WALPOLE WILDERNESS AND ADJACENT PARKS AND RESERVES

Management Plan

2008

Department of Environment and Conservation

Conservation Commission of Western Australia

VISION

The Walpole Wilderness is a vast natural and wild landscape embracing the essence of the southern forests and coast of Western Australia. Old majestic jarrah, karri and tingle forests surround imposing granite peaks, peaceful rivers, heathlands, wetlands and tranquil inlets, and overlook picturesque sandy beaches, sheer coastal cliffs and the Southern Ocean.

The Walpole Wilderness will be recognised as an important component of an international biodiversity hotspot, where natural and cultural values, such as wilderness, tingle forest, a threatened and highly endemic and relictual flora and fauna, threatened ecological communities, old growth forests and wetlands, and our knowledge of them, will be maintained and enhanced for future generations.

This ancient landscape will be recognised for its great visual and aesthetic appeal and for its rich Aboriginal heritage and stewardship, which will be encouraged through joint management with Aboriginal people.

People will find inspiration, enjoyment and livelihoods, and understand and appreciate the natural environment and cultural heritage of the Walpole Wilderness. Sustainable use of the area, reflecting a custodial spirit, will provide benefits to future generations.

Front cover images:
Main photo: Wilderness view from Mt Frankland, photo by Paul Roberts, DEC.
Other photos: Park visitors at the Tree Top Walk, photo by Michael James.
Tassel flower *Leucopogon verticillatus*, photo by Paul Roberts, DEC.

PREFACE

National parks, conservation parks and nature reserves in WA are vested in the Conservation Commission of Western Australia (Conservation Commission). In accordance with the *Conservation and Land Management Act 1984* (CALM Act), the Department of Environment and Conservation (the Department) carries out the management of these reserves and prepares management plans on behalf of the Conservation Commission. The Conservation Commission issues draft plans for public comment and provides final plans for approval by the Minister for the Environment.

The CALM Act specifies that a management plan must contain:

- a statement of the policies or guidelines proposed to be followed; and
- a summary of operations proposed to be undertaken.

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

Changes Since the Previous Management Plan

Walpole-Nornalup National Park, the only reserve within this management plan's planning area with a previous management plan, has been managed according to the *Walpole-Nornalup National Park Management Plan 1992-2002* (CALM 1992) for more than a decade. In this time, there have been a number of changes that have led to differences in this plan including:

- legislative changes or changes in Government policy;
- knowledge of the values of the planning area has increased significantly; and
- an increase in people's understanding and appreciation of the environment and the opportunities it presents.

Legislative or Government Policy changes

- The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* 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 the terrestrial conservation reserve system in WA. This change has given the Conservation Commission 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 performance will be assessed by the Conservation Commission.
- There is an increased commitment by the State Government to involve Aboriginal people in management of the conservation reserve system and to raise the profile of Aboriginal culture. The Government released the consultation paper '*Indigenous Ownership and Joint Management of Conservation Lands in Western Australia*' in 2003.
- The Government's 'Protecting Our Old Growth Forests' Policy promoted the cessation of logging in 100% of all old growth forests and the protection of these areas in a Comprehensive, Adequate and Representative (CAR) reserve system involving the creation of new national parks within the South West. The Walpole Wilderness (WW) has the highest profile and the largest area of these. The Walpole Wilderness Area Community Advisory Committee has been advising the Department on planning and management for the reserve system of the planning area.
- A policy commitment by the State Government to create the WW, based on significant public interest, has led the Department to develop Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas*. This plan applies Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas* to

identify areas within the WW that may be gazetted as wilderness areas (see Part C *Managing Wilderness Values*).

- The State Government's 'Environment' Policy committed to working towards the creation of a marine conservation reserve for the Walpole and Nornalup estuaries. A management plan for the Walpole and Nornalup Inlets Marine Park is in preparation (see Section 3 *Planning Area*). The marine park lies adjacent to and surrounds parts of the Walpole-Nornalup National Park and there is significant interaction between the two reserves, particularly for a variety of visitor access and activities (see Section 30 *Visitor Activities and Use*). This plan will ensure that future management of both the marine and terrestrial parks is consistent and integrated.

Knowledge of the values of the planning area

Since the completion of the Walpole-Nornalup National Park Management Plan (CALM 1992), knowledge of the values of the area has increased significantly. The Comprehensive Regional Assessment for WA's South West Forest Region in 1998 provided detailed assessments of natural values, national estate, wilderness, social values, forest resources and ecologically sustainable forest management for the region (see Section 7 *Legislative Framework* and Section 14 *Biogeography*).

Other State and Federal processes have significantly contributed to the improvement and presentation of knowledge, such as:

- an Interim Biogeographic Regionalisation of Australia in 1995 and subsequent biodiversity audit of WA's bioregions in 2003;
- Commonwealth Scientific and Industrial Research Organisation (CSIRO) and other climate change studies and projections for Australia from 1999;
- the 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 wildfires on societal values, but also to conserve biodiversity. A review of fire in ecosystems of the south-west of 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 biggest wildlife conservation program in Australia involving aerial and ground baiting of more than 3.5 million hectares of land managed by the Department for the introduced predators, the fox and feral cat; and
- salinity and natural resource management planning between 1996 and 2004 has advanced the understanding of landscape processes and threats, and focused efforts in the management of natural landscapes.

Increase in people's understanding and appreciation of the environment

There has been a change in people's attitudes and values, and a growing interest in and appreciation of old growth forests and wilderness. The concept of the Walpole Wilderness, first developed by Donna Selby and Kathy Roberts, was put forward by the South Coast Environment Group in 1998 and since that time there has been an increasing recognition of the need to protect key areas with highest wilderness quality.

There has also been a significant increase in people's appreciation and use of the environment for recreation and tourism. Visitor numbers in Walpole-Nornalup National Park have increased from about 87 000 to 194 000 per year during the past 10 years. This has been, in part, a result of the construction of the Tree Top Walk and improvements to other recreation facilities in the area. Carlsen and Wood (2004) have shown there has been a change in visitor activities and the reasons for visiting – most significantly, visitors in the early 1980s came to enjoy activities such as fishing (73% of visitors), whereas in the past few years there has been a significant reduction in the level of fishing (now 12%) and an increase in the number of visitors coming to enjoy the natural environment (86%). Many of the visitors to the parks are seeking new adventure activities that were not planned for in the previous management plan, such as climbing and hang

gliding, and visitors are increasingly wanting remote experiences while the remoteness of the planning area is being threatened by increased visitation. Increasing visitor use of the parks and demand for activities (such as walking, four-wheel driving and trail bike riding) and facilities (such as camping and built accommodation) requires consideration of an increasing range of recreation and tourism opportunities for people to experience the area, although this should be in keeping with the protection and maintenance of natural, cultural and wilderness qualities (see Part F *Managing Visitor Use*).

NOMENCLATURE

Inclusion of a name in this publication does not imply its approval by the relevant nomenclature authority. The meanings of abbreviations and general terms used throughout this plan are given below, however a glossary of technical terms and phrases is also provided (see Glossary).

Director General

The term 'Director General' refers to the Director General of the Department of Environment and Conservation.

The Minister

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

The Department

The 'Department' or 'DEC' refers to the Department of Environment and Conservation, the agency responsible for managing areas declared under the *Conservation and Land Management Act 1984* and species under the *Wildlife Conservation Act 1950*, or such other agency of the Government of WA that may in future be responsible for managing these areas and species.

South-west

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

Region

When 'region' is used in this plan, it refers to the 'South West' planning region and 'Great Southern' planning region used by the WA Planning Commission (see Section 2 *Regional Context*). This provides an appropriate scale for this plan to link with regional development and planning for local government. The biogeographic boundaries for this area are referred to as 'bioregions' (see Section 14 *Biogeography*). The Department's regional boundaries for this area are referred to as the 'Warren Region'. The planning area is mainly located within the 'Frankland District' of the Warren Region. The day-to-day implementation of the final management plan will be the responsibility of the 'District Manager' of Frankland District, who coordinates the operational management of the parks and reserves in the planning area.

Nyoongar

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.

NatureBase

In many instances throughout this management plan, the reader is referred to the Department's website *NatureBase* for further information. The website address for *NatureBase* is *http://www.naturebase.net/*. This website also contains a range of other information that can be accessed that is of relevance to this management plan.

ACKNOWLEDGEMENTS

This management plan was prepared by a Department planning team consisting of:

- Paul Roberts and Clare Anthony (Planning Officers and management plan coordinators);
- Peter Keppel (Regional Manager – Warren Region);
- Peter Bidwell (District Manager – Frankland District);
- Cliff Winfield (Parks and Visitor Services Regional Leader – Warren Region);
- Dr Erica Shedley (Nature Conservation Regional Leader – Warren Region);
- Rod Simmonds (Regional Fire Coordinator – Warren Region); and
- Shawn Councillor (Indigenous Liaison Officer – Warren Region).

Advice to the planning team was also provided by:

- Karlene Bain (District Nature Conservation Officer – Frankland District);
- Jacki Baxter (Regional Interpretation Officer – Warren Region);
- Allison Driscoll (District Parks and Visitor Services Coordinator – Frankland District);
- Roger Hearn (Regional Ecologist – Warren Region);
- Howard Manning (District Parks and Visitor Services Officer – Frankland District);
- Vicki Winfield (Regional Landscape Architect and Recreation Planner – Warren Region).

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The assistance of current members of the Walpole Wilderness Area Community Advisory Committee is also especially acknowledged:

- Jim Sharp (Chair and Acting Deputy Director General of Parks and Conservation);
- Elizabeth Edmonds;
- Geoff Fernie;
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- Simon Watkin;
- Cr Joan Cameron (Shire of Plantagenet);
- Ted Middleton (Shire of Manjimup);
- Simon Neville (Denmark Environment Centre);
- Gary Schwab (William Bay National Parks Association);
- Owen Stokes-Hughes (Timber Communities of Australia);
- Cr Alex Syme (Shire of Denmark);
- David Warnock (South Coast Environment Group);
- Wendy Williams (South West Aboriginal Land and Sea Council); and
- Peter Bidwell (District Manager – Frankland District).

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- Geoff Evans (Denmark Environment Centre);
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- Rob Versluis (South Coast Environment Group); and
- Reg Yarran (South West Aboriginal Land and Sea Council).

Dr Joanna Young, formerly from the Conservation Commission, was an observer for this plan.

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PART A. INTRODUCTION

1. BRIEF OVERVIEW

This management plan covers the 'Walpole Wilderness' (excluding Shannon National Park) and several nearby conservation reserves, which are henceforth referred to as the 'planning area' (see Section 3 *Planning Area*). The conservation reserves within the planning area are located between Manjimup and Albany on the south coast and south coast hinterland of WA (Map 1). The planning area totals 325 116 ha, or about 35% of the lands within the Department's Warren Region currently vested in the Conservation Commission of Western Australia (Conservation Commission).

The 'Walpole Wilderness' (WW) is a conceptual name for a group of conservation reserves that is a key element of the Government's 'Protecting Our Old-Growth Forests' policy. A number of new parks and reserves have been created within the planning area that significantly expand the reserve system in the region to form a world-class network of interlocking reserves. The planning area, together with the Shannon and D'Entrecasteaux national parks, provides a contiguous conservation reserve system stretching from near Augusta in the west to Denmark in the east. These new parks and reserves, included in the *Forest Management Plan 2004-2013* (Conservation Commission 2004), will assist in meeting a comprehensive, adequate and representative (CAR) reserve system to protect the biodiversity of the Warren and Jarrah Forest bioregions (see Section 14 *Biogeography*) and will create opportunities for people to experience this unique wilderness.

The planning area is rich in values (see Section 4 *Key Values*) and it is the combination of these that elevates the significance of the area. The planning area has long been recognised for its unique natural, cultural, scenic and landscape values (CALM 1990; Christensen 1980; Christensen 1992; Fernie and Fernie 1989), in particular the rich array of endemic and nationally significant flora and fauna. However, the planning area is also recognised as being important for its:

- wilderness qualities;
- old-growth forests;
- outstanding and complex mosaic of landscapes, such as valuable wetlands and heathlands and spectacular granite outcrops;
- location within an internationally-recognised 'biodiversity hotspot';
- many rivers that originate within and pass through the area, including the Deep, Weld, Walpole, Frankland, Bow, Kent, Styx, Denmark, Mitchell and Hay rivers, which provide an important conservation and recreation resource, as well as a potential source for water supply;
- range of recreation and tourism opportunities from wilderness hiking through to world-class and highly visited universal access facilities such as the Tree Top Walk; and
- rich Indigenous and non-Indigenous cultural heritage.

