is now evident that among plant communities in areas of the south-west that receive more than 800 millimetres 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. Also includes 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 to the highly susceptible understorey of dry sclerophyll forest, in banksia woodland and in heathland on podsols, podsolic and lateritic landforms.
- *A variable epidemic* - applies to the dominant jarrah tree component of the forest with all variants in the response of jarrah being coincident with, or preceded by, mass deaths in susceptible elements of the understorey.
- *An 'endemic' pathogen* - where *P. cinnamomi* has been long established (50 years or more) in sites formerly dominated by jarrah/banksia forest and has been heavily impacted, *P. cinnamomi* behaves in a manner characteristic of endemic pathogen. The forest is often replaced by open woodland of marri (*Corymbia calophylla*) and parrot bush (*Dryandra sessilis*). Periodic outbreaks of mortality in parrot bush follow, with subsequent regeneration by seed.

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

Disease caused by *P. cinnamomi* also has a major impact on fauna habitats[18], such as:

- direct and indirect loss of food sources including seeds, nectar, pollen, invertebrates and seasonal food
- loss of food for species that prefer floristically rich vegetation
- loss of habitat for species dependant on thick ground cover
- loss of food and habitat for arboreal species
- decline in litter invertebrates
- decline in invertebrate food sources for insectivores
- increased predation risk
- changes to microclimate.

In the planning area, jarrah forest and woodland as well as the flats, swamps and seasonally inundated areas of the Scott Coastal Plain have a high susceptibility to *P. cinnamomi*. Banksia woodland is especially vulnerable to

[18]Information based on Wilson *et al.* (1994)

the disease (Shearer and Dillon 1996), and upland areas of Scott National Park have already been significantly affected. Banksia woodland within Gingilup Swamps Nature Reserve and Leeuwin-Naturaliste National Park are also at threat. Signs of the disease in jarrah forest are particularly evident in Timber Reserve 60/25.

Areas that contain low scrub on shallow, often inundated soils over ironstone are considered to be extremely favourable for the spread of the disease. The Scott River Ironstone TEC is at particular risk and most occurrences of the community are thought to be infected to some degree. Declared rare flora, such as the Scott River boronia (*Boronia exilis*) and giant spider-orchid (*Caladenia excelsa*) may also be threatened, by either direct impacts on the species or associated effects relating to degradation of habitat.

The incidence and impact of *P. cinnamomi* tends to be low in shrubland, woodland and forest on limestone on the coastal fringe (Shearer 1990) as well as in karri forest and coastal dunes.

Management

Management guidelines for *P. cinnamomi* are described in the department's Manual: *Phytophthora cinnamomi and disease caused by it* (2000) and Policy Statement 3 – *Management of Phytophthora and disease caused by it*. Dieback caused by *P. cinnamomi* is a key threatening process under the EPBC Act and a threat abatement plan has been prepared (Environment Australia 2001).

Management of *P. cinnamomi* within the planning area will focus on significant uninfested areas[19] and areas that are already infested but with significant residual natural values, such as declared rare flora or TECs. Management will aim to:

- Implement practices which ameliorate the damaging effects of *P. cinnamomi* where it has already established
- Contain or retard further autonomous spread at the boundaries of existing infestations. This may include the realignment or hardening of tracks and roads.
- Progressively identify significant uninfested (protectable) areas.
- Reduce the rate of vectored spread and establishment of new infestations within significant uninfested (protectable) areas by:
    - preparing *P. cinnamomi* management plans for new developments (e.g. recreational facilities and upgrades, or realignments of management roads and tracks)
    - restricting operations to dry soil conditions
    - controlling feral animals, for example pigs, in these areas
    - applying phosphite where it has been identified as a priority (see below)
    - minimising or prohibiting access into these areas.

Emphasis of management will be on reduction of vectored spread and the human-assisted establishment of new centres of infestation within protectable areas. Such areas will be managed to ensure their uninfested status and protectability is not compromised.

To accurately determine the extent of *P. cinnamomi* within the planning area and to identify protectable areas, on-ground surveys are required. However due to resource limitations, not all of the planning area can be surveyed. The first priority is to interpret aerial photographs and combine this with knowledge of disease occurrence to map probable disease spread and protectable areas. On-ground surveys should then be prioritised according to the risk to conservation values. This may include the following criteria:

- conservation significance of the area
- susceptibility of plant and plant communities
- intensity of human activity, either existing or projected
- current and proposed access
- climate, including the likelihood of summer rain and the degree of inundation
- soil type and geomorphology
- current knowledge and experience.

In the case of areas that will for the foreseeable future, remain unsurveyed, or are 'unprotectable' and uninfested, standard hygiene practices apply. In some cases, strict adherence to disease hygiene plans may be difficult (e.g. construction of emergency fire access tracks in bushfire situations). Bushfire suppression plans will need to include tactics to minimise this.

[19] Areas likely to remain uninfested by the autonomous spread of the pathogen in the medium term and referred to as 'protectable areas'.

For areas that are already infested but contain significant residual natural values, ecosystem restoration may be considered where there is serious environmental damage. The chemical 'phosphite' has been shown to reduce the impact of *P. cinnamomi* on many susceptible native plants and a program of repeated applications may be developed to help protect threatened species and ecological communities of the planning area. In addition, germplasm from threatened native plants may be collected for cryogenic storage. At present no phosphite is applied within the planning area.

Other plant diseases

Armillaria

Armillaria is a naturally occurring root disease caused by the soil-borne pathogen *Armillaria luteobubalina*. It is found in coastal limestone sands of the planning area and spreads predominantly by root to root contact between healthy and infected plants. Most of the susceptible hosts (dominant small trees and shrubs) are killed in coastal dune communities, significantly altering vegetation structure and composition, and leaving open denuded areas that encourage severe wind erosion (Shearer *et al*. 1997, Shearer 1994) and weed invasion. The highest impact is in regrowth forest and plantations where harvesting and thinning operations provide stumps that *A. luteobubalina* can readily colonise and then infect regrowth saplings and residual trees. The range of species susceptible to the fungus is large and poorly defined (at least 50 families and more than 200 species), with little information on the presence of resistant or tolerant species. Many species that resist infection by *P. cinnamomi* are susceptible to *A. luteobubalina* (Shearer and Tippett 1988, Shearer *et al*. 1997, 1998).

There is no simple method for controlling Armillaria, with prevention through appropriate hygiene practices the best treatment. There are no effective chemicals to control the disease in trees (Shearer and Tippett 1988, Shearer *et al*. 1997, 1998).

Rusts

In contrast to Phytophthora, rust pathogens are most likely to be endemic and require living hosts for normal development. Information on the impacts of rusts on native plants is limited.

Stem cankers

Botryosphaeria ribis and *Cryptodiaporthe melanocraspeda* are two of the most common aerially-dispersed canker-causing fungi, and infect plant hosts mainly from the Proteaceae and Myrtaceae families (Shearer 1994).

Mundulla yellows

Mundulla yellows is a little known and only recently discovered disease, which has the potential to affect native plant species, causing a progressive decline, yellowing and then death of trees. It affects many eucalypt species (23 known species in WA), including jarrah and blackbutt, and maybe also sheoaks, banksias and wattles. The disease occurs 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. It is unknown how the disease is spread. Until more is known about mundulla yellows, general disease hygiene practices should be applied to minimise the risk of human spread.

Animal diseases

Chytrid frog fungus

The "chytrid" frog fungus (*Batrachochytrium dendrobatidis*) is a disease affecting amphibians. The fungus can cause sporadic death in some populations or 100 per cent death in others (Environment Australia 2002). Studies have shown there is a broad zone of infection from just north of Geraldton, south to Augusta and east to Esperance, however this does not imply all frog populations are infected within this zone (Aplin and Kirkpatrick 2001). The fungus occurs in waterbodies or in soil, and frogs that spend more time in or near water are more susceptible to the disease.

Evidence of the frog fungus was found in 17 frog species in the south-west, including the specially protected white-bellied frog (D. Roberts *pers. comm.*). While it is possible that the disease can infect all frog species, the risk to populations of frogs in the south-west of the State is low. For example, the chytrid frog fungus is common in species such as the bell frog (*Litoria moorei*) and quacking frog (*Crinia georgiana*), but both species are still widespread and abundant. Other factors, such as habitat degradation or increased use of chemicals may be more important reasons for the decline of some frog species.

Adequate quarantine measures need to be undertaken when works are carried out in or adjacent to known frog sites. Comprehensive sampling and mapping of chytrid occurrence across the range of the white-bellied frog should be undertaken to quantify the extent of infection and to identify any disease free sites. The infection of amphibians with this fungus is a key threatening process under the EPBC Act and a threat abatement plan has been prepared.

Thelohania

The freshwater crayfish parasite (*Thelohania sp.*) and porcelain disease caused by *Microsporidiosis sp*. are present in some yabbies. Both *Thelohania* and *Microsporidiosis* invade the muscle tissue of freshwater crayfish, possibly causing death. Currently there are no treatments available. These diseases may pose a threat to the hairy and smooth marron (*Cherax tenuimanus* and *C. canei*).

24. Disease

Key points

- *P. cinnamomi* is the most significant pathogen threatening native vegetation and habitat of native fauna within the planning area. Other pathogens include *A. luteobubalina*, rusts and stem cankers.
- *P. cinnamomi* can be spread by humans, vehicles and animals moving infested plant material and soil.
- Jarrah forest and woodland as well as the flats, swamps and seasonally inundated areas of the Scott Coastal Plain have a high probability of being infested with *P. cinnamomi*.
- Frogs in the planning area may be at risk of infection with the "chytrid" frog fungus.

The objective is to ameliorate the impact and minimise the further spread of P. cinnamomi and other diseases.

This will be achieved by:

1. Managing disease according to departmental policies and operational guidelines (e.g. the department's manual – *Phytophthora cinnamomi and disease caused by it*).
2. Progressively identifying, mapping and assessing uninfested areas and rationalising and managing access roads and/or tracks into them. Prioritise on-ground surveying and management actions for *P. cinnamomi* according to the risk to conservation values.
3. Limiting the artificial spread of *P. cinnamomi* at Dugdale Road, Juniper Road and Waddington Road, which all require dry soil operations (e.g. grading fire access tracks). Access should be limited to existing tracks only.
4. Developing *P. cinnamomi* hygiene management plans before commencing any operation that requires soil or plant material movement such as the construction of new roads, fire access tracks and other tracks.
5. Identifying, evaluating and where practical and reasonable, implementing measures for the maintenance and restoration of infested areas where they have been given priority for action. This may involve treating threatened plants, TECs and habitats of threatened native animals with phosphite, or other appropriate treatments, or trialling the reconstruction of badly affected ecosystems.
6. Dependent on the scale of infestation, seeking to restrict the movement of *A. luteobubalina* via affected material by establishing quarantine areas.
7. Using standard hygiene practices, including the need to be clean on entry to areas uninfested with *P. cinnamomi* and the chytrid frog fungus.
8. Mapping the distribution of the chytrid frog fungus in the planning area.
9. Assisting Perth Zoo to develop robust and productive captive breeding populations of the white-bellied frog, including assisting the zoo with cryostorage of eggs.
10. Encouraging research into the effects that *P. cinnamomi*, the chytrid frog fungus and other pathogens are having on plants and animals within the planning area.
11. Documenting any outbreaks of new disease within the planning area (plant or animal) and implementing management responses as appropriate.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
24.1 Infested areas within protectable areas that are a priority for protection	24.1 No new human-assisted infestations of *P. cinnamomi* in protectable areas that are a priority for protection (e.g. Scott Ironstone TEC)	Every 5 years

25. FIRE

Fire is on the one hand an ancient ecosystem process essential to the conservation of biodiversity and on the other, a phenomenon capable of threatening biodiversity, life and community assets. As a result, management of fire is integral to the department's activities and a core management responsibility. The challenge is to devise practical and affordable fire regimes that conserve biodiversity at agreed spatial scales, and minimise the adverse impact of bushfires on social, economic and environmental values.

The department's management of fire, including the use of fire, fire suppression and bushfire prevention, is regulated by legislation (e.g. Bush Fires Act, CALM Act and precedents established under Common Law). It is also guided by the department's Policy Statement No. 19 *Fire Management Policy*, which includes a number of scientific principles (Burrows and Friend 1998, Fire Ecology Working Group 1999).

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, scientific 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, analysis of management outcomes and ongoing research are critical if fire management in the region is to continuously improve.

Fire ecology

Fire ecology is the study of the interaction between fire, biota (plants and animals), and the habitats in which they live. Knowledge of the impacts of this interaction is integral in protecting biodiversity, but also life and community assets. While numerous studies report on changing species assemblages and species diversity, habitat characteristics in response to time since last fire, fire season, fire interval, fire intensity, and the ways in which fire can influence ecosystem processes, not enough is known about local fire ecology. Therefore, fire management will continue to evolve with accumulated knowledge and management experience (Burrows 2004).

Adaptation of biota to fire

Some biota survive and persist in fire prone environments by avoiding fire (e.g. occupy low fuel areas or moist sites), or by developing adaptations that allow them to accommodate and utilise fire. These adaptations are useful in coping with periodic drought and the poor nutrient status of many Australian environments, as well as contributing to the 'life history strategies' that biota have employed to adapt to fire. These adaptive attributes, particularly in plants, are sometimes referred to as 'vital attributes'. Attributes such as the time it takes to flower after germination, time to senescence and death, how a plant regenerates (from seed, re-sprouting or both), where the seed is stored (in the canopy, in the soil or both) or how this seed is triggered to germinate provide valuable clues to understanding what is the most appropriate fire regime in terms of fire frequency, intensity, season and scale. Determining vital attributes of species enables fire regimes to be determined for their conservation.

For many species, reproduction and regeneration are stimulated by fire, and for some plant communities, fire is necessary for the maintenance of floristic and structural diversity (Burrows and Wardell-Johnson 2003). However, no single fire regime is optimal for all species and while many species are resilient to a range of fire regimes, some species are sensitive to fire or have quite specific fire requirements (Table 5). These fire sensitive species are referred to in this plan as key fire response species.

Table 5. Vital attributes of species sensitive to frequent fire (key fire response species)

Fauna	Flora
Restricted, specialised habitats	Readily killed by fire
Low fecundity	Relatively short life span
Exist as discrete dispersed populations	Long juvenile period
Low dispersal capacity	Canopy-stored seed
Require mature or late seral stage vegetation (relatively long unburnt)	Regenerate only from seed ('obligate' seeders)
Prone to predation	Require fire for successful regeneration

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

Typically, fire sensitive species are confined to more mesic or less flammable parts of the landscape such as riparian zones, wetlands and granite outcrops, where fire is less frequent (see *Managing Fire to Conserve Biodiversity*). Generally plant communities in the drier, upland areas of the forest are more drought-adapted and have a history of more regular fire, so display a greater resilience (Burrows 2008). However, even fire sensitive species require fire at some stage for their rejuvenation – an exception perhaps being peat swamps (Burrows and Wardell-Johnson 2003). Extreme regimes such as sustained, frequent burning or infrequent but large, intense fires, are more likely to be damaging to biodiversity than moderate, intermediate regimes (Burrows and Friend 1998, Burrows and Wardell-Johnson 2003).

Vital attributes of flora

The flora of the planning area possess a variety of traits that enable persistence in this fire-prone environment (Burrows and Wardell-Johnson 2003), including:

- soil protection of buried buds
- bark protection of aerial buds
- bud survival and sprouting
- fire stimulated flowering
- fire triggered opening of fruits and seed release (serotinous)
- fire-cued seed germination
- seed stored in the soil and in woody fruits.

Knowledge of the vital attributes of plants has helped to define fire regimes, especially minimum and maximum intervals between fires. Plants are primary producers in natural ecosystems and almost all other life forms depend on them. The rate at which plant species produce adequate seed for regeneration after fire is an important consideration 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 three years of fire. On less flammable sites such as gullies and broad valley floors, some species may take five to six years to flower after fire but may not set adequate quantities of viable seed for several years after this (Burrows and Wardell-Johnson 2003). On the basis of current knowledge, doubling the juvenile period[20] of the slowest maturing fire sensitive species at a particular site provides a conservative minimum interval between lethal intensity fires and allows for adequate replenishment of seed banks (Dr N. Burrows *pers. comm.*). Populations will survive more frequent fires provided the intensity of the fire does not kill the entire cohort of parent plants.

The longevity of plant species (particularly fire sensitive obligate seeding species) helps define the maximum safe interval between fires before the seed bank is lost. While there is little information on the longevity of soil-stored seed banks, limited data suggests that for many south-west ecosystems, fire intervals in excess of 35-40 years are likely to result in decline and local extinction of some serotinous seeders that only regenerate effectively following fire.

Fire response patterns such as post-fire regeneration, the juvenile period and in some cases longevity, of some 700 species has been collated into the department's FIRERESPONSE database. The database indicates that about 97 per cent of understorey species reach flowering age within three years of fire and all species reach flowering age within five to six years of fire. Burrows *et al.* (in press) also report that the 3 per cent of species classified as 'fire sensitive' occur in more mesic or less flammable parts of the landscape (see above). Knowledge of the distribution and habitat preference of these species can be used to develop and implement ecologically-based fire regimes using the vital attributes of species. This typically requires consideration of two landscape components: fire prone upland areas and fire sensitive habitats (e.g. wetlands, granite outcrops and valley floors), although this may vary depending on the fire response of flora and fauna species in the area. An example of one possible fire regime based on the vital attributes of species is provided in Figure 7.

Vital attributes of fauna

Research indicates that the immediate impact of fire on fauna, and their recovery rate, 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, Burbidge 2003, Friend and Wayne 2003). This impact also depends on the presence of predators where displaced species have to travel across open ground to find suitable habitat (Friend 1999).

[20] The juvenile period is defined as the time it takes for at least 50% of the population to reach flowering age.

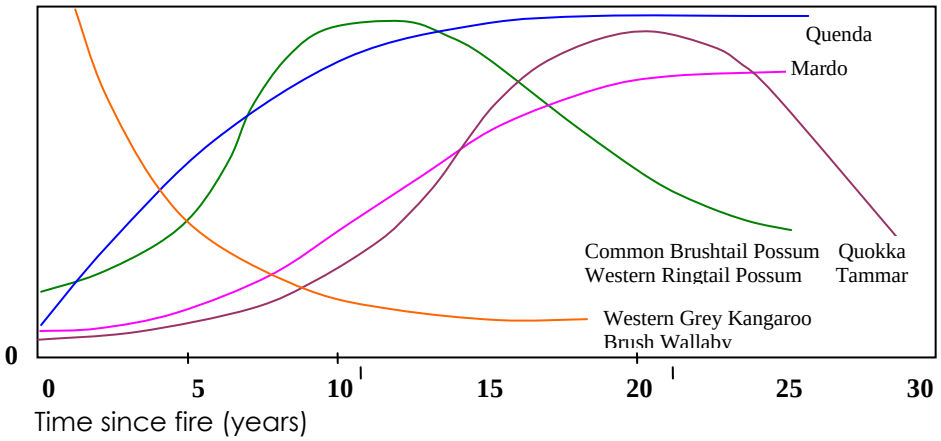


Figure 5. Idealised relationship between the abundance of various mammal species and time since fire
(source: Dr N. Burrows *pers. comm.*).

For mammals, the post-fire response of populations is reasonably predictable and consistent (Figure 5), and is considered in terms of 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 (see *Ecosystem Health*) and floristic composition, which simplifies the prediction of fire impacts (Friend 1999, Friend and Wayne 2003, Burbidge 2003, Bamford and Roberts 2003).

The effects of fire on birds are difficult to predict as each species responds differently (Burbidge 2003). Generally, bird communities are relatively resilient to single fire events of a small scale and low to moderate intensity. The effects of fire on amphibians and reptiles is also complex and less predictable (Friend 1999, Bamford and Roberts 2003).

Invertebrate fauna appears to be resilient to more regular and frequent fires (van Heurck and Abbott 2003). Invertebrate diversity is greatest where there is a wide range of post-fire successional stages in vegetation (van Heurck and Abbott 2003). Due to the rudimentary knowledge of invertebrate taxonomy and ecology, a precautionary and adaptive approach to fire management, including a diversity of post-fire seral stages, is warranted.

Ecosystem health

Maintaining a diversity of post-fire fuel ages, seral stages or habitats, is fundamentally important for ecosystem health and enhances biodiversity. Post-fire vegetation change is continuous, and the rate of change will depend on the severity of disturbance, and local soil and climatic conditions. At least three broad post-fire seral stages are recognised – early, intermediate and late, based on the rate of change in understorey vegetation structure[21] and floristics. In any one landscape, all of these functional habitat characteristics and seral stages are desired. The relative proportion of each seral stage within the landscape is best determined by the theoretically-derived negative exponential distribution[22] (Weir *et al*. 2000, Tolhurst and Friend 2001) of vegetation/fuel age classes across an ecological unit within the landscape (Figure 6). This will guide decisions on where, how much and when to apply fire.

At the local scale specific vegetation types and ecosystems (e.g. riparian zones and wetlands, granite outcrops, coastal vegetation communities, Scott ironstone TECs) may have a different theoretical distribution to that of Figure 6. However, at present the knowledge to derive this distribution is limited, and is not practicable to apply across the landscape. Instead, the department will seek to improve knowledge of the fuel age distributions for specific fire-sensitive ecosystems and use this to develop guidelines for their management. Should this knowledge become available in the future, and it is able to be applied practically, the department may adapt its fire management accordingly. Consideration also needs to be given to the functioning of ecosystems in fragmented landscapes as the objectives at the landscape scale may not apply to these areas.

[21] Forest overstorey species of the south-west are very resilient to fire so stand replacement fires, or fires that kill the overstorey, are relatively rare and most change in seral stage occurs in the understorey vegetation.
[22] The negative exponential distribution aims to produce disturbance-induced mosaic patterns across the landscape, which are thought to resemble those produced by natural disturbance events.

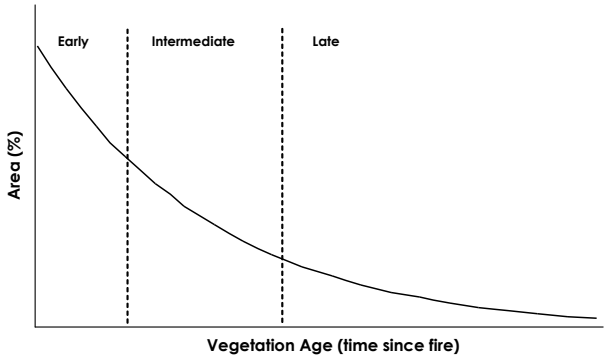


Figure 6. Theoretical distribution of a stable time-since-fire spatial mosaic for an ecological unit

Scales of fire planning

The issue of the most appropriate scale to manage fire in the south-west is complex and will always be a trade-off between what is ecologically desirable based on best available knowledge and what is feasible and practical. This management plan recognises two spatial and temporal scales for fire planning – the landscape scale (30,000 to 100,000 hectares) and the Logical Burn Unit scale (500 to 5,000 hectares). Landscape scale fire management is based about 26 Landscape Conservation Units (LCUs) that have been identified in the south-west. These LCU's are derived by amalgamating the 315 vegetation complexes, according to their burning characteristics (Mattiske and Havel 2004). Objectives derived at the Landscape scale will be used to guide prescribed burning at the more detailed and operational Logical Burn Unit scale. To this end, setting targets at the Logical Burn Unit scale may be more applicable for highly fragmented parts of the planning area, where the ability of smaller fragments to operate as functioning ecosystems needs to be considered.

Although planning at a finer scale is not feasible, it is possible that the scales of fire planning may change over the life of this plan.

Fire management within the planning area

This management plan provides the strategic framework that the department will use to develop ecologically-based fire regimes and regimes for the strategic protection from bushfire. Ecological regimes will be based primarily on vital attributes and life histories of key flora and fauna species to ensure ecosystem health and the protection of biodiversity as well as life and community assets. It recognises the special situation of parks along the Leeuwin-Naturaliste Ridge, where fragmentation, a wide range of adjoining land uses, increasing population growth, rural residential development, presence of high value community assets and high visitation warrant a greater level of protection from bushfire.

The main objectives of fire management within the planning area are to:
- maintain and enhance biodiversity
- reduce the threat that bushfire presents to life and community assets
- increase knowledge through fire research, operational experience and monitoring
- communicate with neighbours, the community and other stakeholders about fire management.

To achieve these objectives, the planning area has been divided into three management zones (Map 4):
- Biodiversity Areas
- Asset Protection Areas
- Strategic Protection Areas.

The management of Biodiversity Areas is described below in *Managing Fire to Conserve Biodiversity* while the management of Asset Protection Areas and Strategic Protection Areas is described in *Managing Fire to Protect Life and Community Assets*.

The department incorporates the guidance contained in its fire policy and this management plan through a dynamic operational planning process known as the Master Burn Plan. This process is used to identify appropriate areas for the application of prescribed fire in the coming three years. Prescribed fire programs are based on regimes identified in this management plan and are updated twice each year on the basis of operational

work and new information, such as bushfire occurrence and improved conservation knowledge (e.g. on vital attributes of species). The Master Burn Plan allows sufficient lead-time for planning and preparing annual burn programs and specific burn plans well ahead of the operation, which enables time for surveys for dieback and threatened flora. This program also provides the public an opportunity to view what is planned for implementation and provide their input into program planning.

Managing fire to conserve biodiversity

There is often debate about the most appropriate fire regimes to conserve biodiversity. The scientific complexity of fire behaviour and ecology means there will continue to be uncertainty and risks surrounding ecosystem responses to fire (planned and unplanned) and the outcomes of various planned fire regimes. Fire managers recognise this uncertainty but also understand that it is not a valid reason to avoid taking action to protect biodiversity, life and community assets from inappropriate fire regimes. Actively applying prescribed fire in a managed way can achieve benefits for biodiversity that outweigh the risk of uncertainty and contribute to a better understanding of ecosystems over time.

This management plan proposes to manage biodiversity across all three management zones (Biodiversity, Asset and Strategic Protection areas). However, specific Biodiversity Areas (Map 4) have been identified where the conservation of biodiversity is deemed the main priority for fire management. In some cases there is a need to avoid fire for biodiversity reasons and the department will not apply fire to several parts of the planning area (i.e. Fire Exclusion Reference Areas, see *Fire Research* and Map 4).

Biodiversity areas

This management plan uses an adaptive approach to fire management in Biodiversity Areas, which, in the long-term, seeks to devise, implement and monitor a range of fire regimes based on:

- vital attributes of threatened species and ecological communities
- vital attributes of key fire response species
- creating and maintaining diverse post-fire (seral) stages, or functional habitat types
- managing fire to protect ecologically sensitive areas and niches
- fuel accumulation rates.

One or a combination of these fire regimes is likely to apply to parts of the planning area. For biodiversity reasons, parts of the planning area will not be burnt. Knowledge of the vital attributes of key fire response species and habitats known or likely to occur within any Landscape Conservation Units will be used to derive appropriate 'ecological' fire regimes for the planning area (see Figure 7). As there are gaps in current knowledge, management for biodiversity conservation will initially focus on the protection of threatened species, TECs and significant habitats that require specific atypical fire regimes. As more information on the vital attributes of species becomes available this will be incorporated into the prescribed burning program. Fire regimes are also developed to protect life and community assets (see *Managing Fire for the Protection of Life and Community Assets*) and will complement ecological fire regimes where possible. Fire regimes for biodiversity conservation may also achieve a protection benefit.

The department has developed a range of fire management guidelines to protect specific fire sensitive species and ecological communities. Several of these guidelines apply to the planning area and will be used to guide fire management where applicable (e.g. organic soils/wetlands, granite outcrops, old-growth forest, and significant caves). These guidelines may differ from the standard ecological fire regime and will inform fire planners and managers of strategies and tactics for a prescribed burn to accommodate the needs of 'fire regime specific' biota. The guidelines have been developed using the best available knowledge but more research and subsequent adaptive management may be required to determine the most appropriate fire regimes for the species and habitats of the planning area.

However, before applying fire management guidelines within the planning area, consistency and compatibility with other conservation, land management and fire management objectives must be checked to ensure the best possible outcome.

Managing fire based on the vital attributes of threatened species and ecological communities

There are several threatened species and communities of the planning area that are prone to modification by fire (e.g. Scott Ironstone TEC and the Rottnest Island tea-tree priority ecological community).

Threatened species and TECs are protected by State and Commonwealth legislation, which imposes requirements in relation to how fire management activities are conducted. In many cases, it is appropriate to devise and implement fire regimes specific to these taxa to ensure their persistence (where the fire ecology of threatened species is well understood). Alternatively, threatened species and ecological communities will be protected from fire regimes that are known to or are likely to cause their decline. Threatening fire regimes include long periods of fire exclusion, sustained frequent burning, large and intense bushfires and post-fire grazing.

Where no fire ecology information exists for a threatened species, carefully monitored experimental burning might be considered. No isolated or sole population should be impacted upon by a single fire event where the consequences of fire are unknown. For the planning area, protection of threatened species and communities will take priority when devising fire regimes to conserve biodiversity. Often, prescriptions for threatened species management are developed as part of a flora or fauna recovery plan.

For other species and communities of conservation significance (e.g. priority, endemic, relictual and disjunct species) where knowledge is limited, research should be a priority.

Managing fire based on the vital attributes of key fire response species

Scientific knowledge of vital attributes of selected plants (key fire response species) within ecosystems is used to derive appropriate fire regimes, especially acceptable intervals between fires, for the planning area. Knowledge of the juvenile period, longevity, regeneration and establishment requirements of key fire response plant species are used to establish minimum and maximum fire intervals and the season and intensity of fire. Knowledge of habitat requirements (seral stage) and dispersal capacity of key fire response fauna species assists with determining fire interval and spatial scale or patchiness. Having devised appropriate 'ecological' fire regimes based on plant attributes, they can then be cross-checked for their efficacy against co-occurring key fire response fauna species. There are gaps in the knowledge of vital attributes of many species but consistent with an adaptive management approach, knowledge will be gained and fire management improved by on-going research and by monitoring of operational programs.

An example of one possible ecological fire regime based on the vital attributes of species is provided in Figure 7. Within any Landscape Conservation Unit (or Logical Burn Unit), there will be a variety of interlocking ecosystem components or habitats with different fire response patterns. For each Landscape Conservation Unit (or Logical Burn Unit), a standard ecological fire regime based on vital attributes of key fire response species is devised for the most fire-prone (least sensitive) components and to protect the least fire-prone (most sensitive) components. This typically requires consideration of two landscape components, although this may vary depending on the fire response of species in the area:

- The drier, more flammable fire tolerant habitats, containing flora species that resprout and have relatively short juvenile periods, and fauna that do not require mature or medium to late successional state vegetation.
- Fire specific habitats (e.g. granite outcrops and valley floors) containing flora that are fire sensitive with relatively long juvenile periods and fauna that prefer mature, medium to late successional stages of vegetation.

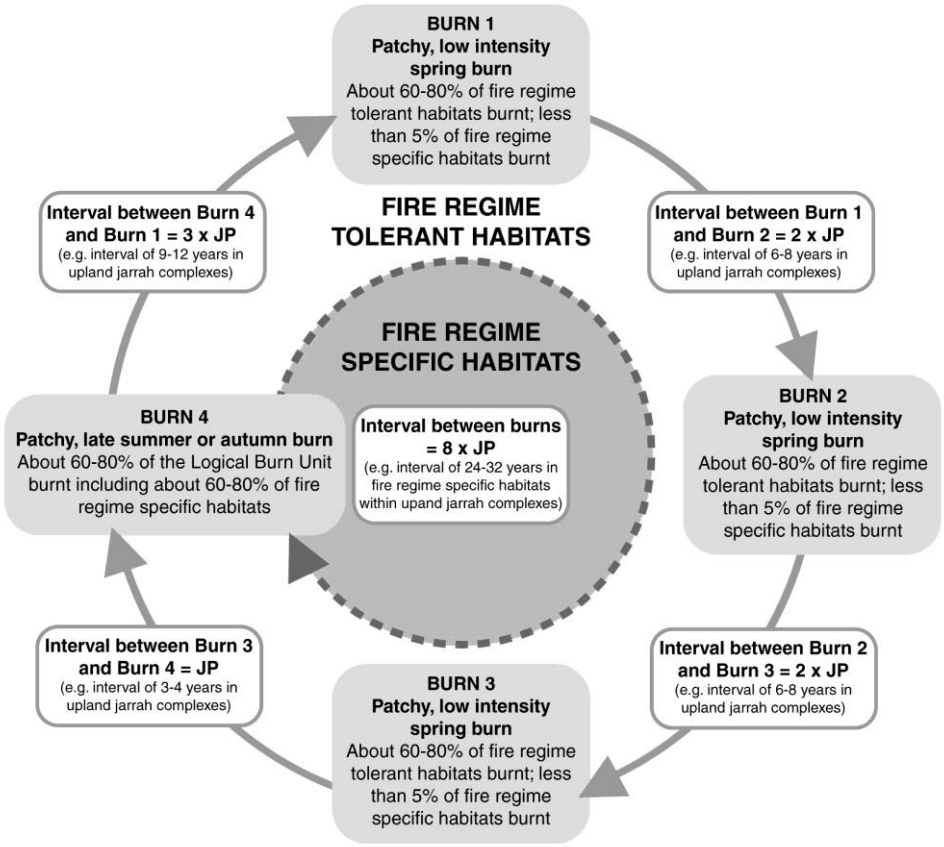


Figure 7. Example of an ecological fire regime for managing ecosystems based on vital attributes

(adapted from the example of a managed jarrah forest fire regime shown in Burrows 2008).
JP= the juvenile period of the slowest maturing fire sensitive understorey species.

Preliminary analysis of the planning area (undertaken in 2004), for which about 50 per cent of vegetation communities have fire response data, indicates that a minimum of six to seven years between lethal intensity fire events post germination may be required in Leeuwin-Naturaliste, Yelverton, Bramley and Forest Grove national parks based on conservative minimum intervals (i.e. two times the juvenile period). The southern part of Scott National Park (south of Milyeannup Coast Road) may require a minimum burn interval for lethal fire intensity events of eight years.

Knowledge of Gingilup Swamps Nature Reserve suggests that it is largely dominated by resprouters with long juvenile periods of just over five years. To develop genetic diversity, these species require the opportunity to produce a sufficient seed store between fire events. Research on resprouting *Restionaceae* genera indicates that a minimum of 8 to 15 years between lethal intensity fire events post germination may be required for a viable seed store for many of these species.

Fauna with specific fire-regime requirements in the planning area include the white-bellied frog, mardo (*Antechinus flavipes*) and the quokka (requires specialised habitat). Studies of the white-bellied frog within Forest Grove National Park revealed that populations declined by just over 50 per cent following fire (Bamford and Roberts 2003). Wardell-Johnson et al. (1995) suggest that where prescribed burning is necessary in the forest surrounding the habitat of these frogs, it should be carried out in early spring using prescriptions that account for seasonal conditions and lessen the likelihood of burning the microhabitat of these frogs. Preliminary results suggest that fire in autumn can burn the calling sites of this species. The department will manage areas of suitable frog habitat to minimise the potential for habitat removal by high intensity bushfire. The application of mild intensity prescribed fire at appropriate times is one method to achieve strategic protection of frog habitat.

Christensen (1997) noted that late successional species such as the quokka and mardo, both found within the planning area, can take 10 years or more to recover from the effects of fire. Animals such as the quokka can quickly re-colonise areas after fire if the fire is relatively small, the vegetation recovers quickly, foxes are controlled and there is a nearby population of source animals (G. Liddelow *pers. comm.*). A fire management

guideline has been developed for the threatened quokka (DEC 2008a) that describes how fire is applied to a Logical Burn Unit that contain this species (or its riparian habitats that are in the intermediate to late seral post-fire stages) to protect the species and/or suitable habitat, or to regenerate suitable habitat that begins to senesce 25 to 35 years after fire.

Frequent and/or intense large fires in coastal areas may have caused the localised extinction of several bird species (Yates *et al*. 2003), although fire may only be one of many factors, and the other effects such as feral animals and visitor impacts need to be considered.

Managing fire to protect ecologically sensitive areas and niches – coastal vegetation communities

Coastal dune and heath vegetation is vulnerable to wind erosion, particularly following intense or frequent fire. While dune systems are generally well adapted to fire and rehabilitate quickly, careful application of fire and protection from bushfire is required to ensure erosion does not occur. In coastal areas the Rottnest Island tea-tree priority ecological community is sensitive to fire.

The department will consider fire management in these areas with caution, seeking to develop fire management guidelines for these ecological communities, and apply low intensity fire that doesn't remove all vegetative cover and ensures that the entire landscape is not burnt (see also *Strategic Protection Areas* below). Areas targeted for prescribed burning will be those off susceptible foredunes and on the leeward side of dunes. The seasonality in applying fire will aim to reduce the impact of prevailing winds. To aid in prescribed burning, more research is required on the regeneration period of coastal heath vegetation.

Managing fire to protect ecologically sensitive areas and niches – caves

Cave environments are particularly susceptible to changes in hydrology (see Section 18 *Soil and Catchment Protection*). Therefore, fire regimes that are detrimental in the long-term to either the quantity (particularly increased flow) or the quality (as a result of ash) of water following a fire needs to be considered as part of their management. As yet there is little information on the effects of fire on the hydrology of cave ecosystems, particularly aquatic root mat communities (see Section 21 *Ecological Communities*). However, a trial was carried out by the department to examine the effects of prescribed burning on Jewel Cave. Preliminary findings suggest that low intensity prescribed fire over the cave system did not adversely affect the hydrology and water quality of this system. More research is still needed to investigate the detrimental effects of certain fire regimes as well as the potential to manipulate fire regimes to adapt to climate change. It is recognised that the effects of fire may be catchment specific.

At the time of writing, a specific fire plan, consistent with this management plan, is being prepared for the commercial caves in the planning area.

Managing fire to protect ecologically sensitive areas and niches – riparian zones and wetlands

Significant wetland environments exist on the Scott Coastal Plain, particularly within Gingilup Swamps Nature Reserve. Some fire regimes, coupled with the impacts of climate change, may have detrimental impacts on riparian zones and wetlands. An observed decline in rainfall since the 1970s has resulted in a sharp fall in streamflow in the south-west, subsequently drying out some wetlands, peat swamps and riparian zones, and predisposing them to fire for a longer period. Consequently, 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, especially for the conservation of peat swamps, which may take thousands of years to recover if completely burnt (Dr N. Burrows *pers. comm.*).

Frequent hot fires, or regimes that remove organic matter in wetland environments, can burn the soil and alter it by exposing anaerobic soils to air, increasing the risk of acidification (Horwitz *et al*. 2003). High intensity 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 department's *Fire Management Guideline No. E1 Organic-Rich Soils (Peatlands)* (DEC 2008b) states the fire management objectives are to specifically protect organic soil habitats from bushfire and avoid ignition of organic solids as a result of prescribed fire operations.

The extent or patchiness of fire in riparian zones is important for fauna that persist in relatively small, linear habitats along drainage lines. Large-scale fires that burn entire habitats are detrimental to some species that utilise these corridors, particularly along major river systems such as the Blackwood, Margaret and Scott rivers. Too infrequent fire may result in some serotinous plant species completing their life cycle and dying, with subsequent loss of the seed bank. The impact of fire on tree species is important in riparian areas as the fire-formed tree hollows provide valuable fauna habitat. Fire can destroy and create tree hollows (Inions *et al*. 1989).

The impact of fire on waterbird habitat is considerable in *Taxandria floribunda* thickets found in Gingilup Swamps Nature Reserve, since these plants appear to be killed by fire and regeneration occurs slowly from seedlings (Jaensch 1992a). It is possible that these thickets may take five to 10 years to reach a height and density that is suitable for waterbird breeding (e.g. little bittern). Therefore prescribed burning that is too excessive or frequent should be avoided in wetlands where these habitats occur. The loss of entire *Taxandria floribunda* thickets throughout the Gingilup-Jasper wetland system would have significant effects on waterbird fauna.

Managing fire to protect ecologically sensitive areas and niches – granite outcrops

Although comprising a small proportion of the total landscape, these biotic islands are important for biodiversity conservation because of the uncommon habitat they provide through a combination of biological isolation, soil type, moisture levels and fire regime. Granite outcrops often contain unique assemblages of flora and fauna, including many fire sensitive taxa.

The fire frequency of granite outcrops is generally 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, thus limiting fire spread under mild/moderate conditions (Burrows 2005). Granite outcrops such as those along the Margaret River, may therefore act as refuges for fire-sensitive species. However, many species on granite outcrops also require infrequent fire under certain conditions to regenerate. Hopper (2000) found a high number of fire-sensitive obligate seeders (77 per cent) 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 one to two decades (i.e. shorter interval) between fire are more probable because of the higher biomass in the forested regions (Dr N. Burrows *pers. comm.*). To enable rock outcrops to function as fire refuges, and to decrease the probability of these fire refuges being damaged by large, intense bushfires from the surrounding forest, it is important that fuel build-up is managed. Prescribed fire can be introduced under mild conditions where rock outcrops do not entirely burn in any one fire event.

The department's *Fire Management Guideline No. E5 Granite Outcrops* (DEC 2008c) states the fire management objectives are to:

- minimise the risk of damaging (high intensity) bushfire impacting on granite outcrops
- protect fire intolerant species and communities (e.g. rock lichen, moss swards, *Boyra* meadows) from damage by fire
- protect fire regime specific vegetation communities (e.g. heaths, shrublands and woodlands) from fire intervals of less than 15 years
- maintain structural and floristic diversity of fire maintained communities by introducing low to moderate intensity fire at intervals of greater than 15 years without damaging or degrading fire intolerant communities and species.

Managing fire and the flammability of vegetation in the surrounding landscape is crucial for protecting the ecological integrity and function of granite outcrops. The regular introduction of low intensity fire to surrounding more flammable and fire tolerant vegetation when outcrop vegetation is unlikely to burn, is a key strategy for protecting outcrop communities from damaging bushfire and to allow them to act as fire refuges. Monitoring the outcomes of the fire management strategies for granite outcrops and surrounding landscapes will be important to assess whether the fire management objectives are being achieved as well as to allow adaptive management.

Managing fire for diverse post-fire (seral) stages

Maintaining a diversity of post-fire fuel ages (seral stages) or habitats, is fundamentally important for ecosystem health and by definition, enhances biodiversity. However, there is insufficient information on the vital attributes of species within the planning area at present to accurately determine the required proportion of each seral stage

in each LCU. Consequently, the department will aim to approximate the theoretical negative exponential distribution for each LCU until more information is available.

Protecting biodiversity by managing fire based on fuel accumulation

In the past, fire management has been based around the manipulation of forest fuels as a means to protect life and community assets from large, damaging bushfires. Controlling the incidence of bushfire, or at least the impacts of such an event, is also important to managing the threat to biodiversity (e.g. old-growth forest, fire sensitive communities and species, and populations of threatened flora and fauna).

Fuel reduction burning is the practise of purposefully setting low intensity fires under defined conditions of fuel, weather and topography to consume a portion of live and dead vegetation. It is a fire management technique that aims to reduce the severity (scale and intensity) of bushfires. Fuel reduction burning rarely prevents bushfires but where a significant proportion of the landscape is managed this way, bushfire severity, and consequently the impact on biodiversity, life and community assets can be significantly reduced.

In the planning area, the department will seek to reduce the threat of bushfire to significant biological assets by:

- Ensuring a mosaic of fuel age classes across the landscape or a system of fuel-reduced buffers, specifically managed to reduce fuels around biological assets. This is particularly important for Forest Grove National Park and Reserve 46400, where bushfire would have detrimental impacts on populations of white-bellied frog.
- Periodically undertake strategic fuel reduction burning in Gingilup Swamps Nature Reserve to mitigate east-west bushfire runs from burning the entire reserve. This will also enhance the conservation of the peat swamps. The reserve has a history of intense, large-scale bushfire burning the entire reserve, caused by lightning strikes in the adjacent D'Entrecasteaux National Park.
- Integrate fire management with D'Entrecasteaux and Blackwood River national parks.

Managing fire to protect life and community assets

The existence of towns, settlements, farmland and other developments, as well as the increasing use of natural areas for recreation, requires that the protection of life and community assets is considered in fire management for the planning area. In particular, special consideration is given to the bushfire threat along the Leeuwin-Naturaliste Ridge.

Identifying vulnerable community assets within the planning area, and determining the risk and consequences posed by bushfire to those assets will assist in managing the threat posed by high intensity bushfires. The department's bushfire threat analysis[23] provides a strategic framework that is the basis for more detailed analysis and evaluation of susceptible areas and specific fire pre-suppression tactics. This process also assists in developing strategies to mitigate the threat to biodiversity values.

The bushfire threat analysis process aims to:

- Provide a framework to analyse the best available information on all factors contributing to a bushfire 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.
- Provide a rational basis for discussion and conflict resolution in the preparation of plans.

To achieve this, the bushfire threat analysis process considers:

- the likelihood of an ignition occurring (past fire history)
- the potential behaviour of fire following ignition (fuel, landform, weather)
- the capacity to mount an effective suppression response (detection, travel time, access for suppression forces and the quantum of those resources)
- the potential consequences on social, economic and environmental values impacted before suppression is achieved.

[23] The bushfire threat analysis is consistent with the accepted framework under which risk assessments are implemented in Australia – the *Australian/New Zealand Standard AS/NZS 4360:2004 – Risk Management*. Variables in the analysis such as fuel age may change over time and hence only provides an assessment of risk at the time of analysis. Consequently, the analysis process is used as a guide and department expertise and experience is necessary to formulate long-term risk mitigation strategies.

A specific bushfire threat analysis for the planning area was undertaken as part of the preparation of this management plan. Table 6 shows the community asset values in and around the planning area that were considered in the bushfire threat analysis for the planning area, and defines what is an acceptable outcome in relation to bushfire.

The bushfire threat analysis, and subsequent analysis by department experts, revealed an extreme bushfire threat around the townsites of Yallingup, Gracetown, Margaret River and Dunsborough, those areas within close proximity to rural-residential areas and Calgardup, Giants and Jewel caves (DEC 2006a).

Table 6. Life community assets in and around the planning area

Life and community assets*	Acceptable outcome
Firefighter and public safety.	No loss of life due to bushfire.
Townsites of Yallingup, Dunsborough, Gracetown, Augusta and Margaret River, and settlements of Prevelly, Injidup, Rosa Brook, Carbanup, Cowaramup, Witchcliffe, Karridale and Kudardup. There are also a number of semi rural urban developments in close proximity to remnant bushland that lack adequate refuge areas (e.g. Molloy Island and rural settlements near Gracetown and Yallingup).	Minimal loss of community assets with little financial loss and disruption to local communities. No loss of life due to bushfire.
Essential utilities including pipelines, loading ramps, water supply facilities, pump stations, communication infrastructure (e.g. towers at Mt Duckworth and Boranup Hill) and transmission lines.	Minimal and short-term financial impacts on infrastructure and minimal disruption to local communities.
Built infrastructure including Hamelin Bay Caravan Park, Conto Campground registration centre, Cape Leeuwin, Cape Naturaliste and Foul Bay lighthouses, Ellensbrook Homestead, Leeuwin Waterwheel and Margaret River Eco Discovery Centre. There are also other built assets including tourist infrastructure associated with the caves (e.g. CaveWorks Discovery Centre) that also need to be considered.	Minimal injury to visitors and minimal financial loss. Minimal disruption to regular activities and impact on historical values/infrastructure.
Recreation sites and tracks/trails, especially high use sites at Conto Campground, Point Road, and Boranup campgrounds and the Cape to Cape Track.	Physical infrastructure may be lost, but is readily replaced at an acceptable cost. No loss of life due to bushfire.
Adjoining plantations, Hill View Golf Course, vineyards, private property.	Minimal financial loss and minor affects on productive potential in the medium term.
Research sites and Fire Exclusion Reference Areas that require protection from bushfire due to their long-term research values.	Minimal loss of investment in research if experiments are fire sensitive.
Natural assets, including significant vegetation complexes, specially protected fauna, threatened flora, TECs and significant habitats and landscape values.	Impact of bushfire on these assets may cause short to medium term loss but recovery, regeneration, translocation or rehabilitation is possible.
Indigenous and non Indigenous heritage sites.	No loss of Indigenous and non-Indigenous heritage.
Water supply areas such as the Ten Mile Brook catchment area.	Short-term effects on potable water quality and quantity as a result of bushfire.
Apiary sites.	Limited sites and short term impacts on production capacity and hives.

* Not all community assets listed are contained within the planning area.

Other high risk areas include bushland in the vicinity of Margaret River, Prevelly, Yallingup, Dunsborough, Gracetown and Augusta. The townsites of Yallingup, Gracetown and Prevelly are surrounded by particularly heavy fuel loading and have limited access. However, the location of adequate refuge areas (i.e. the beach and reticulated ovals) and the presence of reticulated water in some of these areas indicate that bushfire poses a significant threat to infrastructure, but a limited threat to human life. In areas such as Molloy Island, access is severely limited and the onus is on the Augusta-Margaret River Shire and residents to implement self protection measures.

Many built assets and recreation sites managed by the department receive high visitation from tourists, transforming low value, fire resistant sites to locations where there is a significant risk to human life in the event

of a bushfire. The risk to these assets is exacerbated by terminated access points, a lack of refuge (e.g. some sections of the Cape to Cape Track), daily access and poor access for suppression/evacuation.

In some instances, the bushfire threat analysis identified significant amounts of remnant vegetation on adjoining properties, indicating that for effective bushfire threat mitigation, active and complementary management on adjoining lands is required. Several areas were identified where fire management on adjoining properties should be undertaken in order to provide protection from fire to community and reserve values (e.g. north of Gracetown between Cullen, Cowaramup Bay and Caves roads). In such areas the department manages a minor percentage of the land covered with remnant vegetation but the risk to community assets is high (see Table 7 and *Education, Liaison and Community Involvement*).

Strategies for bushfire mitigation

The department recognises the significant bushfire threat along much of the Leeuwin-Naturaliste Ridge and proposes the following strategies for bushfire mitigation (see also Table 7 and Map 4):

- establishing 'Asset Protection Areas' around key community assets
- establishing 'Strategic Protection Areas' to prevent bushfire runs
- using mechanical fuel management where required
- maintaining and improving the department's current fire response capacity
- continuing to liaise with local government authorities, FESA and local fire brigades
- educating and communicating with the community and regulating visitor use
- managing public access (see Section 30 *Visitor Access*) and maintaining access for fire management purposes.

Prescribed burning will be an important strategy for bushfire mitigation in strategic and asset protection areas.

Asset protection areas

Asset protection areas are strategically located along the Leeuwin-Naturaliste Ridge immediately around key community assets (Map 4), and will be managed with a priority for the protection of life and the particular asset. The full range of options for bushfire mitigation described above may be employed in these areas. A key component of management will be prescribed burning and the use of mechanical fuel management techniques (see below). The management objectives for these areas are to maintain a reduced fuel level and a fire response capacity appropriate to protect the asset.

While the priority of asset protection areas and strategic protection areas is for the protection of life and community assets, the department will continue wherever possible, to apply fire in a way that does not compromise biodiversity values. For example, prescribed burns to protect life and community assets may be manipulated using smaller burn cells (and hence the potential for greater intervals between fire) to achieve biodiversity outcomes. However, where life and community asset protection coincides with high biodiversity values, and it is not possible to achieve multiple objectives, priority will be given to the protection of life and community assets.

Where possible, the boundaries of asset and strategic protection areas will align to easily identifiable and manageable boundaries that allow for ease of management operations. The boundaries of these areas may require fine-scale modification to adjust to operational boundaries on the ground or as a result of tenure additions. Flexibility to modify such boundaries is required to maintain the level of protection and intent of this plan. The predicted land use changes and population growth described in the LNRSPP have been considered in determining these boundaries.

Sixteen asset protection areas have been identified in the planning area (Table 7). This excludes the Augusta townsite, which is deemed to be relatively self-protecting.

Table 7. Asset protection areas within the planning area

Asset protection area	Management actions and considerations
Cape Naturaliste and Cape Leeuwin lighthouse precincts	The Cape Naturaliste and Cape Leeuwin lighthouse precincts (Reserves 44658 and 44660) contain high-value infrastructure and high visitation during peak periods. Surrounding areas also contain high value biological assets (e.g. the Cape Leeuwin wetland system and the only known *Wurmbea calcicola* population) that require protection. Site specific fire management plans for the lighthouse precincts are required, including access/egress, building protection, emergency

Asset protection area	Management actions and considerations
	response plans and staff training. This will include a requirement for bushfire mitigation measures to be established and maintained by the lease holders/managers (e.g. provision of on-site fire fighting equipment and adequate water supplies and sprinklers). Fire management requirements will be incorporated into future commercial lease agreements.
Yallingup	The Yallingup asset protection area may utilise a range of mitigation strategies including prescribed burning and mechanical fuel management. The area surrounds the Yallingup townsite and contains cultural and biological values (e.g. Yallingup Brook and tea-tree landscape features), which need to be taken into account when planning for life and community asset protection. The department will encourage bushfire mitigation measures to be established and maintained by the owners/managers of Ngilgi cave. The size of this area is such that it allows flexibility in the segments to be burnt, enabling biodiversity and asset protection objectives to be achieved. Parkland clearing has been applied immediately around the fringe of the townsite. The department has joint obligations in this area with the Shire of Busselton and FESA to mitigate against the threat of bushfire. A Bushfire Ready Action Group has been established to determine the community activities required to ensure self protection of assets. The department will assist local government authorities in the preparation of a fire response plan. Adequate water supplies are required.
Mount Duckworth	This area has a history of grazing and was recently incorporated into Leeuwin-Naturaliste National Park. The department will endeavour to rehabilitate this site taking into account the requirements for fire management. Consideration will be given to the potential for development as provided for in the LNRSPP, potential helicopter landing points and visual impacts.
Gracetown	Gracetown is an enclave within Leeuwin-Naturaliste National Park. South of the townsite the land is predominantly national park with several existing fire access tracks. Prescribed burning and mechanical fuel management will be used in this area to mitigate the bushfire threat. Burn cells will be broken up into various fire intervals and the sequencing of burns will accommodate corridors for fauna movement (i.e. the entire east-west corridor will not be burnt in a single event). The asset protection area excludes the most northern occurrence of karri, which will be managed for biodiversity conservation. The national park occupies only a small proportion of the land to the north of Gracetown (between Cullen and Cowaramup Bay roads), most of which is a narrow coastal strip. The land to the north is predominantly private property containing a large percentage of remnant vegetation. This presents a potential bushfire threat to Gracetown. The responsibility to take action to mitigate this threat rests with the Shire of Augusta-Margaret River.
Kilcarnup	Kilcarnup is a particularly complex area for managing the threat of bushfire because of poor access, steep terrain, high fuel load and the influence of coastal winds. This area poses a potential risk to rural residential development on the southern side of the Margaret River. The department acknowledges these risks but also recognises the obligations of the Augusta-Margaret River Shire and FESA to address fire management within the residential area.
Bramley/Margaret River townsite	Prescribed burning will be applied to mitigate the threat of bushfire to the Margaret River townsite. While identified for asset protection, burning should be applied to maintain the integrity of the river corridor for fauna movement and to minimise weed invasion. Fire runs along the river will be mitigated by implementing strategic breaks. The entire river corridor will not be burnt in a single prescribed burn. One fire exclusion reference area is contained within the asset protection area and will be managed to protect its research value. Burning to enhance the water supply of Ten Mile Brook Dam will be a secondary factor to asset protection and biodiversity conservation.
Prevelly/Wallcliffe	Significant development exists around Prevelly and Wallcliffe with considerable areas developed with little regard for bushfire threat. Mechanical fuel management will be applied as the primary bushfire mitigation technique. It is recognised that prescribed burning is difficult to implement in this area because of

Asset protection area	Management actions and considerations
	the mixture of different land tenures and practicalities in applying fire. The Augusta-Margaret River Shire has the responsibility of addressing bushfire threat in the developed area around Prevelly/Wallcliffe.
Mammoth, Lake, and Jewel caves	The department will encourage bushfire mitigation measures to be established and maintained by the owners/managers of commercial caves outside the national park.
Conto Campground, Giants and Calgardup caves	A site-specific fire management plan will be prepared that considers access/egress, fuel management, building protection and evacuation.
Hamelin Bay	Prescribed burning will be applied as the primary bushfire mitigation technique to protect the highly visited recreation site at Hamelin Bay. This will be complemented by mechanical fuel modification and onsite fire preparedness.
West Augusta	Prescribed burning will be applied as the primary bushfire mitigation technique to protect fringing development around the Augusta townsite. The townsite itself is relatively self protecting.

Strategic protection areas

Strategic protection areas (Table 8 and Map 4) are designed to mitigate bushfire runs in north-south and east-west directions along the Leeuwin-Naturaliste Ridge. Like asset protection areas, strategic protection areas will be managed to maintain reduced fuel levels to minimise the impact of bushfire on life and key community and biological assets. This requires consideration of the fuel age in adjoining biodiversity conservation zones and other lands and recognises that it may not be necessary to consistently maintain low fuels in strategic protection areas adjacent to recently burnt vegetation (i.e. areas of low fuel). Not all strategic protection areas will be burnt and mechanical fuel management may be the preferred bushfire mitigation technique.

The location of strategic protection areas is based on current knowledge and the status of the road/track network. To maintain flexibility for managers, the location of the strategic protection area at Sugarloaf Road will not be fixed and an alternative location may be selected on a rotational basis. In this case, the same fire protection objectives would need to be met. The location of the strategic protection area at Sugarloaf Road would only be relocated temporarily and for biodiversity reasons.

Table 8. Strategic protection areas within the planning area

Strategic protection area	management actions and considerations
Sugarloaf Road	Prescribed burning and mechanical fuel management will be applied to prevent bushfire impacting on biological assets at Cape Naturaliste. This area has also been selected as it adjoins the popular and highly visited Sugarloaf Rock recreation site and will protect the more developed section of the Cape to Cape Track. An alternative area to achieve strategic protection is available to the south.
Boranup	Prescribed burning and mechanical fuel management will be used to prevent bushfire escaping or entering Leeuwin-Naturaliste National Park and to prevent bushfire runs in a north-south and east-west direction. The location of the strategic protection areas provide protection to frog populations in Forest Grove National Park and Reserve 46400 and avoids high density cave locations. Karri vegetation is located in strategic protection areas and biodiversity conservation zones to ensure the entire karri population in the area is not subject to more frequent burning. East of Caves Road, a strategic protection area between frog populations will mitigate bushfire runs in a north-south direction.
Reserve 46400	Prescribed burning will be applied to prevent bushfire runs along the Blackwood River impacting on frog populations in Reserve 46400 and Forest Grove National Park.
Hill View	Prescribed burning will be applied to prevent bushfire impacting on high-value infrastructure and biological assets in the vicinity of Cape Leeuwin.

Mechanical fuel management

Mechanical fuel management involves parkland clearing and the use of slash breaks[24]. Such techniques can be applied to restrict a bushfire and/or enable access for fire-fighting machinery. Parkland clearing may be used in the immediate vicinity of townsites while slash breaks can be applied in asset and strategic protection areas and other areas as required. The location of slashed breaks may be varied to retain flexibility for managers.

Slash breaks associated with burn boundaries of asset and strategic protection areas may be narrower than those not associated with such areas. The visual impacts of slashed breaks will be minimised wherever possible using landscape management techniques (e.g. retaining selected trees around ridgelines, manipulating shrub height or alternating their alignment), especially in landscape management zone A (see Section 35 *Visual Landscape*). The viewshed from Wallcliffe house to Reserve 8431 at Kilcarnup across the Margaret River (about the 60 metres contour) is interim listed under the *Heritage of Western Australia Act 1990* and requires special consideration. Any slash breaks that may be created in this area should be visually unobtrusive.

Should other forms of mechanical fuel management become available in the future they will be investigated for their application and use within the planning area.

Education, liaison and 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. There is interest in the community about the planning process and outcomes associated with prescribed fire management. To this end, the department makes its planned burn programs publicly available.

Most of the planning area interfaces with agricultural land, tree plantations and settlements. In many cases, private property adjoining the planning area also contains significant areas of remnant vegetation. This is a particular concern as these areas may be burnt infrequently and can be situated adjacent to key community assets (see Table 6). It is therefore important for the successful management of fire, and many other land management issues, to foster 'good neighbour' relations with adjoining landowners, particularly to ensure complementary fire management on adjoining lands. In particular, local government authorities have a dual responsibility with the department to mitigate the impacts of bushfire. The threat analysis undertaken for this management plan has assessed the bushfire threat on all tenure types and provides the option for planning and mitigation strategies to be developed across the Leeuwin-Naturaliste Ridge.

Increasingly, people and facilities are being located closer to or within forested and coastal areas, exposing them to the risk of bushfire. This is especially so in the highly fragmented Leeuwin-Naturaliste National Park and in particular, its northern portion, which is experiencing increased development pressure. Development 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 FESA document – *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 bushfire 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 property. The department will apply the guidelines to all applications for subdivisions adjacent to the planning area and encourage a high level of fire protection measures on all adjoining lands. Consistent with other management objectives, the department will comply with the guidelines for the planning area (e.g. including fire protection as part of the ranger accommodation at Conto Campground and for commercial lease agreements).

Liaison and cooperation with other stakeholders in fire management will continue to occur. Engagement with local government, volunteer bushfire brigades, FESA and other State government agencies will be necessary to ensure effective fire management across jurisdictions.

As well as an effective public liaison, education and awareness program, the enforcement of legislation and compliance management is essential. The department will cooperate with agencies responsible for public education and law enforcement, such as the FESA and the WA Police Service.

[24] Slash breaks are areas of reduced fuel where vegetative cover is temporarily reduced to ground cover and root stock. Slashed breaks are generally 10 to 30 metres in width and do not exceed 50 metres.

Managing access

Where possible, public access and visitor use have been designed to minimise the impact of bushfire on visitors and limit the sources of ignition. A strategic public access network for the planning area is described in Section 30 - *Visitor Access*. The department will maintain a strategic fire access network within the planning area that will comprise public and strategic access roads/tracks. This network will be maintained to ensure safe access for fire fighting vehicles and to permit effective fire management. An annual road/track maintenance program will be developed based on available funding and will be planned to consider potential impacts on natural, cultural and recreation values.

Providing alternative access through Leeuwin-Naturaliste National Park to coastal settlements has been considered and weighed against environmental and management implications such as the complication of traversing public and private lands, clearing vegetation and the destruction of fauna habitat, visual amenity, the potential for spreading dieback disease, illegal camping and an increase in illegal access. Indeed, establishing an east-west access road may lead to the threat to human life being increased in a bushfire situation. Given that bushfire poses a limited threat to life and the infrequent inconvenience of a bushfire temporarily cutting off access to coastal settlements, providing alternative access is not warranted at this time.

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 fire access tracks or firelines are constructed during fire suppression activities, these will be rehabilitated after the fire event to minimise the threat of soil erosion, weeds or spread of disease and unauthorised use of the access (see Section 38 *Rehabilitation*).

Caves systems within the planning area increase the risk of subsidence or collapsing ground, and therefore present a safety risk, especially for firefighters using heavy machinery for suppression activities. Hazard maps that identify this risk need to be kept up to date.

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 bushfires. It is recognised that the science of fire and its interaction with biota is incomplete and can be improved. In particular, the planning area provides an ideal opportunity to study the effects of fire in a forested and fragmented landscape.

To improve this knowledge, fire may be planned and used to deliver specific research outcomes. For example, the department has initiated a study into the effects of prescribed burning on the hydrology of Jewel Cave. The department also sets aside Fire Exclusion Reference Areas for research purposes, where fire is excluded to ensure long unburnt sites are available for comparison to areas burnt under prescribed conditions (see Appendix 8 for a definition of all 'conditional burning areas'). These have been selected across the south-west in accordance with a number of criteria which consider the ability to protect them from unplanned fire, minimising the risk these areas pose to adjacent life and property and be broadly representative of major vegetation and landforms in the area. There are five Fire Exclusion Reference Areas located within the planning area (Map 4).

The department may initiate specific fire research/monitoring projects as opportunities arise, including pre and post-burn monitoring (e.g. Boranup ecosystem monitoring). Consistent with principles of adaptive management, fire management will be reviewed and if necessary, adjusted, in response to ongoing research and monitoring.

25. Fire

Key points

- Fire management within the planning are will focus on biodiversity conservation, life and community asset protection and fire research. Due to the high bushfire threat to parks of the Leeuwin-Naturaliste Ridge, increased importance will be placed on the protection of life and community assets in this area.
- Management for biodiversity conservation will be based on the vital attributes of flora and fauna and will aim for a diversity of seral stages across the landscape.
- Diversity and variability in fire regimes at the landscape scale helps maintain biodiversity. Patchiness of burning is important in providing environmental heterogeneity at a local scale.
- Fire sensitive species and ecosystems are most typically associated with wetland and riverine communities, granite outcrops and ironstone vegetation. Coastal heath vegetation is vulnerable to erosion following large-scale bushfires.

- High intensity bushfire is not desirable. The department uses fire in a planned way to reduce the potential severity and extent of bushfire events and in turn provide safety to firefighters, neighbours and visitors as well as protection of community assets.
- Liaison with neighbours, the wider community, local government, volunteer bushfire brigades, FESA and other State government agencies will be necessary to ensure effective fire management across jurisdictions.

The objective is to protect and enhance biodiversity across the landscape and to protect life and community assets in and near the planning area.

This will be achieved by:

1. Continuing to implement fire plans for the planning area according to the rolling three-year indicative burn program, the zoning system for the planning area (e.g. Biodiversity, Asset and Strategic Protection areas) and relevant fire management policies, principles, guidelines and available knowledge.
2. Continuing to focus fire management along the Leeuwin-Naturaliste Ridge on the application of prescribed burns and other strategies to protect community assets. Elsewhere, the protection of biodiversity will be a priority for fire management.
3. Where biodiversity values are at risk, continuing to develop specific fire management guidelines for protecting significant habitats within five years of commencing this management plan, and with the advice of the Conservation Commission.
4. Maintaining a diversity of post-fire (seral) stages by approximating the theoretically-derived negative exponential distribution of fuel age classes across each LCU. At the smaller scale, fire management guidelines and other available knowledge will be used to determine the appropriate fuel age distribution for fire sensitive/atypical habitats.
5. Applying fire to prevent extensive bushfire in Gingilup Swamps Nature Reserve, Forest Grove National Park and Reserve 46400. Management will be integrated with that of the adjoining D'Entrecasteaux and Blackwood River national parks.
6. Trialling low intensity fires at shorter intervals and closely monitoring the survival and recruitment of fire sensitive species.
7. Facilitating and supporting others to undertake research on fire ecology, biological indicators and habitat requirements of vegetation communities and include as relevant, in the preparation of annual fire plans for the planning area (e.g. develop and implement a fire management regime for caves ecosystems).
8. Implementing the management actions shown in Tables 7 and 8 and Map 4 for asset and strategic protection areas. Mechanical fuel reduction will be used in these and other areas as required.
9. Reviewing and updating 'hazard area' maps for karst to ensure firefighter safety.
10. Developing and implementing a strategic fire access plan and maintaining roads/tracks used for fire management according to department standards.
11. Monitoring the impacts of fire on key values.
12. Continuing to liaise with local government, FESA, WAPC, local bushfire brigades, neighbouring land-holders and other appropriate authorities to encourage cooperative arrangements, ensure appropriate community protection from fire and encourage new subdivisions adjoining the planning area to include fire protection measures commensurate with the level of bush fire hazard.
13. Promoting public education and awareness of the department's fire planning and management, the effects of fire on the natural environment, the need to prevent bushfires and the safety and survival of people and property.
14. Providing opportunities for public input into the Master Burn Plan planning process.

Key performance indicators (see also Appendix 1):

Performance measure	Target	Reporting requirement
25.1 The extent of fire diversity measured by the diversity and scale of post-fire (seral) stages within a LCU	25.1 The distribution of post-fire fuel ages (time since fire) for each LCU approximates a negative-exponential distribution	Annually
25.2 The impact of bushfire on life and community assets	25.2 No loss of life or significant community assets, or serious injury, attributable to the department's fire management	
25.3 The extent to which targets	25.3 Development of fire	Every 5 years

have been prepared for significant habitats requiring specific fire regimes	management guidelines for significant habitats requiring specific fire regimes (e.g. granite outcrops, riparian zones and wetlands, caves, coastal vegetation communities, Scott ironstone TEC)	
25.4 The persistence of threatened species and TECs within each LCU	25.4 No loss of populations of threatened species or TECs at the LCU scale because of fire	

PART D. MANAGING OUR CULTURAL HERITAGE

The *Australia ICOMOS Burra Charter 1999* (Burra Charter 1999) was adopted to provide for 'the conservation of places of cultural significance' and includes a series of guidelines for managing cultural heritage (see Section 7 *Legislative Framework*).

A national heritage system was introduced in 2004 to strengthen protection for the nation's natural, Indigenous and historic heritage. This included amendments to the EPBC Act to include 'national heritage' as a matter of national environmental significance and to provide statutory protection to National and Commonwealth Heritage listed places. Actions likely to impact on the heritage values of listed places require approval from the relevant Commonwealth Minister responsible for heritage protection. Places that are not listed (e.g. those listed on the Register of the National Estate) should be assessed for listing on the National or Commonwealth Heritage lists.

In WA, legislation exists to protect Indigenous and non-Indigenous cultural heritage. The Aboriginal Heritage Act was enacted to protect sites and objects customarily used by, or traditional to, the original inhabitants of Australia. A register of sites and objects is maintained under the Act, although the Act also protects sites that have not yet been entered on the register. 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'. These places are registered on the WA 'Register of Heritage Places' database. Places listed on this register 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 WA. The department's draft Policy Statement – *Management of non-Indigenous cultural heritage on lands and waters managed by the DEC* provides more guidelines for managing non-Indigenous cultural heritage.

Many places may have historic interest, but have not been assessed or are not considered significant enough to be worthy of listing under the legislation. 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 information contained in all aforementioned registers and databases is considered before 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.

26. INDIGENOUS CULTURAL HERITAGE

Smith and McDonald (1989) describe the Leeuwin-Naturaliste region as the tribal territory of the *Wardandi* people, who were a coastal people located between Bunbury and Cape Leeuwin, and the *Pibbelmen* people, who occupied the lower Blackwood River. Although the Leeuwin-Naturaliste area was a better place to live than the semi-arid regions, it is relatively poor in resources and did not support large numbers or high densities of Aboriginal people (Lilley 1991). Indigenous cultural history and knowledge of the area is relatively poorly documented, and that which does exist has largely been written with a Eurocentric focus. This does not mean that such knowledge does not exist amongst local Indigenous groups.

The majority of Aboriginal activity is thought to have been concentrated along the Leeuwin-Naturaliste coastline and near-coastal transition zone where Aboriginal people congregated during summer and autumn to procure fish and other foods (Dortch 1984, Lilley 1991). Aboriginal people migrated seasonally between these coastal areas and its hinterland to utilise various resources. Most activity was in the vicinity of fresh water sources, such as rivers and pools, which were used for camping, hunting, foraging and fishing. There are few historical accounts of Aboriginal activities in the inland karri and jarrah forest (Dortch and Dortch 2001). These areas were less occupied, except along larger rivers such as the Blackwood River, and were difficult to access (Hallam 1975). There is even less evidence of Aboriginal activity on the Scott Coastal Plain, which is one of the ethnographically least studied regions in the south-west (Brad Goode and Associates 2003) although it is presumed to have a low level of Aboriginal occupation (O'Connor, Quartermaine and Yates 1995).

Many archaeological sites (mostly stone artefact scatters) are located on the margins of watercourses. These areas are of significance to Aboriginal people as access ways through the forest and/or camping sites in traditional times (Brad Goode and Associates 2003). The waterways are also associated with the *Waugle*, a mythic being or snake like spirit of the dreamtime[25] (Brad Goode and Associates 2003). The Margaret River (an interim registered site) and Lake Davies (a permanently registered site) are identified as having mythological significance associated with the *Waugle*. The department recognises the significance of Lake Davies and liaised with Aboriginal people to divert Hamelin Bay Road around the caravan park to prevent through-traffic. The diverted road was constructed to the south of Lake Davies and disturbed areas are being rehabilitated. This supports the Aboriginal community's vision to separate the burial grounds near Lake Davies from the caravan park (Goode 2001). There are also believed to be a number of graves behind South Point near Cowaramup, which are said to be the result of a massacre in early European times (Goode 1999).

The Blackwood River, along with its tributaries and pools is undergoing assessment by the Department of Indigenous Affairs as a site of mythological significance (Brad Goode and Associates 2003). The river also represents a cultural boundary between the *Pibbelmen* and *Wardandi* language groups and a migration route, or 'bidi', between inland areas around Nannup and the west coast. There is also evidence to suggest that the mouth of the Blackwood River created an intersection of different tracks through the forest and as such became focal points for traditional activities and social interaction (Dortch 1984). Historical camp sites are known along the Blackwood River.

In near-coastal areas, Aboriginal people could have exploited caves, such as Devil's Lair, as base camps (Smith and McDonald 1989). Devil's Lair, Rainbow Cave, Tunnel Cave and Witchcliffe Rock Shelter are all important sites along the Leeuwin-Naturaliste Ridge as they provide relatively abundant artefacts, animal remains and intact hearths (campfire beds). These areas comprise the most significant part of the lower south-west archaeological record. Several stone and bone artefacts, and animal remains have been found at Devil's Lair, providing a valuable record of past Aboriginal life in the Leeuwin-Naturaliste region (Dortch 1984). Artefacts found at the site estimate the first human occupation in the area to be as early as 50,000 years ago, making it one of the oldest and most reliably dated early occupation sites in Australia (Dortch and Dortch 2001). Aboriginal occupation of caves however, appears to be occasional, perhaps only during wet or cold weather. Consequently, it is thought that caves were not crucially important in regional hunter-gatherer land-use systems (Dortch 1984). The bone tools discovered at Devil's Lair are significant as the preservation of bone tools in Pleistocene sites in Australia is quite rare (O'Connor, Quartermaine and Yates 1995). The site also contains the oldest examples of ornamentation in Australian pre-history (O'Connor, Quartermaine and Yates 1995).

Reserve 8437, which contains Devils Lair and is vested with the WA Museum, is proposed to become part of the national park. The Museum has an ongoing interest in Devils Lair as a significant archaeological deposit. As such, the department will enter into a memorandum of understanding with the Museum with regard to access and management of Reserve 8437 and the Devils Lair site until more progress can be made towards reserving it as national park. The taking of artefacts at this site and others within the planning area will continue to be regulated under the Aboriginal Heritage Act.

Potential threats to the conservation of Indigenous heritage include accidental or deliberate damage to culturally significant sites, and the exclusion of Indigenous people from management of their cultural heritage. For the most part, these threats can be addressed by complying with relevant legislative provisions (see introduction to Part D). The planning area contains 30 sites permanently registered under the Aboriginal Heritage Act and a further 17 on the interim register (March 2004). These sites include numerous artefact sites as well as burial sites, middens, mythological sites, historical sites, ceremonial sites, an engraving site, a man-made structure and painting sites. There are no sites on the National or Commonwealth Heritage Lists or the Register of the National Estate.

As the State register is not a comprehensive listing of all Aboriginal heritage sites, assessments may be necessary before 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[26] that may affect Indigenous heritage values. Under the Native Title Act, native title claimants and representative Aboriginal bodies must be advised before undertaking public works on the conservation estate.

[25] The Dreaming is an ideological and philosophical basis for close emotional and spiritual connection between Aboriginal people and the land.

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

In addition to complying with legislative requirements, management of Indigenous cultural heritage within the planning area is guided by the following principles:

- protection of places and objects of Indigenous cultural heritage significance
- restoration, as much as possible, of the relationship between Indigenous people and their heritage places
- recognition that Indigenous people are the primary source of information on the value of, and how best to conserve their heritage
- provision for Indigenous people to have a primary and active role in heritage management
- recognition that Indigenous people must control intellectual property and other information relating specifically to their heritage
- protection of culturally restricted information.

(Australian Heritage Commission 2002).

Aboriginal interpretation of their culture is also important and can be used as a tool to educate visitors and facilitate culturally considerate and appropriate behaviour.

Participation of Aboriginal people in promoting cultural heritage to visitors could be encouraged, and facilitated through the provision of commercial concessions. Participation of Aboriginal people in the management of the planning area is described in Section 8 *Management Arrangements with Aboriginal People*.

26. Indigenous cultural heritage

Key points

- There are numerous sites in the planning area that are important to Indigenous culture and archaeology.
- The Aboriginal Heritage Act provides statutory protection for Indigenous cultural heritage in WA. Aboriginal heritage sites must be managed in accordance with this act.

The objective is to protect and conserve Indigenous cultural heritage in consultation with Aboriginal people.

This will be achieved by:

1. Complying with Commonwealth and State legislation and departmental policy before commencing any potentially damaging operations, and where necessary, prevent damage to culturally significant sites and objects.
2. Protecting and maintaining cultural heritage according to the Burra Charter.
3. Managing threatening processes (e.g. fire) and visitor activities to ensure Aboriginal cultural heritage is not adversely impacted.
4. Consulting and involving local Aboriginal people and relevant organisations, and referring to the State Aboriginal Site Register and other relevant registers, to improve the protection and conservation of Aboriginal cultural heritage.
5. Ensuring that Aboriginal people have a primary and active role in managing their heritage, including the planning and implementation of Indigenous cultural heritage education and interpretation activities.
6. Documenting Indigenous stories about the planning area.
7. After involving Aboriginal people, entering into discussions with the WA Museum with regard to the future management of Reserve 8437, which contains Devils Lair.
8. Continuing to involve Aboriginal people in management by way of membership of any advisory committee for the Leeuwin-Naturaliste Ridge or other management arrangements (see Section 8 *Management Arrangements with Aboriginal People*).

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
26.1 Disturbance of known or identifiable heritage sites	26.1 No disturbance to heritage sites as a result of department operations without formal approval	Every 5 years

27. NON-INDIGENOUS CULTURAL HERITAGE

The planning area and broader region has a history relating mostly to maritime exploration, early European settlement, forestry operations and shipping activities along the coast.

The Cape Leeuwin Lighthouse is the only place in the planning area that is listed on the Commonwealth Heritage List and afforded statutory protection under the EPBC Act. There are no places listed on the National Heritage list. Five places are listed on the WA 'Register of Heritage Places' database including the Cape Leeuwin lighthouse and quarters, Cape Naturaliste lighthouse, Wallcliffe house and landscape (across the Margaret River to about the 60 metres contour of Reserve 8431), Ellensbrook homestead, dam and waterfall and the Cape Leeuwin waterwheel. A conservation plan has been prepared for all of these places except the Cape Leeuwin Waterwheel.

Several other places not protected under legislation are either interim listed on the Register of Heritage Places or listed on other databases (see introduction to this Part). These include, but are not limited to, Matthew Flinders' Cairn at Point Matthew, HMAS Nizam memorial at the Cape Leeuwin Lighthouse, Foul Bay lighthouse, old settlement debris at Hamelin Bay, Hamelin Bay gravesite (James A. Smith), grave at Ellensbrook, Deepdene, Jarrahdene Mill, Canal Rocks footbridge, Collins fire tower, an old bridge in Bramley National Park and former mill and settlement sites at Yelverton National Park. Numerous other sites have also been identified for their social value. Nearby to the planning area, there are several sites such as the Hamelin Bay Jetty, lovespring anchor and heritage trails between Busselton and Augusta.

Providing interpretation of cultural heritage is important for its management. Interpretive facilities should be provided where appropriate to increase visitor awareness and appreciation of cultural heritage within the planning area.

Ellensbrook homestead

Ellensbrook Homestead was established in 1857 and is significant for its association with the pioneering development of dairy farming and sheep and cattle pastoralism in the Augusta-Margaret River area. Today, the Homestead precinct and nearby Meekadarabee Falls have conservation, aesthetic and cultural values and are popular with park visitors and walkers on the Cape to Cape Track. The department is responsible for the management of events and functions at the site.

The National Trust has restored the homestead, retaining its original character, and is responsible for its ongoing maintenance. A lease has been issued to the Trust for the nearby warden's residence (see Section 32 *Commercial Operations*). The residence is not staffed at present. The department and the Trust have a joint responsibility to manage landscape values and interpretation of the site. In 2004, the Trust also released a conservation plan for the area. More recently, the Trust and the department have initiated actions to enable power to be delivered to the site. This may increase functionality of the site in terms of the Trust's capacity to manage facilities and also aid in attracting caretakers to work in the area.

The department will manage the Ellensbrook Homestead by way of a lease agreement with the Trust. The lease area should include the homestead and facilities operated by the Trust and should reflect that the area is to be operated as a precinct rather than totally separate entities. Conditions for the lease would require the Trust to undertake visitor risk management and implement measures to mitigate any risks. Access along the Cape to Cape Track should be realigned to exclude it from the lease area and access to the grounds should be permitted for events. The department will be involved in regulating/approving signage and other interpretation (including guided activities) at the site, commercial opportunities and the preservation of conservation and landscape values.

Lighthouses

The lighthouses at Cape Leeuwin and Cape Naturaliste were constructed in 1895 and 1904 respectively (Australian Heritage Commission 1989), and are typical examples of lighthouses built during this period. The two lighthouses are relatively intact and particularly important in illustrating the development of remote coastal navigation in Australia and the evolution of lighthouse design. The Cape Leeuwin Lighthouse is especially important as it is Australia's tallest and fifth oldest lighthouse (Laurence *et al*. 1992). At Cape Leeuwin, three adjacent lightkeepers cottages were built in 1895 from stone at Quarry Bay and are significant to the establishment and operation of the lighthouse. The cottages also demonstrate a way of life of lightkeepers that is rarely shown today. Similar structures also exist at Cape Naturaliste. In 1967, a lighthouse was built at Foul Bay to replace the Hamelin Island light.

The lighthouse precincts at Cape Leeuwin and Cape Naturaliste have long been popular as tourist destinations and their buildings are ready-made facilities for interpretation, recreation and community interest. These lighthouses, and the Foul Bay lighthouse, remain the property of the Australian Maritime Safety Authority for

the term of their lease. Consequently, the Authority is responsible for all maintenance and structural issues, except where they relate to use, wear and tear from tourist activity (see Section 32 *Commercial Operations*). The Authority is also responsible for public liability risk of the lighthouses and their leased back areas, except for the lighthouse tour arrangements. Any changes to the Cape Naturaliste lighthouse and lighthouse and keepers cottages at Cape Leeuwin, including access and site development, should be undertaken in accordance with the Heritage of Western Australia Act and the relevant conservation plans for these areas. Any restoration work at the Cape Leeuwin waterwheel should give due consideration to protecting the Cape Leeuwin freshwater snail (see Section 20 *Native Animals*).

27. Non-Indigenous cultural heritage

Key points

- The planning area contains various historic remnants relating to early European settlement, forestry operations and shipping activities along the coast, including five registered sites.
- Ellensbrook Homestead has been restored by the National Trust, who lease facilities at the nearby Warden's residence. The Trust has expressed a desire to be more involved in the management of the Homestead, including the provision of interpretation.
- The lighthouse precincts at Cape Leeuwin and Cape Naturaliste have long been popular as tourist destinations and their buildings are ready-made facilities to support interpretation, recreation and community interest. These lighthouses, and the Foul Bay lighthouse, remain the property of the Australian Maritime Safety Authority, who is responsible for maintenance and public liability risk.
- Any restoration work at the Cape Leeuwin Waterwheel should give due consideration to protecting the Cape Leeuwin freshwater snail.
- Providing interpretation of cultural heritage is an important aspect of its management.

The objective is to protect and conserve non-indigenous cultural heritage.

This will be achieved by:

1. Managing non-Indigenous places of cultural heritage significance according to State and Commonwealth legislation, departmental policy and the Burra Charter.
2. Managing threatening processes (e.g. fire) and visitor activities to ensure cultural heritage is not adversely impacted.
3. Entering into a lease agreement to manage Ellensbrook Homestead and continuing the management arrangements for the lighthouses.
4. Investigating the need to prepare a conservation plan for the Cape Leeuwin Waterwheel and assist the relevant authorities where necessary, including nature conservation advice.
5. Progressively updating and collating information on cultural heritage places and stories and maintaining them on the department's RATIS database.
6. In consultation with the relevant authorities, reviewing as necessary, places (e.g. interim listed places) for listing under State and Federal legislation. The cultural heritage management requirements of these places, should be considered before undertaking any operations or works with a view to mitigating potential impacts.
7. Incorporating material on cultural heritage in interpretation and education plans.
8. Conducting training when required to maintain expertise of Regional and District staff in heritage identification and management.

PART E. MANAGING VISITOR USE

The conservation estate 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.

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 14.18 million in 2008-09. The reason for such significant interest is simple: the department manages more than 27 million hectares 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, while the conservation estate brings many benefits to the community, the desire to interact with these unique environments can lead to unacceptable impacts. This part of the management plan addresses these issues, and at the same time ensures that visitors gain an awareness and understanding of the area's values which should, in turn, foster support for and involvement in management.

The department's Policy Statement No. 18 *Recreation, tourism and visitor services* (DEC 2006b) outlines the principles, operational guidelines, procedures and administrative controls that facilitate recreation and tourism on the conservation estate. A draft policy on *Commemorative Memorials* is also being prepared. This management plan follows these policy guidelines where applicable. The department is also obliged to protect water quality as part of managing recreation and hence further considers DoW's *Margaret River Catchment Area (including Ten Mile Brook catchment) Drinking Water Source Protection Plan* (DoE 2005).

The proposals in this draft management plan considered a number of criteria to determine future visitor facilities development in the planning area, including:

- existing visitor facilities, recreation opportunities and predicted patterns of use
- marine and terrestrial natural, landscape, social and cultural values
- visitor expectations and safety.

As a result of these deliberations, the major focus for managing visitor use is to:

- maintain natural values and visitor experiences
- minimise environmental impacts by directing visitors to more robust sites and provide a wide range of opportunities to distribute visitor pressures
- maintain and improve the quality, rather than quantity, of existing recreational opportunities
- retain natural experiences of the planning area by not increasing the number of recreation sites proposed in this management plan
- link the department's visitor management and recreational facilities with interpretation to improve visitor amenity and environmental safeguards as well as ensuring sustainable recreation by portraying a strong conservation education message.

28. PLANNING FOR VISITOR USE

Managing visitor use of the planning area involves management of recreation, commercial activities, public safety, and visitor interpretation, education and information. The planning framework adopted in this plan uses visitor management settings and the classification of recreation sites according to an established site hierarchy. This approach also considers the strategic planning framework established for the LNRSPP and policy and legislative requirements (see parts A and B). The provision of an access strategy and a communication plan that is consistent with this framework will complement the management approach.

Gingilup Swamps Nature Reserve, which has a reserve purpose of 'conservation of flora and fauna', is not available for active recreation.

Visitor management settings

As use of natural areas increases, the character of the setting is often modified to a point where it no longer has the attributes that originally attracted people to the area. As a consequence, initial users are displaced by people who are more tolerant of the changed conditions, with the process continuing until a uniform high level of

services and facilities is provided. This is the concept of 'recreational succession' – where the original attributes of an area that attract recreational use are inevitably changed by that use (Prosser 1986).

The Recreation Opportunity Spectrum is commonly applied as a planning tool in natural areas to address recreational succession (Clarke and Stankey 1979). The department proposes the use of 'visitor management settings', derived from Recreation Opportunity Spectrum principals, to manage recreational succession in natural areas and ensure that impacts on the environment are managed within acceptable limits. This is based on the concept that a range of visitor management settings in an area provides opportunities for different recreational experiences. Settings range from 'wilderness', which is the most remote end of the spectrum, to 'highly modified' (Appendix 9). Map 5 shows how these settings apply to the planning area. The application of visitor management settings within the planning area is consistent with the department's Statewide approach.

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 more 'natural' parts of the planning area being subject to incremental development.

It is important to note that the allocation of a setting to a particular area does not necessarily mean that it should be developed to the full extent of the setting. In many cases, such as the highly modified settings in Leeuwin-Naturaliste National Park, it is still desirable to maintain areas of low development (see *Recreation Site Hierarchy*).

Leeuwin-Naturaliste National Park has the highest visitation of any park outside the Perth metropolitan area and contains 67 individual recreation sites (Appendix 11). The park is highly accessible and contains high conservation and visual landscape values. The department's ability to efficiently and sustainably manage the current level of visitor facilities is at its upper limit. For these reasons, development within the park is considered to be at the limit of acceptable environmental and social change, and therefore at capacity in terms of recreation development. As a result, this management plan will limit more development. However, with increased visitation it is possible that management intervention may still be required to preserve visitor management settings. A reduction in the range of these settings will be the trigger for this intervention. It is also possible that, in such a highly fragmented area, unforeseen developments outside the planning area (e.g. sealing of roads) may alter visitor management settings over the life of this plan.

Recreation site hierarchy

A recreation site hierarchy can be used in conjunction with visitor management settings (Recreation Opportunity Spectrum) where it is specifically desired not to develop all sites in an area to the full extent of the setting. It provides a controlled (site by site) mechanism to limit the level of development and maintain a diversity of experiences within a setting. The recreation site hierarchy divides sites into three categories – Major, Medium and Minor (see Appendix 11).

28. Planning for visitor use

Key points

- The challenge for protected area managers is to provide for visitor use while preserving the natural and cultural values of an area.
- The planning framework adopted to manage recreation uses visitor management settings and the classification of recreation sites according to a site hierarchy. This is used to limit unintended incremental development and ensure that impacts on the environment are managed within acceptable limits.

The objective is to provide visitors with a wide range of nature-based experiences while ensuring the impacts on key values are minimised.

This will be achieved by:

1. Ensuring existing and future recreational development is consistent with departmental policy, the visitor management settings and the recreation site hierarchy as shown in maps 6a and 6b (Public Access) and maps 7a and 7b (Visitor Use) and appendices 9, 10 and 11.
2. Referring any future recreational developments or non-conforming use that will be inconsistent with the visitor management setting to the Conservation Commission.
3. Maintaining a range of day-use recreation options (i.e. size and social conditions) within the 'highly modified' setting.
4. Ensuring recreation and tourism developments and visitor activities are designed and constructed to minimise environmental, visual, cultural and social impacts.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
28.1 The range of visitor management settings over the life of the plan	28.1 Maintain visitor management settings over the life of the plan	Every 5 years

29. VISITOR OPPORTUNITIES

Regional context

The South West Planning Region of WA attracts about 3.4 million visitors annually, contributing about $588 million in direct tourism expenditure (SWDC 2004). It is well serviced to meet the needs of tourists and potentially contains the best and most extensive range of tourism product and infrastructure in the State. The tourism industry continues to grow strongly because of its proximity to Perth, the availability of high quality accommodation, its international reputation as a producer of premium wines and because visitors are increasingly attracted to the unique south-west lifestyle. Margaret River is the most frequently mentioned icon for the south-west, and has emerged as the preferred destination of intrastate travellers in WA. Nature-based tourism has emerged as an area of enormous growth potential.

The south-west is popular for leisure-based activities including walking, cycling, picnicking, four-wheel/scenic driving, camping and a wide range of water-based activities (i.e. swimming, sunbathing, recreational fishing, surfing, diving, snorkelling and boating). These activities are enjoyed by residents and visitors to the area. Most visitors to the region are domestic visitors from intrastate and stay an average of 3.7 nights. Generally, international visitors stay longer, and most stay within the Shire of Augusta-Margaret River. In the main, visitors prefer to stay with friends or relatives or in hotel, motel or resort style accommodation. Most visitors come to the region to relax and prefer a destination with beaches, warm weather, rugged scenery, wildflowers, forests and famous sites. A segment of visitors also wants adventure and to experience new things.

The Leeuwin-Naturaliste Capes Area parks and reserves are set apart from other natural areas in the south-west because of the combination of a diverse natural environment, iconic cultural attractions (e.g. lighthouses and Ellensbrook homestead), availability of world-class surfing and easy access. The importance of the planning area for recreation is highlighted by the fact that there is little remnant vegetation, and consequently few opportunities in forest/coastal environments, elsewhere on the Leeuwin-Naturaliste Ridge. The large tracts of forest found further east are absent in this area.

Remote experiences in the planning area are generally limited (e.g. remote camping and four-wheel drive opportunities), and may become even more limited in the future with increased visitation because of increased four-wheel drive ownership and the pressure to seal roads (and hence providing greater access) to cope with the expected visitor use.

The area is known for its cave opportunities, which complement those found elsewhere within the region (e.g. at Ngilgi, Mammoth, Lake, Jewel and Moondyne caves). Abseiling and rock climbing sites are confined largely to the planning area. The Cape to Cape Track is one of two iconic long-distance walk tracks in the south-west.

There are few river-based settings other than those within Bramley National Park and opportunities elsewhere along the Margaret River. Similarly, canoeing, camping, marroning and river fishing are more prevalent along the Blackwood River and other rivers further east (e.g. Shannon and Donnelly river).

Marine and wildlife experiences in the planning area are highly valued, particularly along the coast, and range from appreciation of spectacular seascapes to whale and dolphin watching.

Not all recreation opportunities and facilities need to be provided within the planning area. Rather, they should complement, instead of compete with those available elsewhere in the region.

Visitor profile

Visitor numbers

Visitation to the planning area is focused on Leeuwin-Naturaliste National Park, which has the highest visitation of any park in WA outside the Perth metropolitan area with about 2.33 million visits[27] recorded in 2008/09. Visitation has been steadily rising over the past 15 years and has increased by 61 per cent from about 1.3 million visits per annum in 1994/95. Based on this growth rate, the park could be supporting as many as 3.4 million visits per annum by 2016. The rapid and continuing growth of population centres such as Margaret River and Busselton and future residential growth in coastal townships suggests that this figure will be attained (see Section 1 *Brief Overview*). The relatively close proximity to Perth also increases short-term visitation, meaning the demand for day use will increase over the life of the plan.

High visitation poses significant challenges for management, particularly in the northern section of Leeuwin-Naturaliste National Park where visitor pressure is especially evident. Sites in this area are coming under increasing pressure as it is the initial access point for visitors travelling from Perth. This is likely to continue.

With rising visitor numbers, the capacity of many recreation facilities in the area may be exceeded. This may have impacts on visitor experiences, such as congestion or overcrowding, as well as physical impacts on the environment. Inland, Bramley National Park has high visitation because of its proximity to the town of Margaret River. This is likely to increase given through traffic along Bussell Highway. As a result, this area should be the focus of future visitor surveys.

Other parks along the Leeuwin-Naturaliste Ridge (Yelverton and Forest Grove national parks), Scott National Park and Gingilup Swamps Nature Reserve have a much lower level of visitation.

Visitor trends

Peak visitation to the planning area is in the warmer months between October and April, especially during school holidays and holiday weekends. At these times, recreation sites are at capacity and overcrowding can occur, especially within Leeuwin-Naturaliste National Park. Activities such as surfing and fishing tend to be ephemeral in nature and crowds are transient, creating short peaks within the overall visitor pattern. Competitive events (e.g. surfing events) produce spectators and competitors that tend to occupy sites for longer periods of time.

Most people visiting the planning area are from intrastate (mostly Perth) and seek access to the coast and nearby areas for a variety of activities such as bushwalking, fishing, camping, swimming, surfing, boating, snorkelling and picnicking. The many caves and rock formations in Leeuwin-Naturaliste National Park also attract many people for caving, rock climbing and abseiling activities. Increasingly, there are demands for relatively new activities such as mountain biking, paragliding and sandboarding.

[27] 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.

More social research can assist in determining visitor trends, and hence guide planning for visitor services. In part, this is achieved using the department's standard visitor satisfaction surveys and visitor statistics program, which are ongoing programs throughout the State. The Nature Based Tourism Research Reference Group also undertakes social research.

29. Visitor opportunities

Key points

- Visitor use of the planning area, particularly Leeuwin-Naturaliste National Park, is expected to increase significantly over the life of the plan. Most recreation opportunities are focussed on the Leeuwin-Naturaliste coastline and Bramley National Park.
- The provision of recreational experiences, facilities and services should consider the opportunities available in neighbouring areas to avoid unnecessary duplication and allow a greater diversity of opportunities.
- There is pressure on protected area managers to cater for greater visitor numbers but maintain environmental and social conditions that attract existing visitors.

The objective is to provide and maintain a range of sustainable, nature-based recreation opportunities.

This will be achieved by:

1. Considering other recreation and tourism opportunities within the region to avoid unnecessary duplication of opportunities within the planning area.
2. Undertaking social research, including the department's visitor satisfaction survey and visitor statistics program, and opportunistic research, especially projects nominated through the Nature Based Tourism Research Reference Group.
3. Conducting visitor surveys and social research to assist in recreation planning and development and adapt management accordingly.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
29.1 Visitor satisfaction levels	29.1 Maintain or increase in visitor satisfaction from 2010 levels	Annually

30. VISITOR ACCESS

The conservation estate is generally available for a variety of recreational uses where conservation values are not unduly compromised. Provision of access is important to enable visitors to recreate in these areas. This includes access to reach a destination for recreation, or for the experience provided by the type of access itself (e.g. scenic viewing, four wheel driving, bush walking). However, there are some areas where public access needs to be restricted because of concerns for public safety, cultural sensitivity, protection of conservation values (e.g. risk of spreading *P. cinnamomi*) and/or the preservation of a particular recreational experience. Current visitation, the physical capacity to accommodate more access and the cost of maintenance also needs to be considered.

Public access to the planning area is available primarily by motor vehicles (see below), but also by boat, walking, cycling or horse-riding (see Section 31 *Visitor Activities and Use*).

Motor vehicle access

Public motor vehicle access within the planning area is identified in Appendix 10 and shown on Maps 6a and 6b. All motor vehicles accessing the planning area are required to stay on established roads or tracks and need to be registered under the *Road Traffic Act 1974*.

The primary intent of the access strategy proposed in this management plan is to maintain, but rationalise, motor vehicle access to coastal recreation sites and inland forest reserves in accordance with the proposed visitor management settings and recreation site hierarchy.

Access to and along the coast is particularly important and must be carefully managed to protect aesthetic and

natural values (e.g. highly erodible soils and fragile heath vegetation). Access to coastal recreation sites will focus on providing nodal access to end-point destinations via spur roads as opposed to parallel access roads along the coast. To preserve the remote qualities of some parts of the planning area, it will be critical to maintain four-wheel drive only access to areas with the more natural visitor management settings. This will become difficult with increasing visitation and a more regulatory style of management may be required. Some roads may need to be sealed where the maintenance cost is unacceptable or for visual amenity reasons. In such cases, traffic calming devices may be required. There are few opportunities for additional road development other than short spur roads to recreation sites.

Necessary environmental impact assessments will be undertaken to satisfy the requirements of the Environmental Protection Act and the Wildlife Conservation Act, should the need arise for greater vehicle access. The department will also consider visual landscape management guidelines identified in Section 35 *Visual Landscape*, and more road modifications, changes in alignment or road closures that may be required as a consequence of identifying 'protectable areas' (see Section 24 *Disease*). Access may be limited in areas known to be sources of ignition for bushfire. The motor vehicle access strategy at Appendix 10 is consistent with the promotion of scenic drive opportunities (see Section 31.12 *Scenic Driving*). Access will be provided to trigonometrical stations.

Coast and beach access

It is proposed to maintain, but rationalise, access to the Leeuwin-Naturaliste coastline. Much of the coastline is sensitive to erosion, particularly the steep, foredune systems subject to vehicle use and therefore requires careful management. Tracks in this terrain are often widened, multiplied or reopened as people try to find easier, more stable access to the coast. In limestone areas, frequent outcroppings of cap rock make access difficult and damage to fragile cliff-tops and headlands does occur. Some of these areas may be unstable or unsafe for vehicle access. Several beaches along the coast are habitat for breeding birds such as hooded plovers (see Section 20 *Native Animals*) and vehicles can displace the birds or damage nests during the breeding season. Poorly defined terminus parking at coastal sites (e.g. Bob's Hollow, North Point Boranup Beach and Elephant Rock) can promote illegal access to beaches and cause damage to vegetation. Similar problems with terminus parking occur along the Margaret River and lead to riverbank erosion.

There are few beaches in Leeuwin-Naturaliste National Park that are suitable for motor vehicle use. The previous management plan recommended beach access only for Deepdene (northern section) and Boranup Beach (north of Reserve Road between the hours of 5 pm and 9 am). Access to Boranup Beach south of Reserve Road is not permitted because of the safety risk to swimmers and pedestrians during peak summer periods. High visitor numbers add to the problem. In recent times there have been requests to open South Beach for vehicle access. This beach is not suitable for four-wheel drive access because of the unsustainable entrance to the beach, the availability of access to adjacent beaches and the desire to have some beaches along the Leeuwin-Naturaliste coast set aside for hooded plover conservation. The seasonal erosion of beach surfaces also limits this activity in summer/autumn and access is often difficult.

Commercial fishermen require access to some beaches that are not open to the public for salmon fishing (see Section 39 *Commercial Fishing*).

New or additional access along beaches will only be allowed to holders of special licences (e.g. people with disabilities; see *Access for Visitors with Disabilities*).

Injidup/Cape Clairault

Cape Clairault is a popular fishing area that has historically been accessed by four-wheel drive vehicles from Injidup in the north and Quinninup in the south. Access from the north occurs through private property (Lot 935) and has recently been closed at the request of the private land-holders. Since its closure, the department has been promoting access to Cape Clairault via the southern end (a four-wheel drive track off Quinninup Road). This presents a detour to those who have enjoyed accessing the Cape from the north. The condition of the track off Quinninup Road is variable, with sandy sections that are difficult to traverse. As the track heads north to Cape Clairault, it becomes a shared track with the Cape to Cape Track. This is not an ideal situation because of potential visitor conflicts. The presence of a priority listed ecological community (Rottnest Island tea-tree) to the east of the existing four-wheel drive and walk track presents an issue for realigning access.

The department proposes to maintain public access from the north via Injidup Springs and Cape Clairault roads and improve access from the south to terminus parking nodes. The existing vehicle track that is aligned parallel to the coast will be closed between these two nodes. A separate alignment for the Cape to Cape Track will be

provided, utilising sections of the closed vehicle track. Four-wheel drive access from the south will occur via existing tracks (Maps 6a and 6b). The new alignment will avoid fragmenting significant vegetation complexes and ensure the protection of the priority listed ecological community.

Kilcarnup

Reserve 8431 (vested with the Shire of Augusta-Margaret River) at Kilcarnup is to be amalgamated with the surrounding Leeuwin-Naturaliste National Park. Once part of the national park, the intention is to retain current four-wheel drive access to maintain the remote feeling of the area and prevent overuse. However, this type of access hinders fire suppression activities and decreases the department's ability to respond to bushfires immediately north of the Margaret River (see Section 25 *Fire*). Consideration needs to be given to greater fire protection measures off the department-managed estate or alternative strategies to mitigate bushfire risk (including upgrading access).

Access through private property

Leeuwin-Naturaliste National Park borders the coast for most of its length. In some instances, vehicles and walkers may pass through private property to reach coastal recreation sites within the national park. This poses several management issues in terms of public liability, road maintenance and management arrangements with private land-holders. This is a particular issue at Wilyabrup Cliffs (a popular abseiling and rock climbing site), which is accessed by foot via private property off Biljedup Road. In such circumstances, the department will investigate options to 1) realign tracks to end-use recreation sites or 2) negotiate formal access arrangements with adjoining private land-holders. In the case of Wilyabrup Cliffs, another option would be to reposition the terminal car park and open the existing dedicated road, or to negotiate a land swap or purchase with the adjoining land-holder. Access through the planning area to private property is not supported and arrangements should be made with local authorities to have road reserves dedicated for this purpose.