The WW is also part of the Government's 'Tourism' Policy and 'Ecotourism Strategy for WA', which committed to infrastructure and facilities for ecotourism in the planning area, such as the Walpole Wilderness Discovery Centre, walk and cycle trails, picnic areas and low-impact camping and cabin accommodation. The area is experiencing increasing visitation, particularly by interstate and overseas visitors, to forest and coastal attractions (e.g. Mt Frankland, Tree Top Walk, Knoll Drive, Conspicuous Cliff and William Bay), and for a variety of nature-based activities (e.g. four-wheel driving and camping). There is a need to provide opportunities for visitors, in a way that maintains the attributes that attract them in the first place. Special-interest activity groups, such as bushwalkers, cyclists, four-wheel drivers and horse riders, are keen to increase their use of the area. The planning area surrounds, or is

close to, many settlements and also has important social and economic values for firewood collecting, wildflower picking, beekeeping, craftwood and water extraction.

The significant values of the area, impacts on these values and the expectations of the community have been considered in preparing this management plan so that an appropriate balance can be found to enable effective management of the planning area and conservation of its many values. Integral to this will be an effective monitoring program of the natural environment, recreation activities and resource uses within the planning area.

2. REGIONAL CONTEXT

The planning area is located across two WA Planning Commission regions and five local government authorities, namely:

- 'South West' planning region (Shire of Manjimup); and
- 'Great Southern' planning region (Shire of Cranbrook, Shire of Denmark, Shire of Plantagenet and City of Albany).

These regions have a variety of attractions including coastal landscapes, beaches, forests, mountains, national parks, caves, wineries, festivals and events, and numerous opportunities for recreation and nature-based tourism.

The South West Planning Region has the highest population in regional WA with about 132 000 people. Most of the population lives along the western coast in the major towns of Bunbury, Busselton and Margaret River (Department of Local Government and Regional Development 2005). Other towns in the region that are located within close proximity of the planning area include Manjimup, Pemberton, Northcliffe and Walpole. The South West Planning Region has grown at a rate of 2.8% per annum and, by 2031, it is estimated that the population of this region will be 218 000 people (South West Development Commission 2003). The Great Southern Planning Region has a population of about 54 000 people (Department of Local Government and Regional Development 2005). Towns in the region that are located within close proximity of the planning area include Denmark, Mount Barker, Rocky Gully, Frankland, Cranbrook, Kojonup and Albany. The Great Southern Planning Region has grown at a rate of 1.1% per annum and, by 2031, it is estimated that the population of this region will be 70 300 (Great Southern Development Commission 2003). A growing population in these regions may lead to greater recreation and tourism demand within the planning area.

The largest contributing sectors to the economies of the South West and Great Southern planning regions are outlined in Table 1. The Government's 'Protecting Our Old Growth Forests' Policy, subsequent park creation, restructure of the timber industry and significant capital works in the planning area to increase tourism will have significant regional impacts. Although the sustainable yield figures changed following the approval of the *Forest Management Plan 2004-2013* (Conservation Commission 2004), which will impact on the forestry sector, blue gum *Eucalyptus globulus* timber plantations have increased in importance in recent years, particularly in areas adjacent or close to the eastern and northern boundaries of the planning area. Tourism plays an important role in both regions and in 2002/3 large numbers of tourists were drawn to the South West region (1.7 million tourists) and the Great Southern (590 200 tourists), primarily to visit natural attractions. The regions are also recognised as world class producers of premium wines, and viticulture in the Pemberton, Manjimup, Mount Barker, Denmark, Frankland and Albany areas, within close proximity to the planning area, is continuing to increase providing associated tourism benefits across both regions.

Table 1. Largest contributing sectors to the economies of the South West and Great Southern planning regions

South West Region		Great Southern Region	
Sector	**$millions (% of State)**	**Sector**	**$millions (% of State)**
Manufacturing[1]	2 960 (16%)	Agriculture[2]	727 (16%)
Mining[3]	1 587 (6%)	Retail[1]	427 (2%)
Retail[1]	1 108 (6%)	Manufacturing[1]	230 (1%)
Agriculture[2]	589 (13%)	Tourism[4]	177 (4%)
Tourism[4]	531 (13%)	Fishing[3]	6 (1%)
Forestry[2]	61 (78%)	Mining	5 (0.02%)
Gross Regional Product	**5868 (7%)**	**Gross Regional Product**	**1969 (2%)**

Source: Department of Local Government and Regional Development 2005.
1 = turnover
2 = production
3 = value
4 = overnight visitor expenditure

The conservation reserves within both regions are promoted as significant drawcards for visitors. The top five national parks within the regions (Table 2) have maintained or increased visitor numbers over the last decade and this trend is expected to continue (see Section 28 *Visitor Opportunities – Visitor Profile*). The way in which these reserves are managed will continue to impact on the nature-based tourism and recreational potential of these regions. Liaison with local authorities will be important in promoting and managing the conservation and nature-based recreation values of the planning area.

Table 2. The highest visited National parks in the South West and Great Southern planning regions

National Park	1994/5 Visits	2006/7 Visits
Leeuwin-Naturaliste National Park	1.3 million	2.2 million
Walpole-Nornalup National Park (including the Valley of the Giants)	232 000	338 000
Torndirrup National Park	227 000	201 000
Gloucester National Park (including the Gloucester Tree)	240 000	146 000
William Bay National Park	124 000	146 000

The Walpole Wilderness Discovery Centre and its associated interpretive experiences will be an added attraction for visitors, and when coupled with other regional nature-based tourism experiences such as the Gloucester Tree and the Tree Top Walk, will ensure the continuing value of national parks to the local economies of many towns within both regions.

In summary:

- a growing population may lead to greater recreation demand;
- tourism is a very important industry, contributing over $700 million to the combined South West and Great Southern regional economies; and
- the growth in plantation timber in the region, combined with an increase in tourism, is expected to offset employment reductions in the timber industry based on reductions in availability of timber from state forests.

3. PLANNING AREA

The parks and reserves covered by this plan are listed in Table 3.

Under section 54 of the *Conservation and Land Management Act 1984* (CALM Act), the controlling bodies of the 'Conservation Commission' and the 'Marine Parks and Reserves Authority' are responsible for the preparation of management plans and the review of expiring

plans for all lands and waters vested in them. The preparation and review of management plans is very resource-dependent, and many conservation reserves do not have plans of management. However, section 33(3) of the CALM Act provides for management of land and waters where there is no plan according to 'necessary operations' (for nature reserves and marine nature reserves) or 'compatible operations' (for national parks, conservation parks and marine parks). While the planning area contains eight existing national parks and a number of nature reserves, a management plan currently only exists for Walpole-Nornalup National Park. Under section 55 of the CALM Act, management plans, which would otherwise normally expire after 10 years, remain in force until a new plan is approved. The Walpole-Nornalup National Park Management Plan (CALM 1992) was approved by the Minister for the Environment in 1992 and is therefore overdue for review, hence its inclusion within this management plan.

Table 3. Planning area

Reserve	Purpose	Area[1]
Walpole Wilderness		
Walpole-Nornalup National Park A31362, A13045, A19175, A19176, A46682	National park	19 447
Mount Frankland National Park A40837	National park	37 359
Shannon National Park A40836[2]	National park	52 598
Mount Frankland North National Park A47888	National park	22 053
Mount Frankland South National Park A47889	National park	42 283
Mount Roe National Park A47890	National park	127 726
Mount Lindesay National Park A47891	National park	39 541
Reserve A46405	Conservation, recreation, future reservoir and water infrastructure	876
Proposed Areas		
Proposed forest conservation area	State forest and timber reserve[3]	21 450
Total for the Walpole Wilderness		**363 333**
Other Areas Covered in the Management Plan		
William Bay National Park A24482 and A12046	National park	1734
Quarram Nature Reserve A33842	Conservation of flora and fauna	3825
Owingup Nature Reserve A41010	Conservation of flora and fauna	2459
Mehniup Nature Reserve C20381	Conservation of flora and fauna	285
Mt Shadforth Nature Reserve A18340	Conservation of flora and fauna	84
Nature Reserve C23068	Conservation of flora and fauna	28
Nature Reserve C23120	Conservation of flora and fauna	38
Nature Reserve A23325	Conservation of flora and fauna	24
Nature Reserve A31468	Conservation of flora and fauna	99
Nature Reserve A31561	Conservation of flora and fauna	52
Nature Reserve A35621	Conservation of flora and fauna	12
Boyndaminup National Park A47671	National park	5439
Kordabup Nature Reserve A46040	Conservation of flora and fauna	302
Total for the Planning Area		**325 116[2]**

1 = Figures are based on legal area rather than that generated from geographic information systems, and have been rounded up in most cases.
2 = Although Shannon National Park is part of the WW, this park is not covered within the planning area of this management plan.
3 = The lands proposed to be classified as forest conservation areas currently cover areas of existing State forest, timber reserve, and other Crown reserves and unallocated Crown land. These lands, where not already, need to be converted to State forest or timber reserve prior to classification as forest conservation area.

While Shannon National Park (class A reserve 40836) is located within the WW, it is not a part of the planning area for this management plan, because it is already included within the *Shannon Park and D'Entrecasteaux National Park Management Plan 1987-1997* (CALM 1987). However, it may be considered for inclusion in a future amalgamated protected area management plan of the WW. Areas and operations within the planning area adjacent to Shannon and D'Entrecasteaux national parks will be managed consistent and in sympathy with those national parks. This plan also complements the *Forest Management Plan 2004-2013*. Where there is conflict between the two plans, this plan takes precedence.

This management plan includes a multitude of conservation reserves within the planning area because:

- they share many similarities in environmental, cultural, and economic values,
- many of the management objectives, strategies and actions are common to all these reserves; and
- it is more efficient to include these conservation reserves within one larger plan of management, than to undertake separate planning processes for each reserve.

Integrating the management of many conservation reserves that lie close together and/or are similar in character ensures a strategic and consistent management approach across this larger conservation area.

Specific conservation reserves vested with the Conservation Commission and managed by the Department that occur within the planning area (Map 2), together with a description of their tenures, specific issues, opportunities and management directions, are outlined below. Many issues (such as climate change and *Phytophthora cinnamomi*) and opportunities (such as recreation activities and camping) are common to most if not all reserves within the planning area, and these are discussed more thoroughly throughout the plan in appropriate sections.

The planning area is split into smaller distinct management units (called 'blocks') (see Map 10) to assist in the delineation and mapping of the area, and individual blocks are frequently referred to throughout this plan. This process commenced in the 1920s, and names were gradually developed for the 81 blocks varying from Aboriginal names (e.g. Cambellup block), explorer and colonial names (e.g. Nuyts block), pioneers and settlers (e.g. Swarbrick block), native flora and fauna (e.g. Ficifolia block), Forests Department deceased staff (e.g. Rate block), and geographic features (e.g. Roe block) (see Part E *Managing Our Cultural Heritage*) (Sclater 2001).

The management plan area consists of existing conservation reserves and proposed conservation reserve additions (see *State Forests and Timber Reserves* below, and Section 11 *Proposed Tenure, Purpose, Vesting and Boundary Changes*). It is intended that the proposed reserve additions listed will come under the management plan once the change in land tenure and purpose occurs and the reserves are vested with the Conservation Commission. Other additions not listed will be managed to be consistent with this management plan, or if necessary the plan will be amended to apply to them.

National Parks

National parks have national or international significance for natural, scenic or cultural values, and can accommodate recreation. These conservation reserves are managed to conserve wildlife and the landscape and to preserve features of archaeological, historical or scientific interest. They are also managed to allow forms of recreation that do not adversely affect their ecosystems or landscapes. There are eight national parks within the planning area.

Walpole-Nornalup National Park

Walpole-Nornalup National Park was originally gazetted on 26 May 1972 and now covers an area of 19 443 ha. The park comprises class A reserves 13045, 19175, 19176, 31362 and 46682. A number of potential reserve additions are proposed in this plan that will expand this park (see Section 11 *Proposed Tenure, Purpose, Vesting and Boundary Changes*). Even though the Walpole-Nornalup National Park Management Plan (CALM 1992) will be replaced by this broader management plan, the 1992 plan contains some valuable information that can be referred to for this park (see Section 9 *Management Planning*).

The park surrounds the towns and settlements of Walpole, Nornalup and Peaceful Bay, and is located in the Shires of Manjimup and Denmark. The park boundary extends to the low water mark of the Walpole and Nornalup inlets and the high water mark of the Southern Ocean. The park adjoins D'Entrecasteaux National Park to the west, and private property to the north and

east. To the north, the park is partially bounded by a section of the South Western Highway. The park also adjoins the new Mount Frankland South National Park.

There are a number of islands close to the coast that are gazetted as part of class A reserve 31362. Thyssen Rock is a small island located to the east off Point Nuyts. There are a small group of islands to the south of Shelly Beach. Saddle Island is the largest of these islands. There are several smaller islands to the north-west of Saddle Island and collectively these are referred to as the Casuarina Islands. Goose Island is located further south from Saddle Island and is much smaller. Another small island is located further east between Rame Head and Point Irwin. Newdegate Island (class A reserve 19175) is a small island (about four hectares) located within Nornalup Inlet.

Issues and Opportunities

The highly scenic park environments (see Section 18 *Landscape*) within close proximity to Walpole attract larger numbers of visitors (see Section 28 *Visitor Opportunities*) than most other parts of the planning area. There is significant interaction between the terrestrial park and the marine park, which are covered by separate management plans. While it is beneficial that the islands are included in this management plan, little knowledge exists about these islands (see Section 21 *Ecological Communities*).