Hazardous areas

Leeuwin-Naturaliste National Park is largely underlain by limestone susceptible to subsidence. Hazardous areas have been identified and access, including more track or road development, should consider this risk. This management plan proposes to rationalise and limit access in hazardous areas (Maps 6a and 6b), particularly in Boranup Forest where there are numerous tracks and a high density of caves. Where local government or main roads exist or are proposed, the department will liaise with the relevant authorities to identify the risk of collapse or to manage the effect on karst values (e.g. Cresswell Road).

Shared/multiple-use access

Conflict between vehicles and other visitors (e.g. walkers, cyclists and horse riders) occurs throughout the planning area on dual/multiple use tracks. In particular, vehicles are accessing parts of the Cape to Cape Track (e.g. Cape Clairault, Boranup Forest), cycle trails in Boranup Forest and sections of Bramley National Park designated for walk/cycle use. While it is necessary in some instances to minimise environmental impacts by having shared tracks, a general principal in recreation planning is to separate vehicles and other types of recreational use. Consistent with the vehicle access strategy at Appendix 10 and maps 6a and 6b, a draft master plan for the Cape to Cape Track identifies several tracks that are to be closed to vehicles to preserve the walking experience.

Margaret River Bypass

In the interests of road safety and provision of suitable road infrastructure to service the Margaret River area, a bypass is planned for the Margaret River townsite. Initial proposals are for the bypass to form the eastern boundary of the townsite near Darch Road. Indicative boundaries for Bramley National Park excluded the bypass from the Park. Should an alignment be selected that passes through the Park, a formal environmental assessment will be required and approval sought under the Environmental Protection Act. It is recommended that the State forest excluded from the Park to allow for the bypass be reserved as national park if an alternative alignment is adopted. In all circumstances, considerations for the future bypass should provide for wildlife movement and recreational trails that pass through the area.

Development adjoining the planning area

The LNRSPP identifies the possible expansion of Gracetown in an area of unallocated Crown land to the south-east. It is possible that the road into south-eastern corner, if constructed, may need to have different alignment to the current dedication. In such a case, the road reserve should be added to the national park.

A strategic road in Ridgelands (from Vidler Road to Cape Naturaliste near Eagle Bay/Bunker Bay) is also proposed under the LNRSPP. This may facilitate spur roads to the coast, particularly the surfing spot know as Three Bears/Kabbijgup. Current access to this site is along a boundary alignment to the east of Leeuwin-Naturaliste National Park. Should the Ridgelands road be developed, the department would seek to improve access to Three Bears/Kabbijgup where this is cost effective. This may result in the creation of a new, shorter track, an upgrade to the current level of four-wheel drive access and the closure of the existing access. This may result in modifications to visitor management settings.

Regional road development

The *Roads 2020 Regional Road Development Strategy* (Main Roads WA 1997) identifies proposed State and local government road developments in the south-west. Typically, these roads are major traffic routes of strategic importance and are expected to have high use in the future. There are three proposals adjacent to the planning area – Bussell Highway (Busselton to Augusta)[28], Rosa Brook Road[29] and Cowaramup Bay Road[30].

The Strategy recognises that future improvements to traffic flow and safety may be required on Caves Road, but also recognises the special nature of the road and its high value as a scenic drive. Consequently, Caves Road will be maintained to its current standard and not upgraded. The Strategy also proposes a study to consider the Busselton Bypass, including considerations for a connection directly from the new road to the Cape Clairault and Smiths Beach area. This may potentially increase visitor use in this area.

Other roads identified for development include Redgate Road, Boodjidup Road, Forest Grove Road and Carters Road. These will be considered as part of the review of the Strategy. Leeuwin Road and Scott River Road are other regionally significant roads but these are not proposed for development unless traffic demands alter.

Management access

Access specifically for management is occasionally required on tracks that are not open to the public. For example, the department uses tracks within the planning area that are closed to the public for fire management, flora and fauna monitoring, pest animal and weed control and for emergency situations. In some instances, access to management only tracks may be allowed in accordance with permit conditions (e.g. access to Injidup and Deepdene beaches for commercial salmon fishing, or to apiary sites for beekeeping). Walkers may use management access tracks.

The roads shown on Maps 6a and 6b are intended to be kept open to the public for the life of the plan[31]. All others will be closed or become access for management vehicles only.

Access for visitors with disabilities

The Australian Bureau of Statistics estimates that 20 per cent of people in Australia in 1993 had a disability[32] (ABS 2004). Based on these figures, it is likely that more than a million visits per year are made to department-managed land by people with some form of disability. Catering for people with disabilities is important and also has subsidiary benefits to the aged, parents with small children and the carers of people with disabilities.

The department is committed to improving access to its services, information and facilities for people with disabilities as outlined in the *Disability Access and Inclusion Plan 2007 - 2010* (DEC 2007a). Strategies identified in this plan include:

- ensure that recreation sites with universal access are maintained to the original standard
- ensure that, where practical and appropriate, all new recreation facilities are accessible to people with disabilities
- continue to upgrade access to recreation areas based on visitor numbers, costs and ease of modification of existing facilities

[28] Improve traffic flow and safety by 1) widen the road to Type 6 standard and provide overtaking lanes between Busselton and Margaret River, 2) construct a single carriageway bypass to Margaret River (see below) and 3) widen road to Type 6 standard and provide overtaking lanes from Margaret River to Augusta.

[29] Realignment of the road to a uniform Type 4 standard.

[30] Widen and improve the road standard to deal with substandard shoulders and surface drainage by 1) upgrading the section between Caves Road and Gracetown to a Type 4 standard and 2) upgrading the section between Bussell Highway and Caves Road to a Type 5 standard.

[31] Roads may need to be closed in exceptional circumstances following unforeseen events (e.g. bushfire).

[32] The *Disability Services Act 1993* defines a disability as a condition that is attributable to an intellectual, psychiatric, cognitive, neurological, sensory or physical impairment.

- use services to disseminate department information that specifically focuses on providing information to people with disabilities
- ensure information is clear, visible and complies with the required standards
- make management plans available in different formats as requested.

These recommendations impact on this management plan in several ways. Most importantly, existing and proposed facilities within the planning area need to be reviewed over the life of the plan to determine the possibility of encouraging greater access for disabled visitors. All major recreation sites in the planning area are proposed to be fully accessible.

Disabled visitors have sought permission to use motorised vehicles off-road, to enable access to beaches not open to the public. The District Manager will assess these situations on a case-by-case basis and may issue a permit for a disabled person to use a vehicle off-road, as long as the vehicle is registered under the *Control of Vehicles (Off-road Areas) Act 1978* or Road Traffic Act and a medical certificate is provided. Conditions may be attached to the permit, which stipulate the period of use and the designated area where any vehicles can be used.

Access to Ten Mile Brook Reservoir

A drinking water source protection plan for the Ten Mile Brook catchment has been prepared by DoW to protect the water source (DoE 2005). To prevent contamination (physical, chemical and biological) of the source water and effectively quarantine the catchment from inappropriate activities, the drinking water source protection plan recommends a 2 kilometres 'Reservoir Protection Zone' (subject to by-law amendment) upstream of the dam wall. This effectively excludes public access for recreation within this zone. Outside this zone, the protection plan places restrictions on some activities. In part, it recommends bushwalking and picnicking be confined to the established downstream facilities that are outside the Priority 1 area (for Ten Mile Brook Reservoir) and swimming be confined to existing designated sites such as Canebreak Pool. No activities are permitted on the water body. The proposals contained within this management plan do not affect the requirements to protect this source.

30. Visitor access

Key points

- Access needs to be carefully managed so it does not compromise key values, public safety or qualities of remoteness valued by visitors.
- Motor vehicle access is planned to provide the appropriate type of access to destinations in coast, river and forest settings. Access to sensitive coastal areas will be based on providing nodal access to end-point destinations via spur as opposed to parallel access roads along the coast. This will generally occur by way of east-west linkages from major transport routes (e.g. Caves Road and Bussell Highway). The type of access (e.g. two or four-wheel drive) or quality of road complements the visitor management setting and the recreation site hierarchy.
- Planning for access must consider access and services for disabled visitors.

The objective is to provide and maintain a range of access types that is consistent with the maintenance of key values and the diverse range of visitor needs.

This will be achieved by:

1. Providing access according to Maps 6a and 6b and Appendix 10, consistent with departmental policies, the appropriate visitor management setting and the protection of key values.
2. Sealing sections of road where the cost of maintenance and visual impact is unacceptable.
3. Requiring any motorised vehicle used in the planning area be appropriately registered unless given written lawful authority by the District Manager.
4. Prohibiting the use of motorised vehicles (e.g. four or six-wheel motorcycles and dune buggies) off established roads, except with the approval by the District Manager.
5. Permitting public vehicle access to Boranup Beach (north of Reserve Road) and Deepdene beach (northern section).
6. Permitting access to beaches not open to the public for people with disabilities and commercial fishermen on a case-by-case basis subject to the approval of the District Manager. However, if such beaches are found to be important breeding sites for hooded plovers, recovery actions will be taken. This may mean that restrictions or conditions of access apply.
7. Providing alternate coastal access to Cape Clairault from the north via the road reserve adjoining Lot

935 and existing vehicle tracks.
8. Improving access to Three Bears/Kabbijgup if the Ridgelands road is developed.
9. Rationalising, but maintaining, four-wheel drive access to Kilcarnup.
10. Separating vehicle use from the Cape to Cape Track and other trails.
11. Negotiating with adjoining land-holders and local authorities to establish formal agreements for public access through private property. These agreements are sought where no other formal access is available, road realignments are not appropriate, public access is desired and there is a historical use. A priority is access to Wilyabrup Cliffs.
12. Ensuring that the Margaret River bypass provides for wildlife and visitor movement.
13. Liaising with Main Roads WA and local government authorities to ensure a formal environmental and visual assessment is undertaken for all proposed developments affecting the planning area.
14. Consistent with the department's *Disability Access and Inclusion Plan* (DEC 2007) and where appropriate, improving access, facilities and services for disabled visitors.
15. Modifying access as required following the identification of protectable areas, if there is an adverse impact on fragile landforms or if it is deemed no longer required.

Key performance indicators (see also Appendix 1):

Performance measure	Target	Reporting requirement
30.1 Number of motor vehicles that are off-road or on unauthorised beaches as reported by department staff	30.1 No unauthorised use of motor vehicles off-road or on beaches	Annually
30.2 Number and extent of dual use tracks along the Cape to Cape Track	30.2 Reduction from 2010 levels, in the number and extent of dual use tracks along the Cape to Cape Track	
30.3 Visitor satisfaction levels regarding recreation at Hamelin Bay	30.3 Reduction from 2010 levels in visitor conflict over commercial fishermen travelling through the swimming beach at Hamelin Bay	

31. VISITOR ACTIVITIES AND USE

31.1 Abseiling and climbing

The karst limestone and granite geology found along the Leeuwin-Naturaliste Ridge provides opportunities for abseiling and rock climbing. While abseiling and rock climbing are legitimate activities, careful management is required to ensure the maintenance of conservation values, safety standards and the rights and enjoyment of other visitors.

People conducting commercial rock climbing and abseiling on department-managed land must obtain a commercial activity licence, requiring them to meet certain minimum standards of experience and competency in instructors. All commercial operators, as well as not-for-profit groups conducting rock climbing and abseiling with dependent participants must use leaders who are registered under the National Outdoor Leader Registration Scheme or hold current equivalent accreditation recognised by the department. Organised groups visiting designated sites, as well as recreational abseilers, require a permit under the department's cave and abseil permit system. This system regulates the number of participants/groups and also provides a booking system. Recreational rock climbers do not require a permit.

Under Regulation 33 of the CALM Regulations, a person must not, without lawful authority, abseil on department-managed land. The CALM Regulations also prevent climbers damaging naturally occurring features by drilling bolt holes, gluing bolts, chipping or drilling holds and gluing on holds, as an aid to climbing.

The Climbers' Association of WA (CAWA) has developed a code of ethics for climbing and bolting, which addresses safety, environmental and social impact considerations associated with climbing. This includes advice on the placement of rock bolts for safety reasons.

Abseiling

Leeuwin-Naturaliste National Park provides prime sites for abseiling. In recent years there has been a marked increase in abseiling by organised groups, often as a commercial activity. Authorised abseiling sites include:

- Wilyabrup Cliffs (granite/gneiss)
- WI 16 (limestone cliff popular for beginners)
- Bride Cave (limestone doline and cave)
- Calgardup Pipe (limestone solution pipe)
- Giants Pipes (two limestone solution pipes).

Abseiling sites receive heavy usage and can experience localised environmental impacts. Soil compaction and erosion are particular problems at the top and bottom of abseil routes and have resulted in areas denuded of vegetation. Access to abseil sites is also an issue, with inadequate vehicle access and parking to cater for groups and multiple walk tracks created to sites. Wilyabrup Cliffs is a particular concern, as there is high demand to use the site but no public vehicle access. The installation of abseil anchors by unauthorised persons also occurs.

Environmental impacts and potential safety issues (particularly because of the greater erodibility of limestone) necessitate significant site hardening (e.g. landing platforms, steps, toilets and car parks) and other remedial actions. Therefore, no additional limestone abseil sites will be developed in the planning area over the life of this plan. Abseiling will be permitted on granite at Wilyabrup Cliffs subject to a geotechnical assessment. Impacts on all sites will be monitored to determine sustainable levels of use.

Rock climbing

Climbing within the region is predominantly limited to the national parks of the planning area and is carried out by recreational users in groups or more commonly, alone or in pairs. The previous management plan for Leeuwin-Naturaliste National Park approved rock climbing at Wilyabrup Cliffs (Biljedup Cliffs), which experiences high use during peak periods. Since this time, other sites have increased in popularity, especially for those who seek more remote and adventurous forms of climbing. Climbers now use many sites, mainly granite/gneiss cliffs along the coast (e.g. Cosy Corner, Gracetown Crag and Moses Rock) but also limestone sites such as Bob's Hollow and Wallcliffe Cliffs (a proposed addition to Leeuwin-Naturaliste National Park). Recreational climbing, but not abseiling, is permitted at the latter. Although there is a lack of information regarding the number of climbers using the planning area, managers have observed an increase in the number of new climbing routes at many sites.

Unauthorised climbing on limestone cliffs has evolved over the past 10 years and is becoming increasingly popular, offering climbers a different aspect of the sport to climbing on granite/gneiss. This was not permitted in the previous management plan and presents several concerns for managers in terms of visitor safety, visual landscape amenity, damage to the cliff environment and the high cost of maintenance/management. The most popular site is Bob's Hollow, which is a sea cliff that involves steep technical climbing and hence is limited to experienced climbers. A geotechnical examination of the sections of cliff used by recreational climbers considered the cliff to be sufficiently stable for climbing. Current access to the site is difficult, there is minor trampling and loss of vegetation at the cliff base, and there are minor visual impact from bolts and straps. Warning signs have been installed below the overhangs. This management plan proposes to permit climbing at Bob's Hollow but not encourage its use. Retaining the current level of vehicle access (a four-wheel drive track) to the site will limit visitor numbers and hence potential for damage.

Various other limestone sites show evidence of climbers with bolts appearing at sites such as WI-16. The installation of climbing bolts by climbers occurs on an ad hoc basis and it is not practicable for these to be routinely tested, as are the cliff top anchors installed by the department. Many bolts are also installed at sites where climbing is not an authorised activity.

31.1. Abseiling and climbing

Key points

- There are numerous sites within Leeuwin-Naturaliste National Park that are suitable for abseiling and rock climbing, providing opportunities for organised groups and individuals.
- Abseiling and rock climbing in organised groups will continue to be managed under the cave and abseil permit system.
- Accessibility, safety, visual landscape amenity and site degradation (erosion control and site compaction) are the primary issues associated with rock climbing and abseiling in the planning area.

The erodibility of coastal limestone is a particular concern to managers.

The objective is to provide opportunities for abseiling and rock climbing while ensuring visitor safety and preventing adverse impacts to key values.

This will be achieved by:

1. Designating appropriate abseiling sites and managing these activities according to the cave and abseil permit system, departmental policy and the CALM Regulations as required.
2. Continuing to permit abseiling at authorised sites subject to geotechnical inspections. No abseiling will be permitted at Wallcliffe cliff or new/unauthorised limestone abseil sites.
3. Allowing rock climbing at Wilyabrup Cliffs, Moses Rock and Gracetown Crag but with no further bolting. Rock climbing at Cosy Corner and Wallcliffe Cliff face will be permitted subject to an environmental assessment and geotechnical inspection.
4. For all other areas, prohibiting climbing on limestone other than Bob's Hollow. Climbing at Bob's Hollow will be restricted to the southern section of the cliff and will be subject to regular geotechnical assessment. If conditions change in the future, the site may be closed to climbing. Use of Bob's Hollow by organised groups or groups with dependant participants will not be permitted.
5. Not improving vehicle access or providing visitor facilities at Bob's Hollow so as to retain, as far as possible, the low level of use.
6. Providing infrastructure (e.g. landing areas at rock/cliff bases, gathering areas and take off ramps) and clearly defined access paths as needed to control erosion and compaction at authorised abseil sites.
7. Providing improved vehicle access and parking (where possible) at Wilyabrup Cliffs and WI-16.
8. Continuing to remove unauthorised abseil anchors and testing and tagging authorised glue in anchors as per Australian Standards.
9. Using signage to alert visitors to the risk of cliff overhangs and rock fall close to climbing and abseil sites.
10. Promoting the CAWA code of ethics.
11. Monitoring high use abseil and rock climbing sites for environmental degradation and visitor safety, with a view to determining sustainable levels of use. Restrictions may be imposed, or recreational activities modified, if monitoring indicates that there is an unacceptable risk to the environment, cultural values or visitor safety.

31.2 Boating

Boating generally occurs outside the planning area in marine and estuarine areas and inland waters. Most use is concentrated off the Leeuwin-Naturaliste coastline although the Blackwood River is also subject to high use, mainly for fishing and waterskiing activities. Commercial interest in boating opportunities is high. There is also a proposal that is being coordinated by the Department of Transport (DoT) to establish a small marina and boat launching facility at Flat Rock in Flinders Bay, servicing commercial and recreation vessels.

While most boating occurs outside the planning area, access for boating is often gained through the conservation estate. Boat access is provided at two sites in Leeuwin-Naturaliste National Park, with formal boat ramps located at Canal Rocks and Hamelin Bay (see *Boat Ramps* below). It is also possible to launch small boats off the beach at Kilcarnup, although access is four-wheel drive only and there are no developed facilities. Canoes and other non-motorised boats are also launched in Bramley National Park along the Margaret River. Scott National Park can be accessed by boat at Twinem's Bend and at the Scott River Picnic Area.

DoT is responsible for boating regulations including licensing, safety standards, marker buoys, moorings and jetties and is responsible for gazetting specific areas and types of use (e.g. speed restrictions, prohibited areas, closed waters and water ski areas). An area that extends 2 kilometres north and 1.86 kilometres south of Twinem's Bend adjoining Scott National Park has been marked and gazetted for water skiing (Map 7b). This area is closed to personal watercraft[33] unless they are conducting water ski operations or transiting directly through the area. Boat launching facilities close to the water ski area are available at Augusta, Molloy Island and Alexandra Bridge. The only facility within the planning area is a water ski boat landing area at Twinem's Bend, where up to 40 boats can be found operating in peak summer periods. Wave action near the landing, which has resulted in weathering of the timber-retained terraces and subsequent collapse of the riverbank, is a concern. Excessive motorised boat use along the Blackwood River may also disturb wildlife and disrupt other park users.

[33] Personal watercraft are crafts powered by an inboard motor that powers a water jet pump. All waters of the Blackwood River upstream of the Alexander Bridge are closed to navigation by personal watercraft.

Wild camping associated with non-motorised boating occurs along the Blackwood and Scott rivers at the southern end of the planning area. This activity can significantly impact on the natural environment and consequently unauthorised sites are closed by the department. Along the Margaret River in Bramley National Park, there are several informal canoe launch sites between Rotary Park and the Old Weir. Uncontrolled river access in this area is impacting on riparian vegetation, causing bank erosion and posing a risk to visitor safety. Appropriate access through the planning area and facilities are required to enhance visitor experiences and to minimise environmental degradation.

In accordance with the water source protection plan for Ten Mile Brook Reservoir, DoW prohibits motorised and non-motorised boating on the Reservoir and intake pool of the Margaret River, so as to protect the public drinking water supply (DoE 2005).

Boat ramps

The department is committed to maintaining and managing boat ramps that are under its statutory responsibility at Canal Rocks and Hamelin Bay. The department has completed major site improvements at Canal Rocks including hardened parking facilities for up to twenty-four trailers. Similar upgrading operations are planned to occur at Hamelin Bay, which will help to resolve conflicts between boat launching and day-use activities and environmental degradation resulting from congestion and the high demand for facilities (see Section 31.6 *Day-use*). Ramps outside the department-managed estate at Dunsborough, Gracetown, Prevelly, Flinders Bay and ramps into Hardy Inlet provide alternative boat launching opportunities.

31.2. Boating

Key points

- Boat launching facilities managed by the department at Hamelin Bay and Canal Rocks will be managed in a manner that maintains the ecological, cultural and recreational values of Leeuwin-Naturaliste National Park.

The objective is to facilitate access for recreational boating activities where they are compatible with other recreational activities and the protection of conservation values.

This will be achieved by:

1. Providing for recreational boating in accordance with departmental policies and other relevant legislation.
2. Upgrading facilities and improving site design at Hamelin Bay to help resolve conflicts between boat launching and day-use activities.
3. Identifying canoe access points along the Margaret River in Bramley National Park and develop appropriate access.
4. Maintaining facilities at Twinem's Bend to department standards and requirements for boat use and, where required, remediate damage to the riverbank.
5. Rehabilitating wild camp sites along the Scott River where necessary with closures as required.

31.3 Bushwalking

The Cape to Cape Track is the primary attraction for bushwalking in the planning area. It offers visitors the opportunity to embark on a hike of several days in duration, or, because of its many access points, a multitude of alternative shorter walks that vary in distance, standard and required expertise (see *Cape to Cape Track* below). The planning area also contains several other short walks and loop walks from recreation nodes or townsites, focusing on day visitors. There are no designated walking trails in the Scott, Forest Grove or Yelverton national parks or Gingilup Swamps Nature Reserve.

Existing walktrails of the planning area are shown in Table 9 and Map 8.

Table 9. Existing walking tracks

Walk track	Length (km)	Proposed class	Visitor management setting
Leeuwin-Naturaliste National Park			
Meekadarabee Falls Walk Track[#]	2	Class 1	Highly Modified
Yallingup Circuits[Δ]:		Class 3	Recreation
Wardanup Walk Track	5		
Quenda Walk Track	4		
Torpedo Walk Track	2		
Cape Naturaliste Tracks[#]:		Class 3	
Whale Lookout Walk Track	2.4		
Cape Naturaliste Loop Walk Track	3.8		
Bunker Bay Loop Walk Track	3.6		
Turner Spring Walk	0.7		
Cape to Cape Track [*#D]	135	Class 4, except Cape Naturaliste to Sugarloaf Rock, which is Class 2 to facilitate disabled access	Natural-Recreation, except the portion of the Cape to Cape Track from Cape Naturaliste to Sugarloaf Rock, which is Highly Modified
Cowaramup Brook Walktrail	2	Class 4	
Calgardup Cave Walktrail	0.8	Class 4	
'Caves' trail between WI 16, Giants and Bride caves	2	Class 4	
Hamelin Bay Walk Track		Class 4	
Bramley National Park			
Ten Mile Brook Walk/Cycle Track[#D]	15 (return). Additional loops 4.7	Class 2	Highly Modified
Carters Road Trails		Class 3	Recreation
Big Brook Walk Track	3.4		
Old Chimney Walk Track	2.7		
Pine Tree Trail	1.7		

Note: The class of each walk track in Table 9 is based on the Australian Standards (Standards Australia 2001), which identify six classes of tracks ranging from sealed disabled access to routes. The track classification system is indicated in the department's Policy Statement No. 18 *Recreation, tourism and visitor services* (DEC 2006b).

* Over-night stay required.

\# Universal access. See Map 8 for sections of tracks that are available for universal access.

D Dual use.

Δ These tracks are circuits from the Yallingup townsite and also traverse land managed by the Busselton Shire. They have been developed in conjunction with the Land Conservation District Committee at Yallingup.

Management of bushwalking within the planning area will focus on existing walktrails, including maintenance to the appropriate Australian Standard for track classification and signposting. Management will continue to concentrate on the Cape to Cape Track although, with increased visitation and short stays, it should seek to develop and maintain short walks (up to several hours in duration) from major recreation sites and interpretation nodes. Walktrails providing different levels of accessibility and expertise, including universal access for disabled visitors, will continue to be important. Priority will be given to the development of self-guiding and loop walks along major tourist routes or linking visitor nodes (e.g. linking cave and abseil sites).

Trails in the planning area are designated as either single use, such as walking, or dual /multi-use. Shared users of dual or multiple-use trails include cyclists, mountain bike riders and horse riders and will be limited to areas where it is desired to manage the impacts on the natural environment by restricting visitor use to a single trail. Ongoing monitoring of these trails is necessary to determine if user conflicts are occurring.

A number of opportunities to enhance the existing trail network have been identified, including:

- a more comprehensive 'caves walk' trail for organised groups, incorporating Bride Cave, Giant's Cave, WI-16, Golgotha Cave and the kiosk at Lake Cave
- trails at Conto Campground that links to the beach and back to the kiosk at Lake Cave
- additional walktrails in Boranup Forest
- nature trails at the Margaret River Eco Education Centre to assist with running eco education programs; and
- Interpretive trails at Hamelin Bay using existing short and long loops encircling the settlement.

The LNRSPP also provides for the progressive extension and development of a Dunsborough to Cape Naturaliste Lighthouse walk/cycle trail.

Other walk and cycle trails are also available in the Margaret River area[34]. One of these trails, the Busselton-Augusta Heritage Trail, passes through Reserve 46400, which supports the critically endangered white-bellied frog. If, at any stage the trail is to be upgraded, consideration should be given to realigning the trail to minimise any potential impacts on the frogs.

Cape to Cape Track

The Cape to Cape Track is the premier walktrail along the Leeuwin-Naturaliste coastline, winding 135 kilometres from Cape Naturaliste to Cape Leeuwin. The track takes 5-7 days to walk and is one of only two long distance walk tracks in the south-west of WA. The track was opportunistically developed in the 1980s and since that time a friends group (Friends of the Cape to Cape Track) has been formed to assist with the development and maintenance of the track as well as to promote an awareness and appreciation of its values. The track was completed in 1997. The department's brochure 'Cape to Cape Track' provides relevant information on the track, including safety precautions and tips on minimising environmental impacts.

More maintenance and modifications to the track are required. To the north, a 3.5 kilometres section of the track from Cape Naturaliste to Sugarloaf Rock has been developed to a higher standard to accommodate disabled and elderly visitors, and higher visitor use. To the south, the track will be less developed to maintain a more remote experience (see Table 9).

Crossing the Margaret River is a particular problem on the Cape to Cape Track. For most of the year a sand bar on which the Track is located separates the river from the ocean. However, with winter rainfall (June to October) the bar is opened making the river dangerous to cross. An alternative route is available although it is a detour of about 10 kilometres. The following options are being considered to overcome problems associated with the crossing:

- Improve the level of communication regarding the hazard, times of year when the crossing is likely to be impassable and alternative routes. This will be combined with information on the department's website and other pre-visit information to assist people in planning their walk.
- Provide a punt or canoe to cross the river at a suitable location.
- Construct a bridge at a suitable location over the Margaret River.

Other brook and creek systems along the track may also be impassable during the winter months (e.g. Wilyabrup Brook and Gunyulgup Brook). In these cases, the department will investigate engineering options, such as small footbridges or anchored stepping stones, to facilitate access.

At Quarry Bay, there are five occurrences of the Augusta microbial TEC that lie within the path of the Cape to Cape Track. Of particular concern are narrow (3-5 metres) beach sections of the track where it is possible for walkers to tread directly on active parts of the community and cause foot damage to the occurrence. The department will consider several options to facilitate walking while protecting the TEC, such as:

- fencing or other structures, with the intention of directing walkers around known occurrences
- diverting the Track, avoiding any impacts on water flow and quality, which the community requires for survival. This may involve diverting the southern section of the track from Skippy Rock to the Quarry Bay car park by following the unsealed road
- educating visitors on the need to keep to defined paths
- monitoring visitor use to determine any detrimental effects on the community.

Such options would also need to consider the impacts on visual amenity at the site.

The department faces several other issues regarding management of the track:

- conflict between walkers and four-wheel drive vehicles using the track, especially between Cape Clairault and Quinninup, Redgate and Bob's Hollow and at Boranup Forest
- access through private property and other surrounding tenures (e.g. sections of the Cape to Cape Track near Smith's Beach)
- determining the appropriate level of infrastructure without compromising remote experiences
- potential for track erosion
- securing vehicles at major drop-off points (both ends of the Track and Conto Campground)

[34] Walk and cycle trails around the Margaret River area are provided by the Shire of Augusta-Margaret River. These include the Margaret River Heritage Trails, which comprise of three short walks from Rotary Park, Busselton-Augusta Heritage Trail and the Prevelly Cycle/walktrail (9km).

- visitor safety, including the availability of water and the distance between supplies for each section of the Track
- provision of appropriate toilet facilities
- vandalism of track marking and signage
- limited information on visitor numbers and use.

A draft recreation masterplan for the Cape to Cape Track has been prepared by the department to address these issues and guide operational works to improve the track, its facilities and services.

31.3. Bushwalking

Key points

- Bushwalking in the planning area is focused on the Cape to Cape Track and associated short walks in Bramley National Park. Most walks emanate from recreation nodes and focus on day visitors.

The objective is to provide a range of bushwalking opportunities that meet visitor needs and do not adversely impact on conservation, visual landscape and other values.

This will be achieved by:

1. Maintaining the network of trails indicated on Map 8 and developing these to the class indicated in Table 9. Trails should be separated from other uses where possible. Inappropriately located or unauthorised walktrails will be redesigned, relocated, or closed and rehabilitated.
2. Realigning walktrails that pass through other tenures or establish formal access agreements to facilitate public access.
3. Expanding the 'caves' loop trail for organised groups.
4. Ensuring that more 'remote', southern sections of the Cape to Cape Track have only minimal infrastructure.
5. Upgrading the Cape to Cape Track from Cape Naturaliste to Sugarloaf Rock to 'wheel chair assist' standard and incorporating disabled access to other developments/upgrades where appropriate.
6. Developing walk-in camping opportunities along the Cape to Cape Track in Boranup Forest.
7. While on the Cape to Cape Track, providing safe crossings over Margaret River, Wilyabrup Brook and other areas where necessary and appropriate.
8. Protecting the Augusta microbial TEC from foot damage along the Cape to Cape Track by:
   - fencing to exclude walkers
   - redirecting the Track around known occurrences and their catchments
   - educating visitors on the need to keep to defined paths
   - monitoring any impacts and taking remedial action where necessary.
9. Working closely with Friends of the Cape to Cape Track and other groups to develop user surveys and collect information as a basis for more informed recreation decision-making.
10. Providing up-to-date track information (especially at Cape Naturaliste and Cape Leeuwin lighthouses) and publicising walktrails by marking them on park literature.

Key performance indicator 30.2 applies

31.4 Caving

Approximately 30 000 people visit caves in Leeuwin-Naturaliste National Park each year, mostly Calgardup Cave (12 967 visits) and Giants Cave (5741 visits) (VISTAT records accessed October 2006). While cave visitation is low compared to other areas[35], the high conservation, geological, archaeological, palaeontological and cultural values and safety issues associated with caving mean that visitor use must be carefully managed.

Cave management has made significant progress during the period of the previous management plan. The formation of the *Caves Management Advisory Committee* (CMAC), the implementation of the cave and abseil permit system since 1992 (see *Regulating use by managing cave access*), the gating of specific caves, the installation of track marking and the *Cave Leader Accreditation* program has formalised and controlled use of popular caves. Recreation facility developments at Calgardup and Giants caves have also arrested significant site impacts and improved visitor experience. Cave management staff are located onsite at Calgardup Cave to

[35] Outside the planning area, Ngilgi, Jewel, Mammoth, and Lake caves, receive high visitation and are a major drawcard for visitors to the region. These caves are managed by local tourism associations.

provide information and manage the permit system. It is recommended in this management plan that these management practices and CMAC continue.

Management over the life of this plan will focus on site management and direct regulation of use, primarily through managing cave access.

Site management

Site management is required to control erosion and compaction (in the cave and at cave entrances), the accidental breakage of limestone formations and to control the destruction of surface vegetation. Site management through the provision of boardwalks and defined pathways, appropriate parking, re-routing of track-markers or other appropriate infrastructure (steps, ramps, safety rails, seating) is required. In some cases, access to caves may need to be restricted if acceptable solutions can not be identified.

Regulating use by managing cave access

Access to caves has progressed from unrestricted and unmanaged to a system of controlled and managed access using the department's cave management classification system (Table 10).

Table 10. Cave management classification system

Classification		User group	Recommended management
Public Access	Tourist Cave (Guided or self-guided)	General public	Developed and managed for tourist use and/or as an educational resource. Clearly signposted with access restricted to specified times. Payment of a fee required for entry. Infrastructure installed to facilitate access, decrease visitor impacts and improve safety
	Adventure Cave – Class 1	General public	May be required to register at the cave entrance and/or pay a fee. May be some infrastructure and signage to decrease visitor impacts and improve safety
	Adventure Caves – Class 2 (horizontal) Class 3 (vertical)	Novice groups (general public) lead by an experienced leader, e.g. school groups and licensed commercial tour operators. Speleologists	General protection. Requires an entry permit and a leader approved by the department*. May be limited infrastructure
Restricted Access	Restricted Access	Experienced and responsible speleologists, scientists	Maximum protection – access restricted for research, monitoring or management purposes and for speleological club visits. An entry permit is required as well as a leader approved by the department

Note: Sections of the one cave may be in different categories. For example, part of Calgardup Cave is a 'Tourist Cave', two extensions in the cave are 'Adventure Cave Class 2' and one extension is 'Restricted Access'.
* Leaders of groups in Leeuwin-Naturaliste National Park are required to have *Cave Leader Accreditation*. If the cave has a vertical entrance the leader must also have a National Outdoor Leadership Registration Scheme (NOLRS) "Certificate of Registration as a Single Pitch Abseiling Guide (natural surfaces)" (or recognised equivalent).

Four categories of caves have been identified in the classification system. Two caves in the planning area are Adventure Cave class 1 and 11 as Adventure Cave class 2/3. All other caves are considered 'restricted access' until an assessment has been made of the values and level of risk. There are five abseil sites, four of which are associated with caves.

Under the department's Policy Statement No. 18 *Recreation, tourism and visitor services* (DEC 2006b), the use of 'adventure' and 'restricted access' caves will be controlled through the continuation of the cave and abseil permit system. This allows impacts to be monitored and visitor numbers[36] and frequency to be controlled to maintain cave values and visitor experience. Impacts are to be monitored on a priority basis for all caves open to visitation, guided or self-guided. Monitoring is also required for illegal visitation to restricted caves. The development and implementation of a visitor impact monitoring program for caves open to visitation will require input from karst management specialists, including volunteers who can assist with condition monitoring.

[36] At the time of publication, visitor numbers and frequency of visits are determined by the physical form of the cave, its size, values and past history and the number of visitors that can be supervised by accredited leaders. Visitation limits may also vary from cave to cave depending on specific management objectives.

Where necessary, the department may close or otherwise restrict public use where such use is resulting in unacceptable damage to caves, cave formations or cave flora and fauna.

31.4. Caving

Key points

- Within the planning area, Calgardup and Giants caves provide the public with an opportunity to experience caves of the Leeuwin-Naturaliste Ridge. Other publicly accessible caves along the ridge are located off the department-managed estate.
- Caves of the planning area have significant conservation, archaeological, palaeontological and Indigenous heritage values and hence require protection.
- Cave management has made significant progress during the period of the previous management plan and as a result, few changes are required to current management.

The objective is to allow caving while ensuring protection of the ecological, archaeological, palaeontological and cultural values of the cave system.

This will be achieved by:

1. Managing the cave and karst system in accordance with departmental policy and CALM Regulations.
2. In consultation with CMAC and caving groups, classifying and managing caves according to the department's cave management classification system.
3. Continuing the cave and abseil permit system to allow public access to caves of the planning area (subject to the necessary environmental and safety assessments). Public use may be prohibited or otherwise restricted where such use is resulting in unacceptable damage to caves (e.g. to cave formations or cave flora and fauna).
4. Periodically assessing risks (e.g. stability of rock formations) in all Tourist and Adventure caves to ensure visitor safety.
5. Providing pedestrian trails and other basic infrastructure where there are safety concerns or a significant risk of erosion and compaction.
6. Track marking all Adventure caves and some restricted access caves.
7. Managing vehicle access to provide adequate off-road parking for standard and long vehicles at Bride and WI-16 caves.
8. Applying the department's caving code of practice for the access and use of caves.
9. Developing and implementing on a priority basis, a visitor impact monitoring program for all caves open to visitation.
10. Providing interpretive information, above and below ground, to enhance visitor experience and to increase awareness of cave values, conservation efforts and safety requirements.
11. Maintaining a confidential and up to date inventory of all caves and major karst features to protect them from access by unauthorised visitors.

Key performance indicators (see also Appendix 1):

Performance measure	Target	Reporting requirement
31.4.1 Changes in the number of illegal visitors to unauthorised caves	31.4.1 A decrease in illegal entry to unauthorised caves	Annually
31.4.2 Amount of speleotherm breakage	31.4.2 No speleotherm breakage	
31.4.3 Changes in the area of vegetation around high use caves	31.4.3 No increase in the area of de-vegetation around high use cave entrances	
31.4.4 Level of 'off track' use	31.4.4 No unauthorised 'off track' use by visitors	

31.5 Cycling

There has been rapid growth in the popularity of cycling, particularly mountain biking, as a recreational and a site-specific competitive activity. This popularity has corresponded to an increased demand for new trails and the expansion of the current trail network on department-managed lands.

In response, the department established a Mountain Bike Working Group and is working with the WA Mountain

Bike Association, Perth and South West mountain bike clubs and other users to create a classification system for developing sustainable, purpose-built mountain bike facilities throughout the State. As part of this process, representative mountain bike groups have identified several different types or styles of mountain biking as well as their different trail requirements (Table 11).

Table 11. Requirements for mountain bike riding

Type/style of use	Trail characteristic/requirements*
Single track	The trail type sought by enthusiasts, because of the technical challenges, segregation from motor vehicles and experiences of natural areas.
Cross-country mountain biking	Focuses on trail riding, using standard mountain bikes that are designed to go uphill as well as down. Most mountain biking is cross-country riding. Cross-country trails vary in technical challenge from easy to extremely difficult. Cross-country racing is the most common mountain bike race format.
Downhill mountain biking	Focuses on descending as fast as possible, usually on technically demanding 'single track' trails, and usually either competitively or in training for competition. Purpose-built downhill bikes are used, that are too heavy and highly geared to be ridden uphill.
Free-riding	A newer form, focusing on extreme technical challenge, high risk and riding in unconventional or extreme terrain. It crosses over with downhill and cross-country mountain biking.

Note: toilets, parking, signs and trail marking may need to be provided for events

* Mountain biking is a diverse activity but is essentially about riding on off-road trails. For all types of use, mountain bike groups prefer to use single track rather than existing vehicle tracks and need challenges of differing degrees of difficulty. For most riders beyond novice level, the key motivators are enjoyment of natural settings, physical activity and technical challenge.

The most suitable style of riding on the conservation estate appears to be cross-country mountain biking. Opportunities for other types of riding may occur on adjoining lands (e.g. State forest).

Provided cycling is confined to roads and trails that are appropriately located, designed, maintained and managed, impacts on the natural environment can generally be minimised. The CALM Regulations allow for cycling on public roads and vehicle tracks on lands managed by the department, and on designated bicycle paths and shared paths. Such trails will generally not be designated in nature reserves. On shared trails, conflicts can arise between walkers, cyclists and other track users. Such conflicts are likely to intensify as mountain bike riding increases in popularity.

Cycling on dual use trails is a pre-existing use in Bramley National Park and also occurs in Boranup Forest. During the mid 1990s, competitive mountain biking events occurred in Bramley National Park, in an area north and south of Carters Road and west of Bramley Brook. This area is seen as unsustainable for future events because of the steepness of the topography, presence of sensitive granite outcrop communities, uncontrolled access and limited areas for parking and congregating. The area also comprises the Margaret River Eco Discovery Centre, which is used primarily for education purposes. Elsewhere in the park, unauthorised tracks have been created and the department has removed several illegal structures, including, jumps, ramps and bridges. Mountain bike riders have also established circuit trails on designated walktrails. To protect conservation values, minimise visitor conflict and meet the needs of mountain bike groups, it is proposed to designate trails for general recreational use in Bramley National Park and relocate events to more suitable areas.

One option to relocate these events is the nearby Margaret plantation. Consideration in planning these trails will be given to Statewide strategies developed with the Mountain Bike Working Group and alternative cycling opportunities outside the planning area[37].

31.5. Cycling

Key points

- Cycling occurs most often in Boranup Forest and Bramley National Park.
- The impacts of cycling can be minimised by maintaining and designating trails but may include conflict with other trail users, the spread of disease, vegetation damage and soil erosion.

[37] The Prevelly Cycle/walktrail (9km) and the Busselton-Augusta Rail Trail are alternative cycle trails located outside the planning area. Both trails are managed by the Shire of Augusta-Margaret River.

The objective is to provide opportunities for cycling that minimise the impact on the environment and other visitors.

This will be achieved by:

1. Permitting cycling on public roads and designated trails in the planning area (Maps 6a, 6b, 7a and 7b). Final trail alignments will be identified in consultation with mountain bike clubs.
2. Permitting cycling on dual/share use trails provided the safety and enjoyment of pedestrians is not jeopardised and the track surface can be adequately maintained. Dual/share use paths will be signposted accordingly.
3. Assessing cycling events on a case-by-case basis and permitting them where the activity is consistent with Policy Statement No. 18 *Recreation, tourism and visitor services* and the provisions of this management plan (see also Section 31.14 *Special Events*).
4. Prohibiting cycling events in Bramley National Park near Carters Road and relocating previous events held in this area to more suitable locations. An option to relocate these events is the nearby Margaret plantation or adjoining State forest.
5. Educating cyclists about the environmental impacts of this activity and actions that can be taken to minimise these impacts.
6. Monitoring the impacts of cycling and modify (e.g. separate or relocate) or restrict use if the activity becomes environmentally or socially unacceptable.

31.6 Day-use

There are 70 day-use sites and two proposed sites in the planning area, most of which are coastal and located within Leeuwin-Naturaliste and Bramley national parks (Appendix 11 and maps 7a and 7b). These areas are subject to high and intense visitor use and development is at or near capacity. The department's ability to manage this number of sites is also at capacity. Consequently, it is necessary to implement restrictions on the number and scale of sites in order to preserve current visitor experiences and minimise environmental impacts. It is intended that, other than the sites described in this management plan, no more sites will be developed. The application of visitor management settings provides an effective mechanism to spatially manage visitor use, as well as ensuring a range of sites from the remote to highly modified (see Section 28 *Planning for Visitor Use*).

The range and number of day-use sites within the planning area results in several management issues. A site by site analysis of these issues reveals a pattern of recurring themes:

- congestion and overcrowding in peak periods
- visitor numbers are exceeding site capacity in many instances
- access to sites through other land tenures (see Section 30 *Visitor Access*)
- because of changing visitor use or visitor demographics, site design and facilities in some areas are no longer appropriate
- ageing facilities, and in some cases a lack of facilities to meet current and predicted needs
- inappropriate site use (e.g. unauthorised camping) and vandalism
- visitor safety at some sites (see Section 33 *Visitor Safety*)
- visitor impacts on natural and cultural values as well as visual landscape quality
- incomplete site improvements from the previous *Leeuwin-Naturaliste National Park Management Plan 1989-1999*.

Proposals in this draft management plan will focus on improving the quality of current sites to meet departmental standards (including safety requirements) and changing visitor expectations. Redevelopment and refurbishment will result in an increased capacity at some sites. Coupled with new site design in these areas, park interpretation will be used to direct visitors (particularly in peak periods) to sites that best meet their requirements. To maintain the visitor experience in minor sites, as well as minimising environmental impacts, access will be unsealed or four-wheel drive only where possible. Conversely, a better standard of access will be provided for major sites.

Opportunities for day-use facilities exist along the Margaret River, although these would need to be carefully planned to ensure water quality and riparian conservation values are protected. In this instance, tracks will be rationalised to include one track to the destination point and facilities that are located back from the bank. Suitable paths to the river will be provided.

Karri Corner

A site of particular concern to managers is an informal parking bay along Caves Road, known as 'karri corner'. The site is located in re-growth karri forest in the Boranup section of Leeuwin-Naturaliste National Park and is

popular with tourists seeking scenic photographic and viewing opportunities. The parking bay is situated on a 'blind corner' of the Road[38] and has poor lines of sight for oncoming traffic. This creates a safety hazard for vehicles entering and leaving the site and visitors who cross the Road to take advantage of the view. The department is proposing to remove this parking bay and create an alternative day-use site with similar scenic attributes, located along the Boranup Drive (see Section 31.12 *Scenic Driving*). This allows for better parking and a link to proposed trail developments.

Hamelin Bay

Activities in Hamelin Bay need to be managed carefully given the presence of a boat ramp, significant levels of boat anchoring and boat traffic, the large numbers of swimmers and a wide range of commercial and recreational activities.

The Hamelin Bay day-use area has reached its physical capacity and is often congested because of lack of space (i.e. parking, access to the boat ramp), caused primarily by competition between park visitors and commercial fishermen (see Section 39 *Commercial Fishing*). Furthermore, there are limited areas available for day-use, minimal facilities and the aging boat ramp has been damaged by ocean swells. Some erosion of the foreshore and headlands has occurred because of uncontrolled access and increasing visitor numbers. Redevelopment of the site, including an upgrade of day-use facilities, car parking for vehicles and boat trailers, pedestrian access to the bay, defined access to the headlands and an upgrade of the boat ramp are planned to alleviate these issues. Waste disposal bins will be provided to prevent littering.

Access to Hamelin Bay has been modified to take traffic around the caravan park, thereby improving safety and amenity for guests at the park (see Section 26 *Indigenous Cultural Heritage*).

Stingray provisioning at Hamelin Bay and Kilcarnup

Stingrays (*Dasyatis brevicaudata* and *Dasyatis thedidis*) and eaglerays (*Myliobatis australis*) at Hamelin Bay and Kilcarnup are subject to unauthorised provisioning (feeding) that is believed to have occurred since the 1950s at Hamelin Bay. During busy periods, up to 40 visitors have been observed feeding the rays, mostly during the middle of the day. This coincides with peak visitation, boats coming into shore and fishers discarding offal. Stingray provisioning is increasing at Hamelin Bay although little is known about the impact on the rays (behavioural and physical) and the risk to humans (Newsome, Lewis and Moncrieff 2004).

Management issues include:

- impacts on stingray health (e.g. skin lesions* on stingrays as a result of overhandling by visitors, damage by boats, overfeeding and being fed the wrong food, risk of disease and damage from fish hooks)
- alteration of natural stingray behaviour (e.g. attraction to humans, aggressive behaviour because of interaction and competition between rays, permanent shoaling behaviour*, stingray dependence on discarded offal during summer and a substantial loss of food in winter)
- offal not consumed attracting sharks close to shore
- pollution of inshore waters
- conflicts between provisioning of stingrays and other recreational uses, such as boating, swimming and fishing
- management of large numbers of people
- risk of visitors being injured by stingray barbs.

(Newsome, Lewis and Moncrieff 2004)

* Skin lesions and permanent shoaling behaviour are impacts that are witnessed at other stingray provisioning sites throughout the world, but have not yet been observed at Kilcarnup or Hamelin Bay.

Under Regulation 10 of the CALM Regulations, a person must not without lawful authority, feed fauna, or entice fauna with food, on land managed by the department. Therefore, focus for management should be to discourage feeding and promote the observation of rays in their natural environment.

31.6. Day-use

Key points

- Leeuwin-Naturaliste National Park and Bramley National Park are at or near capacity in terms of development.

[38] Although Caves Road is managed by Main Roads WA, the pullover area and regrowth karri lies within Leeuwin-Naturaliste National Park.

- This draft management plan will focus on improving the quality of current sites while providing a range of sites from the more remote to highly modified.
- Karri Corner is popular with tourists seeking scenic photographic and viewing opportunities along Caves Road. However, poor lines of sight for oncoming traffic create a safety hazard for visitors who cross the Road to take advantage of the view.
- The Hamelin Bay day-use area is at capacity and is often congested because of a lack of space, caused primarily by competition between park visitors and commercial fishermen.
- Stingray provisioning (feeding) at Hamelin Bay has the potential to adversely impact on the rays (behavioural and physical) and poses a risk to visitor safety. Tourism associated with the rays has the potential to create problems with visitor management.

The objective is to provide opportunities for day-use in appropriately designed sites, which facilitate visitor enjoyment, appreciation and understanding of the key values while minimising environmental and other impacts.

This will be achieved by:

1. Developing day-use sites as per Appendix 11 and in accordance with the visitor management settings in Map 5 and Appendix 9, and limit the number of sites to this level.
2. Improving the quality of current sites to meet current departmental standards (including safety requirements), site capability and increased/changing visitor expectations.
3. Prioritising site development according to the threat to conservation or cultural values, visitor risk and the recreation site hierarchy.
4. Redeveloping the Hamelin Bay day-use area.
5. Closing the informal parking bay at Karri Corner and creating an alternative day-use site with similar scenic attributes along Boranup Drive.
6. Prohibiting the feeding of stingrays by:
   - providing information to educate visitors and promote the observation of rays in their natural environment
   - not permitting commercial operations that relate to the promotion of stingray tourism
   - maintaining Kilcarnup as a 'minor' recreation site and not upgrading four-wheel drive access
   - not expanding the capacity of the Hamelin Bay car park beyond the levels proposed in this plan and include a design that restricts buses
   - increasing ranger presence at Hamelin Bay during peak periods
   - not promoting sites for stingray provisioning.

31.7 Fishing and marroning

Many Western Australians enjoy recreational fishing and marroning in the region, either as a shore-based activity or on inland waters.
DoF manages recreational and commercial fishing and marroning throughout the State in accordance with the Fisheries Resource Management Act. This legislation allows for the issue of section 43 fishing closure notices and for regulation of size and bag limits, gear controls, closed seasons and licensing to limit catches to sustainable levels. Fishing activities may also be regulated by the department by declaring 'Restricted Areas' under the CALM Regulations.

Ten Mile Brook Reservoir and the intake pool on the Margaret River, which is used as a public drinking water supply, is closed to all activities, including fishing and marroning, and is monitored by the Water Corporation.

Coastal fishing

Shore-based fishing is a popular recreational activity and there are many beaches and headlands that provide good recreational fishing opportunities in Leeuwin-Naturaliste National Park. Most of the coast is subject to low levels of recreational fishing by dedicated fishers seeking semi-remote experiences, with a relatively high level of activity concentrated in a limited number of easily accessible areas.

From February to April, predictable salmon runs attract large numbers of commercial and recreational fishermen to beaches between Cape Naturaliste and Cape Leeuwin. Anglers searching the coast for schools of salmon and other fish species do so via a network of two and four-wheel drive roads and tracks. Rock and remote beach fishing sites usually have foot access tracks, some of which traverse steep cliffs or sensitive landforms and may be poorly located.

While shore-based fishing is an important recreational activity, uncontrolled access (vehicles and pedestrians) to favoured fishing spots can lead to vegetation loss, soil compaction and erosion of fragile coastal areas. A major issue with salmon fishing is the denuding of dune vegetation caused by fishers driving off-road and along the beach to gain access to vantage points where schools of fish can be spotted. At peak times, car parks (formal and informal) become congested and are often used as overnight camp sites, causing conflicts with other visitors and site degradation. Semi-remote fishing that attracts anglers to minor recreation sites can also become a problem because of inadequate facilities, such as toilets. In areas of high visitation, appropriate site design is needed to manage demand.

Rock fishing and the risk of unexpected large waves is a major safety issue along the coastline of WA (see Section 33 *Visitor Safety*).

Freshwater fishing

Recreational freshwater fishing is primarily focussed on introduced species such as rainbow trout, brown trout and redfin perch as well as the native freshwater cobbler[39]. It is a popular activity with 18 731 valid licences in October 2007, bringing many tourism benefits. To protect newly released trout, a closed season applies from 1 May to 30 August in most rivers and dams in the south-west. During the closed season, fishing is still allowed on the Serpentine, Murray, Blackwood, Donnelly and Warren Rivers although fishing on the streams, brooks and tributaries flowing into these rivers is prohibited during the closed season. Fishing for redfin perch is permitted all year round.

In the Blackwood River catchment, trout stocking and angling was largely confined to tributaries near Bridgetown and Balingup until 1970. Since then, worthwhile rainbow trout angling in the hatchery stocked Murray River prompted the South West Freshwater Research and Aquaculture Centre to regularly stock tributaries of the Blackwood River. The Blackwood River is now recognised as an excellent rainbow trout fishery and fishing events such as the Forest Fishing Festival are held in the Blackwood, Donnelly and Warren rivers on an annual basis. There are also a number of farm stays and other accommodation facilities in the south-west that have privately owned dams stocked with trout. There are no records of public water trout stocking or angler catch in the Scott River.

Although trout fishing in the Margaret River was known before 1970, there had been no stocking of the River until 1995. Since then it was identified that restricted fish species *Nannatherina balstoni* and *Galaxiella munda* were found in the river as well as the hairy marron (see below). The interaction between trout and native fish species was considered and stocking with trout subsequently ceased in 1998. Ten Mile Brook Reservoir has been stocked in the past but this will not continue because of the need to protect the public drinking water supply.

While rivers such as the Blackwood River are not located in the planning area, recreational fishing may still impact upon it. The main impacts of freshwater fishing are related to access (by foot and vehicle), causing vegetation disturbance and bank erosion, and ancillary activities such as camping, waste disposal and escapes from campfires. The department and Conservation Commission are also concerned about the impact of trout on native species and ecosystems (see Section 23 *Introduced and Other Problem Animals*).

Marroning

The most popular native freshwater crayfish species targeted by recreational fishers in the south-west is marron (*Cherax tenuimanus*). In 2006, the marron fishery involved about 3000 licence holders undertaking about 10 000 fishing days, and provided a major recreational activity as well as tourism benefits. However, marron stocks across the fishery are declining, primarily because of environmental change and a decline in rainfall. A review of the fishery in 2002 resulted in a more restricted marron season, which is limited to a 16 day period in January and February. Subsequent to this, it was decided that a management strategy to review the state of the fishery and ensure its long-term sustainability was required. A draft strategy was prepared by DoF and a subcommittee of the Recreational Fishing Advisory Committee and released for public comment in 2005. Based on the review of the marron fishery, a range of new management strategies have been implemented, commencing in the 2007 marron season.

The most popular areas for marroning within the planning area are along the Blackwood and Margaret rivers. This fishery does not interact with protected species. However, in the Margaret River, a second species of marron has been identified (hairy marron, Austin and Ryan 2002) which is threatened mainly by the extension in range of the more common smooth marron, which is the basis of the recreational marron fishery. In late 2002,

[39] Ornamental koi carp (*Cyprinus carpio*) may also be found but is not a major species targeted by anglers.

recreational marron fishing above the Ten Mile Brook junction with the Margaret River was prohibited to remove the impacts of fishing on the remaining hairy marron stocks. However, illegal fishing is still reported. A recovery plan is being prepared for this species (see Section 20 *Native Animals*).

The activity of marroning can also have other impacts on the natural environment, particularly the loss of riparian vegetation at river-bank locations and the creation of several paths to provide access to the river for marroning. This is already evident along the Margaret River.

31.7. Fishing and marroning

Key points

- The Leeuwin-Naturaliste coastline is popular for fishing, and is particularly significant for shore-based salmon fishing.
- Rock fishing is a high risk activity and a major safety issue.
- Regular stocking of trout has occurred in the Blackwood River, and the area has now developed into a consistent and worthwhile fishery. However, stocking of the Margaret River ceased in 1998 because of the interaction between trout and restricted native fish species. Since this time a second species of marron (the hairy marron) has also been discovered.
- Marron stocks across the fishery are declining and DoF and a subcommittee of the Recreational Fishing Advisory Committee are developing a draft management strategy to ensure its long-term sustainability.
- Marroning in the Margaret River is prohibited upstream of Cane Break Road because of the need to conserve the critically endangered hairy marron.
- Uncontrolled access (vehicles and pedestrians) to favourite fishing and marroning spots is a significant management problem as it can lead to degradation of fragile areas. Inadequate facilities or design at some recreation sites can exacerbate these impacts.

The objective is to allow for fishing and marroning while minimising environmental impacts.

This will be achieved by:

1. Providing access to enable fishing and marroning (subject to knowledge about impacts on key values), in accordance with departmental policy and DoF regulations.
2. Liaising with DoF with regards to the ongoing stocking of trout and other non-native species (see also Section 23 *Introduced and Other Problem Animals*). In particular, discussion on the stocking of non-native species in the Margaret River is required because of the presence of *Nannatherina balstoni*, *Galaxiella munda* and hairy marron.
3. Ensuring the environmental and social impacts of coastal fishing are minimised.
4. Controlling pedestrian access and providing appropriate and safe vehicle/parking facilities to minimise environmental impacts at coast/river access points.
5. Prohibiting camping in coastal car parks.
6. Providing information about safe access points to the coast and the safety risk associated with rock fishing.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
31.7.1 Loss to dune vegetation	31.7.1 No loss of dune vegetation as a result of off-road vehicular activity	Every 5 years

31.8 Horse-riding

Horse-riding in natural bush settings is a popular recreational activity, with low levels of recreational and commercial use occurring in Bramley National Park, Boranup Forest and near Yallingup.

Horse-riding on the public conservation estate is permitted[40] where the environmental and social impacts are considered manageable, and where the activity does not conflict with other management operations or key values. Horse-riding is also permitted on State forest and timber reserves. Under the CALM Regulations, areas

[40] Permitted use may include day-use trails, designated areas, free-range riding and exercise of horses on beaches. However, not all uses are appropriate to all lands managed by the department.

where horse-riding is allowed also need to be designated and published in the Government Gazette. Generally, horse-riding is not permitted in:

- nature reserves or wilderness/remote areas
- areas of special scientific or cultural value
- other areas requiring special protection (e.g. from disease caused by *P. cinnamomi*).

Horses can have a high impact, especially on soils, surface water, and vegetation. Newsome *et al.* (2004) noted that the most common and widely recognised impact was ground level damage caused by horse's hooves. Factors such as long and steep slopes, high elevation, high rainfall events, unvegetated or unsurfaced slopes, low soil organic matter, poor soil structure, fine texture, impeded infiltration of water and close proximity to streams or groundwater discharge areas all contribute to trail degradation Newsome *et al.* (2002a).

Further support for the high impact potential of cross country horse riding or riding on poorly defined trails is afforded by Phillips and Newsome (2002). This study, conducted in a vegetated parabolic dune area in a sub-Mediterranean coastal environment in D'Entrecasteaux National Park set out to determine the impact of horses by measuring changes in species composition, vegetation cover and height, soil micro-topography and soil penetrometry on previously undisturbed plots. The results showed that horse trampling caused a decrease in vegetation cover and height, a change in species composition, a reduction in the frequency of plant species, and increase in soil depth and amount of bare ground.

Monitoring is important to assess management effectiveness in reducing undesirable impacts, and to provide valuable information for planning, public accountability purposes and resource allocation. Successful management requires an understanding of impacts, knowledge and experience to construct and maintain trails, implementation of a monitoring system and then acting if unacceptable impacts are detected (e.g. riders to use designated bridle trails and apply a code of conduct).

In Leeuwin-Naturaliste National Park there are two areas designated for horse-riding:

- an area south-east of Caves Road near Yallingup (Dugdale Road horse trails)
- an area in Boranup Forest bounded by Boulter, Caves, Vlam and Bruce roads.

Horse-riding in the former was permitted on a trial basis, subject to monitoring of environmental impacts, especially track erosion, weed invasion and the spread of *P. cinnamomi*. More investigation is required to determine their suitability. In the interim, existing trails in this area should be rationalised in consultation with the community and no new trails formed.

Significant concerns have arisen regarding horse-riding in Boranup Forest, as it is the most western location of the critically endangered white-bellied frog. Populations of the frogs' have declined and in some instances have become extinct. While it is uncertain as to whether horse-riding has contributed to this decline, it is possible that erosion and sedimentation of watercourses caused by horse activity could affect populations unless preventative action is taken. Horse-riding in the area may also be associated with illegal camping along creek systems inhabited by the frogs. This significantly increases the risks of escaped campfires, the effects of which could significantly impact frog populations. To add to this, there are limited opportunities for designing loop trails. These factors make horse-riding unsuitable and a precautionary approach is warranted to protect frog populations. Therefore, horse-riding at this location will not be permitted. Areas of State forest outside the planning area may provide a suitable alternative. The Shire of Augusta-Margaret River also manages a rail-trail through the Boranup Forest section of Leeuwin-Naturaliste National Park east of Caves Road, which is suitable for horse-riding in parts.

West of Caves Road, horse-riding is not desirable because of potential impacts on cave systems from off-trail use, the increased risk of riders accessing Boranup Beach and the potential conflicts with designated scenic drive opportunities and other walk and cycle trail use.

Horse-riding is not permitted on beaches in Leeuwin-Naturaliste National Park because of impacts on heath vegetation along beach access routes, nesting hooded plovers and potential conflicts with four-wheel drive vehicles accessing the coast. However, the demand for this activity is high and there is evidence of unauthorised horse-riding along sections of beach north of Hamelin Bay.

Horse-riding is a pre-established use within Bramley National Park. The park experiences moderate to high commercial and local community use and conflicts with other visitors are minimal. The environmental impacts in this area are considered manageable and designated trails will therefore be developed (Map 7b). Horse-riding will not be permitted within the two-kilometre reservoir protection zone around Ten Mile Brook Reservoir.

Opportunities for developing more bridle trails however, are limited because of the fragmented nature of the reserves.

31.8. Horse-riding

Key points

- Horse-riding is a popular recreational activity in Bramley National Park and Leeuwin-Naturaliste National Park (Boranup Forest and near Yallingup), although opportunities to develop more trails are limited because of fragmentation of the planning area.
- While horse-riding is a legitimate activity, it can adversely impact on the environment and careful management is required to ensure that the risk of overuse and disturbance does not lead to deterioration of conservation values.
- Horse-riding in Boranup Forest is a significant concern because of the potential impacts on the critically endangered white-bellied frog.

The objective is to provide opportunities for 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 designated trails and on a rotational basis as per Maps 7a and 7b, subject to ongoing and sufficient demand warranting this type of activity and monitoring that assesses its sustainability. Horse-riding in Boranup Forest will be prohibited east of Caves Road to protect frog populations.
2. Designing, constructing and maintaining horse-riding trails to minimise environmental impacts and, where possible, conflict with other visitors.
3. Modifying or closing as necessary, designated bridle trails where they present a risk to conservation values, special scientific or cultural values or areas requiring special protection (e.g. areas protectable from disease).
4. Continuing to prohibit horse-riding on Boranup Beach and at Hamelin Bay because of potential impacts on nesting hooded plovers and potential visitor conflicts.
5. Prohibiting horse-riding within the immediate vicinity of Ten Mile Brook Reservoir to protect water quality.
6. Investigating options for horse-riding outside the planning area (e.g. State forest).
7. Educating visitors on the potential impacts of the activity.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
31.8 Number of horse-riders reported in Boranup Forest east of Caves Road	31.8 No horse-riding in Boranup Forest east of Caves Road	Every 5 years

31.9 Overnight stays

Overnight stays are provided in built accommodation, through camp sites and via commercial lease arrangements (Hamelin Bay Caravan Park). Policy Statement No. 18 *Recreation, tourism and visitor services* (DEC 2006b) covers accommodation and camping.

Built Accommodation

Built accommodation on lands and waters managed by the department is generally provided by way of a commercial concession and gives due consideration to cooperating with the private sector in the provision of a range of accommodation. In the planning area, built accommodation is provided for at the Cape Naturaliste and Cape Leeuwin lighthouses, and is managed by way of a lease agreement. Cabin-style accommodation is also provided for within the grounds of Hamelin Bay Caravan Park. Two huts located in the Boranup Forest provide accommodation for speleologists (see Section 32 *Commercial Operations*).

It is likely that the demand for additional built accommodation will be met on adjoining lands, as there are a number of establishments providing short and long-term tourist accommodation. Therefore, the department will aim to provide opportunities that are not otherwise provided in these areas. Any developments that do occur

would need to involve consultation with Tourism Western Australia and local tourist associations and give due consideration to low impact development as defined in the LNRSPP. Key values of this plan, visitor management settings and the capacity to accommodate more development should also be considered. Generally, built accommodation is not allowed in nature reserves.

Camping

The department manages three vehicle-based camping areas within the planning area – Conto Campground, Point Road Campground and Boranup Campground, all located within Leeuwin-Naturaliste National Park (Maps 7a and 7b). Walk-in camping at 5 sites along the Cape to Cape Track and camping at the Hamelin Bay Caravan Park is also available. The main camping area is Conto Campground with 110 sites (including group sites) and highly developed facilities. Point Road and Boranup campgrounds are small, basic camp sites with 10 and 6 sites respectively, which require upgrading and maintenance. All sites are popular and operate at capacity during peak periods (e.g. public holidays). Vehicle-based camping facilities in the northern quarter of the Park will not be provided due to commercial opportunities off the department-managed estate, the lack of suitable sites and the increased resourcing requirement. This area is best suited to touring and day use.

The combination of physical site capacity, the desire to maintain more natural visitor experiences and the capacity of the department to manage existing sites, dictate that the overall capacity of the planning area is reached. To this end, the department will limit camping to the number of sites that is proposed in this plan and concentrate it in a few areas.

The vehicle-based camping facilities at Point Road require considerable upgrading, as a lack of design and usage issues are contributing to site degradation. For example, soil compaction caused by vehicles has resulted in the decline of several peppermint trees at the site. The department will continue to provide vehicle-based camping at Point Road to offer an alternative (four-wheel drive accessible) experience to Conto Campground. The site will need to be redesigned including the realignment of Point Road to bypass the camping bays.

Over the life of the plan, Boranup Campground will be closed and relocated to another, more suitable, location within the Boranup Forest area. Factors including the small size[41] of the site, its proximity to traffic along Boranup Drive and the distance from primary recreation activities (caving, abseiling, walking) warrant this change. Group camping could be provided but would be designed in a way to minimise conflicts with other campers (e.g. by restricting group camping to a particular area). A possibility for the relocated camp site is the previously harvested plantation at Boranup Plot 8 (Map 7b). This area is being rehabilitated with native vegetation and camping will only be developed once this has been completed. Scope for additional camping in Boranup Forest is limited (see also *Remote Camping*).

A number of opportunities for walk-in camping are provided for walkers of the Cape to Cape Track – Mt Duckworth, Moses Rock, Ellensbrook, Point Road and Deepdene. There is no camp site in Boranup Forest between Point Road and Hamelin Bay and camping is adhoc. To bridge this distance, an additional walk-in camp site will be developed in Boranup Forest. This will also be a site where water can be obtained.

Fundamental to the success of proposals to better manage camping is the introduction of a booking system. The department is developing such a system for a number of parks as a trial, with a view to introducing it Statewide. This will allow visitors to visit the planning area with the surety of obtaining a site during busy periods (in particular school holidays). It is proposed that the system will allow for on-line booking. Conto Campground is the ideal place to instigate such a trial.

Camping in non-designated areas occurs in various locations throughout the planning area. Camping in coastal car parks designed for day use is also undertaken, mostly in association with fishing and surfing activities. Under the CALM Regulations, camping without lawful authority is prohibited in non-designated areas.

Remote camping

Remote camping refers to camp sites where facilities are generally not provided and which may only be accessible by foot. In Boranup Forest, and other locations in Leeuwin-Naturaliste National Park, remote camping occurs regularly and on an adhoc basis. Camping is undertaken primarily by commercial operators and non-commercial groups, who provide a range of outdoor and environmental education programs associated with activities such as caving, rock climbing, abseiling and walking. To facilitate these activities, operators have

[41] The capacity of the Boranup Forest camp site is limited due to the physical/environmental characteristics of the site such as the slope, soils, aspect and vegetation types. These factors are the primary reasons for its small size.

requested remote walk-in camp sites that are in close proximity to these activities, but separate to public camp sites (e.g. Conto Campground and Boranup and Point Road Campgrounds).

Remote camping can have low environmental impacts, especially if undertaken by individuals who apply bushcare ethics (i.e. Leave No Trace). However, some sites may not be located in the most environmentally or culturally appropriate areas, and consequently may not be sustainable. Unmanaged, these sites can have high environmental impacts and may pose a safety risk to visitors (e.g. from falling limbs or cliff risk). Clearing of vegetation to accommodate camping, no formal facilities (e.g. for campfires), and pollution emanating from general rubbish and toilet waste, are common problems experienced at remote camp sites. The impacts of this activity are exacerbated where unmanaged groups are involved. Even for managed groups, there is a requirement for the department to monitor such use.

The department will allow remote camping by commercial operators and other groups in Leeuwin-Naturaliste National Park by way of lawful authority granted under Regulation 4 of the CALM Regulations. The regulations enable the Director General to give lawful authority for camping in areas that would otherwise be unlawful under the regulations. Lawful authority may be given for a specified period and will be subject to strict conditions of use being met. Restrictions on group size and the frequency of use may apply.

Areas for remote camping will be selected based on the following environmental, social and management criteria:

- capacity to cope with the predicted use
- protection of flora, fauna, landscape and cultural values
- potential for damage or overuse of sensitive areas
- risk to water quality
- conflicts with other recreational use
- maintenance of visitor safety
- compatibility with department and other government agency operations
- consistency with other management objectives.

Canoe/boat-in only camping along the Blackwood and Scott Rivers is available outside the planning area at Alexandra Bridge, Warner Glen and Chapman Pool.

31.9. Overnight stays

Key points

- The combination of physical site capacity, the desire to maintain more natural visitor experiences and the capacity of the department to manage existing sites means that the capacity of the planning area to cater for additional camping has been reached.
- There is a need to cater for campers who are seeking vehicle-based camping opportunities and a booking system to manage this use.
- Commercial operators and other groups have a desire to camp in Leeuwin-Naturaliste National Park to facilitate caving, rock climbing, abseiling and walking activities.

The objective is to provide appropriately designed built accommodation and camping opportunities while minimising environmental and other impacts and conflicts between users.

This will be achieved by:

1. Retaining existing built accommodation, and considering more built accommodation where it is commercially viable, consistent with the visitor management setting (see Map 5 and Appendix 9), meets environmental, visual landscape and social objectives of this management plan and provides opportunities not already available on adjoining lands.
2. Permitting camping in the designated sites shown on Maps 7a and 7b and upgrade/redesign sites according to current visitor needs and to manage environmental impacts.
3. Reducing environmental impacts such as soil disturbance and tree decline by realigning Point Road to bypass the camp site.
4. Closing the Boranup Campground within five years of commencing the plan and relocating it within the Boranup Forest area.
5. Developing an additional walk-in camp site on the Cape to Cape Track in Boranup Forest.
6. Trialling a booking system for Conto Campground with a view to extending this to other sites if

appropriate.
7. Allowing remote camping in Leeuwin-Naturaliste National Park by way of lawful authority under the CALM Regulations. Remote camping in other areas will be prohibited and sites rehabilitated where necessary.
8. Monitoring visitor impacts at all camping areas and adapting management as required.

31.10 Paragliding, hang gliding and flying

Paragliding and hang gliding

Paragliding and hang gliding involves cliff/hill top or beach launches using a fully controllable parachute/glider capable of soaring flight. There are several sites along the coast that have been used for gliding including Rabbit Hill, Conto cliff, Injidup beach and point and Greenhills. The latter is located outside the planning area. Most sites experience low levels of use, mainly during the summer. The most popular sites are Conto cliff and Rabbit Hill.

The *Leeuwin-Naturaliste National Park Management Plan 1989-1999* recommended a trial of hang gliding at Conto cliff to determine the viability of developing a permanent hang gliding site. Since this time, the site appears to have more use from paragliders, which require less facilities (in terms of take-off area and ramps) to undertake their activity. The main issue at the site is the lack of suitable parking and assembly areas close to the take-off zone, and as such informal vehicle pullover bays have been established along Conto Road. This does not permit adequate lines of sight for vehicle egress and pedestrians crossing the road, thus creating a safety hazard with visitors milling around vehicles to load/unload gear and crossing Conto Road. To address this issue, parking and formalised paths would need to be provided. This would require clearing of heath vegetation, which is not desired in an area of steep terrain and high landscape value. Additionally, erosion and devegetation is occurring on the take-off area and it has been noted that gliders land on the road. Furthermore, there are no toilet facilities at this site. These concerns have led the department to establish the following sustainability criteria to guide development for hang gliding and paragliding activities within the planning area:

- ensuring appropriate visitor safety
- protection of the environment
- the site has adequate capacity to cope with the predicted use
- provision of adequate facilities
- visual impact of use is minimal
- consistency with other management objectives, including equity of use.

Using these criteria, the most suitable gliding site in the planning area is in the development node around Yallingup, just north of Rabbit Hill car park. This site is however, sensitive to high use and there is concern over the impacts at set-up areas. Consequently, gliding will be approved on a trial basis subject to environmental impacts. Gliding codes of practice will be adopted to limit the number of visitors at the site. The trial and monitoring of this site will determine more infrastructure requirements. Events or commercial use will not be permitted.

For the reasons stated above, Conto cliff does not meet the criteria for sustainability and gliding will not be permitted. The priority for this area is flora conservation, visual amenity and the functioning of Conto Campground, which includes access to the beach for campers and walkers of the Cape to Cape Track as well as wheelchair access to lookout points. This site is more environmentally sensitive than Rabbit Hill and requires more development and site hardening. Cars cannot be parked on adjoining tracks from Conto Campground because of the need to maintain emergency access to the coast and because of safety issues crossing the road.

Hang gliding and paragliding at Injidup, also fails to meet the criteria. In this case, severe dune erosion and loss of vegetative cover at the point have been exacerbated by sandboarding and gliding activities (see Section 31.11 *Sandboarding*) and the department is attempting to rehabilitate the site. Permitting gliding would further compromise the natural values of this sensitive area. Gliding using a beach launch may encourage use of the dune during less favourable winds and is therefore prohibited.

With continued interest and input from the *Hang gliding Association of WA*, paragliding and hang gliding will be considered in other locations as long as they meet sustainability criteria for site use.

Flying

The use of aircraft on or over natural areas can have various impacts, on the biophysical environment itself, wildlife (e.g. waterbirds) and on the quality of visitor experience (e.g. peace and quiet). On the other hand,

sightseeing from aircraft is often the most feasible way to view an area.

A commercial pilot operating from Augusta has conducted sporadic scenic flights over the planning area. In the future, it is possible that scenic flights may also be operated from Margaret River at airstrips in State forest adjoining Bramley National Park.

The operation of aircraft, powered and un-powered, on or over lands and waters managed by the department must comply with relevant Federal and State air safety regulations and procedures. Under Civil Aviation Safety Authority regulations, powered aircraft are not permitted to operate below 500 feet, except upon take-offs and landings, in inclement weather conditions, during search and rescue operations or if an exemption has been granted.

If scenic flights over the planning area start to occur on a more regular basis, the department should initiate the development of 'Fly Neighbourly Advice', which is an agreement between natural area managers and relevant aviation groups to encourage harmonious relations between aviation activities and conservation interests. This usually recommends minimum flying altitudes over natural areas. Where scenic flights may disturb and endanger wildlife and/or impact upon visitor solitude and enjoyment they should be discouraged or site specific guidelines (e.g. preferred flight paths, flight frequencies, flight-free times and the type of aircraft used) developed.

31.10. Paragliding, hang gliding and flying

Key points

- Irregular hang gliding and paragliding activity occurs at several sites in the planning area including Rabbit Hill recreation site, Conto cliff and Injidup beach and point.
- Sporadic scenic flights are conducted over parts of the planning area.

The objective is to allow safe flights over the planning area without adversely impacting on the environment.

This will be achieved by:

1. Allowing paragliding and hang gliding where they meet the above sustainability criteria and approval is granted. At the time of writing, the site just north of Rabbit Hill recreation site is the only site to satisfactorily meet the criteria. Gliding at this site will be permitted on a trial basis and monitoring undertaken to determine the suitability of permanent use.
2. Formalising beach access from Conto Campground to alleviate erosion problems caused by walkers accessing the beach.
3. Prohibiting the landing of aircraft, including ultralight aircraft, in the planning area except in emergency circumstances.
4. Where scenic flights occur on a regular basis, liaising with the relevant authorities to develop 'Fly Neighbourly Advice'.

31.11 Sandboarding

Unauthorised sandboarding is occurring in Leeuwin-Naturaliste National Park and has become increasingly popular amongst young age groups. Most sandboarding occurs at the blowout at Injidup Point, which was originally caused by wind erosion. Rehabilitation has been initiated at the site although rabbits and recreational use have hampered these efforts.

Sandboarding is generally not permitted on lands managed by the department. The sandboarding activity itself, plus the assent of the dune, is particularly destructive on surviving vegetation and can be expensive to rehabilitate. Given the erosion of Injidup Point and efforts to rehabilitate the site, sandboarding will not be permitted. The sensitivity of the Leeuwin-Naturaliste coastline means that there are no suitable sandboarding sites within the planning area.

31.11. Sandboarding

Key points

- Unauthorised sandboarding is occurring at Injidup Point, causing erosion and damage to fringing vegetation.
- Sandboarding is generally not permitted on lands managed by the department.

The objective is to protect dune systems from the impacts of sandboarding.

This will be achieved by:
1. Prohibiting sandboarding within the planning area.
2. Providing signage and/or information as to why sandboarding is prohibited.
3. Continuing the rehabilitation program at Injidup point.

31.12 Scenic driving

While the shape of the planning area provides opportunities for numerous access points to coastal activities and features, it does not allow many opportunities for lengthy or continuous drives along the Leeuwin-Naturaliste Ridge. Caves Road, which is managed by Main Roads WA, is the primary scenic route and perhaps the only road that offers this opportunity. The *Roads 2020 Regional Development Strategy* recognised its high value as a scenic drive and decided to maintain the road in its current standard (see Section 30 *Visitor Access*). Its scenic attributes however, have led to safety issues at 'karri corner' (see Section 31.6 *Day-use*).

There are many other drives passing through the planning area that also offer a scenic driving experience – Boranup Drive, Skippy Rock Road, Cape Naturaliste Road, Canal Rocks Road and Sugarloaf Road. The former will be part of a broader 'Boranup Forest Experience', incorporating scenic driving and viewing opportunities that includes a new 'karri forest lookout' (a proposed alternative to 'karri corner') as well as picnicking, camping, walking, caving, abseiling and cycling. Informal vehicle pullover bays at key viewing sites along some scenic drives are not well defined or safe and require redevelopment.

31.12. Scenic driving

Key points
- The shape of the planning area means that there are limited opportunities for lengthy or continuous scenic driving. However, a number of shorter drives have high quality scenic attributes. Boranup Drive and Caves, Skippy Rock, Cape Naturaliste, Canal Rocks and Sugarloaf roads for example, provide ideal opportunities to experience karri forest and coastal scenery.

The objective is to provide scenic drive opportunities consistent with key values and other visitor use.

This will be achieved by:
1. Maintaining the existing scenic driving opportunities along main access routes, incorporating viewing areas where possible.
2. Liaising with Main Roads WA where necessary to retain safe, scenic drive opportunities along Caves Road.

31.13 Surfing and swimming

Surfing

The Leeuwin-Naturaliste coastline is world renowned as a surfing destination and has been surfed for many years. It has grown to become one of the most popular activities in the region, attracting internationally recognised surfing events at Yallingup and Margaret River. Many local board riding clubs use the area along with metropolitan-based surfing clubs and regular competitions are held at many of the surf breaks (see Section 31.14 *Special Events*). These breaks vary in popularity, accessibility, skill requirements and safety. In more recent years, windsurfers, kite surfers and in tow surfers have also been observed.

While surfing occurs in marine areas outside the planning area, access points and facilities are located within the planning area and consequently it is appropriate that the activity is considered in this plan. This access and use of facilities presents several problems for managers, including:
- car parks are being used as de-facto campgrounds, causing problems of soil erosion, vegetation destruction and pollution (litter and toilet waste)
- erosion and degradation of foredunes and limestone cliffs/ledges where surfers seek access (by foot) to high vantage points
- new tracks that allow for more convenient access to surf breaks are being created illegally
- some minor surfing sites are experiencing high visitor use and impacts

- dogs being brought into the planning area (see Section 34 *Domestic Animals*)
- vandalism of infrastructure
- overcrowding of surfing sites at peak periods.

The need for controls on environmental degradation, adequate parking, defined access paths and provision of other facilities (e.g. toilets and additional lookouts) at surfing sites is growing as visitor pressures increase at many sites. Rationalising the provision of these facilities is required (e.g. the location, type and level of development).

With visitor pressure increasing, including pressure for more competitive surfing events at a range of locations, there is a necessity to develop a surfing policy for Leeuwin-Naturaliste National Park (see Section 31.14 *Special Events*). It is possible over the life of this plan that visitor pressures will increase at recreation sites adjoining proposed marine special purpose (surfing) zones.

Swimming

Sheltered, white sandy beaches and protected bays along the Leeuwin-Naturaliste coastline provide excellent swimming opportunities. Bunker Bay, Yallingup lagoon, Injidup Beach, Gracetown, Kilcarnup, Prevelly/ Gnarabup, Redgate (north and south), Hamelin Bay, Cosy Corner, Quarry Bay and Flinders Bay are particularly popular. Swimming is also popular in the Margaret River.

While swimming is a popular activity, there are some beaches that are not appropriate for swimming because of large swells, rips and difficult conditions. Warning signs in certain locations are in place to inform visitors of this risk (see Section 33 *Visitor Safety*). Overcrowding and car park congestion at some swimming areas is also a concern during peak periods.

Swimming is prohibited in the Ten Mile Brook reservoir protection zone, which surrounds the reservoir, and only permitted at designated sites within the catchment (upstream of the dam)[42] (see *Ten Mile Brook Reservoir*).

31.13. Surfing and swimming

Key points

- The Leeuwin-Naturaliste coastline is world renowned as a surfing destination. The activity has grown to become one of the most popular activities in the region and supports many competitive events.
- Measures to improve parking, control environmental degradation and provide facilities at surfing sites is required, as is a surfing policy.
- The Leeuwin-Naturaliste coastline provides some excellent swimming opportunities although some areas are not appropriate because of large swells, rips and difficult conditions.
- Swimming is prohibited in the reservoir protection zone of Ten Mile Brook Reservoir.

The objective is to facilitate access for surfing and swimming where the environmental impacts are manageable and the risk to public health and visitor safety is acceptable.

This will be achieved by:

1. Maintaining the number of recreation sites that facilitate surfing.
2. Providing the appropriate level and type of facilities at surfing sites, particularly where competitive surfing events are conducted.
3. Controlling visitor access to 'minor' recreation sites used by surfers by maintaining four-wheel drive access and limiting the number of access points (see Maps 6a and 6b).
4. Channelling pedestrian traffic at authorised surfing sites by providing defined access paths to the ocean and vantage points (e.g. lookouts) where appropriate.
5. Prohibiting camping in car parks and providing information at surfing sites as to the location of suitable camping areas.
6. Providing appropriate facilities at access points to popular swimming sites.
7. Providing information on authorised surfing and swimming sites, use patterns and attributes of certain sites to encourage use in areas where facilities are provided.
8. Continuing to provide information to visitors regarding the environmental impacts and safety risks associated with surfing and swimming.

[42] Swimming is allowed where the Margaret River foreshore adjoins farmland.

Key performance indicators (see also Appendix 1):		
Performance measure	**Target**	**Reporting requirement**
31.13.1 Area of foredunes and cliff vantage points eroded	31.13.1 Erosion of foredunes and cliff vantage points is reduced from 2010 levels	Every 5 years
31.13.2 Number of new access tracks to the coast	31.13.2 Number of new access tracks to the coast is reduced from 2010 levels	

31.14 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 that include surfing and fishing competitions at club, State and National levels, cycling events and various concerts and weddings. Surfing events in particular can attract high levels of spectators and participants, which in turn create environmental and social management problems and associated costs (see below). Presently there is an increasing demand for adventure racing events that attract around 1000 competitors and involve running, canoeing, mountain biking and abseiling activities.

Special events that present opportunities for nature-based recreation may be permitted in the planning area, subject to approval from the department and other relevant authorities. These events must be consistent with the department's Policy Statement No. 18 *Recreation, tourism and visitor services* (DEC 2006b). Where requests are made to conduct special events for activities that are inconsistent with this policy, the event must be of national significance and consultation with the Conservation Commission is required. If events are considered a commercial operation, a commercial operations licence is also required. This requires consultation with the Conservation Commission and approval by the Environment Minister. Proponents seeking to hold events should allow sufficient time for this consultation to occur. Events should use existing facilities, roads and tracks.

The suitability of events will be assessed on a case-by-case basis and considered against the following criteria:
- availability of alternative locations outside the planning area
- protection of natural and cultural values
- potential of the event to cause or exacerbate soil erosion and disturbance
- safety and enjoyment of all visitors as well as those who partake in the event
- the availability of suitable facilities
- risk to water quality
- potential to spread disease
- the overuse of sensitive area
- past history of use and compatibility with departmental operations
- location of the event in an appropriate visitor management settings
- cost and benefits involved with management.

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. It is generally preferred that events are located outside the planning area. Special considerations for mountain bike events are described in Section 31.5 *Cycling*.

At the completion of an event, proponents are required to remove any temporary fixtures or facilities constructed for the event, rehabilitate disturbed areas and remove signage.

Surfing events

Surfing events along the Leeuwin-Naturaliste coastline are increasing in number and regularity and are becoming increasingly popular as a spectator sport. There are several locations along the coast that provide opportunities for surfing events, many of which occur in the planning area. Several other surfing events are conducted on Shire-managed lands.

Degradation of foredunes, limestone cliffs, ledges and coastal ecosystems is an on-going environmental problem associated with accessing and viewing surf breaks, especially where this is associated with competitive surfing events. This is compounded by recreation facilities that are not designed to cope with the high visitation during

the competition period. To balance the number of events catering for clubs and the need to maintain individual experiences, the department will prepare a surfing policy to guide the management of surfing events within the planning area. As part of this policy, the department will investigate a fee/licence situation for commercial surfing events.

31.14. Special events

Key points

- Requests may be made to undertake 'one-off' special events within the planning area, which require accommodation, suitable access, viewing points, an established network of tracks and adequate facilities, such as parking and toilets.
- Surfing events can generate large crowds that create environmental, management and access problems.

The objective is to provide for organised special events where they meet the suitability criteria listed above and are cost-neutral to the Department.

This will be achieved by:

1. Assessing special events on a case-by-case basis according to the general criteria stated above and permitting them where the event is consistent with departmental policy. Where the event is inconsistent with departmental policy, events will be permitted only where the event is of national significance and after consultation with the Conservation Commission. Conditions stipulated by the department may apply.
2. Where events are considered to be a commercial operation, requiring that a commercial operators licence is obtained.
3. Ensuring that special events are held only within appropriate visitor management settings, pose no adverse impacts on the environment or unreasonably interfere with public use.
4. Requiring event proponents to remove any temporary fixtures or facilities constructed for the event, rehabilitate disturbed areas and remove any signage.
5. Auditing and assessing events on their completion to assist in future management.
6. Finalising a specific surfing policy for the Leeuwin-Naturaliste coast.
7. Upgrading 'medium'-scale sites, where appropriate, to cater for surfing events. If additional infrastructure is required, this will be provided by the event proponents.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
31.14.1 The extent to which targets and guidelines for an events policy and a specific surfing policy have been prepared	31.14.1 Development of a specific surfing policy for the coast	After 5 years

31.15 Visitor services

Rubbish collection

Central waste bins are provided at Conto Campground. Since the previous management plan for Leeuwin-Naturaliste National Park, rubbish bins were progressively removed from day-use sites and visitors encouraged to take their rubbish home with them. This strategy has proved successful and cost effective, and will apply to recreation sites, other than Conto Campground, over the life of this plan.

Firewood

Firewood is supplied at Rusden Picnic Area, Conto Campground and the Point Road and Boranup Campgrounds. There are significant management costs associated with firewood supply and the department is investigating the most practical and cost-effective options for supplying a source of fuel in the long-term. This may include:

- the department continuing to provide firewood at the aforementioned sites
- the department providing firewood in designated areas at suitable entry points
- a contractor providing firewood
- encouraging visitors to bring their own firewood (see Section 43 *Forest Produce*)
- supplying electric or gas barbecues
- a combination of the above.

For cooking purposes, gas barbecues will continue to be provided at Conto Campground and the Rusden Picnic Area. Elsewhere, visitors will be encouraged to supply their own gas for cooking. Escapes from campfires can lead to bushfires. Consequently, campfires within the planning area can only be lit in authorised fireplaces (i.e. fire sites provided in designated camping and picnic sites). In summer, total fire bans apply.

Water and power supply

Treated water is provided for visitors at two locations in the planning area – lighthouse facilities at Cape Leeuwin and the Rusden Picnic Area. Rainwater or streamflow is used to supply camp sites along the Cape to Cape Track, Conto Campground, certain built accommodation and some major day-use sites. Current water supply services will continue over the life of this management plan although this, and any more use, will require that water is taken and used sustainably. Energy efficient developments (e.g. solar power) and water saving infrastructure/techniques (e.g. recycled stormwater in toilets) should be considered where this is practical and cost effective. A priority could be major recreation sites such as the Margaret River Eco Discovery Centre and Conto Campground.

Toilets

Toilets are provided at all camping areas and many day use sites. There has been considerable demand for toilets along the length of Leeuwin-Naturaliste National Park and, since the previous management plan, many have been constructed. The number of new toilet facilities will be determined by the cost of maintenance and construction. Toilets in known cave catchments should have sealed chambers to prevent leaching of waste into cave systems. The lack of toilet facilities at some surf and high visitation sites is an issue for managers.

Commercial accommodation at Hamelin Bay must comply with environmental health standards for potable water, grey water, and sanitary facilities as determined by the department and the Shire of Augusta-Margaret River.

31.15. Visitor services

Key points

- The department provides a number of services in the planning area to support the visitor experience, while also minimising environmental impact.

The objective is to ensure that visitor services are efficient, environmentally sustainable and compatible with other management objectives.

This will be achieved by:

1. Continuing to collect rubbish from centrally located waste bins.
2. Managing campfires by:
   - permitting campfires in designated fireplaces (i.e. fire rings provided in designated camping sites) only
   - investigating the most cost effective and efficient method to supply firewood and apply accordingly
   - providing fuel (e.g. firewood or gas/electric barbeques) to designated overnight sites and Rusden Picnic Area where the demand exists and it is cost effective and practical to do so.
3. Continuing to ensure that water is taken and used sustainably (e.g. at Hamelin Bay).
4. Providing toilets where required, and ensuring that toilets do not contaminate groundwater in karst areas.

32. COMMERCIAL OPERATIONS

Commercial concessions can help meet the rising demand for high quality recreation and tourism opportunities, facilities and services, while ensuring that financial contributions help meet the costs of managing the resource. A commercial concession is a right granted by way of a lease or licence for occupation or use under appropriate conditions, of an area of land or water managed by the department. The department's Policy Statement No. 18 *Recreation, tourism and visitor services* (DEC 2006b) governs conditions for commercial concessions. All commercial concessions require approval by the Environment Minister.

Leases

Leases are granted under the CALM Act to allow a lessee to occupy a particular area of land. A lease provides security to protect significant investments and may be up to 21 years with an option of a further 21 years. There are eight leases within the planning area (Table 12).

Table 12. Leases of the planning area

Lease No.*	Lessee	Purpose
1866/100	State housing commission	Wardens residence
1889/100	Hamelin Bay Resort Pty. Ltd.	Caravan park, holiday resort
1915/100	Shire of Augusta-Margaret River, Commissioner of Police, FESA, DoF, St John Ambulance and the department. This is a jointly owned facility.	Communications site
2047/100	Telstra Corporation	Mobile communications
2099/100	Optus Communications Pty. Ltd.	Equipment hut**
2194/100	Augusta Margaret River Tourism Association Inc	Development and operation of the Cape Leeuwin Lighthouse Precinct
2196/100	Lease issued to Cape Naturaliste Tourism Association (now Geographe Bay Tourism Association)	Development and operation of the Cape Naturaliste Lighthouse Precinct
2098/100	Vodaphone Network Pty Ltd	Equipment hut

* All leases of the planning area are located in Leeuwin-Naturaliste National Park. A licence associated with facilities at Cape Leeuwin has also been issued for the operation of a hydroacoustic station.

The lighthouses at Cape Naturaliste, Cape Leeuwin and Foul Bay are located on land formerly held by the Australian Maritime Safety Authority. In 2000, the Cape Naturaliste and Cape Leeuwin lighthouses were added to Leeuwin-Naturaliste National Park and the Foul Bay lighthouse was vested with the Conservation Commission as a CALM Act section 5(1)(h) reserve. The properties were leased back to the Authority to permit continued operation of lighthouse facilities. Under the lease back arrangements, the Authority issued a licence to the department's Director General to conduct commercial tours of the Cape Naturaliste and Cape Leeuwin lighthouses. The department has since granted sub-licences to Geographe Bay Tourism Association and Augusta-Margaret River Tourism Association respectively to undertake this activity. Each Association also has a lease to develop and operate the lighthouse precincts (e.g. cottages, buildings), which are located near each lighthouse, but outside the lease back areas. The areas are to be developed as accommodation and/or tourism facilities. Under the lease, each Association is required to upgrade the lighthouse according to Building Code of Australia Standards. The sub-licences ensure that the Associations are responsible for public liability risk associated with conducting the tours. The department expects that the current management arrangement in the lighthouse precincts will continue throughout the life of the management plan.

The WA Speleological Group (Inc.) occupies two huts in Boranup Forest. The huts were previously occupied by the group under a forest lease, which was issued in 1981 for the purpose of 'storage of equipment and overnight shelter'. The lease expired in 1992 when the land tenure was changed from State forest to national park. In 1998, an interim lease was issued and backdated to 1992 to formalise the use of the huts while more definite plans were being considered. Since then the huts have been managed under an Interim Tenancy Agreement between the speleological group and the department. The level of visitation is not known.

The department recognises the invaluable work and research undertaken by speleological groups and would encourage this to continue. However, the huts do not meet relevant current Australian Standards for design and would require extensive works to upgrade the facilities. An upgrade would also be required to meet the department's requirements in terms of managing visitor risk. For these reasons, the department is proposing to remove the huts from the area and liaise with the WA Speleological Group (Inc.) to investigate the most appropriate way to meet the needs of this group given the prescriptions of this management plan.

Licences

In accordance with the CALM Act, all private tour operators conducting commercial tourist activities on conservation reserves are required to obtain a licence. Licensing enables the department to monitor and regulate access and use of lands and waters under its control, and ensure that the key values of these areas are maintained. Two types of licences are issued, depending on the activity, security of the resource and the risk to participants.

The department can grant a T class licence for up to five years and renew it for the same period. There are 148 operators licensed (T class) to operate in the planning area, although not all actually runs tours in the area. Most of the operators run vehicle-based tours within Leeuwin-Naturaliste National Park, stopping at developed recreation sites. The most popular activities include bushwalking, camping, canoeing and caving. Commercial mountain bike operations are becoming more popular and will be permitted in Boranup Forest on designated trails (Map 7b).

The department's *Tour Operator Handbook* provides guidance as to additional conditions attached to T Class licences within Leeuwin-Naturaliste National Park. One licensed operator, the Mirrivale Riding School, has conditions for horse-riding operations attached to their standard licence conditions. These conditions permit the licence holder to use defined trails in the block of Leeuwin-Naturaliste National Park that lies south and east of Caves Road near Yallingup. The licence is issued for a one-year period to coincide with the preparation of this management plan. Monitoring of the area has indicated that horse-riding may be a suitable use for the area because of minimal erosion and loss of vegetation. Weed invasion has been a problem in this area although this has mostly originated from adjoining private property. Consequently, horse-riding will be permitted to continue (see Section 31.8 *Horse-riding*) and a longer licence issued once this management plan has been approved.

The department issues E Class licences where there is safety, environmental or management concerns and the number of licences needs to be restricted. Generally E Class licences are issued following a formal 'Expression of Interest' process. There are no E Class licences within the planning area, although such licences may be issued over the life of this plan.

Once a licence is granted to access land managed by the department, a permit may also be required to undertake certain activities such as caving and abseiling (see Section 31.4 *Caving*). This places additional conditions on operators to maximise visitor safety and environmental protection.

Guidance for the general conditions for tour operators in national parks and conservation parks is provided for in the department's *Tour Operator Handbook*.

32. Commercial operations

Key points

- Commercial concessions can meet the rising demand for high quality recreation and tourism opportunities, facilities and services, promote environmental awareness and generate income. Commercial concessions include leases, licences and permits.
- All commercial tour operators require a licence from the department. Accreditation will enable longer-term licences to be issued.

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 through the involvement of private enterprise.

This will be achieved by:

1. Evaluating proposals for licences and commercial tourism leases according to departmental policy and permit their establishment where appropriate.
2. Ensuring all commercial operations operate under a lease, licence or permit agreement with appropriate conditions that:
   - ensure the operation is consistent with other management objectives;
   - facilitate management
   - provide a service or facility to visitors that the department would not otherwise be able to provide.
3. Not providing concessions if adequate facilities or services exist, or they can be developed, outside the planning area.
4. Liaising with the WA Speleological Group (Inc.) to investigate the most appropriate way to meet their needs while removing huts occupied by the group in Boranup Forest.
5. Encouraging and providing incentives for tour operators to acquire quality assurance through industry accreditation and qualification programs.
6. Identifying the sustainable level of operator use, particularly for caving and horse-riding activities, and monitoring the impact of these activities. The collection of data as part of the licence conditions is required.

7. Permitting commercial horse-riding and mountain biking on designated trails only, subject to monitoring and/or modified licence conditions.
8. Providing resources and training for the tourism industry in interpreting the department's role and the planning area's key values.

33. VISITOR SAFETY

In addition to a genuine concern for visitor welfare, the department has a moral and legal responsibility to consider the personal safety and welfare of visitors to the public conservation estate. The department aims to minimise the potential for injuries and misadventure to visitors, in a manner that does not render the environment sterile or unnecessarily diminish visitor use and enjoyment in the process.

To assist in minimising the incidence of injury to visitors, the department has developed Policy Statement 53 *Visitor Risk Management Policy* and provides for the implementation of a visitor risk management program for the planning area that includes:

- Carrying out periodic safety audits of all recreation sites, facilities and visitor services to identify and assess risks and potential hazards. This information is used as part of the basis for implementation of risk mitigation measures.
- Developing and maintaining an information gathering and recording system to monitor the hazard condition of sites and facilities and the frequency, situation and type of injury and misadventure incidents that occur in the planning area.
- Promptly investigating all reported visitor accidents and injuries and implementing appropriate risk mitigation measures.
- Providing information to enable visitors to consider the risks of recreational activities and be empowered to act in an informed manner.

The department also works closely with the State Emergency Service, the WA Police Service, St John Ambulance and volunteer fire brigades in managing visitor risk within the planning area.

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 attend to these risks during daily maintenance of facilities. However, the stability of cliff and cave landforms, falling trees and limbs (particularly associated with karri), dangerous swimming beaches and high swells while rock fishing can pose more serious risks to visitor safety.

In the late 1990s, the department sought geotechnical advice on cliff and cave (particularly those open to the public) risk along the Leeuwin-Naturaliste coastline and identified several hazardous areas (e.g. Hamelin Bay headland and Bob's Hollow). Typically, the risks associated with these environments are managed by:

- Controlling access to the site (e.g. not upgrading road access to limit visitor numbers, realigning tracks away from risk areas and redirecting visitors through signage).
- Providing infrastructure (viewing platforms and fencing to prevent people from accessing cliff edges and exploring underneath ledges).
- Regular inspection by geotechnical specialists.
- Removing small rocks and overhangs (e.g. at Hamelin Bay headland). This may be subject to department and Conservation Commission approval or EPA review;.
- Installing risk area signs and providing pre-visit information.
- Promoting safe codes of conduct and standard requirements for commercial operators.

The department will continue to monitor these areas on an annual basis to detect changes in cliff and cave structure (e.g. movement of large rocks) and implement appropriate risk mitigation strategies accordingly.

Rock fishing is an inherently dangerous activity, where the natural environment combined with the desire to secure a catch often leads to high-risk behaviours by fishers. In conjunction with Policy Statement 53, the department has prepared *Coastal Safety – Rock Fishing* guidelines to mitigate this risk.

The department removes hazardous trees and lops dead/hazardous limbs in and around all designated recreation areas. Visitors are discouraged from using certain beaches along the coast where there are dangerous rips.

33. Visitor safety

Key points

- Visiting and enjoying natural areas can involve visitor risks either through the recreational activity itself or by the geological structure of the environment.
- The department has a moral and legal responsibility to minimise visitor risk. It does this by implementing departmental policy and a visitor risk program.

The objective is to maintain visitor experiences by minimising risks to public safety wherever possible.

This will be achieved by:

1. Continuing to implement the department's visitor risk management program in accordance with departmental policy, including the regular monitoring of cliff and cave risk areas.
2. 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 daily basis.
3. Providing information (including signs where those hazards associated with structures, facilities, activities or natural attractions may not be obvious) to enable visitors to consider and cater for risks associated with their activities.
4. Applying industry standards and utilising appropriate expertise in the safe design and construction of visitor facilities.
5. Adopting codes of safe conduct for popular activities and promoting and publicising them as appropriate.
6. Based on geotechnical advice, and subject to the appropriate approvals, providing infrastructure (e.g. viewing platforms and fencing) and removing rocks/overhangs at selected cliff risk areas.
7. Ensuring commercial operators are appropriately trained or accredited and carrying appropriate insurance when undertaking high risk activities.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
33.1 Percentage of accidents/incidents per visit reported annually to the department	33.1 The percentage of accidents/incidents per visit reported annually to the department remains stable or decreases from 2010 levels	Every 5 years

34. DOMESTIC ANIMALS

Domestic animals such as dogs and cats are prohibited[43] from national parks, conservation parks and nature reserves. However, many people like to take their pets with them when they travel, including visits commuting through or recreating within the planning area.

Domestic animals present a number of problems including:

- domestic dogs and cats can predate on native fauna
- the scent and general activity of dogs and cats can impede the activity of wildlife (such as nesting seabirds), which may otherwise present ideal wildlife viewing opportunities
- dog faeces can foul an area or watercourse and carry disease
- conflict with other visitors (e.g. noise problems and personal injury)
- dangers to pets arising from poison baits used in feral animal control.