Key Management Directions

The focus of management will be to protect biodiversity and manage the interactions of people with the park environment, while conserving and improving the knowledge and understanding of the park values. There is a need to ensure an integrated approach to management of the interface between the park and the marine park.

Mount Frankland National Park

Mount Frankland National Park (class A reserve 40837) was originally gazetted on 23 December 1988 and comprised an area of 30 830 ha. A further 262 ha was added to the northern boundary of the park on 8 December 2004 via the *Reserves (National Parks, Conservation Parks, Nature Reserves and Other Reserves) Act 2004* and areas totalling 6267 ha were added to the west of the park on 6 April 2005 via the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004*. The park now covers a total area of about 37 359 ha.

The park is located about 18 km north of Walpole. The western boundary of the park is very irregular and the new additions to the park interlace with State forest in Mossop and Weld blocks. The rest of the boundary adjoins new parks in the north, east and south.

Issues and Opportunities

Much of the western part of the park has high wilderness values (see Section 12 *Identification and Dedication of Wilderness Areas*), and there is a need to protect these values until they have been considered further. Parts of the park in the west adjoin State forest and there is potential for nearby timber harvesting activities to impact on park values.

Key Management Directions

The focus of management will be to maintain the current management of this park to ensure wilderness values can be more fully considered and to ensure other park values are not compromised.

William Bay National Park

William Bay National Park (class A reserve 24482) was originally gazetted on 6 July 1956 and covers an area of 1705 ha. The park also includes class A reserve 12046 that joins the park along the northeast boundary. This reserve was originally gazetted on 23 April 1909 and covers an area of 30 ha.

The park is located along WA's southern coastline about 10 km south-west of Denmark. The park's southern boundary extends to the low water mark of the Southern Ocean, and the northern boundary adjoins private property. The park also adjoins Parry Inlet and Kordabup River to the west. The park contains two distinct blocks of land that are connected by a thin strip of the park along Mazzoletti Beach. William Bay Road is a sealed road that enters and runs partly through the park.

There are many small islands off Edward Point between William Bay and Madfish Bay that are gazetted as part of class A reserve 24482.

Issues and Opportunities

William Bay National Park is one of the most highly visited parks on the south coast (see Section 2 *Regional Context*). Greens Pool is a major visitation site within the park for the local community (see Section 30 *Visitor Activities and Use – Picnicking, Barbecuing and Day Use*), and there is potential for a visitor centre at the entrance of the park (see Section 46 *Information, Interpretation and Education*). There is an interest in connecting William Bay Road with Lights Road to the east (see Section 29 *Visitor Access*). The small size of the park and large boundary with private property may increase potential impacts from wildfire, feral animals and weeds.

Key Management Directions

The focus of management will be to manage the interactions of people and adjoining land use with the park environment, while conserving park values. William Bay Road will remain the only primary access into this park. There is potential to increase the conservation value of this reserve by actively encouraging landowners to place adjoining remnant vegetation under conservation covenants.

New National Parks

A number of new national parks and other reserves (see below) were created upon Royal Assent of the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004* and the *Reserves (National Parks, Conservation Parks, Nature Reserves and Other Reserves) Act 2004* on 8 December 2004. Five new national parks (listed below) comprise a substantial part of the planning area (237 042 ha) (Map 2) and incorporate areas of old-growth forest (see Section 21 *Ecological Communities*) in a number of blocks such as Wattle, Mattaband, Burnside, Weld, Mossop, Styx, Hay and Sheepwash blocks.

The new national parks have been provisionally named, however these are not the final park names. The Department's Administrative Instruction No. 14 – '*Nomenclature Guidelines*' provides direction for naming places and features on lands and waters managed by the Department. The Department's Nomenclature Committee recommends proposed names for areas (including parks and reserves), as well as linear and point features to the Conservation Commission for endorsement prior to the necessary approval by WA's Geographic Names Committee and recording in the State's gazetteer of names. Further community consultation, involvement and collaboration will occur on the selection of names relating to the new parks and features within the planning area.

Mount Frankland North National Park

Mount Frankland North National Park (class A reserve 47888) was established on 8 December 2004 by the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004* and occupies an area of 22 053 ha. This national park is located about 25 km north of Walpole, and adjoins the Mount Frankland National Park to the south, Mount Roe National Park to the east, and State forest and the Lake Muir National Park to the north of the park.

Issues and Opportunities

This park contains areas of former regrowth production forests (see Section 19 *Native Plants and Vegetation*) that were extensively roaded. While some areas provide increased accessibility for a range of recreation opportunities (see Section 30 *Visitor Activities and Use*), other areas are more inaccessible because of *P. cinnamomi* (see Section 24 *Diseases*) and proposed wilderness (see Section 12 *Identification and Dedication of Wilderness Areas*). Land uses within the adjacent State forest have the potential to impact upon the values of this park.

Key Management Directions

The focus for management in this park will be protecting the wilderness and natural values and rehabilitating degraded areas, while accommodating a range of recreation opportunities in the more accessible areas.

Mount Frankland South National Park

The Mount Frankland South National Park (class A reserve 47889) was established on 8 December 2004 by the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004* and occupies an area of 42 283 ha. This national park is located immediately north of Walpole and extends between Mount Frankland National Park to the north, D'Entrecasteaux National Park and South Western Highway to the west, and Walpole-Nornalup National Park and private property to the south of the park. Small portions of the boundary also adjoin State forest in the north-west (Wye block) and south of this park (Dawson, Swarbrick, Collis and Keystone blocks) (Map 2).

Issues and Opportunities

This park contains former regrowth production forests (see Section 19 *Native Plants and Vegetation*) that were extensively roaded. While some areas provide increased accessibility for a range of recreation opportunities (see Section 30 *Visitor Activities and Use*), other areas are more inaccessible because of seasonal inundation (see Section 17 *Hydrology and Catchment Protection*) and *P. cinnamomi* (see Section 24 *Diseases*). Land uses within adjacent State forest and private property have the potential to impact upon the values of this park.

Key Management Directions

The focus for management in this park will be protecting the natural values of the area (and rehabilitating degraded areas), while accommodating a range of recreation opportunities in the more accessible parts of the park.

Mount Roe National Park

Mount Roe National Park (class A reserve 47890) was established on 8 December 2004 by the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004* and occupies an area of 127 726 ha. This national park is located centrally within the planning area about 20 km north-east of Walpole, 14 km north-west of Denmark and 10 km south of Rocky Gully. About half of the new park boundary adjoins Mount Frankland North National Park to the west and Mount Lindesay National Park to the east, and half adjoins private property in the south and north (Map 2).

Issues and Opportunities

Much of this park consists of a mosaic of drainage systems, shrub and heath lowlands and lateritic jarrah *Eucalyptus marginata* uplands, and *P. cinnamomi* is a major threat to many of the park's ecosystems (see Section 24 *Diseases*). The two proposed wilderness areas are both located within this park (see Section 12 *Identification and Dedication of Wilderness Areas*). Limited and seasonal access has meant that there is limited recreation in the area and that the Logical Burn Units (LBU) are generally large (see Section 25 *Fire*). Land uses on adjacent private property and illegal flora and forest produce removal (see Section 43 *Flora*

Harvesting, and Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*) have the potential to impact upon the values of this part of the planning area.

Key Management Directions

The focus for management will be to ensure wilderness values are not compromised, to develop some low-key recreation sites, and to protect the park and its significant natural values from a number of threatening processes, such as *P. cinnamomi*, feral animals, illegal flora and forest produce removal.

Mount Lindesay National Park

Mount Lindesay National Park (class A reserve 47891) was established on 8 December 2004 by the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004* and occupies an area of 39 541 ha. This national park is located towards the eastern end of the planning area about nine kilometres north of Denmark and 16 km south-west of Mount Barker. Most of the national park boundary adjoins private property in the north, east and south, with the western boundary adjoining Mount Roe National Park (Map 2).

Issues and Opportunities

The park is a focus for recreational activities for the Denmark and Mount Barker communities, although there are currently only a small number of low-key sites in this area (see Section 30 *Visitor Activities and Use – Picnicking, Barbecuing and Day-use*). The park supplies water to one water supply dam (see Section 17 *Hydrology and Catchment Protection*), although there may be demand for the further supply of water in the future (see Section 45 *Water Resources*), and this may place restrictions on management activities within the park. The park also contains the threatened Mt Lindesay-Little Lindesay Granite Community (see Section 21 *Ecological Communities*). Land uses on adjacent private property and illegal flora and forest produce removal have some potential to impact upon the values of this part of the planning area.

Key Management Directions

Park management will focus on some recreational development in several key areas of the park, while continuing to protect natural values across the park. In particular, the fragile Mt Lindesay-Little Lindesay Granite Community will be protected.

Boyndaminup National Park

Boyndaminup National Park (class A reserve 47671) was established on 8 December 2004 by the *Reserves (National Parks, Conservation Parks, Nature Reserves and Other Reserves) Act 2004* and occupies an area of 5 439 ha. This national park is located towards the north-western section of the planning area about 50 km north of Walpole, and 50 km south-east of Manjimup. This national park comprises part of Boyndaminup and Challar blocks and a separate area from a portion of Mindanup block. Most of this park is bounded by State forest (Map 2), although the park adjoins Shannon National Park on its western side along a short boundary between Arthur and North Roads, and private property. The separate area within Mindanup block adjoins Shannon National Park also along a short boundary within the vicinity of Mindanup 2 Road and Spoon Road.

Issues and Opportunities

This area was identified through the Government's 'Protecting Our Old-Growth Forests' policy as significant for its natural values. The external influences of land uses on State forest and private property have the potential to impact upon this part of the planning area.

Key Management Directions

The focus for future management of this park will be on protection of the natural values of the area, while providing some low-key recreation that has minimal impact on these values.

Nature Reserves

Nature reserves are areas with high conservation value, either because they represent natural ecosystems or because they contain or provide habitat for particular species of plant or animal. These conservation reserves are set aside for the 'conservation of flora and fauna', and are managed so as to maintain and restore the natural environment, and to protect, care for and promote the study of native flora and fauna. The focus of visitor activities is nature appreciation. Forms of recreation that damage natural ecosystems are not permitted. There are 11 nature reserves within the planning area.

Quarram Nature Reserve

The existing Quarram Nature Reserve (class A reserve 33842) was originally gazetted on 6 February 1976 and covers an area of 3 825 ha. The adjoining class A reserve 41010 (locally known as Owingup Nature Reserve) is also part of Quarram Nature Reserve, covers an area of 2459 ha and was originally gazetted on 16 June 1989. Quarram Nature Reserve is located along WA's southern coastline about 20 km east of Walpole, and 23 km west of Denmark in the Shire of Denmark. The reserve contains Owingup Swamp, which drains into Irwin Inlet on the western boundary of the reserve.

The nature reserve is primarily surrounded by private property along its northern boundary and the southern boundary extends to the high water mark of the Southern Ocean. Small reserves vested with the Shire of Denmark and several blocks of unallocated Crown land adjoin the reserve along the eastern boundary.

Issues and Opportunities

The reserve contains tracts of perennial grasslands that were once more extensively located along the south coast, although the relationship between fire and the invasion of woody shrublands is unclear (see Section 25 *Fire*). The reserve contains a wetland of national importance (see Section 7 *Legislative Framework*, and Section 17 *Hydrology and Catchment Protection*), along with peatlands and threatened flora. The Kent River feeds into Owingup Swamp and much of this low-lying delta wetland system is subject to inundation. The south eastern section of the reserve is used frequently for beach-based recreation (see Section 30 *Visitor Activities and Use*). The reserve currently extends to the high water mark, and extension to the low water mark may need to be investigated to enable sufficient control of activities on the beach.

Key Management Directions

The perennial grasslands are subject to a collaborative research program by the Department's Frankland District and Science Division. The wetlands and threatened flora will be protected. Public access should continue to be restricted in the bulk of the reserve. Coastal access tracks will require monitoring for degradation. No camping will be promoted for this nature reserve consistent with the reserve's tenure and purpose, due to the importance and sensitivity of the environments in this reserve and the catering for camping in nearby areas such as Parrys Beach and Peaceful Bay. The extension of the reserve boundary to low water mark will be investigated.

Mehniup Nature Reserve

Mehniup Nature Reserve (class C reserve 20381) was originally gazetted on 7 February 1969 and covers an area of 285 ha. The reserve is located close to Irwin Inlet and north of Quarram Nature Reserve in the southern section of the planning area, about 28 km east of Walpole. This reserve is surrounded by private property with the South Coast Highway adjoining its northern boundary.

Issues and Opportunities

The external influences of private property land use, proximity to the South Coast Highway and the small size of the reserve have the potential to impact upon values of this reserve.

Specifically, there is potential for the Denmark multi-use path (see Section 30 *Visitor Activities and Use*) to pass adjacent to the reserve in the south, and various recreation activities may impact the reserve as a result.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose and visitor management settings, and to explore methods of increasing the size of the reserve and linking to Quarram Nature Reserve to the south.

Kordabup Nature Reserve

Kordabup Nature Reserve (class A reserve 46040) was established on 8 December 2004 by the *Reserves (National Parks, Conservation Parks, Nature Reserves and Other Reserves) Act* 2004 and occupies an area of 302 ha. This nature reserve consists of two areas along Kordabup Road, located close to the South Coast Highway in the south of the planning area about 18 km west of Denmark.

Issues and Opportunities

The two areas of this nature reserve are entirely surrounded by private property and are distant from the rest of the planning area. The larger of the two areas also has a star-shaped configuration. As a result, the external influences of private property land use and the small fragmented size of the reserve have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose. There is potential to increase the conservation value of this reserve by actively encouraging landowners to place adjoining remnant vegetation under conservation covenants.

Mt Shadforth Nature Reserve

Mt Shadforth Nature Reserve (class A reserve 18340) was originally gazetted on 14 March 1980 and covers an area of 84 ha. This reserve consists of two areas located on Mt Shadforth about six kilometres west of Denmark. The reserve is surrounded by private property.

Issues and Opportunities

The reserve is entirely surrounded by private property and is distant from the rest of the planning area. As a result, the external influence of private property land use and the small size of the reserve have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose. There is potential to increase the conservation value of this reserve by actively encouraging landowners to place adjoining remnant vegetation under conservation covenants.

Nature Reserve 11343

Nature Reserve (class A reserve 11343) was originally gazetted on 3 April 1908. This 125 ha reserve is located along Muirs Highway about 22 kilometres east of Rocky Gully. The reserve is surrounded by private property on three sides and adjoins the planning area's Perillup block to the south.

Issues and Opportunities

The external influence of private property land use, the proximity to Muirs Highway, Rocky Gully and Mt Barker, and the small size of the reserve have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose.

Nature Reserve 23068

Nature Reserve (class C reserve 23068) was originally gazetted on 14 October 1983. This 28 ha reserve is located along McIntosh Road about four kilometres east of Denmark. The reserve is surrounded by private property and is close to the South Coast Highway.

Issues and Opportunities

The external influence of private property land use, the proximity to the South Coast Highway and Denmark, and the small size of the reserve have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose.

Nature Reserve 23120

Nature Reserve (class C reserve 23120) was originally gazetted on 9 August 1985. This 38 ha reserve is located along Crusoe Beach Road about 6.5 km south east of Denmark. The reserve is surrounded by private property on three sides, abuts a small strip of unallocated Crown land that surrounds Wilson Inlet, and is close to the South Coast Highway.

Issues and Opportunities

The external influence of private property land use, the proximity to the South Coast Highway and Denmark, and the small size of the reserve have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose.

Nature Reserve 23325

Nature Reserve (class A reserve 23325) was originally gazetted on 14 August 1981 and covers an area of 23 ha. This reserve is located along Scotsdale Road about two kilometres north of Denmark. The reserve is surrounded by private property.

Issues and Opportunities

The external influence of private property land use, the proximity to Scotsdale Road and Denmark, and the small size of the reserve have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose.

Nature Reserve 31468

Nature Reserve (class A reserve 31468) was originally gazetted on 5 July 1991 and covers an area of 99 ha. This reserve adjoins a narrow strip of unallocated Crown land around the north western edge of Irwin Inlet about 20.5 km east of Walpole. The reserve also adjoins Walpole-Nornalup National Park along its western boundary and private property along its northern and eastern boundary. Much of the reserve is subject to inundation.

Issues and Opportunities

The external influence of private property land use and the proximity to the South Coast Highway have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose.

Nature Reserve 31561

Nature Reserve (class A reserve 31561) was originally gazetted on 12 August 1983 and covers an area of 52 ha. This reserve is located along Redmond Road about two kilometres north west of Denmark. The reserve adjoins nature reserve 35621, although it is largely surrounded by private property.

Issues and Opportunities

The external influence of private property land use, the proximity to Denmark, and the small size of the reserve have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose.

Nature Reserve 35621

Nature Reserve (class A reserve 35621) was originally gazetted on 12 August 1983. This 12 ha reserve is located about 1.5 km north west of Denmark. The reserve adjoins nature reserve 31561, although it is largely surrounded by private property.

Issues and Opportunities

The external influence of private property land use, the proximity to Denmark, and the small size of the reserve have the potential to impact upon values of this reserve.

Key Management Directions

The management focus for the reserve will be to manage the potential range of impacts in keeping with the nature reserve tenure and purpose.

CALM Act Section 5(1)(g) and (h) Reserves

CALM Act section 5(1)(g) and (h) reserves are land to which the CALM Act applies in the same way as for example national parks and nature reserves. CALM Act section 5(1)(g) reserves were reserved under the now-repealed *Land Act 1933* and were vested under that Act in what is now the Conservation Commission. CALM Act section 5(1)(h) reserves are reserved under the later *Land Administration Act 1997* and their care, control and management (effectively vesting) is placed with the Conservation Commission. They both differ from other CALM Act land categories in that their purpose is not set by section 6 of the CALM Act as is the case with, for example a national park. The CALM Act section 5(1)(g) and (h) reserves are a flexible CALM Act land category often with a conservation and/or recreation purpose.

Reserve 15623 is the only CALM Act section 5(1)(g) reserve within the planning area, and was originally gazetted on 28 August 1914. The 65 ha reserve occurs along Churchill Road and adjoins the Denmark-Mount Barker Road about 7 km north of Denmark. This reserve will be classified as 'forest conservation area' (Table 4).

Reserve 46405 is the only CALM Act section 5(1)(h) reserve within the planning area, and was established on 8 December 2004 by the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004* for the purpose of conservation, recreation, future reservoir and water infrastructure. The 876 ha reserve occurs on the Denmark River about 15 km north west of Denmark. The reserve has been created over the anticipated area of inundation of a potential future reservoir that may be constructed on the Denmark River, subject to the normal environmental approvals (Map 2) (see Section 45 *Water Resources*).

Issues and Opportunities

Reserve 46405 caters for a number of values that may include the provision of potable drinking water to Denmark and other towns in the Great Southern Region (see Section 45 *Water Resources*), recreation opportunities (see Section 30 *Visitor Activities and Use*), and natural values such as threatened flora (see Section 19 *Native Plants and Vegetation*). Values and impacts of any water supply development would need to be examined in detail through a future environmental review process.

Key Management Directions

The main focus for reserve 46405 is to continue current conservation management to protect natural values and not compromise water values until the future water supply needs for the reserve have been determined.

State Forest and Timber Reserves

Section 55(1a) of the CALM Act requires a management plan for Indigenous State forest or timber reserve to specify the purpose, or combination of purposes, for which it is reserved, being one or more of the purposes identified in that subsection. All areas of Indigenous State forest or timber reserve within this management plan area are proposed to be classified as 'forest conservation area' and are to be reserved for the purposes of:

- conservation;
- recreation;
- timber production on a sustained yield basis;
- water catchment protection;
- other purpose being a purpose prescribed by the regulations; and
- the purpose prescribed by Regulation 81 of the CALM Regulations 2002.

Regulation 81 prescribes the purposes for which an indigenous State forest or timber reserve may be reserved including:

- the removal of water from the reserved land;
- the storage of water on the reserve; and
- the removal of water from the reserve.

The prescribed purpose of timber production may allow for activities such as firewood collection, craftwood collection and beekeeping, however timber production for commercial sawlogs is not permitted. Flora harvesting may also be permitted within these areas in accordance with the *Wildlife Conservation Act 1950* and gravel extraction is subject to notices of intent issued under the *Local Government Act 1995*.

A total of about 21 450 ha (7%) of the planning area will be State forest and timber reserve (Table 4, Map 2) proposed to be classified as 'forest conservation area' under section 62(1)(da) of the CALM Act (see Section 11 *Proposed Tenure, Purpose, Vesting and*

Boundary Changes – Land Classification). These areas are scattered mainly along the southern boundary fringing private property to the north of Walpole and Denmark, although isolated pockets also occur in the north east section of the planning area. The inundation areas of the proposed reservoirs on the Bow and Styx Rivers are within proposed forest conservation areas (see Section 45 *Water Resources*).

Table 4. Existing tenure and area of Forest Conservation Areas proposed within the Walpole Wilderness

FMP ID[1]	Locality	Area[1]	Proposal
239A[2]	Wye-Deep	3000[2]	SF[3] to FCA[4]
239B	Dawson	410	SF to FCA
239C	Dawson	70	SF, *other* (Unvested Reserve 20923 for *Government requirements* – 4 ha) to FCA
239D	Dawson	530	SF to FCA
239E[2]	Keystone-Swarbrick	940[2]	SF, *other* (Reserve 31501 vested in Water and Rivers Commission for *Water* – 687 ha) to FCA
241A	Collis	320	SF, s5(1)(g) (Reserve 42255 for *Timber* – 67 ha), UCL[5] (29 ha) to FCA
241B	Collis	170	SF to FCA
242A	Collis	1110	SF, s5(1)(g) (Reserve 24868 for *Timber* – 34.5 ha) to FCA
243A	Trent	100	TR[6] to FCA
244[2]	Bow River	270	SF to FCA[2]
247A	Swarbrick	260	SF to FCA
256[2]	Bow River	350	SF to FCA[2]
260	Thames	320	TR to FCA
261	Styx	4410	SF, *other* (Reserve 29660 unvested for *Kent River Water Catchment Area* – 4,086 ha) to FCA
263	Thames	60	*Othe*r (Reserve 29660 unvested for *Kent River Water Catchment Area* – 65 ha) to FCA
274A	Denbarker	240	UCL (133 ha), other (Reserve 30456 unvested for *Native Flora* – 98 ha) to FCA
275A	Harewood	3180	SF, TR *other* (Reserve 24660 vested in Water and Rivers Commission for *Water Catchment Area Denmark River* – 129 ha) to FCA
276A	Denmark River	50	SF to FCA
277	Harewood	100	SF to FCA
278	Crown Reserve 15623	60	S5(1)(g) (Reserve 15623 for *Timber* – 65 ha) to FCA
279	Harewood south east	110	SF to FCA
284A	Hay	730	SF, UCL (137 ha) to FCA
286	Hay	910	TR to FCA
Outside of FMP coverage, but within the planning area	Redmond	3750	SF, TR, UCL (73 ha) to FCA
Total[2]		**21 450**	

1 = The 'FMP ID' codes and area figures are those described in Appendix 2 (Reserve proposals) of the *Forest Management Plan 2004-2013* (Conservation Commission 2004). Note: area figures quoted are rounded to the nearest 10 ha.
2 = Area or proposal differs from that detailed in the *Forest Management Plan 2004-2013* as an outcome of stakeholder consultation and subsequent Government consideration and endorsement of the final boundaries of the WW.
3 = State Forest
4 = Forest Conservation Area
5 = Unallocated Crown Land
6 = Timber Reserve.

The lands proposed to be classified as forest conservation areas currently cover areas of existing State forest, timber reserve, CALM Act section 5(1)(g) reserve, other Crown reserves (vested and unvested) and unallocated Crown land (Table 4). These lands, where not already,

will be required to be converted to State forest or timber reserve prior to classification as a forest conservation area.

Issues and Opportunities

A range of sustainable resource uses may be permitted within forest conservation areas such as wildflower picking (see Section 43 *Flora Harvesting*), firewood collection and craftwood collection (see Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*). Much of the southern part of the planning area has a highly species-rich and endemic flora (see Section 19 *Native Plants and Vegetation*), and concentration of these activities in these areas may have a cumulative detrimental effect across the landscape.

Key Management Directions

The management focus in the proposed forest conservation areas is to ensure that resource utilisation activities are sustainable, particularly in terms of their effect on flora of conservation significance.

Marine Reserves

Marine reserves are areas managed for conservation and for recreational and commercial activities consistent with conservation. Commercial and recreational fishing and aquaculture are permissible in appropriate zones of marine reserves and are regulated under the *Fish Resources Management Act 1994*.

A management plan is being prepared for the Walpole and Nornalup Inlets Marine Park. The marine park will cover the lower sections of both the Deep River (which is currently part of Walpole-Nornalup National Park) and the Frankland River (which is Unallocated Crown land) to the extent of their tidal reaches.

Issues and Opportunities

The Walpole and Nornalup Inlets Marine Park lies adjacent to and surrounds parts of the Walpole-Nornalup National Park, and there is significant interaction between the two reserves (see Section 30 *Visitor Activities and Use*, and Section 38 *Commercial Fishing*), particularly through public access.

Key Management Directions

Future management of both the marine and terrestrial parks will be consistent and integrated. Where this plan raises issues for and, where inconsistencies arise, any remaining issues will then be referred to both terrestrial and marine controlling bodies.