Under the CALM Regulations, domestic animals may be permitted in designated areas. Bramley National Park is the only area designated for dog use (see Map 7a). It has a history of dog use, lies on a main travel route, is a key focus for recreation development and is situated adjacent to the growing population centre of Margaret River. Also, there are few areas outside the Park and in the nearby vicinity where dogs can be exercised. It was decided not to designate an area for dog use within Leeuwin-Naturaliste National Park because of the limited availability of space at recreation sites, potential for conflict with visitors and due to impacts on breeding populations of

[43] The exception is guide dogs for people with visual impairment, where designated areas are established and in special cases determined by the department (e.g. specially trained animals for management (i.e. feral animal control), search and rescue, or security purposes). In these circumstances dogs are permitted in all areas.

hooded plover. There are also several alternative dog exercising areas, including beaches, in close proximity.

Dogs on a lead may be allowed on State forest and timber reserves, although no suitable areas exist within the planning area. In all circumstances, visitors must comply with the *Dog Act 1976*.

34. Domestic animals

Key points

- Domestic animals are not permitted within national parks, conservation parks and nature reserves although exemptions may be granted. This includes the establishment of designated areas where visitors may bring domestic animals.

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 except for:
   - guide dogs for people with visual impairment
   - where designated areas are established
   - in special cases as determined by the department (e.g. specially trained animals for management, search and rescue, or security purposes).
2. Designating an area/s in Bramley National Park where domestic dogs on leads are allowed and ensure that visitors comply with the Dog Act.
3. Publicising areas where domestic animals are permitted.
4. Providing information explaining departmental policy on domestic animals.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
34.1 The number of dogs recorded outside of designated areas	34.1 A decreasing trend from 2010 levels in the number of dogs recorded outside of designated areas	Every 5 years

35. VISUAL LANDSCAPE

Visual landscape[44] 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 visual 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.

Parks of the Leeuwin-Naturaliste Ridge are particularly important for their visual landscape values. They are renowned for their unique character and high concentration of significant features, as well as the diverse mix of roadside views and high visibility along the coast. In 1997, a specific landscape study was undertaken for the Leeuwin-Naturaliste Ridge as part of the preparation of the LNRSPP (CALM 1997). The study was initiated because of the comparatively rapid rates of change along the Ridge, brought about by an increasing population, a growing tourism industry and shifts in land use. This, combined with high visitation and easy access, placed mounting pressures on visual landscape values. The LNRSPP recognised these pressures by identifying the protection of visual landscapes as of paramount importance. This intent is reflected in this management plan.

The department's visual landscape management method is based on a systematic broad-scale inventory and analysis of landscape character, visual quality, the level of visibility (seen area) and the level of public sensitivity to landscape values. This information enables a number of visual landscape management zones to be identified so as to guide management at the broad-scale. Specific site-scale projects may require additional assessment.

Landscape character

Landscape character is the combination of natural (e.g. geomorphology, hydrology, soils, vegetation, land-use)

[44] Due to the sea/land interface along the Leeuwin-Naturaliste coastline, the term also incorporates seascapes.

and cultural characteristics that allow people to differentiate one place from another. According to these features, landscapes in the south of WA have been broadly identified and described as Landscape Character Types in order to assess their visual landscape values (CALM 1994). Three landscape character types are identified within the planning area – Leeuwin-Naturaliste Coast, Scott Coastal Plain and the Darling Uplands subtype of the Darling Plateau Landscape Character Type. The department has further described the character of the Leeuwin-Naturaliste Coast in the Leeuwin-Naturaliste Landscape Assessment Study, where an additional 10 sub-units were identified (CALM 1997). These sub-units will be used in site level assessment for specific projects/development proposals.

Visual quality

Visual landscape quality refers to the characteristics (qualities) of a landscape or the degree of excellence it entails in terms of naturalness, distinction and public perception. Within each Landscape Character Type, visual landscape quality has been classed as high, moderate or low. This is typically based on diversity, uniqueness, prominence and naturalness of landform, vegetation and waterform within each type (CALM 1994). Appendix 12 provides a description of the high and moderate visual landscape qualities of the planning area.

Impacts on visual quality

Changes to landscapes occur continually. Natural changes are generally subtle and harmonious and complement perceived visual qualities of the land. Human-imposed alterations to naturally established landscapes could have a positive or negative effect on visual quality. Undesirable impacts may include transmission lines, pipelines, communication towers, railways, buildings, structures, boat moorings and ramps, roads, paths and parking, signs, fences, timber harvesting in State forest, quarries, mining and extractive industries. Usually these can be avoided or minimised by careful location and design.

Development along the coast is a particular concern as it can be highly visible because of low heath vegetation and the available panoramic views. Built infrastructure, roads and paths for example, can contrast strongly with the natural landscape character. The height of infrastructure, particularly where it extends above the ridgeline, can also result in adverse impacts on visual landscape values. As one strategy, it is important that such changes are confined to the smallest viewshed possible. The access and visitor use strategies in this management plan support rationalising access to coastal/river nodes, the sealing of some roads, defining car parks and providing and/or realigning to contours for walking access so as to minimise the impact on visual landscape values.

Rehabilitation can be used to enhance visual landscape values. Former gravel pits, previous disturbance at recreational sites and along sensitive travel routes are priorities in terms of visual landscape management. The department will liaise with local government authorities regarding the potential negative impacts of fire access tracks around coastal townsites that adjoin the planning area. If there are visual impacts to the planning area it may be desired to identify alternative firebreak boundaries. The department should encourage powerlines within the planning area to be located underground (e.g. powerlines to Hamelin Bay, Cape Leeuwin Lighthouse and Yallingup) or where possible, screened through revegetation. Loss of vegetation because of timber harvesting in adjoining lands (e.g. Margaret Plantation) should be assessed for the need for a visual landscape management plan.

Public sensitivity

Public sensitivity to the visual landscape is based on the degree of public exposure, which can be assessed by examining travel routes[45], the number of visitors, distance of the route, duration of visit, and the level of visibility. Public sensitivity is also based on the value placed on a site, feature or area. In general, much of the Leeuwin-Naturaliste Ridge, with its high public exposure, has a high degree of public sensitivity. In contrast, the eastern Scott Coastal Plain has a low level of public sensitivity, because of limited access, few recreation sites and a lower local population.

Visual landscape management zones

An assessment of the inherent visual landscape qualities, the level of visibility or seen area and public sensitivity within the planning area enables it to be classified into management priority zones (see Table 13 and Map 9). Such zones help identify areas of greatest and least visual concern and the appropriate level of management and potential modification.

[45] Travel routes may include roads, railway lines, navigable rivers, walk/cycle tracks or places where people live or gather and are viewed and experienced by other people.

Table 13. Visual landscape management zones

Zone	Description	Management priority
Zone A	Areas of high scenic quality and rare landscape character which have moderate to high public exposure/sensitivity and some areas not assessed with moderate scenic quality but with high public exposure/sensitivity.	High
Zone B	Areas of low to moderate scenic quality and high public exposure/sensitivity and areas of high scenic quality or rare landscape character which have low public exposure/sensitivity.	Medium
Zone C	All remaining areas with few or no elements of particular scenic quality and only low to moderate public exposure/sensitivity.	Low

Most of Leeuwin-Naturaliste, Scott and Forest Grove national parks and Reserve 46400, is classified as Zone A, reflecting a landscape rich in naturalness, diversity, components of high visual quality and areas with high levels of public use and sensitivity.

Visual landscape management

Landscape values of the planning area are managed in accordance with the department's Policy Statement No. 34 *Visual Resource Management of Lands and Waters Managed by CALM* and the intent shown in the LNRSPP. For adjoining lands managed by the department, the provisions of the *Forest Management Plan 2004-2013* apply.

Visual landscape management zones provide an indication of the relative level of concern for the visual landscape, with zone A having greatest concern for the landscape values and the highest priority for management. Specific guidelines for each zone are included in Appendix 13. As a general guideline, management operations or planning proposals which may affect Zone A landscapes require more detailed assessment, projects in Zone B may require additional study, while proposed changes to Zone C landscapes are unlikely to require additional assessment. The visual landscape management zones guide recreation planning (e.g. development of new facilities, recreation sites, signage and built infrastructure), resource use and management operations.

The viewshed from Wallcliffe House requires special consideration. This viewshed, which includes Wallcliffe Cave and extends across the Margaret River to the 60 metres contour of reserve 8431 (Map 9), is registered under the Heritage of Western Australia Act. The department must comply with the provisions of the Act with respect to protecting visual landscape values over the registered area.

Seascapes (views from the ocean) are most important in near-shore waters close to boat ramps, which is where the majority of recreational boating occurs. These areas will be considered in this management plan when considering development proposals.

Due to the sensitivity of visual landscapes along the Leeuwin-Naturaliste Ridge, all development proposals with the potential to impact on visual landscape values will be assessed to determine the requirement for a formal visual impact assessment. WAPC and local government authorities refer all development proposals to the department for their assessment and comment.

Off-estate management

Visual landscape values of the planning area are often dependent on off-estate management as well as management within reserves. Several issues off the department-managed estate were identified for the Leeuwin-Naturaliste Ridge in the assessment by the department in 1997:

- a high rate of population increase with a corresponding rate of development
- the demand for development on the Leeuwin-Naturaliste Ridge and in coast areas
- the loss of landscape values in Leeuwin-Naturaliste National Park because of adjacent development, loss of adjoining remnant vegetation and changes in land use, particularly north of Margaret River
- loss of areas perceived as being natural
- upgrading of roads resulting in loss of remnant vegetation and visual landscape values
- the provision of services and infrastructure
- the character of existing rural residential subdivision design.

These issues are addressed in the LNRSPP. However, it is important that the department provide advice and comment on proposals (e.g. new subdivisions and developments) that may affect visual landscape values of the planning area.

35. Visual landscape

Key points

- Parks of the Leeuwin-Naturaliste Ridge are extremely important for their visual landscape value. They are renowned for their unique character and high concentration of significant features, as well as the diverse mix of roadside views and high visibility along the coast. Visual landscape values in this area are sensitive to modifications to the natural environment.
- The viewshed from Wallcliffe House is registered under the Heritage of Western Australia Act.
- The department manages visual landscapes according to management priority zones.
- Off-estate management often influences visual landscape values and will continue to be important in managing the planning area.

The objective is to protect and enhance visual landscape values.

This will be achieved by:

1. Applying the departmental policy, adhering to the LNRSPP and following the landscape guidelines set out in Appendix 13 for each visual landscape management zone.
2. Complying with the provisions of the Heritage of Western Australia Act with respect to the viewshed from Wallcliffe House.
3. Ensuring visual landscape management, including seascapes, is considered before any development or management activities within the planning area and for timber harvesting in adjoining or nearby State forest (e.g. Margaret Plantation).
4. Providing advice, and making submissions where appropriate, to government agencies and local government authorities regarding subdivision and development referrals and other visual landscape planning matters that may impact upon the planning area.
5. Undertaking a visual impact assessment for development proposals that may impact on visual landscape values of the planning area.
6. Seeking compensation/offsets and/or additions to department-managed estate for losses/ impacts on visual landscape values incurred due to development proposals.
7. Rehabilitating former gravel pits, site disturbance in recreation areas and sites along sensitive travel routes.
8. Encouraging telephone and powerlines to be located underground and where this is not possible, screen using rehabilitation techniques.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
35.1 Areas of high scenic quality	35.1 No permanent or long-term loss of high quality scenic areas	Every 5 years

PART F. MANAGING RESOURCE USE

The use of natural resources involves the consumption of such resources to provide economic and social benefit, and usually requires the determination of sustainable yield or allocation limits to ensure the resources aren't consumed beyond acceptable means. Using the natural resources of the planning area sustainably is critical to the long-term management, conservation and protection of such resources.

36. TRADITIONAL HUNTING AND GATHERING

Section 23 of the Wildlife Conservation Act allows Aboriginal people to hunt for fish and food on lands and waters managed by the department, excluding nature reserves, with the consent of the Chief Executive Officer. 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 may be applied to the taking of some species (e.g. threatened species)
- the activity does not impinge upon the safety of visitors to the planning area and the hunters themselves
- food taken is not sold
- the activity is consistent with other land management objectives.

It is also possible that, over the life of this management 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.

36. Traditional hunting and gathering

Key points

- As part of their culture, Aboriginal people may seek to hunt or gather from the planning area. The Wildlife Conservation Act allows these customary activities to occur provided certain conditions are in place.

The objective is to enable Aboriginal people to hunt and gather food within the planning area where it is sustainable and does not threaten visitor safety.

This will be achieved by:

1. Allowing Aboriginal people to hunt and/or gather in the planning area, provided:
   - they meet the conditions of approval and have authorisation from the department's Chief Executive Officer
   - safety and sustainability issues have been addressed.
2. Ensuring that management adapts to and conforms to any legislative or policy changes during the life of this plan.

37. MINERAL AND PETROLEUM EXPLORATION AND DEVELOPMENT

Mineral and petroleum exploration and development on department-managed lands and waters is controlled by the Mining Act, the *Petroleum and Geothermal Energy Act 1967*, the Environmental Protection Act, the Wildlife Conservation Act and various State Agreement Acts. The Mining and Petroleum and Geothermal Energy Acts take precedence over the CALM Act and may prevail over the contents of this plan.

Under the Mining Act, mining[46] may be carried out in national parks and class A nature reserves with the consent of the relevant Minister responsible for the Mining Act, subject to the concurrence of the Environment Minister and the consent of both Houses of Parliament. Mining may be carried out in nature reserves that are not class A with the consent of the relevant Minister, recommendation of the Environment Minister and the consent of both Houses of Parliament. Mining in timber reserves requires the concurrence of the Environment Minister. The Petroleum and Geothermal Energy Act requires that petroleum exploration and development will not be

[46] Mining includes exploration, fossicking, prospecting and mining operations.

approved until the relevant Minister responsible for this Act obtains the recommendations of the Environment Minister.

In 2006, the EPA released Position Statement No.9 – *Environmental Offsets* (EPA 2006). Should mining tenements be approved in proposed or existing conservation estate, they will be subject to the principle of environmental offsets[47]. There is an expectation under the Mining Act that areas disturbed by mining will be rehabilitated, and it is the department's position that the costs of rehabilitation are borne by those responsible for the activity.

The Department of Mines and Petroleum (DMP), who administer mining and petroleum tenements throughout the State, refer projects that may cause significant environmental impacts to the EPA under section 39 of the Environmental Protection Act. The Environmental Protection Act takes precedence over most other Acts. Under a memorandum of understanding between DMP and the EPA, all mining proposals wholly or partly within two kilometres of a national park, nature reserve, State forest, timber reserve or proposed conservation reserve must also be referred to the EPA for assessment (DMP and EPA, 2009). 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. In addition, actions which may have a significant impact on matters of national environmental significance[48] may also require approval under the EPBC Act.

The Conservation Commission provides advice to the Environment Minister on proposals to extract mineral or petroleum resources from lands vested in it.

Mineral resources and prospectivity

Mineral resources of the planning area are focused in Leeuwin-Naturaliste National Park, which contains an estimated 12.7 billion m^3 of high-grade limestone mineral sand deposits, particularly cemented limestone, construction sand and lime sand. The largest deposit occurs at the Boranup Sand Patch (Map 1), which possibly contains one billion tonnes of lime sand (M. Freeman *pers. comm.*). The area is identified as an important future strategic lime sand resource, valuable for agriculture and horticulture but sensitive to transportation costs. The relevant Minister responsible for the Mining Act has created a section 19 reservation over the deposit to facilitate the State Government managing future access to it. Most other lime resources in the region are unavailable for mining (e.g. conservation estate or semi-rural residential development).

Boranup Sand Patch comprises UCL 4230 and 4296, and Reserve 30656 (vested in the Shire of Augusta-Margaret River for 'Quarry Lime Sand'. Mining in Reserve 30656 is proceeding under authority of the Shire of Augusta-Margaret River (Boranup Limesand Quarry). The Conservation Commission and the department are of the opinion that UCL 4230 and 4296, and Reserve 30656, should be consolidated into Leeuwin-Naturaliste National Park, particularly for their high landscape values. The area was recognised in the LNRSPP as an area of Natural Landscape Significance and in this management plan as landscape management Zone A. It is also a significant linkage between fragments of national park and supports threatened and priority species. DMP has already agreed that a portion of UCL 4296 be added to the national park. Reserve 21769 should also be added to the park for its landscape values. Any future reservation will require more consultation with the DMP.

Other mineral resources of potential economic value occur on the Scott Coastal Plain, where there are concentrations of heavy mineral sands (Hassan 1998). Titanium minerals have already been mined from the Beenup deposit near Scott National Park. The Beenup project is located 17 kilometres northeast of Augusta and was approved by the then Environment Minister in 1991 following assessment by the EPA. The operating Beenup project comprised dredge mining, wet mineral separation and concentration and dry separation facilities, all of which have been decommissioned and/or rehabilitated since closure of the operation in 1999. The department has a particular interest in the success of these activities and other treatments at the Beenup mine site given the potential impacts of sulfate-enriched groundwater, predicted to discharge into Scott River, adjoining Scott National Park. The company responsible for managing Beenup mine site will not be relinquished of its responsibility for potential impacts until it has adequately demonstrated that any residual liability toward the environment is acceptable to Government.

[47] Environmental offsets aim to ensure that significant and unavoidable adverse environmental impacts are counterbalanced by a positive environmental gain, with a goal of achieving a 'net environmental benefit' (EPA 2006).

[48] Under the EPBC Act matters of national environmental significance include (for example), National Heritage Places, nationally listed threatened species and ecological communities and migratory species protected under international agreements.

Coal deposits in the Sue coal measures also underlie Scott National Park (SCPSC 1999). Timber reserve 139/25 also has a high prospectivity for titanium minerals and was excluded from Yelverton National Park during the preparation of the *Forest Management Plan 2004-2013* to facilitate access for mining. Other minerals of the planning area are identified by Hassan (1998) and Bastian (1977).

At the time of printing, nine tenements cover the planning area (Table 14).

Table 14. Mining and petroleum tenements within the planning area

Tenement	Lease holder	Lease status	Lease location
Mineral exploration licences*			
E 70/2726	South West Coal Company Pty. Ltd.	Pending	Yelverton National Park
E 70/2708	Metal Sands Ltd.	Pending	Scott National Park
E 70/2464	Metal Sands Ltd.	Pending	Gingilup Swamps Nature Reserve
E 70/2456	Margaret River Resources Pty. Ltd.	Pending	Leeuwin-Naturaliste National Park
E 70/2342	Lando Pty. Ltd.	Pending	Gingilup Swamps Nature Reserve and Scott National Park
E 70/2441	Lando Pty. Ltd.	Pending	Gingilup Swamps Nature Reserve and Scott National Park
Petroleum exploration permit application			
PA 67 (App 1/03-4 EP)	Red Mountain Energy Pty. Ltd.	Pending	Bramley National Park
PA 67 (App 2/03-4 EP)	Red Mountain Energy Pty. Ltd.	Pending	Reserve 46400, Forest Grove, Bramley, Leeuwin-Naturaliste and Scott national parks
Petroleum drilling reservation			
PA 67 (App 1/02-3 EP)	Red Mountain Energy Pty. Ltd.	Extended	Yelverton National Park

* Only when a mining lease is granted and the holder submits a Notice of Intent for approval to mine can the mineral be extracted.

Exploration and mining activities may have significant impacts on the values of the planning area, particularly in karst environments, Scott ironstone communities and areas sensitive to hydrological change and visual landscape alterations. Given the high conservation significance of these areas, the threats posed through mining are of notable consequence. Examples of impacts include:

- Contamination or alterations to surface or groundwater and associated impacts on groundwater dependant biota. Examples of contaminants include hazardous chemicals, sediment and alkaline mining effluent and the exposure of acid-sulfate soils.
- Destruction of significant caves or other karst features and destabilisation of dunes.
- Direct or indirect impacts on fauna (e.g. direct disturbance or injury, habitat modification).
- Impacts on visual landscape values and other amenities (e.g. from traffic, noise and dust).
- Long-term impacts on vegetation (e.g. weed invasion).
- Impacts on heritage values.

If approved, exploration and mining should be subject to conditions that will ensure impacts on all conservation values are minimised.

Basic raw materials

In general, there is a presumption against accessing basic raw materials[49] (BRM) from the conservation estate, with access only considered where its use is within the reserve boundaries and it is consistent with the relevant management plan and purpose of tenure (see Section 7 *Legislative Framework*).

Over the life of this management plan, BRM may be required to support activities within the planning area consistent with these management objectives (e.g. the construction and maintenance of recreation areas, trails, other built infrastructure and the access network proposed in Section 30 *Visitor Access*). It is likely that these demands can be met off the conservation estate or by purchase from suppliers, although haulage costs will be an important component of supply. The decreasing availability of gravel within the region suggests that the use of alternative materials and techniques, such as crushed rock/laterite, may be more appropriate and aid in reducing costs.

[49] Basic raw materials include earth, sand, stone and gravel.

Applications to access BRM from national parks and nature reserves of the planning area requires referral to the Conservation Commission, who consider all proposals and make recommendations. If supported in principle, proposals may be referred to the EPA to determine the level of assessment. Should proposals be approved, access to BRM may occur using notice of intended entry procedures under the Local Government Act. Access to BRM for use on road reserves that are within the boundaries of the conservation estate will also be considered, provided no better alternatives are available. In all cases, quarrying should not be permitted in poorly represented vegetation complexes, areas at risk of subsidence or areas containing caves, landscape management zone A or in areas protectable from *P. cinnamomi*.

Access to BRM on State forest and timber reserves by local government authorities for use off department-managed estate is permitted, provided no alternative sources are available. In such instances, local government authorities are required to fund future rehabilitation works (see Section 38 *Rehabilitation*). Accessing BRM from State forest and timber reserves is preferred to accessing from the conservation estate.

37. Mineral and petroleum exploration and development

Key points

- Leeuwin-Naturaliste National Park contains high-grade limestone mineral sand deposits. Boranup Sand Patch is the largest deposit along the Leeuwin-Naturaliste Ridge and an important future strategic lime sand resource. The Conservation Commission believe that the area should become national park.
- BRM are sometimes sourced from the planning area and used for the construction and maintenance of recreation facilities, built infrastructure and roads.
- Mining, particularly in karst environments, areas sensitive to hydrological change and in landscape Management Zone A, may have a significant impact on reserve values.

The objective is to minimise the impacts of mineral, basic raw material and petroleum exploration and development on key values.

This will be achieved by:

1. Liaising with, and providing advice to relevant government agencies (e.g. DMP, EPA) and industry regarding mineral and petroleum exploration and development within the planning area.
2. Evaluating proposals for mineral and petroleum exploration and development within the planning area (and external areas that may impact upon it), and make recommendations/ submissions to relevant agencies/authorities with a view to minimising impacts on key values.
3. Referring proposals that may adversely impact on the planning area to the EPA for their consideration of assessment under the Environmental Protection Act.
4. Seeking compensation and/or offsets for environmental impacts incurred because of mineral and petroleum exploration and extraction.
5. Changing the classification of Gingilup Swamps Nature Reserve to class A.
6. Considering access to the planning area for BRM where (1) its use is within the planning area boundaries (except timber reserves) and is consistent with the management objective for the reserve and (2) no alternatives are available. Applications to access BRM on the conservation estate requires referral to the Conservation Commission and, if supported, may require referral to the EPA.
7. Closing and rehabilitating existing exhausted quarries/pits.

38. REHABILITATION

The department's Policy Statement No. 10 *Rehabilitation of disturbed land* (CALM 1986) provides guidelines for the rehabilitation of lands managed by the department based on the following principles:

- land should be managed as far as possible to avoid disturbance
- disturbance followed by rehabilitation should be the last option in a series of management decisions designed to protect environmental values
- rehabilitation should aim to restore original values (including landscape 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 those agencies are responsible for rehabilitation to a suitable standard. In such cases, the cost of rehabilitation should also be borne by the agency.

Rehabilitation in the planning area has previously focused on arresting coastal dune erosion. While dune erosion is a natural coastal process, it has been exacerbated by human access to the coast and special events. Davies (1983) identified areas requiring control along the coast and put forward management recommendations for each area, including a list of priorities based on environmental values and human visitation. Coastcare and Landcare rehabilitation programs have since been successful in stabilising many of these dune systems. This has been supported by strategic road closures, management of access and rabbit control. However, coastal erosion remains a concern and several sites still require rehabilitation.

Rehabilitation may also be required for mined gravel pits, species trial plots, 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 plants, local native species should be used.

38. Rehabilitation

Key points

- Rehabilitation may be required for degraded dune systems, mined gravel pits, road works, previous silviculture activities and species trial plots, 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. Other than for natural erosional processes, developing and implementing a priority-based rehabilitation plan.
3. Ensuring that, whenever possible, the cost of rehabilitation is borne by those responsible for the disturbance.
4. Involving volunteers and Aboriginal people in rehabilitation programs.
5. Ensuring local plant species are used in rehabilitation schemes wherever possible.

39. COMMERCIAL FISHING

The commercial fishing industry along the Leeuwin-Naturaliste coastline depends on selected coastal waters and the Hardy Inlet. The ocean-based fishery mainly targets Australian salmon, Western rock lobster, shark, demersal finfish, baitfish, crab and abalone. The commercial fishing industry is managed by DoF. Access for commercial fishing on lands managed by the department is managed in accordance with the department's Policy Statement No. 51 *Access for Commercial Fishing through CALM Lands*.

While most fishing operations take place outside the planning area (off shore or in the Hardy Inlet), land-based operations such as power-boat servicing, launching, storage of fishing equipment, waste/rubbish disposal and catch transfer take place in the planning area. At Hamelin Bay, commercial fishing operations also cause car park congestion and conflicts with visitors as well as an increased risk of fuel spillage. The department is implementing a site design for this area to minimise existing and potential impacts (see Section 31.6 *Day Use*).

Access to public beaches for commercial fishing is permitted by the department under licence. This acknowledges the limited timeframe that commercial fishermen require access and that this period generally does not conflict with peak periods of use. Where appropriate, commercial fishermen may be granted limited access to closed beaches (e.g. Injidup beach) during the salmon season (February to April) or to management only tracks that access open beaches (e.g. Deepdene beach). Requests for such access will be considered on a case-by-case basis dependant on the following criteria:

- the threat to conservation values (e.g. shore-nesting birds or damage to foredune vegetation)
- sustainability of access points, including the cost of maintaining access
- visitor safety
- conflicts with other recreational use
- retention of the remote qualities of parts of the planning area
- potential for weed invasion.

Conditions of approval, such as restrictions to prevent environmental damage (e.g. prohibiting off-road driving to dune vantage points, camping and campfires on beaches and illegal infrastructure), may apply. Special conditions may apply to beaches with nesting hooded plovers.

Commercial fisherman at Hamelin Bay also access salmon fishing grounds at Boranup Beach, north of Reserve Road, during the salmon run. In order to reach this location from the boat ramp where they unload their catch, fishermen traverse the swimming beach, which is usually closed to vehicles. This, however, poses safety issues to swimmers, sunbathers and pedestrians. Conflicts of space (i.e. use of beaches) and loss of amenity (real or perceived) by other park visitors may also occur and is an issue for management. Access will continue to be granted to this area, subject to fishermen adhering to licence conditions, which stipulate the code of conduct for these areas.

39. Commercial fishing

Key points

- The planning area provides access points at Hamelin Bay and Canal Rocks to the commercial ocean-based fishery. Car park congestion and conflicts between commercial fishermen and recreational users occur at Hamelin Bay.
- Beach access for commercial shore-based fishing requires a licence. Conflict for beach use and loss of amenity (real or perceived) by other park visitors is an issue.
- DoF controls all fishing operations, however the department controls access through the planning area.

The objective is to continue to allow access for commercial fishing subject to conditions that minimise the on-shore impacts to visitors and key values.

This will be achieved by:

1. Ensuring the on-shore environmental and social impacts of commercial fishing operations are minimised (see Section 30 *Visitor Access*).
2. Allowing existing vehicle access by commercial shore-based fishers to beaches and tracks otherwise closed to public vehicle use by way of a licence. Continued access will be subject to ongoing monitoring of environmental impacts and user conflicts as well as conditions of use being met. Conditions may be placed on commercial salmon fishing as part of licence agreements (e.g. to prevent environmental damage, protect hooded plovers or to reduce visitor conflicts at Hamelin Bay).
3. Not permitting any new access tracks within the planning area for commercial fishing.
4. Educating recreational fishers about commercial shore-based fishing practices and conditions of access to beach areas closed to the public.
5. Liaising with DoF to ensure that any changes to fishing operations do not adversely affect key values or the experiences of visitors.

Key performance indicator 31.6.1 also applies (see Appendix 1)

Performance measure	Target	Reporting requirement
39.1 Visitor satisfaction levels regarding recreation at Hamelin Bay	39.1 Reductions from 2010 levels in visitor conflict over commercial fishermen travelling through the swimming beach at Hamelin Bay	Every 5 years

40. EMERGENCY SERVICES AND OTHER TRAINING

Emergency services and other types of training may be an acceptable use of some lands and waters managed by the department, although many activities associated with such training may be inappropriate in national parks and nature reserves. The planning area is sometimes used for search and rescue training including cave and cliff rescues. Cave rescue training is confined to Giants Cave, and is undertaken only by the local State Emergency Service.

As a general guide, the following activities, sometimes associated with emergency services training, are not acceptable in the planning area:

- damaging, cutting or destroying vegetation
- damaging or destroying geological features

- taking vehicles off roads and tracks
- use of domestic animals (for example dogs).

A written application has to be made to the department before any training exercise can be carried out within the planning area. Such activities will be assessed on a case-by-case basis, so that the particular requirements of each exercise can be considered, impacts assessed and appropriate conditions applied.

Guidance for managing emergency service training is provided by departmental policy Statement No. 54 *Defence force training on CALM managed lands and waters* (CALM 1996).

40. Emergency services and other training

Key points

- Emergency services and other types of training may be an acceptable use of lands and waters managed by the department if carried out in appropriate areas and in an ecologically sustainable manner.
- Approval for emergency services training activities within the planning area will be considered on a case-by-case basis.

The objective is to minimise the environmental and other impacts from emergency services and other types of training on key values.

This will be achieved by:

1. Ensuring that activities are carried out in accordance with relevant departmental policies.
2. Assessing impacts of specific proposals for undertaking emergency services training and providing conditional approvals if/as appropriate.
3. Liaising with emergency services organisations and encouraging them to seek alternative locations outside the planning area wherever possible.
4. Restricting cave rescue training to Giants Cave.
5. Prohibiting training exercises in areas likely to cause unacceptable damage to the environment, or unacceptable disturbance to visitors.

41. UTILITIES AND SERVICES

Occasionally utility service providers will seek access to and/or acquisition of areas in the conservation reserve system to facilitate provision of their services (e.g. electricity, gas, public transport, infrastructure, water and telecommunications). Within the planning area, many of these are located to accommodate adjoining townsites (e.g. Margaret River bypass road), enclaves of private property, projected development requirements and various statutory zoning schemes (e.g. the LNRSPP).

Utilities presently include a jointly owned communication facility at Boranup Hill, a communication tower at Mt Duckworth, and a Telstra mobile communication tower near Yallingup. Co-located with the Telstra communication tower are Optus and Vodaphone Network facilities. All of these facilities are managed under a commercial lease arrangement with the department. A special agreement licence is also issued for the operation of a hydrostatic station for nuclear detection, located at Cape Leeuwin. Numerous power distribution lines also dissect the planning area, including the main transmission line from Busselton to Margaret River. Water is extracted from the Ten Mile Brook Reservoir, although some infrastructure associated with this use has been excluded from the boundary of the planning area. Water is also extracted from the Cape Leeuwin Spring but infrastructure is located on Sussex location 5322, which is owned by the Water Corporation.

The demand for more utilities on the Leeuwin-Naturaliste Ridge is expected to increase with a corresponding increase in the demand for community infrastructure such as rural-residential housing (see Section 2 *Regional Context*). This is a particular issue where utilities and services must traverse Leeuwin-Naturaliste National Park to service coastal townsites. Future demands for utilities and services may also arise as a result of proposals to extract water from surface flows or groundwater aquifers or to utilise alternative energy sources such as wind farms. An increased demand for improved power supplies on the Scott Coastal Plain because of additional horticulture and dairying developments is also likely (SCPSC 1999).

The construction and subsequent maintenance of infrastructure corridors, as with all access routes, can result in a number of significant management problems, including, for example:

- disturbance of karst systems (and other landforms), flora and fauna (particularly threatened or otherwise significant species or communities)
- habitat fragmentation and associated problems
- increased susceptibility to the spread of weeds and disease
- impediments to fauna movement
- increased susceptibility to fire
- noise or other environmental pollution (including the potential for electromagnetic radiation from communication towers)
- soil erosion
- degradation of water quality
- visual impacts[50]
- restrictions/limitations on management activities.

To limit these problems, it is the department's and the Conservation Commission's preference that utility infrastructure not servicing the planning area itself, is accommodated outside of the planning area. The initial response in considering proposals for utility service developments is to therefore ensure alternative site options that avoid impacting on conservation and landscape values. Potential for use of already degraded areas, pre-existing corridors or co-location with existing infrastructure (i.e. clustering facilities), is also preferred. In instances where accommodating utility service developments within or adjacent to the planning area is acceptable, or undesirable but nonetheless unavoidable, negotiation and liaison are important to ensure that adverse impacts on ecological, visual landscape and other values are minimised.

This management plan provides for continuation of existing utility and service arrangements. The Conservation Commission and the department play an important role in identifying, assessing and monitoring of any future developments/proposals that may impact on the values of the planning area. However, formal environmental impact assessments (and the imposition and monitoring of environmental conditions) for development proposals occurs under the Environmental Protection Act, which is administered by the EPA51.

41. Utilities and services

Key points

- Demand for utilities on the Leeuwin-Naturaliste Ridge is expected to increase with a corresponding increase in the demand for community infrastructure. Proposals for wind farms and to extract water may also increase the infrastructure/service requirements within the planning area.
- The construction and subsequent maintenance of utility service infrastructure within or adjacent to the planning area can cause a number of significant management problems.
- Ideally, all utility services and infrastructure not servicing the planning area should be accommodated outside of it, but where this is not possible, the department and Conservation Commission seeks to minimise ecological impacts.
- Several communication sites and a hydrostatic station for nuclear detection are located within the planning area and managed under lease agreement. Numerous distribution lines also exist.

The objective is to minimise the impacts of utilities and services on key values.

This will be achieved by:

1. Opposing utility service developments that cannot be managed to be acceptable on ecological, cultural or aesthetic grounds or where viable alternatives are available. Where such developments are deemed acceptable, these should be confined to existing utility corridors and degraded areas wherever possible.
2. Referring development proposals to the EPA for assessment if/as necessary.
3. Liaising with relevant agencies and development proponents to minimise ecological (and other) impacts where the development is approved by the department.
4. Excising land containing communication towers from Leeuwin-Naturaliste National Park and reserving these areas as CALM Act section 5(1)(h) reserves. Should the communication towers no

[50] In accordance with the LNRSPP, a landscape management plan must be prepared by the proponent where new services and utilities are proposed and the clearing of native vegetation is required. Infrastructure should also be sensitive to the character of the area.

[51] Actions which may have a significant impact on matters of national environmental significance (e.g. nationally threatened species or ecological communities and certain migratory species) will also require approval (but not necessarily assessment) under the Environmental Protection Act.

longer be required, the land should be incorporated back into the national park.
5. Permitting the co-location of structures on department-managed lands provided that department operations are not impeded and ancillary equipment shelters or ground works associated with the proposal do not impact on the values of the planning area.
6. Ensuring that land disturbed by utility service development and maintenance is adequately rehabilitated using appropriate local species, and at the expense of the parties responsible for the development.
7. Seeking contributions to management costs to offset the impacts of developments in accordance with environmental offset principles.
8. Providing an appropriate level of bushfire protection for public utilities and services.

42. BEEKEEPING

Commercial beekeeping is a small but significant industry in WA. Apiarists have traditionally relied on large areas of native vegetation for honey production, and are increasingly dependent on lands managed by the department. All apiary sites on Crown land in WA (including land not managed by the department), require a permit from the department.

To provide industry input to the department on beekeeping matters, the Beekeeping Consultative Committee was created to facilitate discussion and consultation between the department, industry groups and other government agencies. The *National Best Management Practice for Beekeeping in the Australian Environment* (DAFF and NSW DPI 2007) highlights 19 elements, outlining the guidelines for the management of honeybees in Australia.

At the time of publication, there are 15 registered (recognised sites where hives have been placed) apiary sites in the planning area: 10 sites in Leeuwin-Naturaliste National Park, one site in Bramley National Park, one site in Gingilup Swamps Nature Reserve and three sites in the proposed additions to existing reserves (one site in reserve 12457, UCL 4973 and UCL 753). No sites exist in Scott, Yelverton and Forest Grove national parks, although there are two vacant sites in Forest Grove National Park that can be re-issued. In 2000, the department also started withholding sites to offer to beekeepers as a replacement for sites that need to be cancelled. Seven such 'pool' sites occur in the planning area.

Departmental policy

General guidance for the management of apiculture on Crown land is provided for by the department's 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[52], until a management plan has been prepared. In this instance, the department, 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 14). Thus the management planning process will identify suitable areas for beekeeping while minimising the potential impacts of managed honeybees.

Applying departmental policy to the planning area

While it is recognised that feral honeybees are more of a threat to the values of conservation reserves than managed honeybees (see Section 23 *Introduced and Other Problem Animals*), there is little knowledge about the range of conditions which honeybees leave the hive, and become feral. Consequently, the department will take a 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 include 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 honeybees (Appendix 14).

Visitation by honeybees and any predicted impact on declared rare and Priority flora and significant habitats and communities within the planning area will be assessed by department specialists. As a result, the planning area can be categorised as either:

[52] Lands reserved primarily for nature conservation includes national parks, conservation parks, nature reserves and 5(1)(g) and (h) reserves.

- ‘suitable’ for apiary sites (1 site)
- ‘suitable but conditional’ (13 sites)
- ‘highly constrained’ (1 site).

The department’s management approach for each category and an assessment of the planning area is shown in Appendix 14. Some sites are not suitable for beekeeping because they do not meet environmental or management criteria.

Gingilup Swamps Nature Reserve and parts of Scott National Park for example, are not suitable for beekeeping because they have limited access, are seasonally inundated over large areas and are highly susceptible to the spread of *P. cinnamomi*. Site 624 in Gingilup Swamp Nature Reserve was assessed as ‘highly constrained’ because of its proximity to the Scott River Ironstone Association threatened ecological community and an alternative site will need to be negotiated with the licence holder. Sites 623, 5632 and 5992 were all assessed as being ‘suitable but conditional’ because of environmental concerns such as the flowering season of threatened and priority flora. Conditions restricting the time of year that hives can be placed in these conservation reserves will need to be added to the permit.

Sites adjoining the planning area (2 sites) may also impact on its environmental values. Where these are located on lands managed by the department the criteria in Appendix 14 should be applied. ‘Pool’ or ‘vacant’ sites (9 sites), that is those that may become available, have also been assessed.

Several apiary sites were assessed as being too close to existing recreation sites. Sites 626, 908, 1270, 1425 and 4933 will need to be relocated further away from such recreation sites.

Two sites, 623 and 1425, were assessed as being in close proximity to weed species that have a year-round impact. Monitoring of the weed species found at these sites, *Samolus valeran*, will need to occur and control implemented as required.

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 14. Any change in the categories for beekeeping, criteria or values of the planning area should ideally coincide with the review of apiary permits. More research is also required to quantify the impacts of managed honeybees on the natural environment.

42. 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.
- The planning area will be assessed as being either suitable, suitable but conditional or highly constrained for apiary sites based on environmental and management criteria.

The objective is to minimise the impact of commercial honeybees on natural values and park visitors while supporting the beekeeping industry.

This will be achieved by:

1. Managing beekeeping in accordance with departmental policy.
2. Renewing, with standard conditions, permits for apiary sites in areas deemed ‘suitable’.
3. Renewing, with additional conditions, permits for apiary sites in areas deemed ‘suitable but conditional’.
4. Allowing new sites or the transfer of sites to areas deemed ‘suitable’ or ‘suitable but conditional’, subject to the appropriate conditions.
5. Prohibiting beekeeping from reserves where there is no historical use and areas deemed to be ‘highly constrained’. Where possible, providing alternative sites in the general area.
6. Managing weed species to minimise potential impact as required and according to the weed control plan (see Section 22 *Environmental Weeds*).
7. Reviewing the criteria for determining the suitability of beekeeping in the planning area as new knowledge becomes available or the control of feral honeybees is feasible.
8. Supporting department research on the impact of beekeeping on native flora and fauna within natural ecosystems of the south-west and adapting management accordingly.
9. Liaising with beekeepers, the Beekeepers Consultative Committee, and the Department of Agriculture

and Food to ensure the most efficient and sustainable use of sites.

43. FOREST PRODUCE

Section 99A of the CALM Act enables the Executive Director to grant a licence to take forest produce[53] from the planning area provided it is:

- to remove exotic trees (e.g. pines or exotic eucalypt species), honey, beeswax or pollen (by apiary site permit)
- used for therapeutic, scientific or horticultural purposes [CALM Act Section 99A(1)(b)]
- for essential works.

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 fire-break (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.

Consequently, introduced tree species located within species trial plots, could be selectively logged from the planning area and sold by the department, through a specified process, as forest produce. Harvesting of native species other than for therapeutic, scientific or horticultural purposes or essential works will not be permitted in the planning area.

The harvesting of forest produce from adjacent multiple-use State forest (plantations) should be compatible with the *Forest Management Plan 2004-2013*. Landscape management in particular should be carefully considered in timber harvesting proposals and, where possible, incorporated into management prescriptions (see Section 35 *Visual Landscape*).

Non-commercial firewood

Illegal firewood collection has been a particular problem in Yelverton, Forest Grove and Bramley national parks. 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 of State forest and timber reserves. Firewood collection is not permitted within nature reserves, national parks and conservation parks within the planning area. Illegal firewood collection will be an ongoing issue within the planning area because of the increasing population and lack of multiple-use State forest of sufficient size that is in close proximity to towns such as Margaret River.

As part of its management obligations, the department will seek to designate or gazette 'Firewood Collection Areas' within the Blackwood District 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.

Other sources of firewood include residue from management operations and product sourced from harvesting operations by licensed contractors (e.g. the removal of trees as a result of 'essential works') or the removal of exotic trees.

43. Forest produce

Key points

- The Executive Director can issue a licence under section 99A to take forest produce from the planning area provided it is 1) used for therapeutic, scientific or horticultural purposes 2) it is for the removal of exotic trees, honey, beeswax or pollen or 3) it is for essential works.
- Illegal firewood collection has been a particular problem in Yelverton, Forest Grove and Bramley national parks and will be an ongoing issue because of an increasing population and a lack of firewood collection areas.

The objective is to prohibit the removal of forest produce except where it is in accordance with the CALM Act.

[53] 'Forest produce' includes trees, parts of trees, timber, sawdust, chips, firewood, charcoal, gum, kino, resin, sap, honey, seed, bees-wax, rocks, stone and soil.

This will be achieved by:

1. Prohibiting forest produce to be taken from the planning area, except where it is used for 1) therapeutic, scientific or horticultural purposes 2) the removal of exotic trees, honey, beeswax or pollen or 3) for essential works, and a licence is granted by the Executive Director.
2. Prohibiting the removal of any native forest product for commercial use from the planning area (enforced by the CALM Act).
3. Designating or gazetting 'Firewood Collection Areas' in State forest and timber reserves within the department's Blackwood District and prohibiting this activity within national parks and nature reserves of the planning area.
4. Promoting areas for firewood collection by clearly signposting them and marking them on park literature.
5. Removing trees that pose a threat to the public or facilities, or that obstruct designated access tracks and using the timber from trees as much as possible in the planning area.

44. WATER RESOURCES

The responsibility for water resource protection, licensing and management rests with DoW. Water sources used for public drinking water supply are protected under the *Country Areas Water Supply Act 1947* (CAWS Act) by proclaiming catchment areas, water reserves and underground water pollution control areas (see *Water Supply*).

The taking of water from catchments of the planning area is regulated under the RIWI Act, which is administered by DoW. Under the RIWI Act, a licence is required to take water in proclaimed areas or non-artesian groundwater areas proclaimed or prescribed under the Act. 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 diversions to ensure environmental impacts are acceptable and downstream flow regimes are maintained to meet environmental and social water needs. All groundwater and surface water catchments on the Leeuwin-Naturaliste Ridge are proclaimed under the RIWI Act.

Proponents seeking to extract water from the planning area also require a water removal permit, issued under section 97A(2) and (6) of the CALM Act for State forest and timber reserves and section101 (1a) and (1e) of the CALM Act for other CALM Act land (e.g. national parks). These permits require approval by the Environment Minister and are subject to consideration by the Conservation Commission and the recommendation of the department's Director General. The permits cannot limit the operation of the RIWI Act and needs to be in accord with a CALM Act management plan. A water removal permit can place conditions on the proposed extraction (e.g. on the quantity of water extracted). Where infrastructure is required, a lease may also be issued. An assessment by the EPA may be required for projects with potentially significant environmental impacts.

Under the *Water Agencies (Powers) Act 1984*, the Water Corporation (as the proponent) is also required to acquire an interest in the land for major works, such as dams or groundwater extraction schemes. In the case of the planning area, a water removal permit issued by the department would classify as an 'interest' needed to undertake major works.

Water supply

Water is abstracted from the planning area for public drinking water supply and reserve management.

Public drinking water supply

The Ten Mile Brook Reservoir and catchment[54] is proclaimed under the CAWS Act for the supply of water to Margaret River, Prevelly, Gnarabup, and Cowaramup (DoE 2005). The current licensed allocation for town water supplies from this source is 1 million kilolitres per year. However, the sustainable yield of the Ten Mile Brook Reservoir catchment is about 650 000 kilolitres per year, and therefore the Reservoir is augmented by pumping water from Margaret River when the flow from Ten Mile Brook is insufficient to meet scheme demand. In this instance, only 3 per cent of the total annual flow in the Margaret River is taken. In the future, town water supply may be supplemented from groundwater sources.

[54] The catchment of the Ten Mile Brook Reservoir includes the Margaret River and Ten Mile Brook catchments (see Map 3). The Ten Mile Brook Reservoir itself and associated infrastructure is not located in the planning area.

Water is also abstracted from the spring at Cape Leeuwin (on land owned by the Water Corporation) for supply to the southern section of the Augusta townsite and for bottled water. Augusta also receives water from the Fisher Road borefield, which will be expanded as demand increases. In 2006, the Water Corporation noted that there has been a considerable decline in the level of the Leeuwin Spring outflow, the level of the swamp to the west and the level of Leeuwin Spring Weir, possibly due to the sequence of poor winters over the previous five years. The continued use of the Leeuwin Spring as a source of drinking water is uncertain because it is not licenced under the RIWI Act, the catchment is not proclaimed under the CAWS Act, it is subject to strict environmental flow requirements and there is uncertainty over the sustainability of the source given the potential for more climate variability (DoW 2007a). It remains the department's position that water abstraction from the site cease to protect vegetation communities, habitat of the Cape Leeuwin freshwater snail and water supply to Augusta microbial TEC.

Small volumes of groundwater are also abstracted from the South West Yarragadee groundwater aquifer for local public water supply purposes. The aquifer is the largest freshwater aquifer in the Perth Basin and underlies virtually the whole of the Scott Coastal Plain (Baddock 1995), including Scott National Park and Gingilup Swamps Nature Reserve. In 2007, the former State Government decided not to proceed with the proposal to extract larger quantities of water from the aquifer, favouring alternative options for water supply. The aquifer will continue to be used for local public water supply purposes.

DoW is also undertaking surface water planning for the Margaret River, Willyabrup Brook, Cowaramup Brook and Chapman Brook catchments to determine future environmental, social and economic water allocation requirements. This could lead to use of these areas for public drinking water supply and may also have implications for other land management activities, including the management of recreational use.

Other water supply

Leased facilities at the Cape Naturaliste lighthouse are supplied with groundwater from a bore in the national park. The quantity of the supply is uncertain and a concern for the department. The department is committed to supplying water to existing facilities, as per the lease agreement, although any more demands may place a strain on existing supplies. As such, the department will investigate options to extend the scheme supply at Bunker Bay to the lighthouse facilities and monitor the impact of current use. If this is not suitable, investigations may be required to determine the extent of the groundwater supply, its quality and options for additional bores.

Caves House, Ngilgi Cave and the caravan park at Yallingup are extracting water from a nearby spring/Yallingup Brook within Leeuwin-Naturaliste National Park. The department recognises this long-standing arrangement and, over the life of the plan, will formalise the arrangements to supply water to these areas, giving due consideration to potential environmental impacts. Foremost in the investigations will be the option to connect to the nearby scheme water supply. Alternatively, extraction could be approved by way of a lease agreement and the licensing provisions of the RIWI Act. Should a lease be issued, a Water Removal Permit stipulating conditions to mitigate environmental impacts would be required. A lease agreement would also be subject to the proponent(s) undertaking an environmental assessment of the site demonstrating the sustainability of extracting water.

Water is also supplied to other facilities such as the lighthouse at Cape Leeuwin and Rusden Picnic Area, which are supplied with treated water from Augusta and Ten Mile Brook Reservoir respectively. Camp sites along the Cape to Cape Track, Conto Campground, Conto ranger accommodation, facilities at Giants and Calgardup caves and the Ellensbrook caretaker's house are all supplied with untreated rainwater. This water should be tested to ensure it meets health requirements. In other areas (e.g. Canal Rocks), water for toilet facilities is obtained from nearby springs. Formal approval to remove groundwater to supply the Hamelin Bay caravan park is required.

An increase in the viticulture industry in the Augusta-Margaret River area has seen a similar increase in the number of farm dams. The cumulative effect of these dams may have an impact on biodiversity values, particularly wetlands, threatened frogs and cave invertebrates. DoW is developing a policy position on farm dams in the region as part of their water management plan.

44. Water resources

Key points

- Many ecosystems and species of the planning area are dependent on the maintenance of water quality and quantity for their survival.
- The cumulative affect of farm dams along the Leeuwin-Naturaliste Ridge has the potential to impact

upon biodiversity, especially threatened frogs and cave invertebrates.

- A licence from DoW and a permit under the CALM Act is required to extract water from the planning area.

The objective is to minimise the impact of water extraction on key values.

This will be achieved by:

1. Requesting that DoW liaise with the department when investigating water resources in the planning area with the view to ensuring environmental and social impacts are mitigated.
2. Allowing access to the planning area to extract water where it is consistent with the CALM Act and potential adverse impacts can be prevented or sufficiently mitigated.
3. Issuing a water removal permit, after consultation with the Conservation Commission and approval by the Environment Minister, approval by DoW and an appropriate level of assessment, for the extraction (taking) of water from the planning area. Where a CALM Act water removal permit is not issued, or DoW does not grant a licence, water may not be extracted from the planning area.
4. Requesting that the EPA formally assess any proposals for water extraction where this may adversely affect the values of the planning area.
5. Subjecting all new infrastructure supporting water extraction to the strategies of Section 41 *Utilities and Services*.
6. Investigating options to extend the scheme supply at Bunker Bay to the Cape Naturaliste lighthouse. If this is not suitable, the groundwater supply will be investigated for additional bores. This will be subject to adverse impacts being sufficiently mitigated.
7. Formalising options to supply water to the caravan park at Hamelin Bay and Caves House, Ngilgi Cave and the caravan park at Yallingup.
8. Ensuring that water used by the department is licenced under the RIWI Act.
9. Testing untreated water at recreation sites to ensure it meets health requirements.
10. Liaising with DoW regarding their policy on farm dams.
11. Liaising with DoW and the Water Corporation to ensure that environmental water requirements are maintained along the Margaret River and at the spring at Cape Leeuwin.