4. KEY VALUES

The key values of the planning area that this management plan seeks to protect include:

Natural Values

- intact and varied natural landscapes of high scenic quality such as coastal cliffs, wetlands, rivers, granite outcrops, forests and beaches;
- the protection of a major river (Deep River) in a relatively natural state;
- extensive, varied, unique and nationally-significant wetland systems;
- a rich complex mosaic of vegetation representing forest, woodland, heath, wetland, riparian and coastal ecosystems, including extensive old growth forest and a number of threatened ecological communities such as the ‘Mt Lindesay-Little Lindesay Granite Community’;
- a profusion of threatened, endemic and relictual native plants, including the unique red flowering gum *Corymbia ficifolia* and tingle trees, heath and swamp species, and rare orchids such as the blue babe-in-a-cradle *Epiblema grandiflorum* var. *cyaneum ms* (see Section 19 *Native Plants and Vegetation*);

- populations of threatened, endemic and relictual fauna species such as the quokka *Setonix brachyurus*, sunset frog *Spicospina flammocaerulea*, Walpole burrowing crayfish *Engaewa walpolea* and the tingle trapdoor spider *Moggridgea tingle* (see Section 20 *Native Animals*);
- extensive areas of undisturbed habitat for flora and fauna where biological, ecological and evolutionary processes can occur largely free from interference by humans.

Wilderness Values

- qualities of remoteness and naturalness not readily available elsewhere in the south-west.

Cultural Values

- Aboriginal sites and landscapes of mythological, ceremonial, cultural and spiritual significance;
- the potential for 'joint management' between Aboriginal people and the Department;
- a rich non-Indigenous cultural heritage associated with exploration, early settlement, and the agricultural/forestry industries.

Recreation and Tourism Values

- a terrestrial environment that provides opportunities for a wide range of nature-based recreation activities including bushwalking, camping, fishing, picnicking, recreational driving and wildlife interaction;
- regionally significant quality interpretive and experiential recreation opportunities such as the Tree Top Walk and Walpole Wilderness Discovery Centre;
- coastal and hinterland day use opportunities for many local communities within the Manjimup, Denmark, Plantagenet and Albany local government areas.

Economic Values

- commercial nature-based tourism opportunities that focus on the area's unique and varied range of natural and cultural values;
- local water supply opportunities that are consistent with the protection of natural values;
- limited resource supply opportunities for firewood, craftwood, apiary, gravel and wildflower picking activities.

Scientific and Educational Values

- a biological refuge that can provide sanctuary for biodiversity, and maximising protection from and minimising potential impacts of climate change;
- a wide range of natural components and systems that can be monitored over time;
- immense international, national and local educational value as a giant outdoor classroom for expanding understanding about the natural world, bush skills and Aboriginal and European societies; and
- a source of inspiration for artists, photographers, and crafts people stemming from the beauty of, and natural forces acting upon, the varied landscapes of the planning area and our human interaction with the area.

5. PUBLIC PARTICIPATION

The CALM Act specifies that the public will be given the opportunity to comment on proposed management plans. This management plan has been developed in consultation with local communities, visitors to the planning area and other interested parties in the following ways:

- the 'Walpole Wilderness Area Community Advisory Committee' was established to provide community input for the management plan of the WW and advice to the Department on the proposed reservation process and assist the Department with community liaison and dissemination of information relevant to the WW;

- the 'Walpole Wilderness Area Stakeholder Reference Group' was established to consider the proposed boundaries of the WW and the economic and social impacts of the WW and how these impacts could be addressed. Eighteen key organisations were involved representing the interests of local government, conservation, cultural aspirations, water resources, mineral exploration, tourism, timber harvesting, craftwood and firewood, wildflower industry and apiary industry;
- public submissions were invited through State and local newspapers, the Department's *NatureBase* website (see Nomenclature), and '*Have Your Say*' brochures during the preparation and release of the draft plan for public comment;
- community consultation meetings were conducted;
- meetings were held with stakeholder groups and interested individuals; and
- Government agencies were consulted, including local government authorities, Department of Water, Fire and Emergency Services Authority (FESA), Department of Industry and Resources (DOIR), Tourism Western Australia, Department of Sport and Recreation, Department of Indigenous Affairs and Fisheries Western Australia.

PART B. MANAGEMENT DIRECTIONS AND PURPOSE

6. VISION

The vision of this plan is derived from State legislation and policy, and community input. The vision also reflects the key values of the area, the importance the Department places upon the management of wilderness areas and the increasing role of Aboriginal people in managing the values.

The vision for the planning area is as follows:

The Walpole Wilderness is a vast natural and wild landscape embracing the essence of the southern forests and coast of Western Australia. Old majestic jarrah, karri and tingle forests surround imposing granite peaks, peaceful rivers, heathlands, wetlands and tranquil inlets, and overlook picturesque sandy beaches, sheer coastal cliffs and the Southern Ocean.

The Walpole Wilderness will be recognised as an important component of an international biodiversity hotspot, where natural and cultural values, such as wilderness, tingle forest, a threatened and highly endemic and relictual flora and fauna, threatened ecological communities, old growth forests and wetlands, and our knowledge of them, will be maintained and enhanced for future generations.

This ancient landscape will be recognised for its great visual and aesthetic appeal and for its rich Aboriginal heritage and stewardship, which will be encouraged through joint management with Aboriginal people.

People will find inspiration, enjoyment and livelihoods, and understand and appreciate the natural environment and cultural heritage of the Walpole Wilderness. Sustainable use of the area, reflecting a custodial spirit, will provide benefits to future generations.

7. LEGISLATIVE FRAMEWORK

Legislation and Policy

The CALM Act was proclaimed on 22 March 1985, establishing the Department and two controlling bodies (the National Parks and Nature Conservation Authority, and the Lands and Forest Commission) in which the lands managed by the Department were vested. In 2000, amendments to the CALM Act replaced these controlling bodies with the Conservation Commission, in which national parks, nature reserves, conservation parks, State forests and timber reserves are vested.

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 10 *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 and auditing the performance of the Department and the Forest Products Commission (FPC) in carrying out and complying with the management plans; and
- to assess and audit the performance of the Department and the FPC in carrying out and complying with the management plans.

Management plans are prepared for the Conservation Commission through the agency of the Department.

The two primary Acts under which the Department operates are the CALM Act and the *Wildlife Conservation Act 1950*. A number of other Acts also affect the Department's activities or confer specific powers on the Department. The CALM Act covers such matters as defining categories of lands and waters managed by the Department, establishing controlling bodies, establishing and defining the functions of the Department and the controlling bodies, management planning, control and eradication of forest diseases, permits, licences, contracts, leases, offences and enforcement.

The *Wildlife Conservation Act 1950* provides for specific protection of native flora and fauna on all lands and waters within the State boundaries (see Part D *Managing the Natural Environment*, Section 19 *Native Plants and Vegetation*, and Section 20 *Native Animals*).

The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) contains provisions relating to matters of national environmental significance, such as (i) World Heritage properties, (ii) National Heritage properties, (iii) Ramsar wetlands of international importance, (iv) threatened species and ecological communities, (v) migratory species protected under international agreements, (vi) the Commonwealth marine environment, or (vii) nuclear actions. These provisions require referral to and consultation with the Commonwealth Environment Minister under this Act if an action has, will have or is likely to have a significant impact on any of these matters unless, under section 46, an action is approved under, and taken in accordance with, a State management plan that is accredited by the Commonwealth.

Sale of forest produce (includes honey, seed, beeswax, rocks, stone and soil) from all Crown land and pastoral leases is controlled by the Department under section 88 of the CALM Act. Minerals are excluded from forest produce under the *Mining Act 1978*. Removal of forest products, which includes trees and timber, is managed by the FPC under the *Forest Products Commission Act 2000*. Licensing of the taking of flora and fauna is administered by the Department under the *Wildlife Conservation Act 1950*.

This management plan is required to conform to the *Bush Fires Act 1954* and satisfy FESA that adequate fire protection will be provided for the conservation reserves (see Section 25 *Fire*). Under section 34(1)(1a)(a) of that Act, plans that set out the measures taken and proposed to be taken to prevent, control and extinguish bushfires on conservation reserves require approval from FESA. Under section 45 of the *Bush Fires Act 1954*, the Department may take responsibility for the suppression of fires threatening the conservation estate.

Under the *Aboriginal Heritage Act 1972*, the Department is required to report Aboriginal heritage sites and ensure that sites are protected (see Section 26 *Indigenous Heritage*). The Commonwealth's *Native Title Act 1993* requires that native title claimants and representative bodies are notified when a management plan is being prepared or major public works undertaken. The South West Aboriginal Land and Sea Council is the native title representative body for the region and has a number of functions prescribed under the *Native Title Act 1993.*

Recreational fishing in the planning area is provided for under the *Fish Resources Management Act 1994*. Access is provided for under the CALM Act and regulated under the *Conservation and Land Management Regulations 2002*.

The *Mining Act 1978* and the *Petroleum Act 1967* take precedence over the CALM Act. Activities authorised under either of these Acts may override the contents of this management plan (see Section 37 *Mineral and Petroleum Exploration and Development*).

The Department's management is guided by a number of policies, administrative instructions and circulars. Policies of the Department and the Conservation Commission are available from the Department upon request. Some policies of the Department can be accessed via the Department's *NatureBase* website (see Nomenclature).

Obligations and Agreements

Australia is a participant or signatory to a number of important international, national and State conservation agreements, some of which may affect the management of parks and reserves of the planning area. The provisions of this plan, where relevant, are consistent with obligations under these agreements and programs.

Migratory Bird Agreements

The Japan-Australia Migratory Bird Agreement (JAMBA) in 1981, China-Australia Migratory Bird Agreement (CAMBA) in 1988 and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) in 2006 are treaties that provide for cooperation between the countries involved to protect shared migratory bird species and their habitats. Nearly 80 bird species, many of them associated with wetlands, are listed in these agreements.

Migratory birds listed under these agreements are further protected under the Commonwealth's EPBC Act, which stipulates that all actions that are likely to impact on such species are subject to environmental assessment and approval. This places Australia in a stronger position to meet its international obligations for the protection and management of migratory birds listed under the JAMBA, CAMBA and ROKAMBA agreements.

There are ten bird species covered under the JAMBA, CAMBA and/or ROKAMBAagreements that have been recorded in the planning area (see Section 20 *Native Animals*).

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 agree to protect species that regularly migrate across international boundaries. There are three bird species covered under the Bonn Convention that have been recorded in the planning area (see Section 20 *Native Animals*).

Convention on Wetlands (Ramsar Convention)

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) was signed in Ramsar, Iran in 1971, is an intergovernmental treaty dedicated to the conservation and 'wise use' of wetlands. The Ramsar Convention provides for the listing of internationally important wetlands. Australia became a signatory to the Convention in 1974.

The Convention encourages contracting parties to designate sites containing representative, rare or unique wetland types, or that are important for conserving biological diversity, to the List of Wetlands of International Importance ('Ramsar sites'). These sites need to be managed to ensure their special natural values are maintained or improved.

There are currently no Ramsar-listed wetlands in the planning area. However, it is possible that some of the wetlands in the planning area may be nominated for Ramsar listing during the life of this plan, as some wetlands have already been identified as being nationally important (see Section 17 *Hydrology and Catchment Protection*, and Section 21 *Ecological Communities*).

National Wetlands Program

The *National Wetlands Program* was established in 1989 in response to growing concern for wetland conservation in Australia and the recognition of the need to act more strategically and

cooperatively in implementing Australia's obligations under the Ramsar Convention, JAMBA and CAMBA. The program was established to undertake, in cooperation with State and Territory Governments, a comprehensive inventory of Australia's nationally important wetlands known as *A Directory of Important Wetlands in Australia*. The wetland classification system used in the directory is based on that used by the Ramsar Convention in describing *Wetlands of International Importance*. Within the planning area, there are two nationally important wetlands: the Mt Soho Swamps and the Owingup Swamp system.

The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (the Burra Charter)

The Burra Charter was adopted from the International Charter for the Conservation and Restoration of Monuments and Sites (Venice 1964) and the Resolutions of the Fifth General Assembly of the International Council on Monuments and Sites (ICOMOS) (Moscow 1978) in 1979 at Burra, South Australia. The charter provides guidance for the conservation and management of natural, indigenous and historic places of cultural significance in Australia (see Part E *Managing Our Cultural Heritage*). The charter sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers and custodians.

Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention)

The World Heritage Convention aims to promote cooperation among nations to protect worldwide heritage that is of such universal value that its conservation is of concern to all people. Under the terms of the 1972 Convention, a World Heritage List has been established that has areas of outstanding universal value and that form part of the cultural and natural heritage of the signatory countries. Areas can be added to the World Heritage List after nomination by signatory countries on the basis of their natural or cultural values, or in some exceptional cases on both.

This convention does not affect the planning area. However, the Government's 'Tourism' and 'Ecotourism Strategy for WA' policies suggest that the WW be recommended to the Commonwealth Government for nomination for World Heritage listing. Under World Heritage guidelines, there can be only one natural environment nomination from Australia for World Heritage listing every year. The State Government is putting together a nomination for the World Heritage listing of the Cape Range/Ningaloo area. Although this management plan will contribute significantly to the development of any case for listing, nomination of the WW will be dependent on priority setting at both the Statewide and national levels.

Man and the Biosphere Program

Biosphere reserves (see Glossary) are nominated by governments and designated by the International Coordinating Council of the Man and the Biosphere (MAB) program of the United Nations Educational, Scientific and Cultural Organisation (UNESCO). In 2005, there were 459 biosphere reserves in 97 countries.

Biosphere reserves function as a world network of protected areas that demonstrate the value of activities that link conservation and development (UNESCO 2005). Biosphere reserves usually contain a core conservation area consisting of protected areas that give long-term protection to the landscape, ecosystem and species it contains, as well as buffers and transition zones that consist of private property and other reserves adjacent to core areas.

A biosphere reserve is being considered within the general vicinity of Denmark, Mount Barker and Albany, and is proposed to include as a core area about 152 000 ha of conservation estate that lies within eastern parts of the planning area. A biosphere reserve in this area is an option that exists alongside potential World Heritage status and is consistent with the pursuit of conservation, social and economic objectives of this plan. These objectives do not diminish the possibility, in fact enhance the prospect, of either option occurring in the future.

Regional Forest Agreement for the South West Forest Region of WA

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

The *Regional Forest Agreement for the South West Forest Region of Western Australia* (RFA) was made on the 4 May 1999 between the Commonwealth of Australia and the State of WA, and will remain in place for a minimum of 20 years. The agreement:

- identifies a CAR reserve system and provides for the conservation of those areas;
- provides for the ecologically sustainable management and use of forests in the region;
- is for the purpose of providing long-term stability of forests and forest-based industries; and
- has regard to studies and projects carried out in relation to a range of natural, cultural, recreation and economic values (see Section 4 *Key Values*) relevant to the region.

The planning area is located mostly within the bounds of the RFA, although some parts of the planning area such as Quarram Nature Reserve, William Bay National Park and parts of Redmond State Forest lie outside of the RFA boundary.

7. Legislative Framework

Key Points

- The Australian Commonwealth Government is signatory to the Japan-Australia, China-Australia and Republic of Korea-Australia Migratory Bird Agreements. Ten JAMBA/CAMBA/ROKAMBA species occur in the planning area.
- The Australian Commonwealth Government is signatory to the Bonn Convention. Three species listed under this Convention have been recorded in the planning area.
- The plan area has two nationally important wetlands that are listed under the 'Directory of Important Wetlands in Australia'.

The objective is to ensure obligations to international treaties and conventions are met.

This will be achieved by:

1. implementing Australia's obligations under the JAMBA, CAMBA and ROKAMBA agreements and the Bonn Convention in the planning area; and
2. ensuring the implementation of this plan is consistent with international, national and state obligations, where relevant.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

8. MANAGEMENT ARRANGEMENTS WITH ABORIGINAL PEOPLE

There is a strong interest by Aboriginal 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 enriching cross-cultural awareness.

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

and the Department are working together to establish a joint management agreement for the parks that provides Aboriginal representation and participation in management of the planning area. The establishment of a Park Council is one option that may facilitate joint management.

A Memorandum of Understanding is already in place between the Department and the South West Aboriginal Land and Sea Council Aboriginal Corporation that, under the *Native Title Act 1993*, is the representative body for the south-west of the State. This memorandum of understanding sets out both principles and guidelines under which access and 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 management plan, the Native Title representative body, as well as the Native Title claimants, were notified of the management planning process.

There are two registered National Native Title Tribunal claims over all or part of the planning area: the Southern Nyoongar claim (WC96/109) and the Wagyl Kaip claim (WC98/70).

8. Management Arrangements with Aboriginal People

Key Points

- The knowledge and association that Aboriginal people have with 'country' can make a valuable contribution to the management of lands and waters managed by the Department.
- The State Government is developing a policy on ownership, administration and joint management of conservation lands in WA.

The objective is to provide a mechanism for Aboriginal people to be engaged cooperatively by the Department.

This will be achieved by:

1. maintaining and building upon a commitment to pursue cooperative management arrangements with Aboriginal people consistent with Government policy;
2. contributing to the negotiations of indigenous land use agreements under the provisions of the *Native Title Act 1993*; and
3. establishing a Park Council, or similar arrangement, to facilitate joint management.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
8.1 The establishment of a Park Council or similar joint management arrangement	8.1 The successful establishment of a Park Council or similar joint management arrangement within 5 years of commencement of the plan	After 5 years

9. MANAGEMENT PLANNING

The Department initiates the preparation of management plans according to State-wide priorities, and on behalf of the Conservation Commission. The standard process of producing a management plan is outlined in Figure 1.

This management plan replaces the *Walpole-Nornalup National Park Management Plan 1992-2002* (CALM 1992) (see Section 3 *Planning Area* and Section 14 *Biogeography*). While this management plan takes a more strategic approach to management because it covers a large number of reserves over a large area, the *Walpole-Nornalup National Park Management Plan* (CALM 1992) nevertheless contains some valuable, more localised information that can be referred to for this park (see Section 3 *Planning Area*). This local park information has been taken into account in the planning process for this management plan.

This management plan is, as far as possible, consistent with the plans and strategies of other Commonwealth, State and local government agencies for this area. Where inconsistencies arise, the Department will liaise with agencies to reach resolution where possible, and provide information on the Department's position. The Department will continue to provide input into plans and strategies prepared by other agencies to maintain consistency with this management plan and other plans, policies and commitments of the Department.

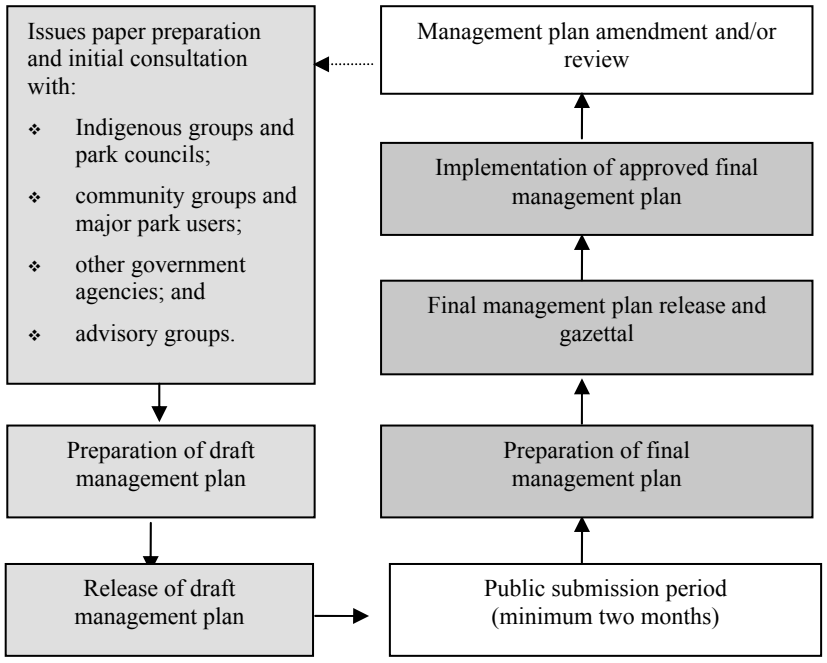

Figure 1. Management planning process for terrestrial conservation reserves

10. PERFORMANCE ASSESSMENT

The Conservation Commission undertakes a number of types of performance assessment, one of which are conservation reserve management plan performance assessments. The Conservation Commission will measure the success of this plan in accord with its conservation reserve management plan performance assessment function under section 19(1)(g)(iii) of the CALM Act by using performance indicators and other mechanisms as appropriate (Conservation Commission 2005). It is not efficient to measure all aspects of management given resource and technical impediments – consequently, indicators will target 'key' components of the plan. Each key performance indicator (KPI) (Kanowski *et al*. 2001) comprises evaluation of a measure, target and reporting requirements. These components provide a basis for adaptive management, whereby management is altered if necessary to meet a desired outcome (see Section 48 *Research and Monitoring*).

The Department is responsible for providing information to the Conservation Commission to allow it to assess the performance of the Department in carrying out and complying with management plans, such as in meeting targets specified in the KPIs. The frequency of reporting will depend upon the requirements of each KPI, the establishment of baseline information against which to assess performance, and any unforeseen changes to the environmental conditions. Where a report identifies a target shortfall, a response to the Conservation Commission may be required. The response may identify factors that have led to the target shortfall, and propose alternative management where appropriate. The Conservation Commission will consider the Department's response on the target shortfall and evaluate the need for action. The Conservation Commission will make the results of performance assessments available to the public. The adequacy of the range of selected KPIs

and management strategies will be reviewed following each Conservation Commission performance assessment.

KPIs are identified in relevant sections throughout the plan and are also presented in a summary in Appendix 2.

11. PROPOSED TENURE, PURPOSE, VESTING AND BOUNDARY CHANGES

The Government's 'Protecting Our Old-Growth Forests' policy provided for the creation of the parks and reserves that form the WW. The Government's policy was given effect through the *Forest Management Plan 2004-2013*, which proposed changes to land tenure, purpose, vesting and boundaries, including the parks of the WW. The parks of the WW were created on 8 December 2004 (see Section 3 *Planning Area*).

The primary reasons for the establishment of the parks of the WW were to provide protection for old growth forests, wilderness values, and to contribute towards a comprehensive, adequate and representative reserve system for the protection of biodiversity (see Section 14 *Biogeography*). There are, however, still many small patches of Crown and other lands in areas surrounded by and within close proximity to the planning area that may be suitable to add to the conservation estate (Appendix 3). These areas are worthy of further investigation and analysis of vegetation communities, landforms and the adequacy of their representation in the conservation reserve system.

Criteria that may be considered in the assessment process for incorporating new lands into the conservation estate under this plan may include:

- location – proximity and connectivity to other conservation reserves;
- size and shape;
- presence of threatened or priority species and ecological communities (see Section 19 *Native Plants and Vegetation*, Section 20 *Native Animals* and Section 21 *Ecological Communities*);
- biological and biophysical diversity, and contribution to the CAR system of protected areas (see Section 14 *Biogeography*);
- assists in the management of threatening processes impacting on reserve values, such as weeds (see Section 22 *Environmental Weeds*), feral animals (see Section 23 *Introduced and Other Problem Animals*) and diseased vegetation (see Section 24 *Diseases*);
- assists in the resolution of boundary management issues; and
- compatible land use benefits – protection of soils and catchments (see Section 16 *Geology, Landforms and Soils*, and Section 17 *Hydrology and Catchment Protection*), cultural heritage values (see Part E *Managing Our Cultural Heritage*), recreation values (see Part F *Managing Visitor Use*), and sustainable resource values (see Part G *Managing Resource Use*).

The *Walpole-Nornalup National Park Management Plan* (CALM 1992) recommended 20 land tenure changes. One proposed change was completed – State Forest 42 (Giants block) and Hay Location 602 formed part of reserve 46682 in 2002. Seventeen of these proposed changes (Appendix 3) remain yet to be addressed and will be re-assessed against the above criteria.

An inconsistency exists in the boundaries of reserves in the planning area that adjoin inlets and the Southern Ocean. The southern boundaries of Walpole-Nornalup National Park and Quarram Nature Reserve adjoining the Southern Ocean are currently to the high water mark (see Section 3 *Planning Area*). However, this boundary with the Southern Ocean extends to the low water mark in the neighbouring D'Entrecasteaux and William Bay national parks. In addition, the boundary of Walpole-Nornalup National Park adjoining the Walpole and Nornalup Inlets is also to the low water mark. Extension of the park boundary along the coast

to the low water mark is an uncompleted action in the *Walpole-Nornalup National Park Management Plan* (CALM 1992). Extending the boundary in these reserves to the low water mark will assist managers in controlling activities within the narrow strip of beach between the high and low water marks, and will be investigated in this plan.

Some areas of private property that are surrounded by or adjacent to conservation estate have potential acquisition value, where they could add significant natural or recreation values, management benefits or protect areas with these values within the planning area and contribute to the national reserve system. While there may not be any areas immediately suitable to consider for acquiring by purchase, exchange or other means, potential areas should nevertheless be considered during the life of this plan if opportunities for acquisition arise and funds become available.

Any Crown or other lands outlined in Table 4 and Appendix 3 that become conservation estate within the life of the plan, will be covered under this management plan.

Land Classification

A strategy for the conservation of natural and cultural values and the facilitation of sustainable resource use, is the implementation of a land classification scheme to designate appropriate levels and types of use and access. Areas of land managed by the Department can be classified under section 62(1) of the CALM Act to establish the following land classifications to which specific management prescriptions or regulations apply:

- wilderness area (see Section 13 *Management of Wilderness Areas*);
- prohibited area;
- limited access area;
- temporary control area;
- forest conservation area;
- recreation area for purpose specified in the notice; or
- such other class of area as the Minister, on recommendation of the Conservation Commission, thinks necessary to give effect to the object of this area.