PART G. INVOLVING THE COMMUNITY

The planning area provides a valuable opportunity for the community to experience and learn about coastal and forested environments. An effective communication program to involve the community is vital to achieving the vision and objectives of this management plan. It informs the public of the attractions, facilities, opportunities and interpretive services available, and assists in increasing appreciation and understanding of the natural and cultural environment. It also fosters a sense of community ownership of the planning area, engenders support for management and encourages appropriate behaviour. Communication is also vital to managing visitor risk so that visitors have safe, enjoyable experiences in the planning area.

A range of communication strategies targeting different audiences is required, and should comprise the following:

- information (embracing publicity, promotions and marketing)
- interpretation[55] of visitor experiences
- education (for schools and special interest groups)
- community involvement (public participation, volunteers, friends and advisory groups)
- liaison, consultation and advisory services to stakeholder groups.

Communication strategies presented in this management plan were prepared in conjunction with planning for visitor use (see Part E *Managing Visitor Use*).

45. INFORMATION, INTERPRETATION AND EDUCATION

Information

Information provided by the department about the planning area is available through park signage, print media, the department's website and park rangers. Information is also widely available from many external sources, including tour operators and the tourism industry. The delivery of consistent and accurate information by internal and external providers is important in achieving effective communication. To that end, the department will provide advice, resources and training to tour operators and other information providers to assist them in reinforcing the department's messages to visitors. It is a requirement for tour operators to actively promote the values of the planning area, which are the subject of their operations and to attend training workshops if requested (conditions 5.10 (d) and (e) of the department's *Tour Operator Handbook*). The department will incorporate these requirements into future commercial lease agreements at major sites (e.g. at the lighthouses and Hamelin Bay). This will greatly assist the department in directing and managing visitors within the planning area.

Interpretation

Interpretation of the planning area will focus on providing the opportunity for visitors to experience each major component of its character[56]. Analysis of this character has identified three primary interpretive themes:

- *Landscapes* – Explore a landscape of ancient granites, overlain by limestone and sculpted by rivers, creeks, subterranean waters and coastal processes.
- *Seascapes* – Discover a varied seascape of granites interspersed with sandy bays and beaches of seagrasses, limestone reefs and associated marine life.
- *Peoples* – Wonder at the evidence of Dutch, French and English exploration through to colonial settlement and contemporary land use. Learn about traditional Aboriginal people.

The diversity of recreation sites available within the planning area makes for a range of places to experience these primary themes and their values. However, to cater for mass tourism and to enable visitors to experience the range of themes, a defined menu of sites to visit is required. Consequently, the planning area has been

[55] Interpretation explains the natural and cultural features and management activities to enrich visitor experiences.
[56] The character of the planning area is determined by the land and seascapes, the associated plant and animal communities and species, and the stories of people's perceptions, resource use, lifestyles and events over time.

divided into interpretive areas and the interpretation of primary themes restricted to a limited number of more developed recreation sites (Table 15).

Table 15. Primary interpretive themes expressed at specific sites

Primary theme	Interpretive area	Major sites for interpretation**
Landscapes ❖ Granite outcrops ❖ Limestone and karst features of the Leeuwin-Naturaliste Ridge ❖ Caves ❖ Rivers/creeks/springs ❖ Jarrah and karri forest	The valley and jarrah forest	Margaret River Eco Discovery Centre Margaret River townsite* Prevelly Park* Rusden Picnic Area
	The caves	CaveWorks* Conto Campground Calgardup, Mammoth*, Lake*, Jewel* and Ngilgi* caves
	Blackwood River	Augusta*
Seascapes ❖ Granite/algae/kelp ❖ Limestone features ❖ Sandy bays/seagrass ❖ Reefs/corals ❖ Islands	The bay	Cape Naturaliste
	The surf and coastal processes	Canal Rocks, Yallingup*
	The oceans, including the islands	Cape Leeuwin (including the waterwheel) Hamelin Bay Augusta*
Peoples ❖ Nyoongar (traditional, historic, contemporary) ❖ Exploration (marine, land) ❖ Colonial history ❖ Twentieth century land use/lifestyles ❖ The people of today	The people	Wardandi Cultural Centre* Ellensbrook Homestead Gracetown* Margaret River Eco Discovery Centre Margaret River townsite*
	The karri forest	Hamelin Bay Boranup Forest (proposed new day use site) Margaret River Eco Discovery Centre

* Denotes sites located outside the planning area. Interpretation at these sites it should be encouraged to support the strategies in place for this management plan.

** Major sites of interpretation will include the primary themes as stated, but may also include other primary themes as a secondary focus.

Note: At least one recreation site in a highly modified visitor management setting will be included in each interpretive area.

Mass tourism requires the development of facilities and services that can overwhelm local interests and experiences. Special interests such as surfing, fishing, diving, boating and caving may therefore be incompatible with such development. These activities are usually undertaken in less developed settings, which are not promoted at other sites to ensure they remain sustainable in meeting the niche market. These sites will primarily be interpretive free and provide only essential information for visitor safety and environmental management purposes. Personal communication with special interest and local visitors can direct them to the right place for a particular activity.

Guided interpretive experiences are occasionally conducted over public and school holiday periods by department staff at various localities such as Conto Campground, Boranup Forest, Calgardup Cave and Margaret River Eco Discovery Centre as resources allow or special needs arise. They are also provided by other agencies (sometimes in conjunction with the department) and commercial tour operators with guides. The department's 'Go with a guide' services are encouraged to meet the objectives of this management plan.

The effectiveness of interpretation strategies will be assessed over the life of the plan. If there is no significant change in visitor patterns following site promotion and development, then a visitor interpretation centre is a strategy that can attract, inform and direct visitors (to major sites) as well as interpret park values and experiences. The feasibility and usefulness of a visitor centre will need to consider advances in communication technology and other, more cost effective, means to convey key messages. The dispersed nature of recreation sites along the Leeuwin-Naturaliste coastline, numerous access points and different travel routes, also presents difficulties in locating such a facility.

Education

Eco-education programs are offered at the Margaret River Eco Discovery Centre, which is located at Wharncliffe, about 1 kilometres north of the Margaret River townsite in Bramley National Park. Wharncliffe was originally an old pine mill, but has been managed by the department as campground and bunkhouse accommodation (Wharncliffe Mill Forest Camp) since 1987. In 2004, the Margaret River Eco Discovery Centre

was built at the site to promote and deliver the department's eco education program. Together, the Centre and campground operate as an eco-education facility and a key overnight accommodation for groups with educational interests (predominantly schools). All users are required to book in advance.

Use of the facilities at the Margaret River Eco Discovery Centre is expected to increase with a growing demand in eco-education. The accommodation capacity includes 38 beds in the Old Mill Building and about 80 campers (in tents). Larger groups of campers will be considered, but this will depend on the capability of the surrounding forest to withstand visitation and the availability of the department's Eco Education Officer. As the eco-education program is open to day users and campers, and because two camp groups can potentially occupy the site at the same time, more site design and development is required to avoid user conflicts. To this end, a visitor master plan is being prepared by the department.

The Big Bush Heritage Celebration on Easter Sunday is the only existing annual organised event to occur at the site.

45. Information, interpretation and education

Key points

- A communication program that considers the planning area in a regional context is vital in achieving park management objectives and increasing awareness of key values within the planning area.

The objective is to promote community awareness, appreciation and understanding of key values and engender support for management activities.

This will be achieved by:

1. Providing information to visitors on the key values and issues within the planning area such as visitor safety, wildlife interactions and appropriate activities, sites visitor behaviour.
2. Continuing to develop the Margaret River Eco Discovery Centre as the focal point for community education programs. The department will determine the environmental capacity of the site to run these programs by monitoring the ecological health of the forest.
3. Interpreting primary themes of the planning area at the sites shown in Table 15.
4. Encouraging interpretation off the department-managed estate to be consistent with the approach taken for this management plan.
5. Assessing the effectiveness of communication strategies in managing visitor use and following this, giving consideration to the usefulness of a visitor centre.
6. Considering interpretation along trails where appropriate to the track class.
7. Consulting with the Director of the Geological Survey of WA in compiling interpretive geological information.
8. Ensuring that the tourism industry has relevant and factual interpretive material by developing a local tourism industry network to disseminate information and by providing professional development and training opportunities. The preparation of a tourism manual specific to the planning area will be considered for this purpose.
9. Incorporating the promotion of key values into future commercial lease agreements at major interpretive sites.
10. Developing, or continuing to provide, facilities for tour guides at Conto Campground, Cape Leeuwin and Cape Naturaliste lighthouses, Margaret River Eco Discovery Centre, Calgardup Cave and Ellensbrook and supporting the department's 'Go with a Guide' service.
11. Monitoring tour operator compliance with licence and lease conditions, and encourage tourism industry/business accreditation and guide certification to assure quality product and service delivery.

Key performance indicator (see also Appendix 1):

Performance measure	Target	Reporting requirement
45.1 Participation in education programs offered at the Margaret River Eco Discovery Centre	45.1 Increase of at least 10 per cent in participation, including recurrent participation, in education programs offered at the Margaret River Eco Discovery Centre from 2010 levels	Every 5 years

45.2 Visitor numbers at major, medium and minor sites	45.2 An increase in visitation at major sites in comparison to medium and minor sites[57]	

46. COMMUNITY INVOLVEMENT AND LIAISON

Key functions of the Conservation Commission and the department are to promote and facilitate active community involvement in the management of conservation lands. The community, as groups or individuals, is encouraged to be involved in the planning and management of many of the department's activities.

The community has been involved in drafting this management plan through pre-draft written submissions and consultation meetings. The Capes Parks Community Advisory Committee has also advised the management planning team throughout the preparation of the draft management plan. At this stage of the planning process, community members and organisations have the opportunity to comment further on the proposed management of the planning area, either by written submission or by making an electronic submission on the department's website.

Ongoing community support is essential for the successful implementation of the final management plan. Community members take part in volunteer activities such as walktrail development, cave conservation and management, coastal rehabilitation and campground hosting. They are also encouraged to be involved in visitor surveys, clean up days and assistance with maintenance, such as erosion control, weed removal, track maintenance, and data collection. Volunteer activities not only increase the department's work capabilities and skills base, but also foster communication links and understanding with the community.

The involvement of Aboriginal people, adjacent landowners and managers, users of the planning area, tour operators and interest groups is important to the conservation of the planning areas values. Liaison with other government agencies, commercial groups, tourism associations and schools is also important.

The department's *Good Neighbour Policy* (DEC 2007b) outlines several principles for effective neighbour relations. The Policy addresses issues such as fences adjacent to department-managed lands, fire management, control of weeds and introduced pest animals, stock on department-managed lands, access to department-managed lands and others.

To facilitate integrated management of the planning area with surrounding tenures, this management plan also proposes to use the Capes Parks Community Advisory Committee as a means of addressing any NRM issues and the management of conservation reserves in the context of other land uses within the region.

46. Community involvement and liaison

Key points

- Community involvement and support are critical to the successful implementation of this management plan.

The objective is to facilitate community involvement in management.

This will be achieved by:

1. Continuing to provide and promote opportunities for involvement of interested community members in management of the planning area (e.g. through advisory committees and volunteer programs).
2. Using the Capes Parks Community Advisory Committee as a means of addressing NRM issues.
3. Encouraging the establishment of a 'friends' group to coordinate and/or oversee community involvement programs, including the Friends of the Cape to Cape Track and special events involving the community.
4. Ensuring that Aboriginal people have an active role in communication relating to Indigenous cultural heritage.
5. Liaising closely with other agencies, organisations and individuals (such as tourism agencies, tour operators, caving groups, schools and museums) that can impact on and input into the management of values within the planning area.

[57] The increase in visitor numbers at major sites will be proportional to the sites proximity to major population centres.

PART H. RESEARCH

47. RESEARCH

Research is an essential component of management, and is required to successfully implement this management plan. It 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 the best outcome.

The involvement of a wide range of organisations and groups is important in achieving research outcomes as well as reducing the costs involved in these activities.

Research requirements

The department's research activities are subject to a prioritisation process for research across the entire conservation estate. Priorities are given to:

- describing and documenting WA'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 priorities for research may result in conducting programs that have relatively little direct management application to the planning area but significant indirect application to the conservation estate and species or communities as a whole.

Research itself, if not properly managed, has the potential to adversely impact upon the values of the planning area, and proposals should therefore be assessed for their suitability.

The following is a list of research requirements relevant to the planning area. They include knowledge gaps identified by Hearn *et al*. (2003a), Hearn *et al*. (2003b) and other gaps identified in the preparation of this management plan.

Subject	Research requirements
Climate change	❖ Research the potential impacts of land management responses to climate change, particularly with respect to threatened species. ❖ Potential effects of climate change on catchment water quality and quantity and the implications of more frequent and severe bushfires.
Hydrology	❖ An understanding of hydrological and hydrogeological processes, especially in relation to threatened ecosystems, communities and species (e.g. white-bellied frog) but also for cave, spring and seep systems. ❖ A comprehensive investigation of karst on the Leeuwin-Naturaliste Ridge, identifying fundamental processes, flow regimes, water quality tolerances and cave catchment boundaries. ❖ The cumulative effects of farm dams and plantations on natural processes. ❖ The location, status, life cycle requirements (e.g. hydrological requirements), threats and issues relating to the Cape Leeuwin freshwater snail and the Augusta microbial TEC (at Quarry Bay and Canal Rocks). ❖ The ecological water requirements for other threatened species and communities as well as common and iconic species.
Native plants and animals	❖ Vegetation mapping and community identification has been undertaken at a broadscale for the RFA, but more refinement of these boundaries is required, focusing on important community types. ❖ Knowledge on the population ecology and biology of vascular flora. In particular, floristic surveys of potentially diverse upland vegetation in Gingilup Swamps Nature Reserve. ❖ Understanding the role of Leeuwin-Naturaliste National Park in the conservation of critical weight range mammals. ❖ Inventory and taxonomic work to clarify karst conservation values (particularly

Subject	Research requirements
	subterranean fauna) and taxon distribution. ❖ The habitat requirements, life histories, ecology or distribution of invertebrates. In particular, research and surveys of wet area invertebrates is required. ❖ A biological inventory and condition assessment for important wetlands and the formation of habitat-specific management regimes. ❖ Recruitment processes and population dynamics for Critically Endangered species.
Ecosystem function	❖ Long-term ecosystem monitoring (sites to be developed in Boranup Forest and on the Scott Coastal Plain) to gain a better understanding of ecosystem processes. On the Scott Coastal Plain this will investigate aquatic systems and fringing vegetation.
Introduced and other problem animals and environmental weeds	❖ An understanding of feral pig distribution and densities, and impacts on biodiversity values. ❖ An understanding of fox and cat population data/dynamics and impacts, and the effectiveness and practicalities of control measures for small and fragmented sections of the Leeuwin-Naturaliste Ridge. ❖ Documenting and mapping the distribution and impact of feral bees. ❖ The development of strategies to control/minimise the impact of pest bird species (corellas, galahs and eventual invasion of rainbow lorikeets). ❖ The distribution and impacts of environmental weeds and introduced and problem animals.
Disease	❖ Detailed *P. cinnamomi* mapping and modelling. ❖ The impacts of *P. cinnamomi* on a range of faunal assemblages, individual plant species and plant communities. Impacts of animal and other plant diseases. ❖ More research into developing viable *P. cinnamomi* operational control techniques in regard to threatened taxa and ecological communities.
Fire	❖ Improved knowledge about the science of fire and its interaction with biota, particularly flora and fauna responses to fire (e.g. reproduction biology, taxonomy and age to maturity). Fire effect/response research will enable ecologically-based fire regimes to be developed with a view to maintaining taxa. ❖ Identifying fire regimes that minimise the extinction of genes, species and ecosystems. ❖ The interplay between altered fire regimes, weed invasion, acid-sulfate and organic-rich soils (e.g. wetlands of the Scott Coastal Plain), hydrogeology (particularly groundwater recharge) and hydrology and the subsequent influence on biodiversity. ❖ Monitoring of *Fire Exclusion Reference Areas.* ❖ Impact of fire on the regeneration of coastal heath, and the refinement of strategies to conserve biodiversity while protecting coastal community assets. ❖ Impact of fire on threatened frog species and the development of specific fire regimes for these species.
Cultural heritage	❖ The recording of oral histories and knowledge (where appropriate) of traditional Aboriginal custodians and their views toward and issues with park management.
Visitor use	❖ Profiles on visitors to the planning area, the level of use of recreation sites, patterns of usage (e.g. seasonal beach use) and visitor perceptions/expectations . ❖ The environmental and social impacts related to visitor facilities and their use and associated management responses. ❖ Defining the 'level of acceptable change' within the planning area, such that recreational use does not negatively impact on the biodiversity or social values of the area. In particular, establish acceptable limits of disturbance within caves (especially publicly accessible caves s) and abseil sites. ❖ The success of interpretation strategies in directing visitors to major sites.

47. Research

Key points

- In order to implement this management plan and achieve the objectives contained within, research is required to improve the understanding of key values.
- Future management of the planning area will have to be adaptive and will be based on increased understanding of key values and natural processes.

The objective is to increase knowledge and understanding of flora, fauna, natural processes, and visitor use so as to provide for better management.

This will be achieved by:
1. Identifying and initiating integrated research programs, as resources permit and according to priority, that facilitates management of the planning area. Research will focus on key issues and values identified in this management plan, but is also essential in the establishment of baseline information and predictive thresholds of ecosystem change for future assessment and adaptive management.
2. Ensuring information gained through research, monitoring and experience is provided 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.
3. Developing and maintaining a database of historical, current and required research.
4. Incorporating research findings into interpretive and educational material where appropriate.
5. Encouraging and supporting, wherever possible, external agencies and individuals to carry out research projects where their research contributes directly to the department's corporate strategies or the implementation and assessment of this management plan.
6. Ensuring that research activities do not adversely impact on the values of the planning area. If necessary conditions for research proposals may apply.
7. Pursuing external funding sources to achieve research objectives.

48. SCIENTIFIC AND RESEARCH USE

Scientific knowledge to inform management of the planning area is insufficient. Consequently, research activities by or in partnership with external parties is supported and encouraged where such activities will not unduly impact on key values, or if the benefit of the research is such that potential or actual impacts are sufficiently justified.

Scientific research activity involving disturbance of flora or fauna requires a licence issued under the Wildlife Conservation Act. Similarly, a licence is required to remove or cause significant damage or disturbance to any naturally occurring feature on lands managed by the department. Such licences will generally be subject to conditions, including that results are forwarded to the department.

The department and Conservation Commission hope 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 WA universities, and assists the department's regions and districts find student university researchers to investigate management solutions to recreation and tourism issues.

Section 47 *Research* provides more information on the research requirements for the planning area.

48. Scientific and research use

Key points
- Protected areas are a valuable resource for a wide range of research projects.
- Wildlife research within the planning area requires a permit from the department's Nature Protection Branch.
- The Nature-based Tourism Research Reference Group provides a link between students and the department in carrying out social research.

The objective is to provide for scientific research where it will assist in delivering the objectives of this management plan or other departmental objectives and where it will not have significant adverse impacts on the values of the planning area.

This will be achieved by:
1. Assisting, wherever possible, external agencies and individuals where their research contributes directly to an understanding of ecosystems and social values of the planning area, departmental objectives and strategies and the assessment of this plan.
2. Applying a permit/licence system for research proposals from outside the department, which specifies conditions under which work may be undertaken and results distributed.
3. Continuing to issue permits for research on wildlife as appropriate.
4. Proposing nature-based tourism research projects through the Nature-based Tourism Research Reference Group for listing on the department's website.

GLOSSARY

1080	A naturally occurring toxin (sodium fluoroacetate) found in many native south-west plants known as 'poison peas' (*Gastrolobium* sp.)
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 geography and biology including the relationships between plants, animals, soils, water, climate and humans
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 *Agricultural and Related Resources Protection Act 1976*.
Dieback	A disease of plants caused by the infection by the soil-borne fungi of the genus *Phytophthora*
Ecological community	An integrated assemblage of species that inhabit a particular area
Ecosystem	A community or an assemblage of communities of organisms, interacting with one another and the environment in which they live
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
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 the 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
Fauna	The animals inhabiting an area: including mammals, birds, reptiles, amphibians and invertebrates. Usually restricted to animals occurring naturally and excluding feral or introduced animals
Fire regime	A fire regime is a description of fire in terms of its fire frequency (how often it occurs on a site), fire 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 the landscape and local scale)
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
Geoheritage	State-wide to nationally significant features of geology, including igneous, metamorphic, sedimentary, structural, palaeontologic, geomorphic, pedologic or hydrologic attributes that offer important information or insights into the formation or evolution of the continent; or that can be used for research, teaching or as a reference site
Habitat	The place where an animal or plant normally lives and reproduces
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)
Key Fire Response Species	Species or communities that are either sensitive to fire or those that may not be fire sensitive but are important in the development of fire regimes for other reasons (e.g. keystone or threatened species)
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 Character Type	A broadscale 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
Naturalised species	Introduced plants that are well established in the wild (i.e. producing offspring and colonising new areas)
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
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 may be rare or threatened but for which there is insufficient survey data available to accurately determine their true status. Priority species also include rare species that are not threatened. Species are grouped from P1 to P4 (flora) and P5 (fauna) according to the perceived urgency for further survey
Protectable area	An area within the vulnerable zone (predominantly the South West Land Division) that is free of *P. cinnamomi*, of sufficient size (greater than 4 hectares and an axis of 100 metres), 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
Public Drinking Water Supply Area	An area defined under the Country Areas Water Supply Act
Rehabilitation	The process necessary to return disturbed land to a predetermined state, in terms of surface, vegetation cover, land-use and/or productivity
Salinity	The measure of total soluble salt (i.e. mineral constituents) in water.
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
Taxa	A defined unit (e.g. species or genus) in the classification of plants and animals
Visual Landscape	Appearance or visual quality of an area determined by its geology, soils, landforms, vegetation, water features and land use history
Wetland	Areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline (e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries)

ACRONYMS

BRM	Basic Raw Materials
DEC	Department of Environment and Conservation
CALM Act	*Conservation and Land Management Act 1984*
CAMBA	China Australia Migratory Bird Agreement
CAR	Comprehensive, adequate and representative protected area reserve system
DMP	Department of Mines and Petroleum
DoF	Department of Fisheries
DOIR	Department of Industry and Resources
DoP	Department of Planning
DoT	Department of Transport
DoW	Department of Water
DPI	Department for Planning and Infrastructure
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FESA	Fire and Emergency Services Authority
FMP	*Forest Management Plan 2004-2013*
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for the Conservation of Nature
JAMBA	Japan Australia Migratory Bird Agreement
LBU	Logical Burn Unit
LCU	Landscape Conservation Unit
LNRSPP	Leeuwin-Naturaliste Ridge Statement of Planning Policy
NRM	Natural Resource Management
RFA	Regional Forest Agreement
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
TEC	Threatened Ecological Community

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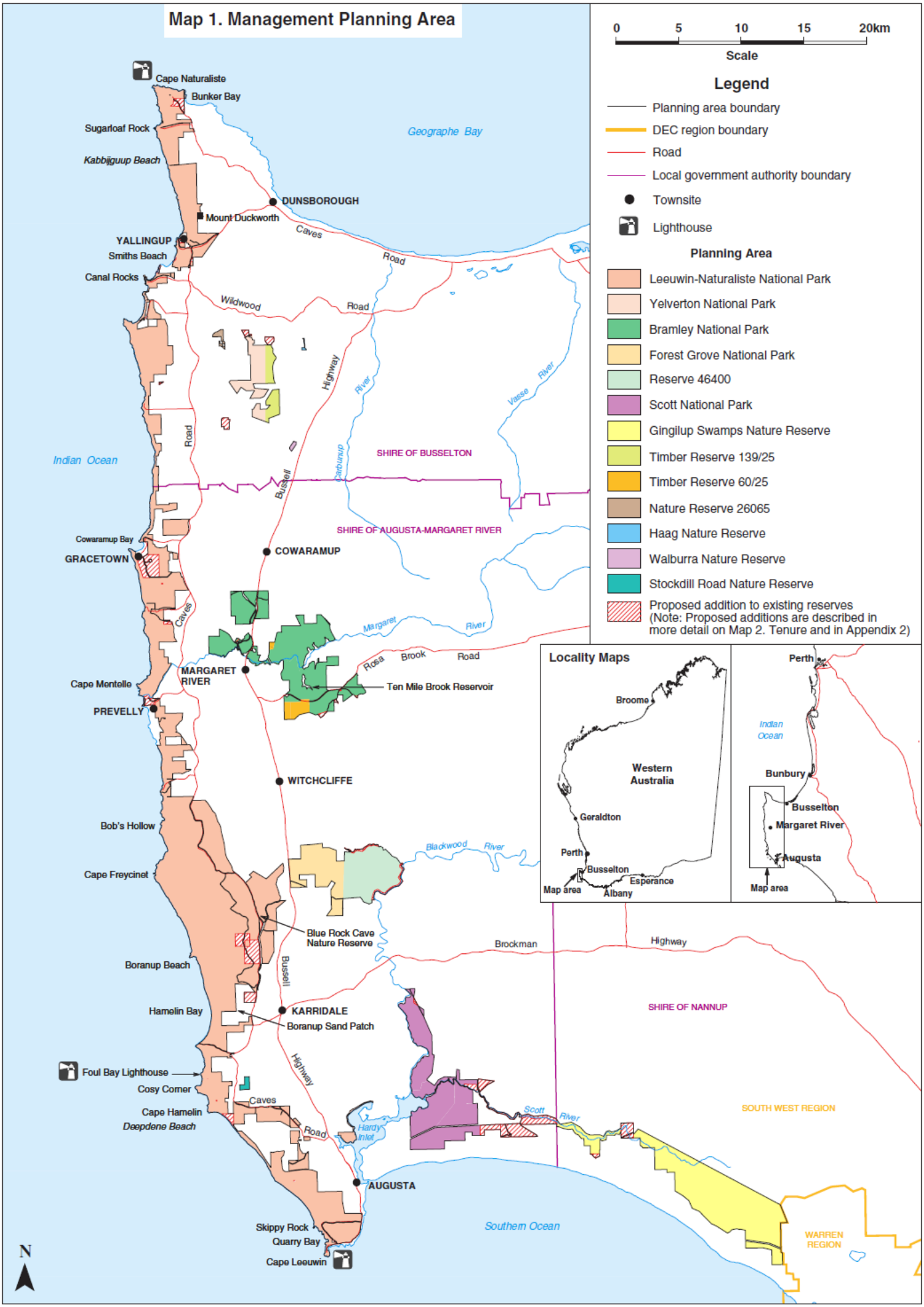
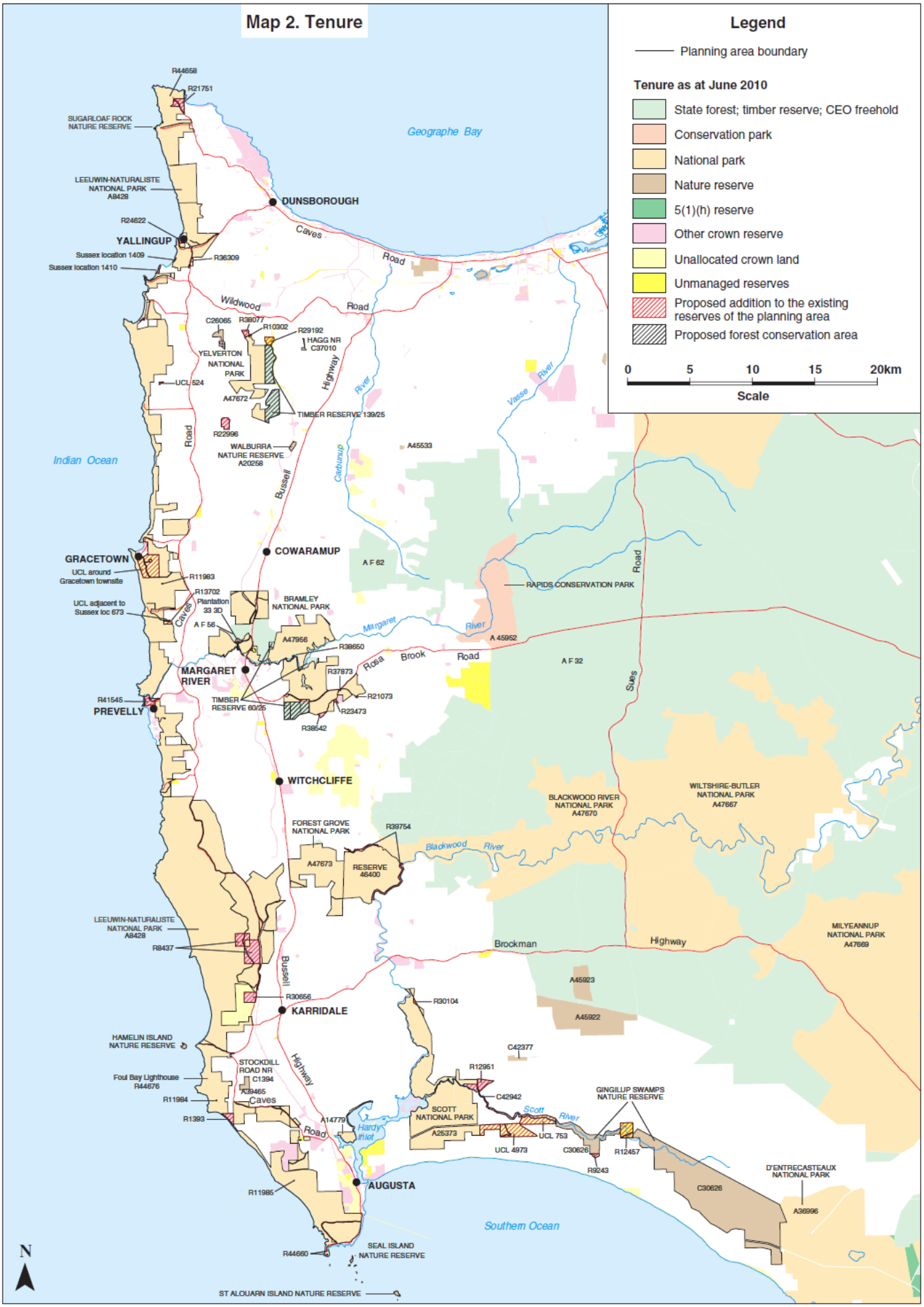
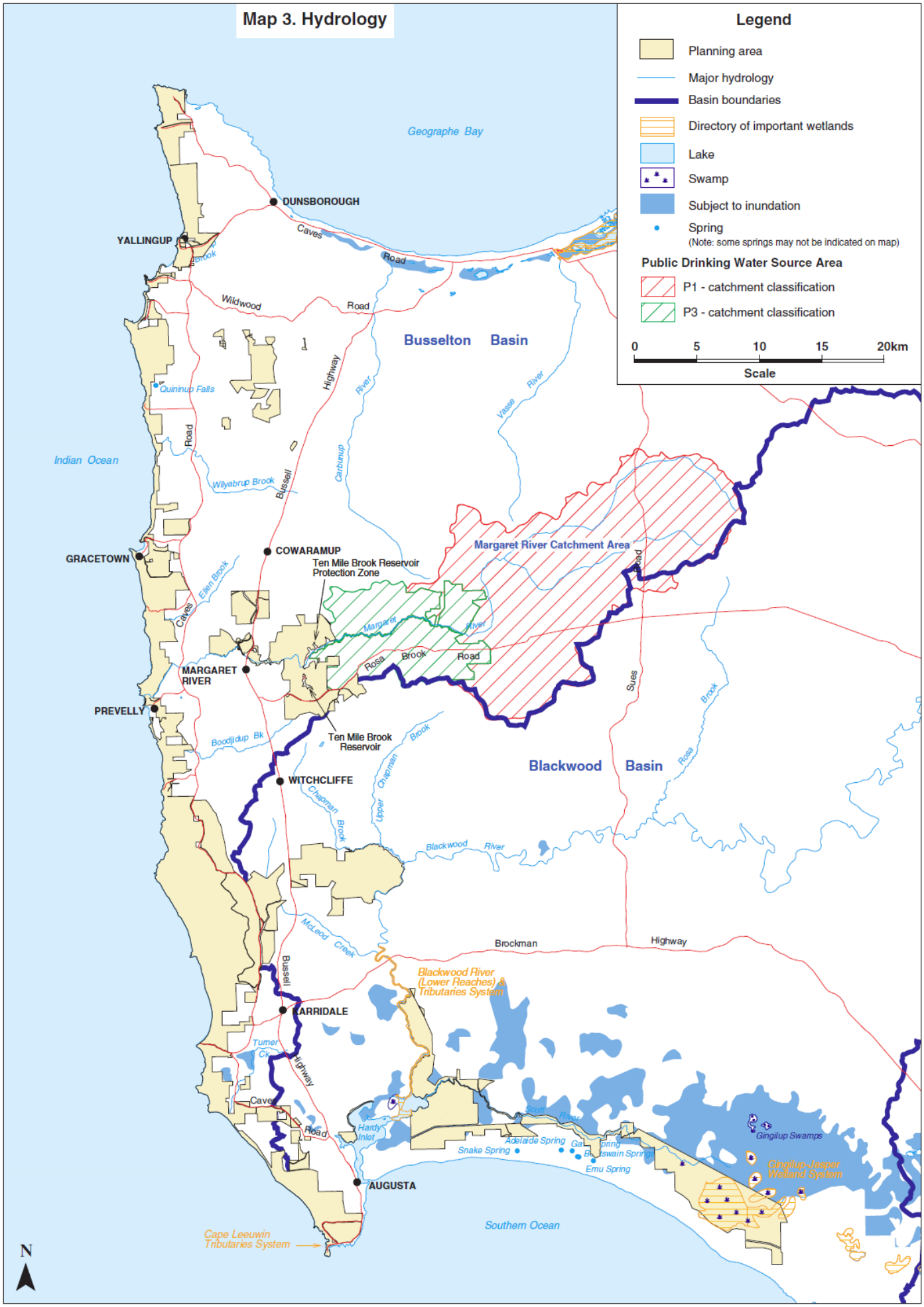
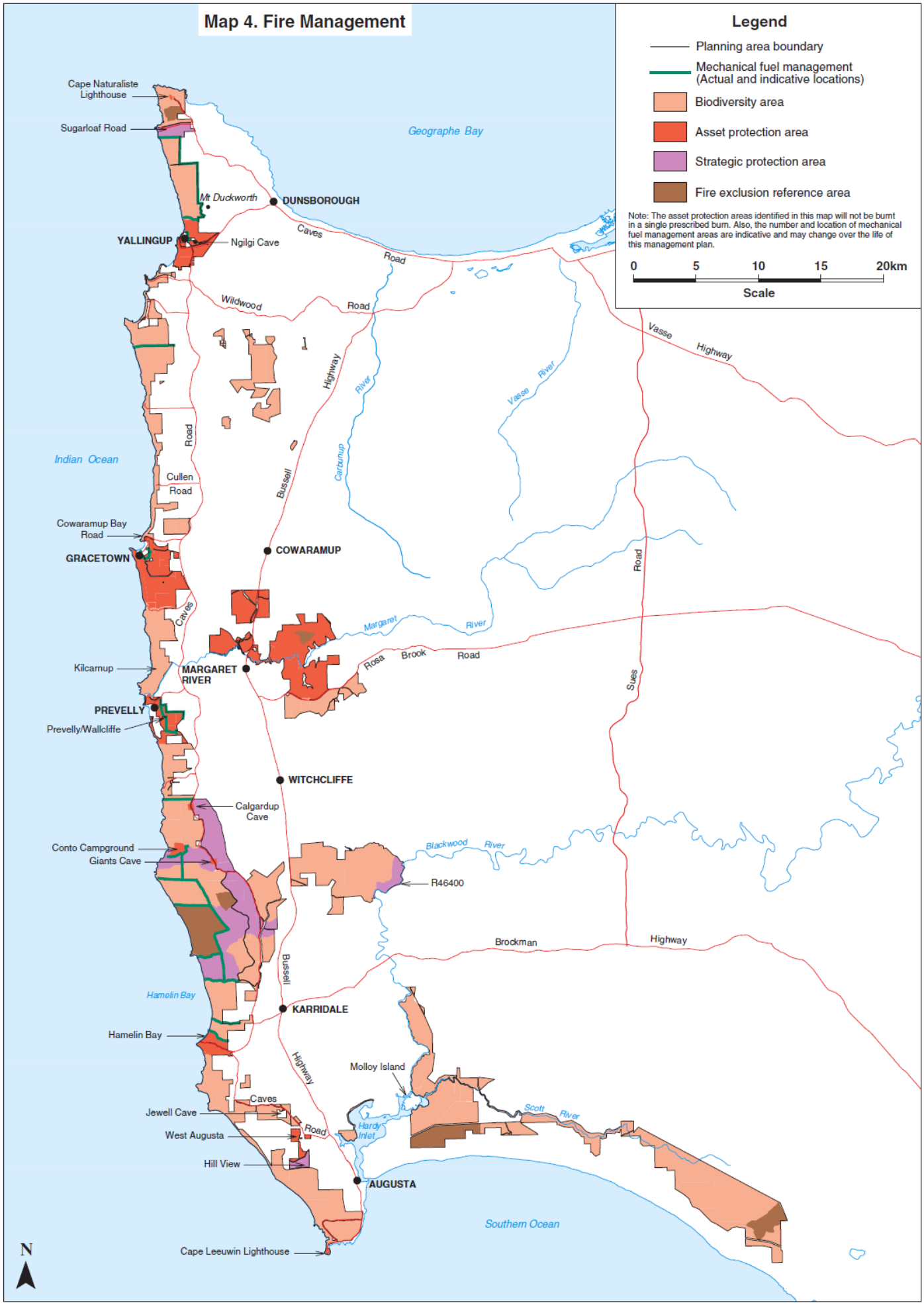
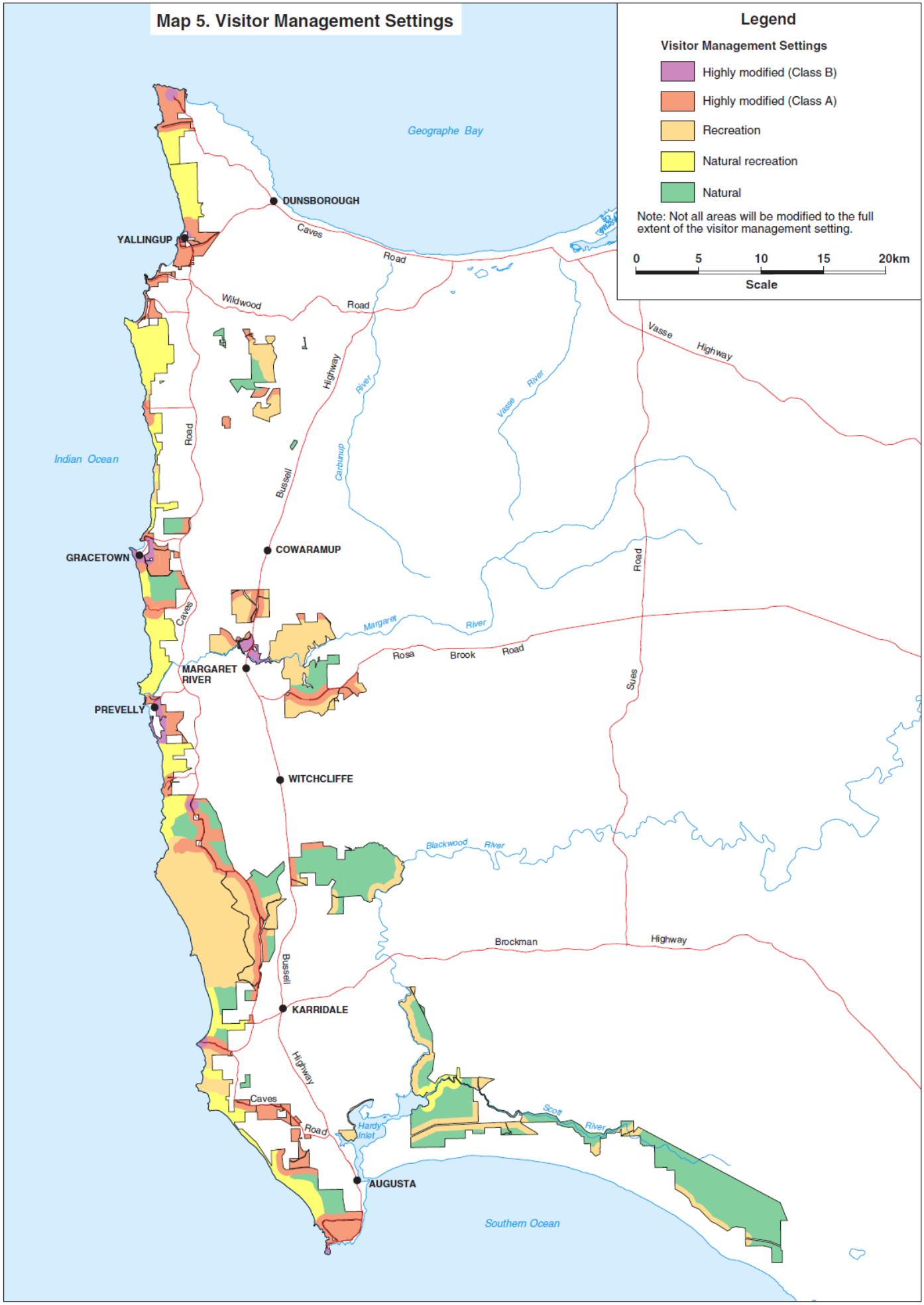

Map 1. Management Planning Area
0 5 10 15 20km
Scale
Legend
Planning area boundary
DEC region boundary
Road
Local government authority boundary
Townsite
Lighthouse
Planning Area
Leeuwin-Naturaliste National Park
Yelverton National Park
Bramley National Park
Forest Grove National Park
Reserve 46400
Scott National Park
Gingilup Swamps Nature Reserve
Timber Reserve 139/25
Timber Reserve 60/25
Nature Reserve 26065
Haag Nature Reserve
Walburra Nature Reserve
Stockdill Road Nature Reserve
Proposed addition to existing reserves (Note: Proposed additions are described in more detail on Map 2. Tenure and in Appendix 2)
Locality Maps
Broome
Western Australia
Geraldton
Perth
Busselton
Esperance
Albany
Map area
Perth
Indian Ocean
Bunbury
Busselton
Margaret River
Augusta
Map area
Cape Naturaliste
Bunker Bay
Sugarloaf Rock
Kabbijguup Beach
Geographe Bay
DUNSBOROUGH
Mount Duckworth
YALLINGUP
Smiths Beach
Canal Rocks
Caves Road
Wildwood Road
Highway
River
Vasse River
Road
Indian Ocean
SHIRE OF BUSSELTON
Busselt
Carbunup
SHIRE OF AUGUSTA-MARGARET RIVER
Cowaramup Bay
GRACETOWN
COWARAMUP
Caves
Margaret River
Rosa Brook Road
MARGARET RIVER
Ten Mile Brook Reservoir
Cape Mentelle
PREVELLY
WITCHCLIFFE
Bob's Hollow
Cape Freycinet
Blackwood River
Blue Rock Cave Nature Reserve
Brockman Highway
Boranup Beach
Busselt
Hamelin Bay
KARRIDALE
Boranup Sand Patch
SHIRE OF NANNUP
Foul Bay Lighthouse
Cosy Corner
Cape Hamelin
Deepdene Beach
Caves
Highway
Road
Hardy Inlet
Scott River
SOUTH WEST REGION
AUGUSTA
Skippy Rock
Quarry Bay
Cape Leeuwin
Southern Ocean
WARREN REGION
N

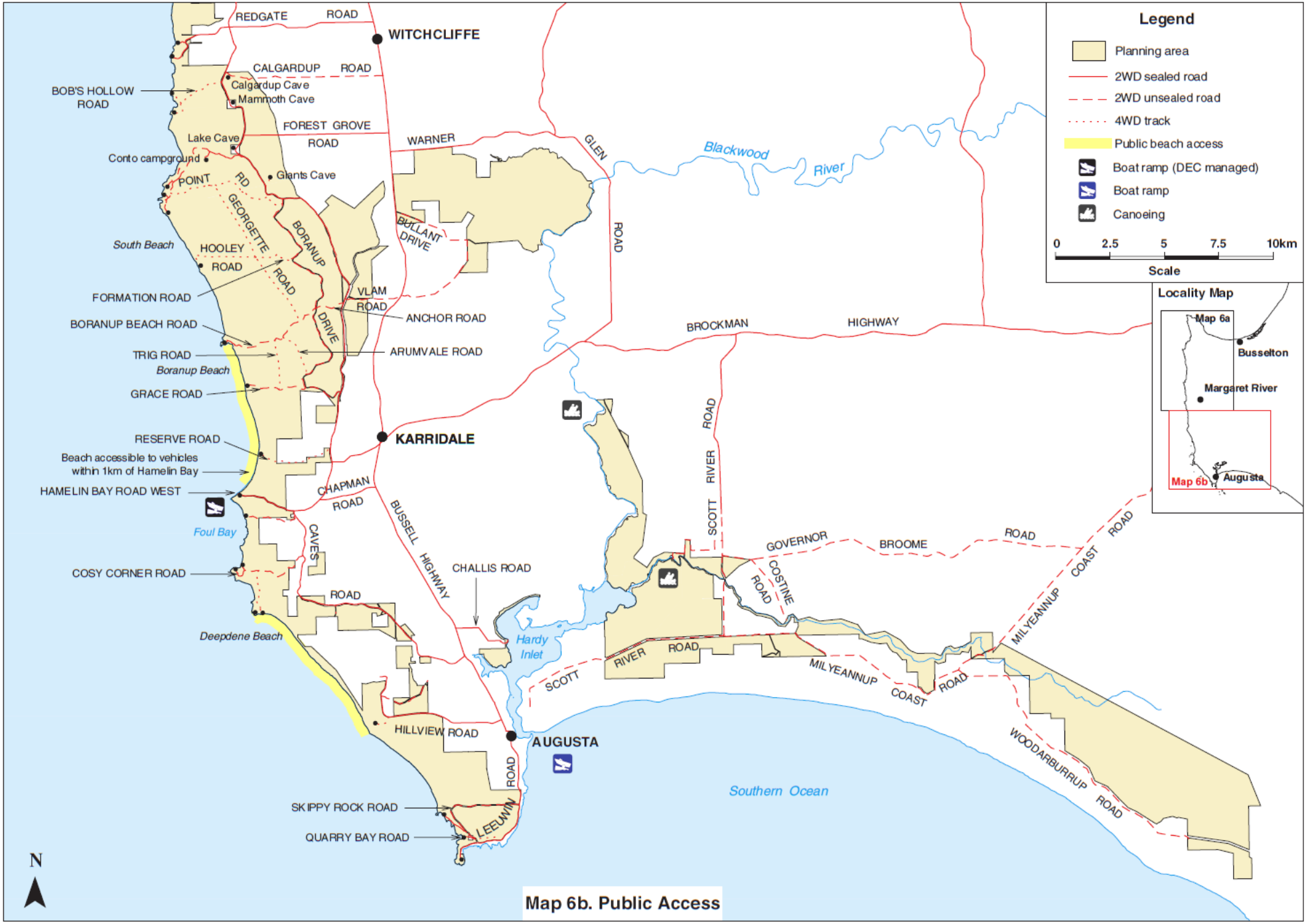

Map 2. Tenure
Legend
Planning area boundary
Tenure as at June 2010
State forest; timber reserve; CEO freehold
Conservation park
National park
Nature reserve
5(1)(h) reserve
Other crown reserve
Unallocated crown land
Unmanaged reserves
Proposed addition to the existing reserves of the planning area
Proposed forest conservation area
0 5 10 15 20km
Scale
Geographe Bay
Indian Ocean
Southern Ocean
DUNSBOROUGH
YALLINGUP
GRACETOWN
PREVELLY
MARGARET RIVER
COWARAMUP
WITCHCLIFFE
KARRIDALE
AUGUSTA
Caves Road
Wildwood Road
Bussell Highway
Carbunup River
Vasse River
Margaret River
Rosa Brook Road
Blackwood River
Brockman Highway
Scott River
Hardy Inlet
Sues Road
Road
SUGARLOAF ROCK NATURE RESERVE
LEEUWIN-NATURALISTE NATIONAL PARK A8428
YELVERTON NATIONAL PARK
HAGG NR C37010
TIMBER RESERVE 139/25
WALBURRA NATURE RESERVE A20258
BRAMLEY NATIONAL PARK
RAPIDS CONSERVATION PARK
TIMBER RESERVE 60/25
FOREST GROVE NATIONAL PARK
RESERVE 46400
BLACKWOOD RIVER NATIONAL PARK A47670
WILTSHIRE-BUTLER NATIONAL PARK A47667
MILYEANNUP NATIONAL PARK A47669
HAMELIN ISLAND NATURE RESERVE
STOCKDILL ROAD NR C1394
Foul Bay Lighthouse R44676
SCOTT NATIONAL PARK
GINGILUP SWAMPS NATURE RESERVE
D'ENTRECASTEAUX NATIONAL PARK
SEAL ISLAND NATURE RESERVE
ST ALOUARN ISLAND NATURE RESERVE
N


Map 3. Hydrology
Legend
Planning area
Major hydrology
Basin boundaries
Directory of important wetlands
Lake
Swamp
Subject to inundation
Spring
(Note: some springs may not be indicated on map)
Public Drinking Water Source Area
P1 - catchment classification
P3 - catchment classification
0 5 10 15 20km
Scale
Geographe Bay
DUNSBOROUGH
YALLINGUP
Caves Road
Wildwood Road
Busselton Basin
Quininup Falls
Highway
Vasse River
Carbunup River
Indian Ocean
Wilyabrup Brook
Bussell Road
GRACETOWN
COWARAMUP
Ten Mile Brook Reservoir Protection Zone
Margaret River Catchment Area
Ellen Brook
Caves Road
MARGARET RIVER
Margaret River
Rosa Brook Road
PREVELLY
Boodjidup Bk
Ten Mile Brook Reservoir
Sues Road
Brook
Blackwood Basin
WITCHCLIFFE
Chapman Brook
Upper Chapman Brook
Rosa Brook
Blackwood River
McLeod Creek
Brockman Highway
Bussell Highway
Blackwood River (Lower Reaches) & Tributaries System
KARRIDALE
Turner Ck
Caves Road
Hardy Inlet
Scott River
Gingilup Swamps
Adelaide Spring
Snake Spring
Emu Spring
Gingilup-Jasper Wetland System
AUGUSTA
Southern Ocean
Cape Leeuwin Tributaries System
N