Under the *Forest Management Plan 2004-2013*, portions of State forest, timber reserve and other Crown lands in the Wye, Deep, Dawson, Keystone, Swarbrick, Collis, Trent, Thames, Styx, Harewood, Hay, Redmond and Denbarker blocks have been recommended to be classified as 'forest conservation area' under section 62(1)(da) of the CALM Act (see Section 3 *Planning Area*). This classification may allow for resource uses such as firewood and craftwood collection (see Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*), wildflower picking and seed collection (see Section 43 *Flora Harvesting*), apiculture (see Section 42 *Beekeeping*) and gravel extraction (see Section 37 *Mineral and Petroleum Exploration and Development*), but will not include timber production for commercial sawlogs. In the event that mining is approved in forest conservation areas, timber may be salvaged for use within the planning area (see Section 37 *Mineral and Petroleum Exploration and Development*).

The areas to be converted to State forest or timber reserve prior to classification as a forest conservation area within the WW are shown in Table 4 (see Section 3 *Planning Area*).

The tenure, classification and function of forest conservation areas within the planning area, including their future requirement and whether they will be amalgamated with adjacent national parks, will be reviewed during the next Forest Management Plan review.

11. Proposed Tenure, Purpose, Vesting and Boundary Changes

Key Points

- Although the establishment of the parks of the WW provided protection for old growth forests, wilderness values, and contributed towards a CAR reserve system, there are other areas that may be suitable to add to the conservation estate.
- Criteria have been developed that will assist in assessing the suitability of other areas for addition to the public conservation estate.
- Recommendations for proposed tenure changes and additions were made in the *Walpole-Nornalup National Park Management Plan 1992-2002* and the *Forest Management Plan 2004-2013*. Almost all are outstanding.
- Any Crown or other lands outlined in Table 4 and Appendix 3 that become conservation estate within the life of the plan, will be covered under this management plan.
- Section 62(1)(da) of the CALM Act allows for the classification of land vested with the Conservation Commission as 'forest conservation area', whereby specific management prescriptions apply. A number of these areas are proposed.

The objective is to incorporate identified lands into the conservation estate to assist in the protection of the values of the planning area, to provide maximum security of tenure, and to contribute towards the establishment of a comprehensive, adequate and representative reserve system.

This will be achieved by:

1. completing all tenure actions for which the Department and Conservation Commission are responsible;
2. using these criteria to assess other proposals that may come to light over the life of the plan;
3. negotiating with relevant State agencies and local authorities to add important conservation and recreation reserves under their control to the public conservation estate;
4. extending the boundaries of the Walpole-Nornalup National Park and Quarram Nature Reserve to the low water mark along the Southern Ocean; and
5. managing any areas under this management plan that:
   - are intended to be covered by this management plan until they can be vested with the Conservation Commission; and
   - are subsequently added to the planning area.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
11.1 Tenure actions for which the Department and Conservation Commission are responsible	11.1 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 WILDERNESS VALUES

12. IDENTIFICATION AND DEDICATION OF WILDERNESS AREAS

Identification of Wilderness Areas

The concept of wilderness evolved from natural and social perspectives during the nineteenth and twentieth centuries. For some, it is a state of mind, an opportunity. For others, wilderness is best described as a place where nature and its forces work undisturbed by human activities.

The World Conservation Union defines wilderness as a:

'*...large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition*'.

The Australian Heritage Commission (now called the Australian Heritage Council) developed the National Wilderness Inventory (NWI) in 1986 following community concern over the decline in the area and quality of remote and natural land in Australia.

The Commonwealth Department of the Environment and Heritage is the custodian of the NWI (now called the 'Australian Land Disturbance Database'). This database uses four indicators to estimate the 'quality' of wilderness across the landscape. These are:

- remoteness from settlement - how remote a site is from permanent human occupation. It includes permanently occupied places and built up areas;
- remoteness from access - how remote a site is from established access routes. It includes all classes of road and vehicle tracks, railways, aircraft landing grounds and other access infrastructure;
- apparent naturalness - the degree to which a site is free from permanent structures associated with modern technological society. It includes all built infrastructure; and
- biophysical naturalness - the degree to which a site is free from biophysical disturbances caused by the influence of modern technological society. It includes a variety of human and biophysical landscape attributes.

This database can test different scenarios for mapping wilderness within the parameters of these four indicators. The NWI does not make any statements in relation to which areas qualify as wilderness, but rather provides an index rating of wilderness quality from zero to 20, with 20 being the highest quality based on the above four indicators.

Assessment of wilderness in the south-west forest region of WA was carried out as part of the 1998 Comprehensive Regional Assessment (CRA), which preceded the Regional Forest Agreement (RFA) in 1999.

However, the policy commitment by the State Government to create the WW has led the Department to consider the process for identifying wilderness areas, and its ongoing management. In relation to the former, Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas*, has been developed that incorporates the NWI criteria and defines a 'wilderness area' as an area that has a NWI wilderness quality rating of ≥12 and meets a minimum size threshold of 8000 ha in temperate areas.

Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas* does not place a limit on the number of areas or units of land that can be classified as wilderness areas across a tract of Crown land. The planning area is considerably large with significant areas of higher wilderness quality (Map 3). However, two wilderness areas have been identified within the planning area that (i) satisfy the policy criteria above, (ii) are manageable in terms of fire protection and management, and (iii) do not close off any access that is strategically required (Map 3). These two wilderness areas are centrally located within the planning area in:

- Roe, Peak, northern part of Crossing, and southern parts of Rocky and Long blocks. This wilderness area has an area of ≥ 12 NWI rating of 12 849 hectares. This area contains significant areas of old growth forests and a range of ecosystems including granite outcrops such as Mt Roe and part of the Frankland River, in addition to significant remote and natural values.
- Willmott and Quindinillup blocks. This wilderness area has an area of ≥ 12 NWI rating of 8 156 hectares. This area contains significant areas of shrublands that have significant species richness, endemic, relictual and disjunct flora values, in addition to significant remote and natural values.

It has been recognised that Johnston and O'Donnell blocks, together with the adjoining Sharpe and part Deep blocks, collectively have the 'potential' to become a wilderness area because the area of 11 367 hectares of ≥ 12 NWI rating in these blocks exceeds the size criterion for a wilderness area. However, the specific boundary configuration and ongoing management of this area requires further analysis. Therefore, a precautionary approach to management of this area will be adopted until further analysis is undertaken. Extraordinary management operations, other than those compatible operations that have been normally undertaken in this area such as fire, disease, weed, feral animal and threatened species management, will not be permitted. This will allow this area to be managed over the life of the plan to enable future consideration as a wilderness area.

In addition to these three options, a range of other potential candidate wilderness areas of varying configurations that meet the NWI and size criteria have been examined during the planning process, but are not considered to be manageable.

The area that has been informally known as the 'Nuyts Wilderness Area' in Walpole-Nornalup National Park is not gazetted as a wilderness area under section 62 of the CALM Act. This area does not meet the criteria for classification as a wilderness area as defined in Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas*, and therefore will not be considered for gazettal within the planning area.

Dedication of Wilderness Areas

Areas of reserves are classified under section 62 of the CALM Act to establish management zones to which specific management prescriptions or regulations apply (see Section 11 *Proposed Tenure, Purpose, Vesting and Boundary Changes*). Under section 62(1)(a) of the CALM Act a wilderness area can be established (gazetted by way of a 'section 62 notice' in the Government Gazette) by the Minister on any Crown land (reserve) that is vested in the Conservation Commission.

Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas* recognises that the criterion of a NWI wilderness quality index of 12 or above may be achieved over time by rehabilitation of past disturbances. Areas within the external boundary of a wilderness area that do not meet the initial NWI criterion may be included within the gazetted wilderness area, as they will increase their NWI rating as they rehabilitate over time. Periodic re-assessment of NWI would be desirable to confirm this and monitor for any adverse changes to NWI rating of the wilderness area.

12. Identification and Dedication of Wilderness Areas

Key Points

- The NWI provides an index rating of wilderness quality from zero to 20, with 20 being the highest quality based on four indicators.
- The NWI database can test different scenarios for mapping wilderness areas within the parameters of the four indicators.
- A 'wilderness area' is an area that has a NWI wilderness quality rating of 12 or greater and meets a minimum size threshold of 8000 hectares in temperate areas.
- Two wilderness areas have been identified within the planning area.
- A third area has also been identified as having potential for being a wilderness area.

The objective is to provide statutory protection to wilderness areas.

This will be achieved by:

1. gazetting the two wilderness areas under section 62 of the CALM Act; and
2. managing the area of Johnston, O'Donnell, Sharpe and part of Deep blocks over the life of this plan in a way that does not reduce the potential to be considered as a wilderness area.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
12.1 Gazettal of two wilderness areas under section 62 of the CALM Act	12.1 Gazettal of two wilderness areas within 2 years	After 2 years

13. MANAGEMENT OF WILDERNESS AREAS

Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas* guides the management of both wilderness areas and conservation lands surrounding wilderness. Management activities within surrounding areas have the potential to impact wilderness values. Surrounding areas provide a buffer and, under the wilderness policy, will be managed to support wilderness values.

Many values and their specific relationship to the wilderness policy are discussed throughout this plan. However, the main points from Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas* include:

- biodiversity, ecological communities and natural processes will be maintained and, where possible, restored by protecting them from unnatural disturbances and maintaining ecological processes;
- biodiversity will be protected from threatening processes, agents and activities;
- use of mechanised transport will not be permitted within wilderness areas, except for emergency or essential management operations, or reasons of cultural importance;
- opportunities for solitude, inspiration and self-reliant recreation will be maintained where compatible with maintaining biodiversity;
- education and/or recreation expeditions will be permitted within wilderness. Commercial recreation and tourism will not be permitted within wilderness because CALM Act leases and licenses cannot be issued for wilderness classified under section 62 of the Act;
- constructed walk tracks, signs and toilets will not be provided in wilderness;
- wherever possible, ground disturbing activities for fire management will be conducted outside of wilderness, which includes construction and maintenance of access roads, firebreaks, fuel-reduced buffers, and water points;
- prescribed burning within wilderness may be carried out for the protection and maintenance of natural values and processes;

- appropriate fire protection strategies according to established standards will be implemented in areas surrounding wilderness where life, property and natural values may be threatened;
- any existing vehicle tracks and constructed walk trails within wilderness that are not required for emergency and essential management purposes will be closed;
- management of wilderness and surrounding areas will be consistent with the principles in the Malimup Communiqué[1].
- information to visitors to minimise their impact on the environment is provided in the form of a 'Caring Code for the Bush'.

The protection of threatened flora (see Section 19 *Native Plants and Vegetation*) and fauna (see Section 20 *Native Animals*), and ecological communities (see Section 21 *Ecological Communities*) that may occur within wilderness areas may require active site management to collect seed (in the case of flora), translocate individuals, monitor existing populations, survey for new populations, and manage threatening processes. The requirements for access into wilderness areas to manage threatened species and ecological communities depends on their location and specific requirements, although limited access is unlikely to affect management.

Wilderness quality will be assessed and maintained using the NWI database to determine the effect that any specific activity/site development or operational options might have on wilderness quality.

13. Management of Wilderness Areas

Key Points

- Management activities in wilderness areas and in areas that surround wilderness have the potential to impact wilderness values.

The objective is to maintain or enhance wilderness qualities within wilderness areas.

This will be achieved by:

1. managing wilderness areas according to Department policies;
2. maintaining wilderness qualities within wilderness areas by monitoring the extent and level of wilderness quality and controlling impacts on wilderness areas; and
3. providing appropriate information and interpretation on wilderness to promote awareness, appreciation and understanding.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
13.1 The extent and level of wilderness quality within wilderness areas	13.1 The extent and level of wilderness quality in wilderness areas does not diminish from 2008 levels	After 5 years

[1] The Malimup Communiqué was developed between indigenous communities, government authorities and non-government environmental groups in May 1998 at Malimup Springs in WA. It is concerned with indigenous people and the management of areas zoned as wilderness, primarily within national parks, or other lands reserved for conservation or recreational purposes.

PART D. MANAGING THE NATURAL ENVIRONMENT

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

The CALM and Wildlife Conservation acts give the Department responsibility for the conservation and protection of native flora and fauna on all lands and waters throughout the State. However, it is probable that during the life of this management plan the Government will replace the *Wildlife Conservation Act 1950* with new legislation to protect biodiversity. As a result, the Department released a consultation paper in December 2002, outlining the intent of the proposed Biodiversity Conservation Act. The proposed act will:

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

The State Government is also committed to the development of a State biodiversity conservation strategy and, to this end, released a consultation paper in 2004. The strategy will provide the blueprint for addressing the decline in biodiversity in WA for the next 100 years. Phase one of the strategy will be to provide a framework for conserving biodiversity over the next 25 years.

The regional management of natural resources through effective and efficient partnerships between all levels of government, industry and the community is one component of conserving biodiversity. In WA, natural resource management (NRM) is undertaken by regional community based groups in partnership with State NRM agencies (such as the Department) and the Joint State Commonwealth Steering Committee. The planning area is part of the South Coast and South West NRM regions. The regional groups that coordinate the Australia-wide framework for NRM planning and investment across these regions are the 'South Coast NRM' and 'South West Catchments Council'. The planning area falls mostly within the 'South Coast NRM' region. The Conservation Commission is currently developing a project to formalise its relationships with regional NRM groups with the goal of better integrating the work of those groups with management planning for national parks and other reserves for which the Conservation Commission is responsible.