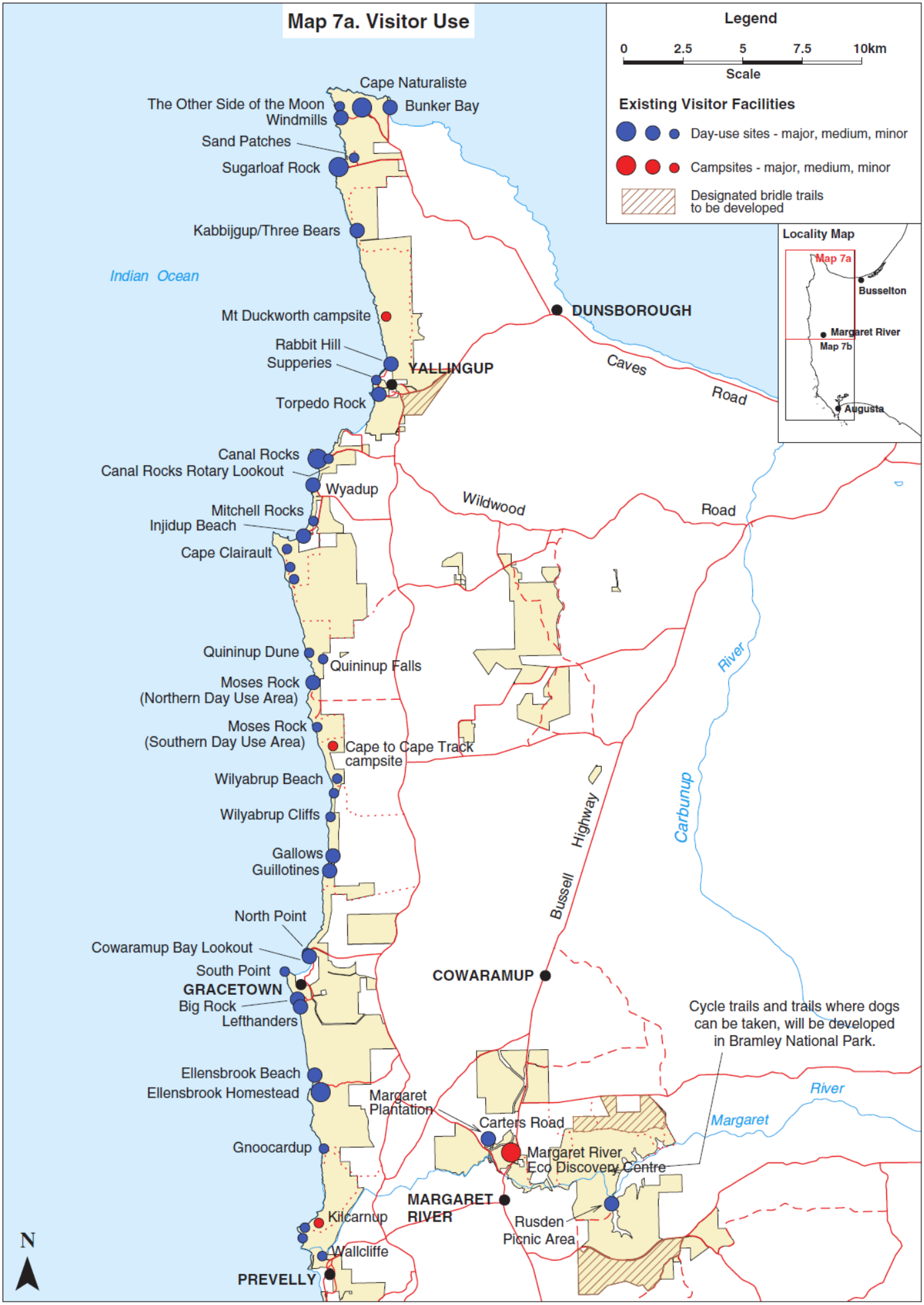

Map 4. Fire Management
Legend
Planning area boundary
Mechanical fuel management (Actual and indicative locations)
Biodiversity area
Asset protection area
Strategic protection area
Fire exclusion reference area
Note: The asset protection areas identified in this map will not be burnt in a single prescribed burn. Also, the number and location of mechanical fuel management areas are indicative and may change over the life of this management plan.
0 5 10 15 20km
Scale
Cape Naturaliste Lighthouse
Sugarloaf Road
Geographe Bay
Mt Duckworth
DUNSBOROUGH
YALLINGUP
Ngilgi Cave
Caves Road
Wildwood Road
Vasse Highway
Vasse River
Indian Ocean
Cullen Road
Bussell Highway
Carbunup River
Cowaramup Bay Road
GRACETOWN
COWARAMUP
Caves Road
Margaret River
Rosa Brook Road
Sues Road
Kilcarnup
MARGARET RIVER
PREVELLY
Prevelly/Wallcliffe
WITCHCLIFFE
Calgardup Cave
Conto Campground
Giants Cave
Blackwood River
R46400
Brockman Highway
Bussell Highway
Hamelin Bay
KARRIDALE
Hamelin Bay
Molloy Island
Caves Road
Jewell Cave
West Augusta
Hill View
Hardy Inlet
Scott River
AUGUSTA
Southern Ocean
Cape Leeuwin Lighthouse
N


Map 5. Visitor Management Settings
Legend
Visitor Management Settings
Highly modified (Class B)
Highly modified (Class A)
Recreation
Natural recreation
Natural
Note: Not all areas will be modified to the full extent of the visitor management setting.
0 5 10 15 20km
Scale
Geographe Bay
DUNSBOROUGH
YALLINGUP
Caves Road
Wildwood Road
Vasse Highway
Vasse River
Bussell Highway
Carbunup River
Road
Indian Ocean
GRACETOWN
COWARAMUP
Caves Road
Margaret River
Rosa Brook Road
Sues Road
MARGARET RIVER
PREVELLY
WITCHCLIFFE
Blackwood River
Brockman Highway
Bussell Highway
KARRIDALE
Caves Road
Hardy Inlet
Scott River
AUGUSTA
Southern Ocean

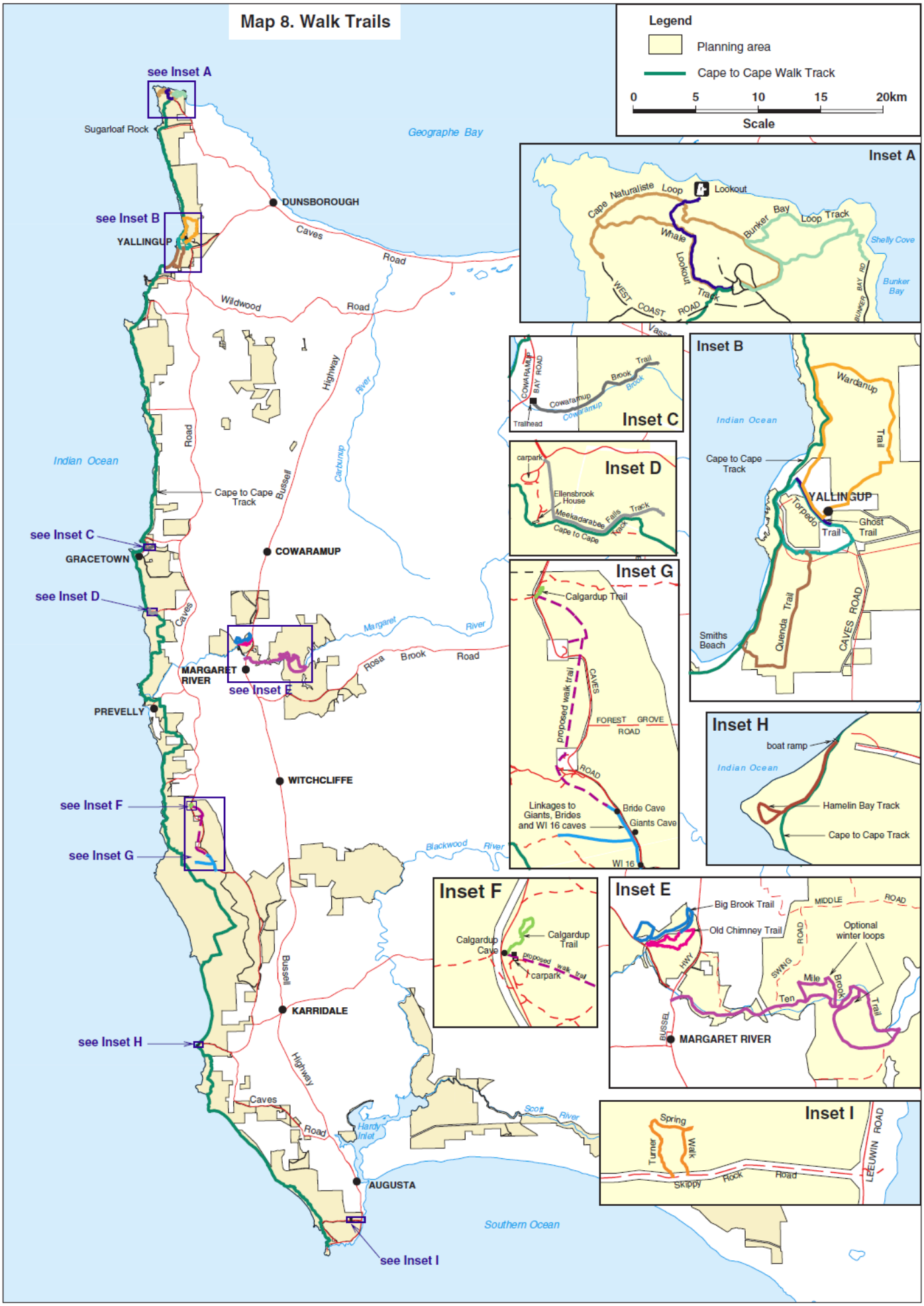

Map 6a. Public Access
Legend
Planning area
2WD sealed road
2WD unsealed road
4WD track
Boat ramp (DEC managed)
Boat ramp
Canoeing
0 2.5 5 7.5 10km
Scale
Locality Map
Map 6a
Busselton
Margaret River
Map 6b
Augusta
WEST COAST ROAD
Gull Rock
Sandpatches
SUGARLOAF ROAD
BUNKERS BAY ROAD
CAPE NATURALISTE ROAD
Kabbijgup Beach
Indian Ocean
DUNSBOROUGH
Rabbit Hill
YALLINGUP
CAVES ROAD
HEMSLEY ROAD
YALLINGUP BEACH ROAD
Canal Rocks
CANAL ROCKS ROAD
SMITHS BEACH ROAD
WYADUP ROAD
CAPE CLAIRAULT ROAD
WILDWOOD ROAD
THORNTON ROAD
ABBEYS FARM ROAD
BLYTH ROAD
QUININUP ROAD
MOSES ROCK ROAD
CAVES ROAD
YELVERTON ROAD
METRICUP YELVERTON ROAD
CARTER ROAD
METRICUP ROAD
River
BILJEDUP BEACH ROAD
ROAD
BUSSELL HIGHWAY
Carbunup
JUNIPER ROAD
COWARAMUP BAY ROAD
Cowaramup Bay
GRACETOWN
COWARAMUP
WIRRING ROAD
ROAD
TANAH MARAH ROAD
OSMINGTON ROAD
ELLEN BROOK ROAD
CARTER ROAD
BURNSIDE ROAD
GREY ROAD
River Margaret
MIDDLE ROAD
KILCARNUP ROAD
SWING ROAD
MARGARET RIVER
ROSA BROOK ROAD
MANEAR ROAD
ROAD
WALLCLIFFE ROAD
PREVELLY
WALLIS ROAD
WICKHAM ROAD
BESSELL ROAD
ROSA GLEN ROAD
REDGATE ROAD
WITCHCLIFFE
N

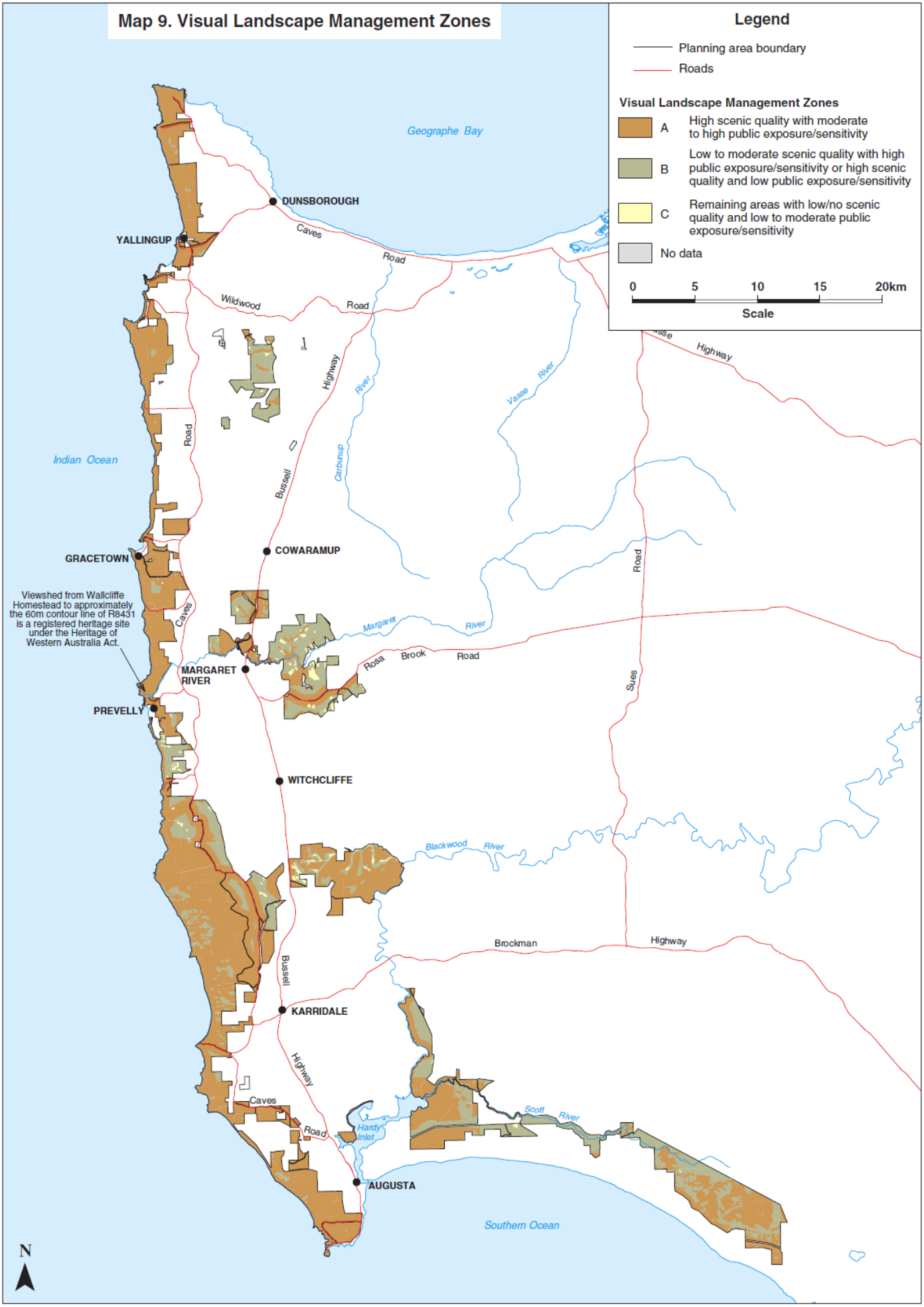


Map 6b. Public Access


Map 7a. Visitor Use
Legend
0 2.5 5 7.5 10km
Scale
Existing Visitor Facilities
Day-use sites - major, medium, minor
Campsites - major, medium, minor
Designated bridle trails to be developed
Locality Map
Map 7a
Busselton
Margaret River
Map 7b
Augusta
Cape Naturaliste
The Other Side of the Moon
Windmills
Bunker Bay
Sand Patches
Sugarloaf Rock
Kabbijgup/Three Bears
Indian Ocean
Mt Duckworth campsite
DUNSBOROUGH
Rabbit Hill
Supperies
YALLINGUP
Caves
Road
Torpedo Rock
Canal Rocks
Canal Rocks Rotary Lookout
Wyadup
Wildwood
Road
Mitchell Rocks
Injidup Beach
Cape Clairault
Quininup Dune
Quininup Falls
Moses Rock
(Northern Day Use Area)
Moses Rock
(Southern Day Use Area)
Cape to Cape Track
campsite
Wilyabrup Beach
Wilyabrup Cliffs
Gallows
Guillotines
North Point
Cowaramup Bay Lookout
South Point
GRACETOWN
Big Rock
Lefthanders
COWARAMUP
Bussell Highway
Carbunup River
Cycle trails and trails where dogs can be taken, will be developed in Bramley National Park.
Ellensbrook Beach
Ellensbrook Homestead
Margaret Plantation
Carters Road
Margaret River
Eco Discovery Centre
Margaret River
Gnoocardup
MARGARET RIVER
Kilcarnup
Rusden
Picnic Area
Wallcliffe
PREVELLY
N

Map 7b. Visitor Use


Map 8. Walk Trails
Legend
Planning area
Cape to Cape Walk Track
0 5 10 15 20km
Scale
see Inset A
see Inset B
see Inset C
see Inset D
see Inset E
see Inset F
see Inset G
see Inset H
see Inset I
Sugarloaf Rock
DUNSBOROUGH
YALLINGUP
Caves Road
Wildwood Road
Geographe Bay
Indian Ocean
Cape to Cape Track
Bussell Highway
Carbunup River
GRACETOWN
COWARAMUP
MARGARET RIVER
Margaret River
Rosa Brook Road
PREVELLY
WITCHCLIFFE
Blackwood River
KARRIDALE
Hardy Inlet
Scott River
AUGUSTA
Southern Ocean
Inset A
Cape Naturaliste Loop
Lookout
Bunker Bay Loop Track
Whale Lookout Track
WEST COAST ROAD
Shelly Cove
Bunker Bay
Inset B
Wardanup Trail
Indian Ocean
Cape to Cape Track
YALLINGUP
Torpedo Trail
Ghost Trail
Smiths Beach
Quenda Trail
CAVES ROAD
Inset C
COWARAMUP BAY ROAD
Cowaramup Brook Trail
Trailhead
Inset D
carpark
Ellensbrook House
Meekadarabee Falls Track
Cape to Cape
Inset G
Calgardup Trail
proposed walk trail
CAVES ROAD
FOREST GROVE ROAD
Linkages to Giants, Brides and WI 16 caves
Bride Cave
Giants Cave
WI 16
Inset H
boat ramp
Indian Ocean
Hamelin Bay Track
Cape to Cape Track
Inset F
Calgardup Cave
Calgardup Trail
proposed walk trail
carpark
Inset E
Big Brook Trail
Old Chimney Trail
MIDDLE ROAD
Optional winter loops
SWING BRIDGE ROAD
Mile Brook Trail
Ten
BUSSELL HWY
MARGARET RIVER
Inset I
Spring Walk
Turner
Skippy Rock Road
LEEUWIN ROAD


Map 9. Visual Landscape Management Zones
Legend
Planning area boundary
Roads
Visual Landscape Management Zones
A
High scenic quality with moderate to high public exposure/sensitivity
B
Low to moderate scenic quality with high public exposure/sensitivity or high scenic quality and low public exposure/sensitivity
C
Remaining areas with low/no scenic quality and low to moderate public exposure/sensitivity
No data
0 5 10 15 20km
Scale
Geographe Bay
Indian Ocean
Southern Ocean
DUNSBOROUGH
YALLINGUP
GRACETOWN
COWARAMUP
MARGARET RIVER
PREVELLY
WITCHCLIFFE
KARRIDALE
AUGUSTA
Caves Road
Wildwood Road
Bussell Highway
Vasse Highway
Carbunup River
Vasse River
Margaret River
Rosa Brook Road
Blackwood River
Brockman Highway
Scott River
Hardy Inlet
Sues Road
Viewshed from Wallcliffe Homestead to approximately the 60m contour line of R8431 is a registered heritage site under the Heritage of Western Australia Act.
N

APPENDICES

APPENDIX 1. KEY PERFORMANCE INDICATORS

Key values	Key objectives	Key performance indicators*		
		Performance measure	Target	Reporting requirements
Part B. Management directions and purpose	Section 10. Existing and proposed reserves			
Key values indicated throughout this table	To protect conservation reserves of the planning area by providing maximum security of tenure, class and purpose	10.1 Tenure actions for which the department and Conservation Commission are responsible	10.1 Complete all tenure actions for which the department and Conservation Commission are responsible within the life of the plan	After 5 years
Part C. Managing the natural Environment	Section 18. Soil and catchment protection			
An area that is part of one of 34 biodiversity hot spots in the world, and one of 15 national terrestrial biodiversity hot spots An area recognised for its endemic vascular plant species richness, particularly Scott National Park, which is rich in wetland area and type Reserves that represent invaluable remnants of vegetation that was once present along the Leeuwin-Naturaliste Ridge and Scott Coastal Plain, and is now predominantly cleared High concentrations of endemic taxa in Leeuwin-Naturaliste National Park and on the Scott Coastal Plain, with similar concentrations of locally endemic taxa in	To protect and conserve the soils and quality and quantity of water within the planning area, particularly in wetland, cave, lake, spring and river/stream systems and ironstone vegetation communities	18.1 Alterations in karst hydrology and the quantity and quality of water in selected caves, wetlands springs and creeks	18.1 Maintenance or increase in water quality and quantity in selected caves, wetlands, springs and creeks	Every 5 years subject to information provided by DoW
		18.2 The extent to which groundwater catchments of cave systems has been defined and spring and wetland areas have been investigated for their biological values	18.2 Identification of groundwater catchments of cave systems and investigations of spring and wetland areas for their biological values	
		18.3 Changes in the area of erosion (particularly coastal erosion)	18.3 Reduction from 2010 levels in the area of erosion occurring as a result of human activities	
	Section 19. Native plants and vegetation communities			
	To identify, protect and conserve native plants and vegetation communities	19.1 The persistence and condition of populations of threatened species	19.1 No loss or decline as a result of management actions	Every 5 years, or as per recovery plans if applicable

Key values	Key objectives	Key performance indicators*		
		Performance measure	Target	Reporting requirements
parks within the Blackwood Plateau Species at the limits of their range, including the northern limit for many south coast plant species and southern limit for many species of the Swan Coastal Plain. Cape Naturaliste is the only place where the jarrah forest meets the coast The occurrence of threatened and priority flora and fauna, TECs, critical weight-range mammals and species that are endemic, locally restricted, disjunct or relictual Transition zone between tropical and temperate seabird species A karst system of national and international significance, being the most extensive and thickest development of an aeolian limestone formation containing karst features in Australia Caves that support unique subterranean ecological communities of endemic and locally endemic aquatic invertebrate fauna A candidate wetland system for nomination under the Ramsar Convention on Wetlands Nationally important wetlands and wetlands of subregional significance that are important for the maintenance of ecological processes and linkages between ecological systems	Section 20. Native animals			
	The objective is to protect and conserve native animals and their habitats	20.1 Range and population size of critical weight range mammals	20.1 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
		20.2 Range and number of populations of selected locally endemic fauna species (white-bellied frog and Cape Leeuwin freshwater snail)	20.2 The range and number of populations of selected locally endemic fauna species is maintained or increased subject to natural variation	
	Section 21. Ecological communities			
	The objectives are to: 1. identify, protect and conserve threatened and other ecological communities of conservation significance; and 2. prevent negative changes to the ecological character of wetlands proposed for nomination under the Ramsar Convention on Wetlands	21.1 Thresholds of ecological change that have been identified for wetlands listed under the Ramsar Convention on Wetlands	21.1 Thresholds of ecological change are not exceeded for wetlands listed under the Ramsar Convention on Wetlands	Every 5 years after candidate site is listed under the Ramsar Convention on Wetlands
		21.2 The extent to which Rottnest Island tea-tree and potential *Calothamnus* heath and reedia swamps TECs have been defined	21.2 The location of Rottnest Island tea-tree and potential *Calothamnus* heath and reedia swamps TECs will be identified	After 5 years
		21.3 The extent to which aquatic invertebrate species composition of caves is determined	21.3 The aquatic invertebrate species composition of caves determined	
	Section 22. Environmental weeds			
	To minimise the impacts of environmental weeds on key values	22.1 Number and cover of environmental weed species rated as 'High' in the EWS or considered a local priority	22.1 Decrease in the number and cover of species rated as 'High' in the EWS or considered a local priority	Every 5 years
	Section 23. Introduced and other problem animals			
	To minimise the impacts of introduced and other problem animals on key values	23.1 Populations and area impacted by feral pigs	23.1 No increase in the number of populations or area impacted by feral pigs	Every 5 years

Key values	Key objectives	Key performance indicators*		
		Performance measure	Target	Reporting requirements
Regionally significant corridors that provide ecological linkages of contiguous ecosystems Distinctive wetland habitats in Leeuwin-Naturaliste National Park that support, a number of rare organisms such as rare snails, microbiolite formations and cave invertebrate fauna Fossil deposits of considerable importance to increasing the understanding of mammal extinction, with Tight Entrance cave containing a richer and more diverse assemblage of fossil vertebrates than any other Pleistocene deposit in the western half of Australia Caves and other geological features that give unique insights into a range of scientific pursuits (e.g. palaeoclimatology, archaeology, anthropology and palaeontology) as well as having value for teaching or as reference sites	Section 24. Disease			
	To ameliorate the impact and minimise the further spread of *P. cinnamomi* and other diseases	24.1 Infested areas within protectable areas that are a priority for protection	24.1 No new human-assisted infestations of *P. cinnamomi* in protectable areas that are a priority for protection (e.g. Scott Ironstone TEC)	Every 5 years
	Section 25. Fire			
	To protect and enhance biodiversity across the landscape and to protect life and community assets in and near the planning area	25.1 The extent of fire diversity measured by the diversity and scale of post-fire (seral) stages within a LCU	25.1 The distribution of post-fire fuel ages (time since fire) for each LCU approximates a negative-exponential distribution	Annually
		25.2 The impact of bushfire on life and community assets	25.2 No loss of life or significant community assets, or serious injury, attributable to the department's fire management	
		25.3 The extent to which targets have been prepared for significant habitats requiring specific fire regimes	25.3 Development of fire management guidelines for significant habitats requiring specific fire regimes (e.g. granite outcrops, riparian zones and wetlands, caves, coastal vegetation communities, Scott ironstone TEC)	Every 5 years
		25.4 The persistence of threatened species and TECs within each LCU	25.4 No loss of populations of threatened species or TECs at the LCU scale due to fire	

Key values	Key objectives	Key performance indicators*		
		Performance measure	Target	Reporting requirements
Part D. Managing Our cultural heritage	Section 26. Indigenous cultural heritage			
Confirmed evidence of early occupation by Aboriginal people (55 000 years before present), from archaeological deposits Artefacts in Devils Lair cave that make it one of the oldest occupation sites in Australia, providing a valuable record of past Aboriginal life in the Leeuwin-Naturaliste region Numerous other Aboriginal cultural sites of significance, particularly along the coast	To protect and conserve Indigenous cultural heritage in consultation with Aboriginal people	26.1 Disturbance of known or identifiable heritage sites	26.1 No disturbance to heritage sites as a result of department operations without formal approval	Every 5 years
Part E. Managing visitor use	Section 28. Planning for visitor use			
A significant recreation destination within the State, containing the most visited parks outside the Perth metropolitan area A terrestrial environment that provides opportunities for a wide range of predominantly coast and river-based recreation opportunities focusing on day-use at major attractions related to the coast, the forest or caves World-class surfing and a wide range of recreational fishing experiences The Cape to Cape Track, one of only two long distance walk tracks in WA	To provide visitors with a wide range of nature-based experiences while ensuring the impacts on key values are minimised	28.1 The range of visitor management settings over the life of the plan	28.1 Maintain visitor management settings over the life of the plan	Every 5 years
	Section 29. Visitor opportunities			
	To provide and maintain a range of sustainable, nature-based recreation opportunities	29.1 Visitor satisfaction levels	29.1 Maintain or increase in visitor satisfaction from 2010 levels	Annually
	Section 30. Visitor access			
	To provide and maintain a range of access types that is consistent with the maintenance of key values and the diverse range of visitor needs	30.1 Number of motor vehicles that are off-road or on unauthorised beaches as reported by department staff	30.1 No unauthorised use of motor vehicles off-road or on beaches	Annually
		30.2 Number and extent of dual use tracks along the Cape to Cape Track	30.2 Reduction from 2010 levels, in the number and extent of dual use tracks along the Cape to Cape Track	

Key values	Key objectives	Key performance indicators*		
		Performance measure	Target	Reporting requirements
Important caving and abseiling opportunities Areas of high scenic quality, including exceptional coastal scenery along the Leeuwin-Naturaliste Ridge Icon parks within the State, providing numerous commercial nature-based tourism opportunities and economic benefit from tourism expenditure		30.3 Visitor satisfaction levels regarding recreation at Hamelin Bay	Reduction from 2010 levels in visitor conflict over commercial fishermen travelling through the swimming beach at Hamelin Bay	
	Section 31. Visitor activities and use			
	To allow caving while ensuring protection of the ecological, archaeological, palaeontological and cultural values of the cave system	31.4.1 Changes in the number of illegal visitors to unauthorised caves	31.4.1 A decrease in illegal entry to unauthorised caves	Annually
		31.4.2 Amount of speleotherm breakage	31.4.2 No speleotherm breakage	
		31.4.3 Changes in the area of vegetation around high use caves	31.4.3 No increase in the area of de-vegetation around high use cave entrances	
		31.4.4 Level of 'off track' use	31.4.4 No unauthorised 'off track' use by visitors	
	To allow for fishing and marroning while minimising environmental impacts	31.7.1 Loss to dune vegetation	31.7.1 No loss of dune vegetation as a result of off-road vehicular activity	Every 5 years
A significant attraction to the region, providing an important backdrop for tourism and commercial opportunities	To provide opportunities for 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	31.8.1 Number of horse-riders in Boranup Forest east of Caves Road	31.8.1 No horse-riding in Boranup Forest east of Caves Road	Every 5 years
	To facilitate access for surfing and swimming where the environmental impacts are manageable and the risk to public health and visitor safety is acceptable	31.13.1 Area of foredunes and cliff vantage points eroded	31.13.1 Erosion of foredunes and cliff vantage points is reduced from 2010 levels	Every 5 years
		31.13.2 Number of new access tracks to the coast	31.13.2 Number of new access tracks to the coast is reduced from 2010 levels	
	To provide for organised special events where they meet the suitability criteria listed above and are cost-neutral to the department	31.14.1 The extent to which targets and guidelines for an events policy and a specific surfing policy have been prepared	31.14.1 Development of a specific surfing policy for the coast	After 5 years

Key values	Key objectives	Key performance indicators*		
		Performance measure	Target	Reporting requirements
	Section 33. Visitor safety			
	To maintain visitor experiences by minimising risks to public safety wherever possible	33.1 Percentage of accidents/incidents per visit reported annually to the department	33.1 The percentage of accidents/incidents per visit reported annually to the department remains stable or decreases from 2010 levels	Every 5 years
	Section 34. Domestic animals			
	To protect native fauna and visitors from the impacts of domestic animals	34.1 The number of dogs recorded outside of designated areas	34.1 A decreasing trend from 2010 levels in the number of dogs[1] recorded outside of designated areas	Every 5 years
	Section 35. Visual Landscape			
	To protect and enhance visual landscape values	35.1 Areas of high scenic quality	35.1 No permanent or long-term loss of high quality scenic areas	Every 5 years
Part F. Managing resource use	Section 39. Commercial fishing			
	To continue to allow access for commercial fishing subject to conditions that minimise the on-shore impacts to visitors and key values	39.1 Visitor satisfaction levels regarding recreation at Hamelin Bay	39.1 Reduction from 2010 levels in visitor conflict over commercial fishermen travelling through the swimming beach at Hamelin Bay	Every 5 years
		See KPI 31.6.1		
Part G. Involving the community	Section 45. Information, interpretation and education			
An important area for local communities of the Leeuwin-Naturaliste Ridge, contributing to their way of life, sense of identity and enjoyment of the natural environment An extensive range of interpretation and education programs at the Margaret River Eco Discovery Centre and guided interpretive experiences throughout the planning area	To promote community awareness, appreciation and understanding of key values and engender support for management activities	45.1 Participation in education programs offered at the Margaret River Eco Discovery Centre	45.1 Increase of at least 10 per cent in participation, including recurrent participation, in education programs offered at the Margaret River Eco Discovery Centre from 2010 levels	Every 5 years

Key values	Key objectives	Key performance indicators*		
		Performance measure	Target	Reporting requirements
Opportunities for visitors to interpret and acquire knowledge regarding natural and cultural values of the planning area				
Opportunities for community involvement in activities and experiences in nature conservation and visitor services Opportunities for involvement of individuals in various committees associated with the management of the planning area		45.2 Visitor numbers at major, medium and minor sites	45.2 An increase in visitation at major sites in comparison to medium and minor sites	Every 5 years

* Note: where there is a target shortfall for any of the key performance indicators, department will investigate the cause and report to the Conservation Commission for action.

1 Excludes dogs that are seeing-eye dogs or dogs required for emergency search and rescue purposes.

APPENDIX 2. MANAGEMENT PLAN AREA

This management plan area includes the following existing reserves managed under the CALM Act and proposed additions.

Existing CALM Act reserves

Reserve	Name	Current purpose	Vesting	Area (ha)
See Appendix 3	Leeuwin-Naturaliste National Park$^{\Delta}$	See Appendix 3	Conservation Commission	21,037.7
8436	Blue Rock Cave Nature Reserve (Proposed to be added to Leeuwin-Naturaliste National Park) $^{\Delta}$	Protection and preservation of caves and flora and for health and pleasure resort	Conservation Commission	10
39465 and 1394	Stockdill Road Nature Reserve$^{\Delta}$	Conservation of flora and fauna	Conservation Commission	56.42
44676	Un-named	Navigation, communication, meteorology, survey and conservation	Conservation Commission	0.04
47672	Yelverton National Park$^{\Delta}$	National park	Conservation Commission	729
Timber reserve 139/25	Timber reserve 139/25**	Timber reserve	Conservation Commission	420
37010	Haag Nature Reserve	Conservation of flora and fauna	Conservation Commission	9.26
20258	Walburra Nature Reserve	Conservation of flora and fauna	Conservation Commission	21.55
26065	Un-named nature reserve	Conservation of flora and fauna	Conservation Commission	55
47956	Bramley National Park$^{\Delta\,\infty}$	National park	Conservation Commission	3,892
Timber reserve 60/25	Timber reserve 60/25**	Timber reserve	Conservation Commission	250
47673	Forest Grove National Park$^{\Delta}$	National park	Conservation Commission	1,379
46400	Un-named national park	National park	Conservation Commission	1,571.1
25373	Scott National Park	National park and recreation	Conservation Commission	3,273
30626	Gingilup Swamps Nature Reserve	Conservation of flora and fauna	Conservation Commission	4,326
			TOTAL	**37,030.07**

* Leeuwin-Naturaliste National Park includes Reserve 13404, which has no legally gazetted area and therefore is not included in calculating the total area of the park.

** Proposed forest conservation area under the FMP.

$^{\infty}$ Land tenure under Ten Mile Brook Reservoir, an enclave within Bramley National Park, is timber reserve.

$^{\Delta}$ Reserves that are unofficially named. Some reserves names that comprise Leeuwin-Naturaliste National Park are gazetted.

Proposed additions

Proposed addition	Vesting	Purpose	Comments and recommended changes*
Leeuwin-Naturaliste National Park			
Part Reserve 24622 #	Shire of Busselton W.P.L. 21 Yrs	Public Recreation	Incorporated into Reserve 8428 on 30 June 2010
Reserve 23264 #	Shire of Busselton	Recreation	Incorporated into Reserve 8428 on 30 June 2010
Reserve 32132 #	Shire of Busselton	Rubbish Disposal Site	Incorporated into Reserve 8428 on 30 June 2010
Reserve 32136 #	Unvested	Gravel	Incorporated into Reserve 8428 on 30 June 2010
Reserve 36309	Commissioner of Main Roads and Shire of Busselton	Sand Quarry	Incorporate into Reserve 8428
Sussex location 1409	Unvested	UCL	The portion to the north and west to be added to Reserve 8428. These areas are nominally bound from the swimming beach by rocks to the west and the surf break reef/remnant headland to the north
Sussex location 1410	Unvested	UCL	Incorporate into Reserve 8428
Injidup development #	Freehold	No purpose	Lots 5531, 5532, 5545 and 5546 were ceded to the State pursuant to S20A of the *Town Planning and Development Act 1928* (now Planning and Development Act) for addition to Leeuwin-Naturaliste National Park. These lots were incorporated into Reserve 8428 on 30 June 2010. Lots 5532, 5545 and 5546 are subject to a restrictive covenant curtailing development without the consent of the former landowner
Lot 3 portion of Sussex location 777 #	Freehold	No purpose	As a condition of subdivision of the former Sussex location 777, a portion of land was transferred to the State for the purpose of "reserve for conservation". It was incorporated into Reserve 8428 on 30 June 2010
UCL 524 south of Sussex locations 348 and 4751	Unvested	UCL	Incorporate into Reserve 8428
Reserve 12503 #	Unvested	Quarry Gravel	Incorporated into Reserve 8428 on 30 June 2010
Lot 3 portion of Sussex location 1194 #	Freehold	No purpose	Incorporated into Reserve 8428 on 30 June 2010
UCL adjacent to Sussex location 673	Unvested	UCL	Incorporate into Reserve 8428
Reserve 13702	Unvested	Gravel	Incorporate into Reserve 8428
Reserve 8431 #	Shire of Augusta-Margaret River	Protection and preservation of caves and flora and for health and pleasure resort	The department is aware of the Shire's abiding interest in the Kilcarnup portion of this area and regards it as a key stakeholder. The Shire's desire to participate in future planning is also recognised. The unvested portion and the portion vested in the Shire was incorporated into Reserve 8428 on 30 June 2010
Reserve 20724 #	Unvested	Recreation	Incorporated into Reserve 8428 on 30 June 2010
Reserve 21769 #	Unvested	Recreation Golf Links	The western and northern portions were incorporated into Reserve 8428 on 30 June 2010
Reserve 8249 #	Unvested	Accommodation House Caves	Incorporated into Reserve 8428 on 30 June 2010
Blue Rock Cave Nature Reserve	Conservation Commission	Protection and Preservation of	Incorporated into Reserve 8428 on 30 June 2010

Proposed addition	Vesting	Purpose	Comments and recommended changes*
(Reserve 8436) #		Caves and Flora and for Health and Pleasure Resort	
Sussex location 4296 #	Unvested	No purpose	This location has been identified by DMP as a strategic lime resource. The western portion was incorporated into Reserve 8428 on 30 June 2010 to provide greater continuity and better reserve design
Reserve 34917 #	Shire of Augusta-Margaret River	Recreation	Incorporated into Reserve 8428 on 30 June 2010
Reserve 41545	Shire of Augusta-Margaret River	Recreation	A portion of Reserve 41545 east of surfers point and south of Margaret River be incorporated into Reserve 8428. The precise boundaries are being determined
Reserve 21751	Shire of Busselton	Recreation and Camping	Because of its conservation values and subject to the agreement of the Shire of Busselton, continue to conduct negotiations with a view to incorporating Reserve 21751 into Reserve 8428
UCL within the Gracetown townsite	Unvested	UCL	Gracetown has been earmarked for expansion in a proposal that incorporates a tourism site, about 140 residential lots on a 14.4 hectare site and improved infrastructure. This proposal will see about 235 hectares being added to Leeuwin-Naturaliste National Park (Reserve 8428).
Reserve 8437	WA Museum	Protection and Preservation of Caves and Flora and for Health and Pleasure Resort	Incorporate into Reserve 8428
Reserve 30656	Shire of Augusta-Margaret River	Quarry Lime Sand	This reserve is identified by DMP as a strategic lime resource but is recommended for incorporation into Reserve 8428 for its conservation value
Reserve 1393	Minister for Water Resources	Access to Water	Incorporate into Reserve 8428
Reserve 19020 #	Shire of Augusta-Margaret River	Recreation	This 484 hectare reserve comprises the Hillview golf course. The portion of this reserve south of Lawrence Road and south-west of Hillview Road was incorporated into Reserve 8428 on 30 June 2010 with the support of the Shire of Augusta-Margaret River, which has the vesting of the reserve.
Reserves 11982, 11983, 11984 and 11985 #	Unvested	Trigonometrical station	Incorporate into Reserve 8428. Access to these sites will be maintained
Boranup Drive road easement	Unvested	No purpose	Incorporate into Reserve 8428 as the department has undertaken maintenance of the road for many years
Nature reserves of the Leeuwin-Naturaliste Ridge			
Reserves 26065, 37010, 39465 and 1394	Conservation Commission	Conservation of flora and fauna	Change all reserves to class A nature reserve. Amalgamate reserves 39465 and 1394 into a single reserve.
Gingilup Swamps Nature Reserve			
Gingilup Swamps Nature Reserve - Reserve 30626	Conservation Commission	Conservation of flora and fauna	Change to class A nature reserve
Reserve 12457	Unvested	Water	Incorporate into Gingilup Swamps Nature Reserve
Reserve 9243^	Shire of Nannup	Camping	Because of its conservation values and subject to agreement of the Shire of Nannup, continue

Proposed addition	Vesting	Purpose	Comments and recommended changes*
			negotiations with a view to incorporating Reserve 9243 into Gingilup Swamps Nature Reserve
Reserve 42942	Conservation Commission	Nature Reserve	Incorporate into Gingilup Swamps Nature Reserve
UCL 753, 4973 and UCL along the Scott River between Reserve 42942 and UCL 753^^	Unvested	No purpose	Incorporate into Gingilup Swamps Nature Reserve
Scott National Park			
Scott National Park - Reserve 25373	Conservation Commission	National park and recreation	Under the CALM Act, the category of land referred to as national park includes recreation as a management objective. Therefore, 'Recreation' should be removed from the purpose of Scott National Park. The park boundary should be re-aligned to abut the Scott River.
Reserve 12951	Shire of Augusta-Margaret River	Water Camping and Recreation	Incorporate into Scott National Park
Reserve 30104	Unvested	Gravel	Incorporate into Scott National Park
Surveyed but unmade roads	Unvested	No purpose	Incorporate into Scott National Park
Reserve 46400 (Un-named National Park)***			
Reserve 46400	Conservation Commission	National park	Consolidate into Forest Grove National Park
Reserve 39754	Shire of Augusta-Margaret River	Public Recreation	Incorporate into un-named national park (Reserve 46400) where it adjoins the national park
UCL adjoining Reserve 39754 to the north	Unvested	No purpose	Incorporate into un-named national park (Reserve 46400)
Bramley National Park**			
Timber reserve 60/25	Conservation Commission	Timber Reserve	Incorporate the north-western portion of the reserve into Bramley National Park
Reserve 21073	Shire of Augusta-Margaret River	Recreation	Incorporate into Bramley National Park
Reserve 38542	Shire of Augusta-Margaret River	Gravel	Incorporate into Bramley National Park
Reserve 37873	Electricity Corporation	Government Requirements State Energy Commission	Incorporate into Bramley National Park
Reserve 38650	Shire of Augusta-Margaret River	Recreation	Incorporate part of the reserve into Bramley National Park where there is national park on both sides and north of the river where it adjoins the national park
UCL along the Margaret River	Unvested	UCL	Incorporate into Bramley National Park where there is national park on both sides of the Margaret River and where there is UCL on the north side of the river
Reserve 23473	Shire of Augusta-Margaret River	Sanitary Site	Incorporate western portion in Bramley National Park
Plantation (PR 33 3D)	Unvested	No purpose	Resolve issues of exotic species on the plot and liaise with the Forest Products Commission to incorporate into Bramley National Park
Yelverton National Park			
Reserve 38077	Shire of Busselton	Gravel	Excluding the area containing the Shire / Bush Fire Brigade infrastructure and incorporate into Yelverton National Park
Reserve 10302	Unvested	Water	Incorporate into Yelverton National Park

Proposed addition	Vesting	Purpose	Comments and recommended changes*
Reserve 29192	Unvested	Sand and Gravel	Incorporate into Yelverton National Park
Reserve 22996	Shire of Busselton	Recreation and Community Purposes	Incorporate into Yelverton National Park subject to the exclusion of the portion north-west of Pusey Road and the Wilyabrup Hall and car park

* All reserves added to the planning area should be class A.

** Should an alternative location be defined for the Margaret River by-pass, the current proposed alignment should be incorporated into Bramley National Park.

*** More investigation is required as to the suitability/value of adding the portion of Reserve 39754 south of Patmore Road and UCL along the Blackwood River to Reserve 46400, providing a link to Scott National Park.

Included as part of the reserve consolidation process for Leeuwin-Naturaliste National Park that was completed on 30 June 2010 (see Section 10 *Existing and Proposed Reserves*). The remaining seven proposed additions to Leeuwin-Naturaliste National Park that were not included as part of this process should be considered when appropriate.

^ At the time of printing, the Shire of Nannup objects to the proposal to remove the care, control and management of this reserve and incorporating it into Gingilup Swamps Nature Reserve

^ ^ Recommended under the draft *Augusta-Walpole Coastal Strategy* (WAPC 2007)

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APPENDIX 3. CONSOLIDATION OF LEEUWIN-NATURALISTE NATIONAL PARK

Reserve	Purpose	Area (ha)	Comments
7406	National Park and Water	91.9	Consolidated into Reserve 8428 on 30 June 2010
8427	Protection and Preservation of Caves and Flora and for Health and Pleasure Resort	686.1	The bulk of the reserve is vested in the Conservation Commission but Sussex Location 4309, which is part of the reserve, is vested in the Shire of Busselton. Although the reserve has been consolidated into the park, Sussex Location 4309 will continue to be vested in the Shire
8428	National park	507.8	Core reserve of Leeuwin-Naturaliste National Park
8429	National Park Act 103-1978	622	Consolidated into Reserve 8428 on 30 June 2010
8430	National Park Act 103-1978	318.1	Consolidated into Reserve 8428 on 30 June 2010
8432	National Park Act 103-1978	151.4	Consolidated into Reserve 8428 on 30 June 2010
8433	National Park Act 103-1978	215.3	Consolidated into Reserve 8428 on 30 June 2010
8434	Protection and Preservation of Caves and Flora and for Health and Pleasure Resort	2,206	The bulk of the reserve is vested in the Conservation Commission but Sussex locations 4171 and 4172, which are part of the reserve, are vested in the Augusta-Margaret River Tourism Association. Although the reserve has been consolidated into the park, Sussex locations 4171 and 4172 will continue to be vested in the Association
8435	National Park	192.2	Consolidated into Reserve 8428 on 30 June 2010
8438	Protection and Preservation of Caves and Flora and for Health and Pleasure Resort	498.3	The bulk of the reserve is vested in the Conservation Commission but Sussex Location 4174, which is part of the reserve, is vested in the Augusta-Margaret River Tourism Association. Although the reserve has been consolidated into the park, Sussex Location 4174 will continue to be vested in the Association
8694	National Park Act 103-1978	220.6	Consolidated into Reserve 8428 on 30 June 2010
8768	National Park	225.4	Consolidated into Reserve 8428 on 30 June 2010
10922	National Park Act 103-1978	167.8	Consolidated into Reserve 8428 on 30 June 2010
12507	National Park Act 103-1978	34	Consolidated into Reserve 8428 on 30 June 2010
13404	Recreation and ocean frontage	Legal area not gazetted (approx. 1,885)	The bulk of the reserve was vested in the Conservation Commission and was consolidated into Reserve 8428 on 30 June 2010. A section of Reserve 13404 south of Prevelly (45 ha) was vested in the Shire of Augusta-Margaret River. This section is now part of Reserve 41545, which is vested in the Shire
13984	Water and National Park	64.7	Consolidated into Reserve 8428 on 30 June 2010
14779	National Park	103.6	Reserve 14779 is remote from the park. The *Leeuwin-Naturaliste National Park Management Plan 1989-1999* recommended that it be included in Scott National Park
15633	National Park	709.4	Consolidated into Reserve 8428 on 30 June 2010
20455	National Park	754.3	Consolidated into Reserve 8428 on 30 June 2010
20548	National Park	2,325	Consolidated into Reserve 8428 on 30 June 2010
20849	National Park	252.3	Consolidated into Reserve 8428 on 30 June 2010
21451	National Park	790.1	Consolidated into Reserve 8428 on 30 June 2010
22673	National Park	1,074.9	Consolidated into Reserve 8428 on 30 June 2010
23286	National Park	87.4	Consolidated into Reserve 8428 on 30 June 2010
30826	National Park	328.1	Consolidated into Reserve 8428 on 30 June 2010
32376	National Park	1,865.7	Consolidated into Reserve 8428 on 30 June 2010

Reserve	Purpose	Area (ha)	Comments
35035	National Park	767.3	Consolidated into Reserve 8428 on 30 June 2010
35036	National Park	430.6	Consolidated into Reserve 8428 on 30 June 2010
40346	National Park	112.7	Consolidated into Reserve 8428 on 30 June 2010
41692	National Park	76.2	Consolidated into Reserve 8428 on 30 June 2010
42065	National Park	3,155.9	Consolidated into Reserve 8428 on 30 June 2010
42732	National Park	16	Consolidated into Reserve 8428 on 30 June 2010
44658	National park, navigation, communication, meteorology, survey, tourism and conservation	0.2	Reserves 44658 and 44660 are small reserves that contain the Cape Leeuwin and Cape Naturaliste lighthouses. Because of their particular purposes, it is not practical for these reserves to be consolidated into the national park. However, they will continue to be part of the park
44660	National park, tourism, navigation, communication, meteorology and survey	0.4	
47264	National Park	7.9	Consolidated into Reserve 8428 on 30 June 2010
47676	National park	93.1	Consolidated into Reserve 8428 on 30 June 2010
	TOTAL	**21,037.7**	

Note: All reserves within Leeuwin-Naturaliste National Park are vested in the Conservation Commission.

APPENDIX 4. GEOHERITAGE

Potential geoheritage of the planning area

Site/description	Significance	Management issues
Bunker Bay**		
❖ Exposures of granite and gneisses at Bunker Bay, particularly in a cliff face to the west of the bay where a magnificent sea cave has been cut into Proterozoic era gneiss	❖ illustrates the structural features of high-grade metamorphic rocks that has been separated from Tamala limestone of the Pleistocene period (0-2 M.B.P). ❖ stalactites that hang from Tamala limestone form a portcullis ruin	❖ vandalism of speleothems or cave decorations in the sea cave
Meekadarabee Tufa Barrier		
❖ A lime-saturated spring that has built a tufa terrace out of Tamala limestone to carry its waters completely over Ellen Brook. The barrier is about 2 metres thick and extends for more than 50 metres to a cave-like grotto	❖ possibly a unique phenomenon. ❖ calcium carbonate saturated spring near contact with Proterozoic crystalline basement rock. ❖ speleothems, notably flow stones, terraces and rimstone pools	❖ proposals to dam the valley for water supply and perhaps also to intercept by borehole the lime-saturated springs waters of the spring
Paleosols of Skippy Rock, Hamelin Bay and Cosy Corner		
❖ Near Cape Leeuwin in the coastal cliffs 600 to 800 metres north of Skippy Rock, mature fossil soils or paleosols separate distinctive limestone types. This contrasts the less mature paleosols at the southern point of Hamelin Bay	❖ mature paleosol and its cobble bed capping represent a considerable disconformity within the Tamala limestone, possibly corresponding to a major lowering of sea levels during a period of high glacial activity ❖ paleosols at Hamelin Bay possibly represent minor breaks in the dune building process ❖ Pleistocene relationships	❖ unmanaged development at or near cliff faces or the headland of Hamelin Bay

*Defined in a draft report and by Carter (1987).

** Significant natural place listed on the *Register of the National Estate*.

APPENDIX 5. VEGETATION COMPLEXES

Vegetation complexes (Havel and Mattiske 2000) of the planning area with 15 per cent or less of their Pre-1750 distribution in formal reserves.[58]

Vegetation complex	Total area of Pre-1750 distribution[59] (ha)	Pre-1750 distribution in proposed and existing formal reserves		Extant distribution (ha)	Extant distribution represented in the planning area		Percentage of extant distribution in formal reserves represented in the planning area
		(ha)	(per cent)		(ha)	(per cent)	
Blackwood (Bwy)	62	8	13	15	8	53	100
Cowaramup (C1)	18968	2417	13	5854	2321	40	96
Cowaramup (C2)	13683	853	6	2962	812	27	95
Cowaramup (Cw1)	6172	606	10	1390	585	42	97
Cowaramup (Cw2)	6652	269	4	855	258	30	96
D' Entrecasteaux (D5)	2838	280	10	139	139	100	50
Glenarty hills (H)	7701	663	9	1982	663	33	100
Glenarty hills (Hw)	2749	209	8	740	209	28	100
Metricup (Mv)	973	86	9	327	86	26	100
Treeton (T)	27818	2750	10	11805	1549	13	56
Treeton (Tw)	8723	464	5	2524	238	9	51
Wilyabrup (W2)	4101	67	2	741	66	9	99
Wilyabrup (Wr)	1,111	84	8	207	84	41	100
Wilyabrup (Ww2)	1,328	6	0	198	6	3	100
Yelverton (Y)	9,046	320	0	1543	6	0*	2
Yelverton (Yd)	2,214	38	2	614	35	6	92
Yelverton (Yw)	4,216	35	1	460	18	4	51

* Less than 1 per cent represented in the planning area.

[58] Figures for total area and percentages relate to the boundary of the WA Regional Forest Agreement area and have been obtained from datasets current to December 2003. Detailed site planning at a finer scale will require that the spatial extent of vegetation complexes be ground truthed.

[59] The area of Pre-1750 vegetation is based on data layers developed for the Regional Forest Agreement 1999 as updated.

APPENDIX 6. SPECIALLY PROTECTED AND PRIORITY FAUNA

			Conservation status		
Species	**Common name**	**Recovery plan**	**In WA**	**EPBC Act**	**IUCN Red List**
Austroassiminea letha	Cape Leeuwin freshwater snail	No	S1		VU
Calyptorhynchus banksii naso	Forest red-tailed black cockatoo	Yes	S1	VU	LC
Calyptorhynchus baudinii	Baudin's black cockatoo	Yes	S1	VU	EN
Calyptorhynchus latirostris	Carnaby's black cockatoo	Yes	S1	EN	EN
Cherax tenuimanus	Margaret River marron	No	S1	CR	VU
Dasyurus geoffroii	Chuditch, Western quoll	Yes	S1	VU	NT
Engaewa reducta	Dunsborough burrowing crayfish	Yes	S1	CR	
Galaxiella munda	Western mud minnow	No	S1		NT
Geocrinia alba	White-bellied frog	Yes	S1	EN	CR
Leipoa ocellata (National Plan)	Malleefowl	No	S1	VU	VU
Macronectes giganteus	Southern giant petrel	No	S1	EN	LC
Nannatherina balstoni	Balston's pygmy perch	No	S1	VU	DD
Phascogale tapoatafa ssp.	Brush-tailed phascogale, wambenger	No	S1		NT
Pseudocheirus occidentalis	Western ringtail possum	Yes (interim)	S1	VU	VU
Setonix brachyurus	Quokka	Draft in preparation	S1	VU	VU
Thalassarche cauta	Shy albatross	No	S1	VU	NT
Thalassarche chlororhynchos	Atlantic yellow-nosed albatross	No	S1		EN
Thalassarche melanophrys	Black-browed albatross	No	S1	VU	EN
Arctocephalus forsteri	New Zealand fur-seal	No	S4		LC
Falco peregrinus	Peregrine falcon	No	S4		LC
Neophoca cinerea	Australian sea lion	No	S4	VU	EN
Geotria australis	Pouched lamprey	No	P1		
Austromerope poultoni	Scorpion fly	No	P2		
Elapognathus minor	Short-nosed snake	No	P2		NT
Ninox connivens connivens	Barking owl (south-west)	No	P2		
Galaxiella nigrostriata	Black-stripe minnow	No	P3		
Ixobrychus flavicollis australis	Black bittern	No	P3		
Tyto novaehollandiae novaehollandiae	Masked owl (south-west)	No	P3		LC
Charadrius rubricollis	Hooded plover	No	P4		NT
Falcunculus frontatus leucogaster	Crested shrike-tit (south-west)	No	P4		LC
Falsistrellus mackenziei	Western false pipistrelle	No	P4		NT
Hydromys chrysogaster	Water rat, rakali	No	P4		LC
Macropus Irma	Western brush wallaby	No	P4		LC
Morelia spilota imbricata	Carpet python	No	P4 (S4)		
Psophodes nigrogularis oberon (National Action Plan for Australian Birds)	Western whipbird	No	P4		NT
Isoodon obesulus fusciventer	Quenda, Southern brown bandicoot	No	P5		LC

Scheduled species under the Wildlife Conservation Act

Fauna declared under the Western Australian Wildlife Conservation Act as likely to become extinct or rare, or otherwise in need of special protection:

- Schedule 1 (S1): Fauna that is rare or likely to become extinct.
- Schedule 4 (S4): Other specially protected fauna.

P1-5 = Priority Fauna (see *Glossary* for more information).

Terminology for scheduled species under the EPBC Act and the IUCN Red List

The definitions for threatened species categories are the same for the EPBC Act and IUCN Red List.

- Critically endangered (CR): Taxon facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered (EN): Taxon facing a very high risk of extinction in the wild in the near future.
- Vulnerable (VU): Taxon facing a high risk of extinction in the wild in the medium-term future.
- Near Threatened (NT): Taxon that is close to qualifying or likely to qualify for a threatened category in the near future.
- Least Concern (LC): Taxon considered to be widespread and abundant.
- Data Deficient (DD): Taxon for which there is insufficient information to assess the risk of extinction in the wild.

APPENDIX 7. ENVIRONMENTAL WEEDS

Species∞[60]	Common name	Invasive	Environmental impacts	State wide EWS rating
Asparagus asparagoides (WONS)	bridal creeper	Yes	Yes	High
Bromus diandrus	great brome	Yes	Yes	High
Euphorbia terracina	Geraldton carnation weed	Yes	Yes	High
Hyparrhena hirta○	tambookie Grass	Yes	Yes	High
Lagurus ovatus	hares tail grass	Yes	Yes	High
Leptospermum laevigatum	Victorian tea tree	Yes	Yes	High
Lupinus cosentinii	sandplain lupin	Yes	Yes	High
*Moraea flaccida**	one-leaf cape tulip	Yes	Yes	High
Pelargonium capitatum	rose pelargonium	Yes	Yes	High
Romulea rosea var. *australis*	Guilford grass	Yes	Yes	High
Sparaxis bulbifera	harlequin flower	Yes	Yes	High
Typha orientalis	bullrush	Yes	Yes	High
*Zantedeschia aethiopica**	arum lily	Yes	Yes	High
Aira caryophylla	silvery hairgrass			Moderate
Aira cupaniana	silvery hairgrass	Yes		Moderate
Anagallis arvensis	pimpernel	Yes		Moderate
Arctotheca calendula	cape weed	Yes		Moderate
Arctotheca populifolia	dune arctotheca	Yes		Moderate
Avena fatua Δ	wild oat	Yes		Moderate
Briza maxima	blowfly grass	Yes		Moderate
Briza minor	shivery grass	Yes		Moderate
Cardus pycnocephalus	slender thistle	Yes		Moderate
Carex divisa	divided sedge	Yes		Moderate
Crassula glomerata	no common name	Yes		Moderate
Crassula natans	no common name	Yes		Moderate
Cuscuta epithymum	dodder	Yes		Moderate
Cynodon dactylon Δ	couch	Yes		Moderate
Ehrharta longiflora	annual veldgrass	Yes		Moderate
Ehrharta villosa	pyp grass	Yes		Moderate
Erodium cicutarium	no common name	Yes		Moderate
Euphorbia peplus	petty spurge	Yes		Moderate
Ficus carica	fig	Yes	Yes	Moderate
Galium divaricatum	slender bedstraw	Yes		Moderate
Galium murale	small goosegrass	Yes		Moderate
Gladiolus caryophyllaceus	wild gladiolus	Yes		Moderate
Heliophila pusilla	no common name	Yes		Moderate
Holcus lanatus	yorkshire fog	Yes		Moderate
Hordeum leporinum	barley grass	Yes		Moderate
Hypochaeris glabra	smooth cat's ear flat weed	Yes		Moderate
Isolepis prolifera	budding club-rush	Yes		Moderate
Juncus bufonius	toad rush	Yes		Moderate
Juncus capitatus	capitate rush	Yes		Moderate
Lolium rigidum	annual rye grass	Yes		Moderate
Orobanche minor	lesser broomrape	Yes		Moderate
Parentucellia latifolia	common bartsia	Yes		Moderate
Parentucellia viscosa	sticky bartsia	Yes		Moderate
Paspalum dilatatum	paspalum	Yes		Moderate
Paspalum distichum	water couch	Yes		Moderate
Pennisetum clandestinum	kikuyu	Yes		Moderate
Pelargonium alchemilloides (NEAW)○		Yes		Moderate
Physalis peruviana	cape gooseberry	Yes		Moderate

[60] Results obtained from the WA Herbarium (February 2006) and consultation with department staff.

Species∞60	Common name	Invasive	Environmental impacts	State wide EWS rating
Pseudognaphalium luteoalbum	jersey cudweed	Yes		Moderate
Rorippa nasturtium-aquaticum	watercress	Yes		Moderate
Rubus discolor	rubi germ	Yes		Moderate
Samolus valerandi	no common name	Yes		Moderate
*Senecio diaschides**	ragwort	Yes		Moderate
Sigesbeckia orientalis	no common name	Yes		Moderate
Solanum linnaenum	no common name	Yes		Moderate
Solanum nigrum	no common name	Yes		Moderate
Sonchus asper subsp. *glaucescens*	no common name	Yes		Moderate
Stenotaphrum secundatum	buffalo grass	Yes	Yes	Moderate
Rorippa nasturtium-aquaticum Δ	no common name	Yes		Moderate
Tetragonia decumbens	sea spinach	Yes		Moderate
Trifolium campestre var. *campestre*	hop clover	Yes		Moderate
Trifolium dubium	suckling clover	Yes		Moderate
Trifolium glomeratum	ball clover cluster clover	Yes		Moderate
Trifolium subterraneum	subterranean clover	Yes		Moderate
Ursinia anthemoides	ursinia	Yes		Moderate
Vellereophyton dealbatum	white cudweed	Yes		Moderate
Vulpia myuros	rat's tail fescue	Yes		Moderate
Watsonia meriana var. *meriana*	watsonia	Yes	Yes	Moderate

* Declared species under the *Agriculture and Related Resources Protection Act* 1976 (as of 22 February 2004).
Δ Source: Ninox Wildlife Consulting (1994)
○ Source: Greg Keighery *pers. comm.*
WONS Weeds of National Significance
NEAW National Environmental Alert Weeds
∞ Several introduced *Eucalypt* species were also planted previously in species trial plots.

Environmental Weed Strategy 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
Invasiveness Ability to invade bushland in good to excellent condition or ability to invade waterways. (score 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 *Environmental Weed Strategy for WA (1999)*

APPENDIX 8. CONDITIONAL BURNING AREA CLASSIFICATIONS

Conditional Burning Area Classifications include:

a. Fire Exclusion Reference Areas* are areas (generally less than 500 hectares) where fire has been deliberately excluded to provide opportunities for a reference site for scientific studies of the effects of different fire regimes on the environment. These areas are broadly representative of the landscape within which they are located. The fire management objective is to protect these areas from bushfire and exclude fire in perpetuity.

b. 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.

c. 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.

d. 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.

e. Fire Exclusion – Habitat is an area identified as having special value as fauna or flora habitat because of its vegetation structure, species composition, seral stages, niche values or location.

f. Fire Exclusion – Silviculture is an area that contains regrowth that is sensitive to fire.

g. Fire Exclusion – Cultural is an area identified as having Indigenous or non-Indigenous cultural values that are sensitive to fire.

h. Specified Management 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. It may also included selected areas of major vegetation types that should not receive prescribed burning until a biological survey has been conducted on them.

* The selection criteria for Fire Exclusion Reference Areas is currently under review following a public comment period.

APPENDIX 9. DRAFT VISITOR MANAGEMENT SETTINGS

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Principle purpose	Maintain and restore the integrity of ecological processes and natural landscapes, maintain and restore biodiversity, and retain opportunities for solitude by maintaining or restoring the highest degree of biophysical naturalness and remoteness from permanent modern structures (*refer to Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	'Surrounding areas' provide a buffer to wilderness areas and are managed to support wilderness values. Conservation of significant natural and cultural values, with low level recreation.	Conservation of significant natural and cultural values, with low level recreation.	Conservation of significant natural and cultural values, with low to medium level recreation.	Moderate intensity recreation.	Moderate to high level recreation, education and interpretation. Group activities specifically catered for at many sites.	As per 'A' but with high level recreation, education and interpretation and permanent, commercial structures (e.g. shops, cafes, ecolodges).
Description	Natural areas with an NWI rating of ≥12. Wilderness areas are large and remote (8,000 hectares in temperate areas, 20,000 in arid, semi-arid and tropical), with minimal evidence of modern human activity (*refer to Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	Provides a buffer to wilderness areas that assist in maintaining wilderness values in adjacent areas.	Remote areas with conservation significance. Some evidence of previous development in process of rehabilitation, or existing activity related to management tracks/trails, designated four-wheel drive tracks and walking tracks.	Modified environment, dominated by natural vegetation and landscapes of conservation significance. Signs of past use evident.	Modified environment but includes areas with 'natural' landscape values. Exotic plants may be present but rarely dominant. Recreation facilities present.	Highly modified environment with a moderate to high level of nature-based development set in a mostly natural landscape. Signs of human activity are a regular feature.	As per 'A' but with a higher level of development. Facilities and services set in a modified natural landscape (e.g. exotic plants present). Includes structures for commercial purposes.

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Access (standards and type of transport used)	Vehicles: any form of mechanised transport is not permitted within wilderness, except for emergency or essential management operations, or reasons of cultural importance. Walk: constructed tracks, signs, track markers and toilets are not permitted, and walking access is via natural routes. AS Walking Track standard 6 only. Existing vehicle tracks and built walking tracks, other than those required for emergency and essential management purposes, will be closed. Aircraft: landing of non-fixed wing aircraft is permitted for emergency and essential research purposes only. Flying under 2,000 feet for fixed wing aircraft and 1,500 feet for helicopters above wilderness is discouraged, except for emergency or essential research purposes.	Vehicles: mechanised transport is permitted on designated access routes and in other areas for emergency or essential management reasons only. Walk: AS Walking Track class 5-6; tracks generally formed (class 6 tracks not formed).	Vehicles: four-wheel drive only. Walk: AS Walking Track class 4 to 6; tracks generally formed (class 6 tracks not formed). Boats: non-motorised boats only. Cycle: type 4 cycle trail. Horses: not permitted. Airstrip: no airstrips permitted.	Vehicles: four-wheel drive, sometimes 2WD (seasonal). Walk: AS Walking Track class 3 to 5; tracks formed. Boats: motorised and non-motorised, on designated routes/areas. Cycle: type 4 cycle trail. Horses: designated bridle trails possible. Airstrip: natural earth.	Vehicles: 2WD unsealed. Walk: AS Walking Track class 2 to 4; tracks generally formed. Boats: motorised and non-motorised, on designated routes/areas. Cycle: types 2 & 3 cycle trails. Horses: designated bridle trails possible. Airstrip: unsealed.	Vehicles: 2WD sealed. Walk: AS Walking Track class 1 & 2; tracks well constructed; universal access provided where appropriate and practical Boats: Areas may be open to all types of boats. Cycle: type 1 cycle trail. Horses: designated bridle trails possible. Airstrip: sealed.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Site modification (Extent, type and design of infrastructure and facilities, and the style of accommodation provided)	No site modification and no facilities or structures, except existing cultural structures that are essential for reasons of visitor safety, resource protection and/or management operations. Any rehabilitation or repair of worn trails or sites is unobtrusive, with no long-term or permanent marking or hardening of trails or sites. Overnight Stays: camp sites not defined but includes 'Wild' or 'Remote' camping. Day Use: sites not defined. Walking: tracks are not defined.	Services and infrastructure adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of such areas should be avoided where possible. Overnight Stays: camp sites not defined. Day Use: sites not defined.	Minimal modification at sites. 'No Facilities' level of development. Overnight Stays: camp sites not defined. Day Use: car parking not defined. Facilities: none provided.	Minor modification at specific sites. 'Medium' and 'Low' level of development. Overnight Stays: camp sites generally defined. Day Use: car parking generally defined. Facilities: basic facilities may be provided such as shade shelters, BBQs, toilets.	Modification of sites evident. 'Medium' level of development. Overnight Stays: camp sites generally defined; nature-based built accommodation either single structure (e.g. shack/hut) or semi-permanent multiple structures (e.g. safari camp). Day Use: car parking area defined. Facilities: generally provided such as shade and interpretive shelters, gas BBQs, tables, toilets.	Modification of site clearly evident. 'Medium' to 'High' level of development. Overnight Stays: nature-based built accommodation with multiple structures. Moderate level of facilities and services (safari camp, ecolodge). Day Use: defined car parking and bays. Facilities: High level of facilities including shade shelters, gas BBQs, tables, toilets, rubbish collection, visitor information shelter / building.	Modification of site clearly evident. 'High' level of development. Overnight Stays: built accommodation with a high level of facilities and services (e.g. ecolodge, motel style). Day Use: as per 'A'. Facilities: As per 'A' but visitor centres and/or permanent structures for commercial purposes (shops, café's) may be present.

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Social interaction (Density of users and degree of interaction and opportunities for solitude)	Interaction between users is minimal. Usually less than two other groups encountered during a day, and no groups within sight or sound at camp sites. Maximum group size of about six to eight people.		Little interaction between users, with small numbers of brief encounters with individuals or small groups, except at camp sites.	High likelihood of contact with individuals and small groups along access routes and at camp sites.	High level of contact with others at camp sites and along access routes. Camp site design allows for group camping.	Constant interaction expected. Group and family activities important part of visitor experience. Interaction with others unavoidable. Natural setting important but in the security of a safe and managed environment.	
Degree of self reliance (level of support services)	Visitors must be totally self-reliant as support services are inappropriate and not provided (except where necessary to protect wilderness values). Commercial tourism and recreation operators not permitted in wilderness.		Visitors must be totally self-reliant. Support services infrequent or unreliable.	Visitors must be largely self-reliant. Basic support services provided in specific locations.	Self-reliance requirements are generally low where facilities are provided, but outdoor skills will be important in areas away from roads and tracks.	Minimal self-reliance. High level of support facilities present or in close proximity.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		Natural	Natural - Recreation	Recreation	Highly modified	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
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 trail information in brochures. Boundary signage only. Very infrequent ranger presence. Constraints on visitors may apply to areas subject to resource use. Where possible, activities required for fire management will be conducted outside of wilderness. This includes construction and maintenance of access roads, fire access tracks, fuel-reduced buffers and water points. Prescribed burning may be carried out for the protection and maintenance of ecological values and processes as determined through the preparation of area and regional management plans and interim management guidelines.	Activities, including services and infrastructure, adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of these areas should be avoided where possible (such activities are not permitted within wilderness). Surrounding areas to be managed to complement wilderness and provide a buffer.	Infrequent DEC presence. Information principally off-site (e.g. brochures, guides, maps); minimal signs. Low maintenance.	Some management presence including visits by DEC staff and signs. Information may be provided on-site. Permit system may be used to control access; emphasis on establishing appropriate visitor expectations and behaviour.	May be frequent ranger presence. Interpretive material, brochures and track guides available. Moderate on-site management requirements, including signs and barriers; facilities may be common but clustered.	Frequent staff presence, on-site manager. Could be interpretative and education focus. High degree of on-site management including use of physical barriers and on-site staff; vehicle and pedestrian movement heavily controlled.	
Interpretation facilities and services	Signposting not provided on site, although some information provided off-site (e.g. websites, books, DEC offices).	Signposting often not provided but may be at start of pedestrian tracks and/or may be noted on wilderness interpretive signposting (located in 'surrounding area').	Signposting may be provided at trailheads; track markers and signs may occur for public health or safety reasons (e.g. at track junctions). Some guided tours may be permitted (see below).	Signposting may be provided where necessary. Interpretive material off-site or at trailheads; guided tours permitted.	Well signposted at trailheads and along track. Interpretive shelters, displays and leaflets, guided tours may be provided. Primary themes may be expressed at recreation sites. Extensive range of opportunities.	Well signposted at trailheads and along track. Interpretive shelters, displays and leaflets, guided tours may be provided; visitor centre may be present. Primary themes may be expressed at recreation sites. Extensive range of opportunities.	

	Wilderness Area (as recognised in *Policy 62 – Identification And Management of Wilderness and Surrounding Areas*)		**Natural**	**Natural - Recreation**	**Recreation**	**Highly modified**	
	1A - Wilderness	**1B – 'Surrounding areas'**				**A**	**B**
Commercial uses	Commercial recreation and tourism operations are not permitted (*see section 4.3 of Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	All tourism management operations will be carried out in a manner consistent with maintaining the qualities of wilderness. CTOs permitted, but may need to consider restricted licences to maintain adjacent wilderness qualities (E class).	CTO licences permitted, but may consider regulating numbers to maintain visitor experiences consistent with setting (E class). Focus on nature-based/cultural activities. Leases generally not permitted, or if allowed then setting revised.	CTO licences permitted with focus on nature-based/cultural activities. Leases permitted in appropriate tenure and subject to strict sustainable conditions.	CTO licences permitted, nature-based/cultural and adventure activities. Leases permitted	CTO licences permitted, nature-based/ cultural and adventure activities. Leases permitted.	
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. Educational and/or recreation expeditions will be permitted within wilderness providing they are consistent with maintenance of the qualities of the area and operate according to DEC's code of ethics (*see Attachment 2 of Policy 62 – Identification And Management of Wilderness and Surrounding Areas*).	Activities adjacent to wilderness that may impact on landscape values and/or otherwise degrade the quality of such areas should be avoided where possible, and all recreation and tourism management operations will be carried out in a manner consistent with maintaining the qualities of wilderness.	Opportunities for solitude, independence, closeness to nature, tranquillity and self-reliance in an environment that offers a high degree of challenge. Although the activity may not be based on the use of a motorised vehicle, the influence of vehicles and the safety afforded by them may be significant.	Opportunities for challenging interaction with nature using outdoor skills. Opportunities may have human elements but still high probability that visitors can experience isolation from human influences.	Opportunities to interact with nature while still having access to facilities. Interaction with others expected.	Opportunities for nature appreciation and social interaction in a safe environment. Facilities support group activities. Interaction with others unavoidable.	

*Wilderness areas are classified under section 62(1)(a) of the *Conservation and Land Management Act 1984* to establish management zones to which specific management prescriptions or regulations apply.

Sources: Policy Statement No. 62 – Identification And Management of Wilderness and Surrounding Areas (CALM 2004), The Recreation Opportunity Spectrum (Clark and Stankey 1979)

APPENDIX 10. MOTOR VEHICLE ACCESS

The type of access provided affects the level and type of use of an area and supports the strategic approach to recreation planning identified in Section 30 *Visitor Access*. This Appendix details the roads and tracks that will remain open for the public or for management vehicle access (see Maps 6 and 7).

Motor vehicle access to the planning area has been categorised into the following:

- 2WD sealed (public access suitable for all motor vehicles);
- 2WD unsealed (public access suitable for all motor vehicles);
- four-wheel drive (public access on unsealed roads 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). Access for walkers is permitted;
- Closed (closed to all vehicles).

Roads and tracks shown in Maps 6 and 7 will remain open to the public. Any roads or tracks not shown on these maps or listed in this Appendix may be temporarily or permanently closed or restricted to management only. The draft masterplan for the Cape to Cape Track specifically indicates management tracks that will be closed to preserve the experience of walking along the track.

Vehicle access strategy

Road/track	LNNP Management Plan 1989-1999	Current level of access	Proposed management and comments
Leeuwin-Naturaliste National Park			
Bunkers Bay Road	Open – 2WD sealed	Open – 2WD sealed	Open – 2WD sealed
Cape Naturaliste Road	Open – 2WD unsealed	Open – 2WD sealed	Open – 2WD sealed
West Coast Road	Open – 2WD unsealed	Open – 2WD unsealed	Open – 2WD sealed
Track to Gull Rock	No recommendation	Open – 2WD unsealed	Open – 2WD sealed
Track to Sandpatches	No recommendation	Open – four-wheel drive	Open – 2WD sealed
Tracks north and parallel to Sugarloaf Road	No recommendation	Open – four-wheel drive	Close – for conservation reasons. Tracks rarely used
Track to Three Bears/Kabbijgup	Open – four-wheel drive	Open – four-wheel drive	Open – four-wheel drive. Access along the Cape to Cape Track will be prohibited. Should subdivisions be approved adjoining the park, access may be upgraded
Tracks north, south and parallel with track to Three Bears/Kabbijgup	No recommendation	Open – four-wheel drive	Close – track is overgrown and duplicates existing track to Three Bears /Kabbijgup
Track to Rabbit Hill	No recommendation	Open – 2WD sealed	Open – 2WD sealed
Tracks in Yallingup Ranger house block	No recommendation	Close – Management only	Management only
North-south track from Yallingup cricket pitch	No recommendation	Open – four-wheel drive	Close – track duplication
Tracks in adjoining Smiths Beach	No recommendation	Close – Management only	Management only
North and south access to Injidup Point	No recommendation	Proposed to be closed but still accessible by four-wheel drive	Close – access to the Point from the north is steep and from the south there are conflicts with the Cape to Cape Track and potential TEC. The Point is prone to erosion and is being rehabilitated. It can be accessed on foot via the beach. Coastal four-wheel drive access can be gained further south
Track to Quinninup Dune	No recommendation	Open – four-wheel drive	Open – four-wheel drive but control access to Quinninup Dune by terminating the car park at the edge of

Road/track	LNNP Management Plan 1989-1999	Current level of access	Proposed management and comments
			the dune
Moses Rock Road North	Open – 2WD unsealed	Open – 2WD unsealed	Open – 2WD unsealed
Moses Rock Road South	Open – 2WD unsealed	Open – 2WD unsealed	Open – 2WD and seal below existing sealed hill
Tracks south of Moses Rock South	No recommendation	Open – four-wheel drive	Rationalise and close where required. Tracks remaining open will be four-wheel drive
Biljedup Beach Road	Open – four-wheel drive	Open – four-wheel drive	Open – four-wheel drive
Tracks from Biljedup block to the coast	No recommendation	Open – four-wheel drive	Management only. Track traverses private property and conflicts with the Cape to Cape Track
Juniper Road (to Guillotines)	Open – four-wheel drive	Open – four-wheel drive	Open – four-wheel drive
Track north of Juniper Road	No recommendation	Open – four-wheel drive	Close and rehabilitate – track does not lead to a destination and is rarely used
Track north from Cowaramup Bay Road	No recommendation	Open – Management only	Management only
Track to North Point Cowaramup	Open – 2WD unsealed	Open – 2WD unsealed	Open – Redevelop and seal (2WD unsealed)
Tracks south-east of Gracetown	Open – four-wheel drive and management only	Management only	Management only but rationalised to avoid track duplication
Track to Lefthanders and Big Rock	Open – 2WD sealed and unsealed (Big Rock)	Open – 2WD sealed and unsealed	Open – 2WD sealed
Ellen Brook Road (includes Ellensbrook beach)	Open – 2WD unsealed	Open – 2WD sealed	Open – 2WD sealed
Track north of Ellen Brook Road	No recommendation	Open – four-wheel drive	Close – track is overgrown and not required for management
Tracks between Gnoocardup and Ellensbrook Homestead	No recommendation	Open – four-wheel drive	Management only because of conflict with Cape to Cape Track
Boundary track north of Gnoocardup	No recommendation	Open – four-wheel drive	Close – duplicates management track to the west
Track to Joeys Nose	Open – four-wheel drive	Open – four-wheel drive, closed at the car park	Open – four-wheel drive but closed at the car park to prevent vehicles on the Cape to Cape Track and access to the beach
Tracks in Reserve 8431 (Kilcarnup)	No recommendation	Open – four-wheel drive	Open – four-wheel drive. Rationalise four-wheel drive access to the coast ensuring fragile limestone and dune areas are not compromised, and access to the beach is prevented (access to the beach may be approved for possible boat launching)
Track to the east of Blackboy Hollow block	No recommendation	Open – four-wheel drive	Management only and close the most eastern track to avoid duplication
Road to Redgate North Car park	No recommendation	Open – 2WD unsealed	Open – 2WD unsealed
Tracks on perimeter of Redgate block	No recommendation	Open – four-wheel drive	Management only
Calgardup Road	Open – four-wheel drive	Open – 2WD unsealed	Open – 2WD unsealed
Track east of Caves Road to Calgardup Road	No recommendation	Open – four-wheel drive	Close – no strategic purpose and duplicates other tracks
Bobs Hollow Road	Open – four-wheel drive	Open – four-wheel drive	Open – four-wheel drive

Road/track	LNNP Management Plan 1989-1999	Current level of access	Proposed management and comments
North-south track between Bob's Hollow and Conto roads	No recommendation	Open – four-wheel drive	Management only
Tracks west of Caves Road to Bob's Hollow	No recommendation	Open – four-wheel drive	Close – no strategic purpose and duplicates Bob's Hollow Road
Forest Grove Road	Open – 2WD unsealed	Open – 2WD sealed	Open – 2WD sealed
Track to Conto Road/Cape Freycinet	Open – 2WD unsealed	Open – 2WD sealed to Conto Campground and unsealed to Cape Freycinet	Open – 2WD sealed to Conto Campground. Unsealed to Cape Freycinet
Point Road	Open – 2WD unsealed	Open – four-wheel drive	Open – four-wheel drive. Realign the Road around the camping area
Georgette Road	Open – four-wheel drive	Open – four-wheel drive	Open – four-wheel drive
Hooley Road	Open – four-wheel drive	Open – four-wheel drive	Open – four-wheel drive
Formation Road	No recommendation	Open – four-wheel drive	Open – four-wheel drive from Hooley Road to Boranup Drive
Boranup Beach Road	Open – four-wheel drive	Open – four-wheel drive	Open – 2WD unsealed. Upgrade to cope with medium site status
Anchor Road	No recommendation	Open – four-wheel drive	Open – four-wheel drive to maintain access to the coast from Caves Road
Arumvale Road	No recommendation	Open – four-wheel drive	Open – four-wheel drive to maintain access between Boranup Beach and Grace roads
Grace Road	Open – 2WD unsealed	Open – four-wheel drive	Open – 2WD unsealed. Upgrade to cope with medium site status
Davies Road	No recommendation	Open – four-wheel drive	Close – track duplicates other tracks. The track will remain open for walkers of the Cape to Cape Track
Trig Road	Open – four-wheel drive	Open – four-wheel drive	Close – other than Boranup Beach to Grace roads
Other roads between Conto and Grace road (Love-Spring, Brozie, Donovan roads)	No recommendation, Management only	Open – four-wheel drive	Management only or closed. Close to avoid track duplication, to separate vehicles from walkers/cyclists, for cave protection and because of subsidence hazard
Tacks east of Caves Road (including Bruce, Jarrahdene, Loop Ring, Boulter)	No recommendation	Open – 2WD unsealed	Management only or closed to protect the white-bellied frog
Reserve Road	No recommendation	Open – four-wheel drive	Open – four-wheel drive to access Hamelin Bay beach
Tracks south of Reserve Road	No recommendation	Open – four-wheel drive	Close – not a strategic access road
Tracks north of Hamelin Bay Road	No recommendation	Management only	Management only
Hamelin Bay Road West	Open – 2WD sealed	Open – 2WD sealed	Shire road – not part of the planning area. Negotiate with the Shire to realign the road around the caravan park leased area
Tracks south of Hamelin Bay	Open – four-wheel drive	Open – four-wheel drive	Open – four-wheel drive. Close one track.
Cosy Corner Road	Open – 2WD unsealed	Open – 2WD unsealed	Open – 2WD unsealed
Foul Bay Lighthouse Track	Management only	Management only	Close – proposed to become the Cape to Cape Track

Road/track	LNNP Management Plan 1989-1999	Current level of access	Proposed management and comments
Foul Bay	Open – 2WD unsealed	Open – 2WD unsealed	Open – 2WD unsealed
Elephant Rock Track	Open – four-wheel drive	Open – four-wheel drive	Open – four-wheel drive
Tracks east and west of the Cape to Cape Track and south of Hillview Road	No recommendation	Open – four-wheel drive	Close – Not a strategic access road and no destination point. Conflict with Cape to Cape Track
Quarry Bay Road	Open – 2WD unsealed	Open – 2WD unsealed	Open – 2WD sealed
Skippy Rock Road	No recommendation	Open – 2WD unsealed	Open – 2WD unsealed. This is a Shire road that is identified as a road to come under management of the department
Track to Skippy Rock	No recommendation	Open – 2WD unsealed	Open – 2WD sealed
Challis Road	n/a	Open – 2WD sealed	Open – 2WD sealed
Tracks south of Challis Road	n/a	Open – 2WD sealed	Management only
Bramley National Park			
Roads east of Margaret Plantation and south of Osmington Road (Middle, Swing and Gray roads)	n/a	Open – four-wheel drive	Open – four-wheel drive. Access to Margaret River. All other tracks and roads east of Margaret Plantation and south of Osmington Road will be management only, closed or rehabilitated because of conflicts with trail users, reservoir protection and/or track duplication
Track to Rusden Picnic Area	n/a	Open – 2WD unsealed	Open – 2WD unsealed
Tracks east of Bussell Highway and south of the Margaret Plantation	n/a	Open – four-wheel drive	Rationalise to one four-wheel drive track and close others to maintain integrity of the walk/cycle trail
Roads north of Margaret Plantation and east of Bussell Highway (Lynn, Plot and Creek roads)	n/a	Open – four-wheel drive	Close – rehabilitate because of illegal camping. The tracks have no strategic purpose
Roads north of Margaret Plantation and west of Bussell Highway (O'Neil, and Norm roads)	n/a	Open – four-wheel drive	Management only or close because of illegal camping and firewood collection
Roads south-west of Carters Road (Gan, Mott and Umberto roads)	n/a	Open – four-wheel drive	Close – rehabilitate because of illegal camping, firewood collection and rubbish dumping. The area is steep and at risk of erosion and contains sensitive granite outcrops. The area is accessible for walking
Tracks in the Ten Mile Brook reservoir protection zone (e.g. S.E.C, Rev, Walton and Nelson roads)	n/a	Open – 2WD unsealed and four-wheel drive	Management only or closed because of water catchment protection
Neilson Road	n/a	Open –2WD unsealed	Management only because of erosion and little use
Tracks south of Rosa Brook Road (including Walton, Jones and Lang roads)	n/a	Open – 2WD unsealed and four-wheel drive	Management only, closed or designated bridle trail. Illegal firewood collection and rubbish dumping occurs and these roads offer no strategic access
Yelverton National Park			
North-south track from	n/a	Open – 2WD	Open – 2WD unsealed

Road/track	LNNP Management Plan 1989-1999	Current level of access	Proposed management and comments
Farm Road to Yelverton Road and Yelverton Road to Carter Road		unsealed	
Tracks between Yelverton Road and the western boundary	n/a	Open – four-wheel drive	Close – to prevent through-traffic from Yelverton to Pusey roads
Boundary tracks (other than listed above)	n/a	Open – four-wheel drive	Management only or closed because of the risk of spreading *P. cinnamomi*. These tracks are not well used.
Forest Grove National Park and Reserve 46400			
All tracks (including Holland, Hinton, Furniss, Mullin, Lee roads)	n/a	Open – 2WD unsealed and four-wheel drive	Close – close unnecessary tracks/roads to protect white-bellied frog populations and retain management only tracks for monitoring and fire management
Scott National Park			
Track to Scott River Picnic Site	n/a	Open – 2WD unsealed	Open – 2WD unsealed
Other tracks	n/a	Open – four-wheel drive and 2WD unsealed	Management only or closed due to high conservation values, the risk of spreading *P. cinnamomi* and seasonally restricted access. Twinem's Bend can be accessed by boat
Gingilup Swamps Nature Reserve			
All tracks	n/a	Open – four-wheel drive	Management only but rationalised to avoid track duplication. This area has high conservation values

Note: Several roads pass through the planning area as scenic drives (e.g. Boranup Drive and Caves Road), access to coastal recreation sites (e.g. Sugarloaf, Yallingup Beach, Smiths Beach, Canal Rocks, Cape Clairault, Cowaramup Bay, Ellen Brook, Redgate, Hamelin Bay West roads) or local and regional transport roads (e.g. Bussell Highway, Bullant Drive and Thornton, Abbys Farm, Tanah Marah, Carter, Wallis, Rosa Brook, Rosa Glen, Warner Glen, Scott River, Milyeannup Coast, Vlam, Hillview roads). These roads are not included in the above table as they are not part of the planning area and are managed by local government authorities or Main Roads WA. Most of these roads are sealed and likely to remain in their current condition over the life of this plan. The department undertakes maintenance of some of these roads.

LNNP = Leeuwin-Naturaliste National Park

APPENDIX 11. DAY-USE AND OVERNIGHT STAYS

Day use			Camping		
Major[1]	Medium[2]	Minor[3]	Major[1]	Medium[2]	Minor[3]
❖ Cape Naturaliste ❖ Bunker Bay ❖ Canal Rocks ❖ Ellensbrook Homestead ❖ Redgate Beach ❖ Calgardup Cave ❖ Hamelin Bay ❖ Cape Leeuwin ❖ Sugarloaf Rock	❖ Big Rock ❖ Rusden Picnic Area ❖ Kabbijgup/Three Bears ❖ Rabbit Hill (Yallingup) ❖ Wyadup ❖ Injidup Beach ❖ Moses Rock (Northern Day Use Area) ❖ Gallows ❖ Guillotines ❖ Cowaramup Bay Lookout ❖ Lefthanders ❖ Ellensbrook Beach ❖ Conto Spring ❖ Giants Cave ❖ Cosy Corner ❖ Waterwheel ❖ Carters Road ❖ Windmills ❖ Torpedo Rock ❖ Skippy Rock ❖ Twinem's Bend ❖ *Boranup Day Use Site*	❖ South Point ❖ Canal Rocks Rotary Lookout ❖ Mitchell Rocks ❖ Cape Clairault ❖ Quinninup Dune ❖ Quinninup Falls ❖ Bob's Hollow ❖ Hooley Road ❖ North Point (Boranup Beach) ❖ Grace Road ❖ Foul Bay ❖ Elephant Rock ❖ Other Side of the Moon ❖ Moses Rock (Southern Day Use Area) ❖ Wilyabrup Beach ❖ Wilyabrup Cliffs (Biljedup Cliffs) ❖ Wallcliffe* ❖ Gnoocardup ❖ Redgate North ❖ Scott River Picnic Area ❖ Boranup Lookout ❖ Sand Patches ❖ Supperies* ❖ North Point (Gracetown) ❖ Merchant Rock ❖ Round Rock ❖ The Point ❖ South Beach ❖ Quarry Bay ❖ WI 16 ❖ Bride Cave (WI 24) ❖ Un-named sites ❖ *Yallingup Reef Car park*	Conto Campground Margaret River Eco Discovery Centre	❖ Boranup Campground	❖ Point Road Campground ❖ Kilcarnup* ❖ Camp sites along the Cape To Cape Track

* proposed to be vested with the Conservation Commission and managed by the department (see Section 10 *Existing and Proposed Reserves*)

[1] Major day use areas comprise, or can be developed to include, more than 30 individual car bays and may provide boat access and parking for long turning vehicles
[2] Medium day use areas comprise up to 30 individual car bays and may provide boat access
[3] Minor day use areas comprise up to 15 individual car bays
[1] Major camping areas comprise more than 20 individual sites. Major camping areas may also include additional group camping sites, where about 25 people could be accommodated on a single large site
[2] Medium camping areas comprise up to 20 individual sites
[3] Minor camping areas comprise up to 10 individual sites

New sites are listed in italics

APPENDIX 12. VISUAL QUALITY

Landform	Vegetation	Waterform
High visual quality		
Irregular coastline of Leeuwin-Naturaliste National Park, emphasised by distinctive rock outcroppings (e.g. Canal, Sugarloaf Skippy and Gull rocks), steep slopes, bays (e.g. Bunker, Cowaramup and Foul bays), inlets and cliffs (e.g. coastal cliffs south of Moses Rock)	Distinctive vegetation patterns and attractive diversity in species, density, age, height and growth habit (e.g. abrupt transition from heath to woodland or combinations of forest, woodland and sedgeland species)	Major permanent rivers (e.g. Margaret, Blackwood and Scott rivers) Streams with changing flow characteristics and features such as waterfalls
Ridges and dune formations of distinctive height and/or configuration, which provide obvious contrast to landform patterns in the surrounding area (e.g. Cape Mentelle Ridge, dune domes at Cosy Corner and dunes north of Redgate Road)	Pockets or unique stands of specimen vegetation which become focal points because of isolation, unusual form, position in the landscape or canopy variation (e.g. karri in Boranup Forest)	Permanent river pools, wetlands (e.g. those of the Scott Coastal Plain) and waterholes in intermittent watercourses
Limestone features including caves (e.g. Lake and Mammoth caves), dolines and fault lines	Plant groups which display seasonal colour or unusual forms, distinguishing them from their surroundings	Lakes and wetlands with dominant natural characteristics (e.g. Lake Davies)
Coastal dunes with steep and irregular slopes or sand blown edges such as Boranup Sand Patch and Injidup Point	Wind-shaped, gnarled or dwarfed vegetation unusual in form, colour or texture (e.g. coastal heath)	Estuaries(e.g. Hardy Inlet, Margaret River, Calgardup and Wilyabrup estuaries), swamps and seasonal wetlands (e.g. those of Scott National Park)
Coastal landscapes with natural elements (e.g. Cape Hamelin, Leeuwin, Naturaliste, Clairault and Mentelle; promontories at Cosy Corner, Canal Rocks and areas south of Cape Mentelle)	Gradual and naturally appearing transitions between other land uses (such as agriculture), with forested land	
Well defined valleys, dissected slopes and/or lateral irregular tributaries, such as the Blackwood River and Wilyabrup Brook valleys		
Isolated peaks or hills with distinctive form and visual dominance		
Granite domes or outcrops		
Undulating and steeply sloping terrain of distinctive shape and abrupt appearance		
Moderate visual quality		
Rounded hills and ridges with some dissection that are surrounded by landforms of a similar nature	Patterns evident in land cover but lacking uniqueness or distinction relative to surrounding vegetation	Seasonal wetlands, intermittent watercourses with unchanging flow characteristics
Dune formations of uniform height and configuration	Expanses of uniform vegetation with some variation in colour, texture or pattern	Reservoirs with some natural characteristics
Regular coast edges without bays, inlets, promontories or cliffs	Transition between coastal to forest vegetation lacks distinction	
Areas of gently sloping land with less distinct drainage patterns	Open forest and woodland with natural openings and species mix	

Landform	Vegetation	Waterform
	that offers dome visual diversity	
Broad or shallow valleys and tributaries that are not distinctively defined by adjacent landforms	Remnant areas of naturally appearing streamline and roadside vegetation exhibiting some structural diversity and colour	
Minor rock outcroppings		

Based on CALM (1994, 1997).

APPENDIX 13. GUIDELINES FOR VISUAL LANDSCAPE MANAGEMENT

Visual 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. Guidelines for landscape management are as follows:

Zone A

These areas are a high priority for visual landscape management. The objective in these areas is to retain the maximum amount of visual quality.

Guidance for management is as follows:

- Focus on maximum protection of all existing visual landscape features. These features should be identified and evaluated before any management activities.
- Landscape alteration should be low as this zone is the least accommodating to visual change.
- Alterations to landscape character should be subtle, remaining subordinate to natural elements by borrowing extensively from form, line, colour, texture and scale in the surrounding landscape. Alterations should be visually inevident within one year of project completion.
- Avoid operations that lead to a major change in scenic quality in the short-term.
- Prescribed burning should minimise impact on landscape values (i.e. maintain substantial unburnt sections around sensitive areas).
- Slash breaks required for fire management should use techniques that minimise visual landscape impacts wherever possible.
- 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.
- Where structures are required they should be small scale, carefully sited away from major natural focal points, out of viewer sight-lines (preferably at a background distance and where the time viewed is shortest) and where vegetation or landform screening can be used.
- Road design and construction should remain subordinate to landscape elements by utilising minimum design standards, limited cut and fill, minimum clearing width, undulating edges, sensitive alignment. Roads and tracks should focus views on to distinctive features where possible.
- Previously disturbed areas should be given the highest priority for rehabilitation until the desired standard of scenic quality is attained.
- Interpretive and explanatory signing should be utilised before and during operations that alter landscape character (i.e. recreation site development, prescribed burning adjoining sensitive areas).
- Land uses and developments that do not require scenic environments should be excluded (e.g. mining/quarries, large recreation sites, large car parks, telecommunication towers and powerlines).

Zone B

These areas are a moderate priority for visual landscape management. The objective is to retain a moderate amount of visual quality. Landscape alterations may be visually apparent but the focus should remain on protection of the dominant visual landscape features. In this instance, alterations to the naturally established landscape character should still borrow form, line, colour, texture and scale from natural elements.

Zone C

These areas are a moderate priority for visual landscape management. The objective is for partial retention/enhancement of visual quality.

Guidelines for management are as follows:

- Landscape alterations may be visually dominant (i.e. accommodating to visual change) but should reflect the lines, forms, colours and textures of the surrounding landscape.
- Where possible, visual quality should be optimised and enhanced (e.g. through rehabilitation) over the medium to longer term.
- Essential but visually depreciative facilities not requiring areas of scenic amenity should be accommodated in these areas first (e.g. gravel pits, transmission towers and powerlines).
- Views to disturbed landscapes may require landform and vegetation screening.

APPENDIX 14. 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 number of apiary sites in these areas. Standard permit conditions apply	Maintain or increase number of apiary sites in these areas. Additional permit conditions apply, such as increased hygiene control, seasonal site location and access restrictions. Research and monitoring may be required	Close, and relocate where possible, any current apiary sites in these areas. Prevent any new apiary sites
Environmental criteria			
1. Threatened and/or other conservation significant flora within a 2 kilometres radius[1]	No rare, priority 1 or priority 2 flora present that are visited by honey bees	Rare, priority 1 or priority 2 flora present that are visited by honey bees and impacts are seasonal or undetermined[2]	Rare, priority 1 or priority 2 flora present that are visited by honey bees and impact is predicted to be year-round[2]
	-	Rare, priority 1 or priority 2 flora present that are visited by honey bees but no predicted impact[3]	-
	No priority 3 or priority 4, endemic, disjunct or relictual flora present that are visited by honey bees	Priority 3 or priority 4, endemic, disjunct or relictual flora that are visited by honey bees present[4]	-
2. Significant communities within a 2 kilometres radius	No threatened ecological communities (TECs) or priority ecological communities (PECs)	TEC or priority 1 or 2 PEC present and impacts are seasonal[2]	A TEC or priority 1 or 2 PEC present and impact is predicted to be year-round[2]
	-	TEC or priority 1 or 2 PEC present but no predicted impact[3]	-
	-	Priority 3 or 4 PEC present and flora is visited by honey bees[4]	-
3. Threatened fauna and/or other significant habitats (i.e. habitats for fauna adversely impacted by honey bees) within a 2 kilometres radius	No old-growth forest or other known habitat of hollow nesting threatened fauna present	Old-growth forest or other known habitat of hollow nesting threatened fauna is present[5]	-
	No watering points at fauna breeding centres and re-introduction sites present	-	Watering point at fauna breeding centres and re-introduction sites present[6]
	No other significant habitats or communities present	Other significant habitats or communities are present that are seasonally impacted[7]	Other significant habitats or communities are present that are impacted year-round

	Suitable	Suitable but conditional	Highly constrained
Management criteria			
1. Previous use	Conservation reserve with authorised historic use of commercial beekeeping	-	Conservation reserve with no authorised historic use of commercial beekeeping
2. Access	Public or suitable management vehicle only access is available	-	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 metres radius	No built accommodation, camping or day use site present	-	Built accommodation, camping or day use site present
4. Tracks and trails within a 200 metres radius	No walktrail present (Class 1 or 2)	Walktrail present but only used infrequently or proposed walktrail (Class 1 or 2)	Walk trail present and used frequently (Class 1 or 2)
5. Disease control[8]	Low risk of *P. cinnamomi* spread	*P. cinnamomi* present or area identified as protectable from *P. cinnamomi* spread but there is an existing site	Area identified as protectable from *P. cinnamomi* spread are there are no existing sites
	-	Disease present or vegetation identified as being susceptible to disease and there is a risk of spread from existing apiary activities	Disease present, or vegetation identified as susceptible to disease and there are no existing sites
6. Apiary sites within 3 kilometres radius	No other apiary sites present	-	Apiary site present
7. Feral honey bee management within 2 kilometres	-	Feral honey bee control program in place[9]	-
8. Weed management within a 2 kilometres 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[10]	High or moderate rated environmental weeds that are considered to have an increased seed set due to honey bees and flower year-round[10]
9. Other management concerns	No impact on department operations or the requirements of other authorities managing Crown land or Government reserves	Manageable impacts on department operations or the requirements of other authorities managing Crown land or Government reserves	Impacts on department operations or the requirements of other authorities controlling Crown land or Government reserves that cannot be managed

Notes

[1] This process is based on existing spatial data for threatened and other conservation significant flora. The apiary assessment should be adaptive through the life of the plan and the best data incorporated. For example, an assessment for a new site or a review of an existing apiary site should include any new locations of threatened species or communities.

[2] 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.

[3] Visited by honey bees, but no predicted impact. These flora and TECs/PECs are of high conservation significance and a precautionary approach is warranted (see Guidance for Additional Conditions – B).

[4] As with note 3 above, priority 3 or priority 4, endemic, disjunct and relictual flora are of conservation significance and a precautionary approach is warranted. Although populations of these species may be widespread and impacts 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).

[5] If there is a current apiary site and there are feral honey bees present, then use can continue year-round. However, old-growth forest and other significant habitats for hollow nesting fauna will be targeted for feral honey bee control (see Guidance for Additional Conditions – D). For new sites within old-growth forest see Guidance for Additional Conditions – E.

[6] Native fauna breeding centres and fauna re-introduction sites often have watering points. Commercial beekeeping in the vicinity may disturb the animals from drinking.

[7] To be determined through the planning process. Other significant habitats may be identified because of:

- 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.

[8] 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*;
- designated Disease Risk Areas; or
- in vegetation associations identified as susceptible to disease).

[9] There may need to be seasonal restrictions (see Guidance for Additional Conditions – D) when a feral honey bee control program is in place.

[10] 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 metres from populations) and number of hives may be restricted. Monitoring of representative samples for health of adult populations and seedling recruitment or TEC/PEC 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 old-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 kilometres 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 were assessed against environmental and management criteria and categorised as suitable, suitable but conditional or highly constrained. The table below shows the results of the assessment including what criteria require additional conditions. Some of these conditions have been included as guidance but should be seen as a minimum set.

	Environmental criteria assessment								**Management criteria assessment**							
	Rare & priority 1, 2 flora visited			Other cons. flora visited	TEC/PEC			Fauna habitat (e.g. old growth)	Wilderness		Rec. sites	Class 1 or 2 walktrail	Disease risk	Weed management		Conditions
Apiary Site No.	Impact year-round	Impact seasonal	No predicted impact		Impact year-round	Impact seasonal	No predicted impact		Cand-idate	Gaze-tted				Impact seasonal	Impact year-round	
Suitable																
2819																
Suitable but conditional																
311			X	X		X								X		B, C, F
626		X	X	X		X					X					A, B, C (Sep-Dec)
908		X		X							X			X		A, C, F (Sep-Dec)
1268			X	X										X		B, C, F
1269			X	X		X										B, C
1270			X	X							X			X		B, C, F
1425				X				X			X	X		X	X	C, F
2820		X		X										X		A, F (Sep-May)
4927		X						X						X		A, F (Sep-Dec)
4929		X		X				X						X		A, C, F (Sep-Dec)
4933				X				X			X			X		C, F
5635			X													B
5992				X										X		C, F
Highly constrained																
624			X		X	X										A, B
Sites within 2 kilometres of planning area																
623		X		X		X									X	A (Jun-Jan)
5146				X										X		C, F
Pool sites																
2796				X												C
2797				X										X		C, F
3863				X				X								C
3866				X												C
3867																
4275		X														A (Jun-Feb)
4936		X		X										X		A, C, F (Jun-Feb)
4937		X		X										X		A, C, F (Jun-Feb)
5752				X				X								C

Sites located within a two kilometre radius of the planning area require a separate assessment as they may affect adjoining conservation estate.