Various Departmental policies, some of which are currently under review, provide management directions for managing the natural environment, including:

- No. 3 - *Management of Phytophthora and Disease caused by it*;
- No. 9 - *Conserving Threatened Species and Ecological Communities* (subject to final consultation);
- No. 13 - *Commercial Flora*;
- No. 18 - *Recreation, Tourism and Visitor Services* (subject to final consultation);
- No. 19 - *Fire Management*;
- No. 27 - *CALM's Role in Management of Native Vegetation in Rural Areas*;
- No. 31 - *Management of Reserves for the Conservation of Nature*;

- No. 56 - *Risk Management*;
- proposed *Environmental Weed Management* policy (subject to final consultation); and
- proposed *Management of Pest Animals on CALM-managed Lands* policy (subject to final consultation).

The planning area is recognised for its high biodiversity values (see Section 4 *Key Values*) and is an important part of an international biodiversity hotspot. There are several large-scale threatening processes that are impacting or may impact on these values, such as *P. cinnamomi*, feral animals, inappropriate fire regimes, and climate change. This chapter will describe the biodiversity values, the major threats to these values, and actions proposed by the Department to mitigate the threats. The main focus will be on:

- identifying large protectable areas that are not infested by *P. cinnamomi*;
- gaining a better knowledge and understanding of the natural values, threatening processes and their impacts within the planning area and adapt management accordingly;
- continuing to control priority introduced and other problem animals and environmental weeds, particularly in areas that may impact on threatened species and communities;
- managing fire to protect and promote the natural values and to protect life and community assets;
- monitoring and maintaining the health of wetlands, rivers and riparian vegetation;
- ensuring knowledge is stored and updated by, and available to, staff managing the natural environment of the planning area;
- rehabilitating ecosystems; and
- gazetting wilderness areas (see Section 12 *Identification and Dedication of Wilderness Areas*).

14. BIOGEOGRAPHY

The National Reserve System Program was adopted to establish a CAR system of protected areas to conserve Australia's biodiversity. To ensure that the National Reserve System encompassed the full range of biological and biophysical diversity across Australia, the Interim Biogeographic Regionalisation for Australia (IBRA) and Interim Marine and Coastal Regionalisation for Australia (IMCRA) (Thackway and Cresswell 1995) were developed. The current Statewide target level for a CAR reserve system is set at 15%, consistent with national benchmarks (CALM 2003a).

Bioregions

The IBRA divides WA into 26 biogeographic regions, based on climate, geology, soils, topography and vegetation. The planning area lies across the boundary of two bioregions: the Jarrah Forest and the Warren bioregions, with about equal representation of these across the planning area (Figure 2).

Warren Bioregion

The Warren Bioregion is characterised by dissected undulating country of the Leeuwin Complex, Southern Perth Basin (Blackwood Plateau), South West intrusions of the Yilgarn Craton and western parts of the Albany-Fraser Orogen. Loamy soils support karri *Eucalyptus diversicolor* forest, laterites support jarrah – marri *Corymbia calophylla* forest, leached sandy soils in depressions and plains support low jarrah woodlands and paperbark/sedge swamps, and Holocene marine dunes with peppermint *Agonis flexuosa* and banksia woodlands and heaths.

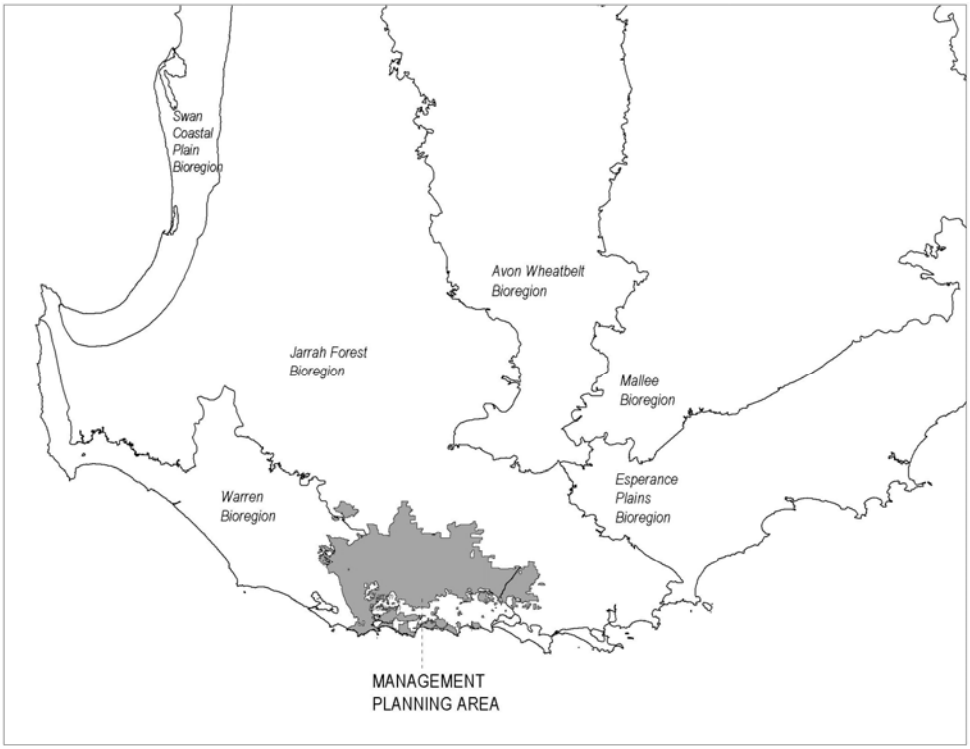

Figure 2. Bioregions in the South-west

About 46% of the Warren bioregion (392 301 ha) is protected within formal conservation reserves, after additions to the conservation estate under the *Forest Management Plan 2004-2013* (Conservation Commission 2004). Of this total area, 32% is protected within the planning area.

Jarrah Forest Bioregion

The Jarrah Forest bioregion is characterised by jarrah-marri forest on laterite gravels and, in the eastern part, by wandoo-marri woodlands on clayey soils. Two sub regions are recognised within this bioregion, differentiated principally by the slight variations in climate, geology and understorey species composition, although only the southern Jarrah Forest sub region is represented within the planning area.

About 13% of the Jarrah Forest bioregion (572 262 ha) is protected within formal conservation reserves, after additions to the conservation estate under the *Forest Management Plan 2004-2013* (Conservation Commission 2004). Of this total area, 31% is protected within the planning area.

When combined with adjacent national parks and State forest, reservation of the planning area significantly adds to a sizeable, relatively unfragmented area of natural vegetation that extends along the south coast and its hinterland from Black Point to Denmark. Shannon, D'Entrecasteaux and Lake Muir National parks adjoin the WW to form an unbroken link of protected areas in the Region. Areas within the planning area adjacent to these parks will be managed in sympathy and consistent with these parks.

Forest Ecosystems

Forest ecosystems were defined in the south-west for use in the WA Regional Forest Agreement by Bradshaw and Mattiske (1997). Twenty-six ecosystems were identified and used to further the establishment of a CAR reserve system to protect the biodiversity of the south-west forest areas. The forest ecosystems are at a finer scale than the bioregional approach for the rest of the State. They are based on key species of the overstorey, the height of the overstorey, canopy cover and the understorey vegetation communities, and are different

to the vegetation complexes and vegetation associations referred to in Section 19 *Native Plants and Vegetation*.

The reservation target for each forest ecosystem in the south-west is 15% of the pre-1750 distribution, except where the forest ecosystem is recognised as rare/endangered and a target of 100% of their remaining extent is set (Commonwealth of Australia 1997). There are 17 forest ecosystems in the planning area (Map 4). Of these, 16 will meet or exceed the reservation targets for these ecosystems in the formal conservation reserve system, once the additions proposed in the *Forest Management Plan 2004-2013* are complete. The 'Shrub, Herb and Sedgelands' and 'Jarrah Forest South' forest ecosystem types each make up 37% of the planning area. The target for 'Bullich *Eucalyptus megacarpa* and Yate *Eucalyptus cornuta* Woodland', 'Jarrah/Rates Tingle *Eucalyptus brevistylis*', 'Jarrah/Red Tingle *Eucalyptus jacksonii*' and 'Karri/Rates Tingle' forest ecosystems is 100% of extant vegetation, and with the additions proposed in the *Forest Management Plan 2004-2013* they reach 88%, 93%, 85% and 92% reservation, respectively. Although the 'Karri South Coast' forest ecosystem is represented in several pockets across the planning area (such as Mt Shadforth Nature Reserve), information is presently unavailable for areas beyond the RFA boundary.

Marine Bioregions

Three major marine biogeographical zones occur on the WA coast: a tropical zone north of North West Cape, a temperate zone east of Cape Leeuwin and a biological overlap zone in between. These three zones are represented by 18 IMCRA bioregions. The WA South Coast marine bioregion lies adjacent to the planning area and the two candidate areas for marine parks and reserves planning (CALM 1994a) are the Walpole and Nornalup Inlets and the State waters adjacent to William Bay National Park. A management plan for the Walpole and Nornalup Inlets Marine Park is in preparation.

14. Biogeography

Key Points

- The planning area lies within two IBRA bioregions: Jarrah Forest and Warren. The southern Jarrah Forest sub region is the only sub region of the Jarrah Forest bioregion that occurs in the planning area.
- About 46% of the Warren bioregion is in a formal conservation reserve.
- About 13% of the Jarrah Forest bioregion is in a formal conservation reserve.
- A management plan for the Walpole and Nornalup Inlets Marine Park is in preparation.
- The 26 forest ecosystems defined for the WA RFA have been used to assist in the establishment of a comprehensive, adequate and representative national reserve system to protect the biodiversity of the south-west forest area.
- Reserve proposals in the *Forest Management Plan 2004-2013* will significantly increase the representation levels of many forest ecosystems in the national reserve system. Seventeen forest ecosystems occur in the planning area, 16 of which meet the agreed reservation target for the national reserve system.
- Reservation of the planning area significantly adds to the relatively unfragmented area protected under conservation, extending along the South Coast and its hinterland from Black Point to Denmark. Shannon, D'Entrecasteaux and Lake Muir National parks, adjoin the WW to form an unbroken link of protected areas in the Region. Areas within the planning area adjacent to these parks will be managed in sympathy and consistent with these parks.

The objective is to establish a comprehensive, adequate and representative reserve system to protect biodiversity within the planning area.

This will be achieved by:

1. continuing to pursue additions to the reserve system to meet the recommendations of the *Forest Management Plan 2004-2013* regarding a comprehensive, adequate and representative reserve system;
2. completing all actions for which the Department and Conservation Commission are responsible to reserve proposed parks as class A reserves under the *Land Administration Act 1997*; and
3. taking into account any refinements to the IBRA system over the life of this management plan.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

15. CLIMATE AND CLIMATE CHANGE

The climate of the region is Mediterranean, characterised by mild winters, a pronounced winter rainfall maximum, and a prolonged seasonal drought during the summer and early autumn period (McCaw and Hanstrum 2003). Regional weather is influenced by the surrounding oceans, mid-latitude cold fronts, southerly changes and the sub-tropical ridge, which create a variable climatic pattern of alternating eastwardly-moving high and low pressure systems. In summer, high pressure systems block the movement of low pressure systems deflecting rain bearing frontal systems south of the continent. In winter, high pressure systems move further north enabling low pressure systems to carry rain bearing fronts across the south-west.

Annual average rainfall decreases along a south-west to north-east gradient from about 1400 mm on the south coast west of Walpole to 800 mm in the north eastern part of the planning area near Mount Barker (Map 4). The wettest period of the year is from May to September, with prolonged dry periods being common in the hotter months. The south coast may receive light local rain during summer and autumn. Occasionally widespread heavy rain may occur during the southward passage of decaying tropical cyclones during summer.

Observed and Projected Climate Change

Climate has varied greatly over geological time. Recent concern about climate change has arisen due to the magnitude of change that is projected to occur over a relatively short time frame. Climatic change has come about as a result of global warming, caused by increases in the concentrations of greenhouse gases such as carbon dioxide, methane and nitrous oxide (IPCC 2001a, Hughes 2003). Consistent with global trends, Australia has warmed about 0.8 ^{o}C over the last century, mostly after 1950 (Collins *et al*. 2000, Hughes 2003). The projected rate of global warming is 0.1 to 0.5 °C per decade, compared with an observed rate of 0.15 °C per decade since the 1970s.

Projections for climate change suggest that by 2030, annual average temperatures will be 0.4 to 2.0 °C higher over most of Australia, with slightly less warming in some coastal areas. By 2070, it is projected that annual average temperatures will increase by 1 to 6 °C (0.8 to 5 °C in the south-west) (CSIRO 2001, Hughes 2003). The range of warming is projected to be greatest in spring and least in winter, and the temperature trend consists of increases in both daily maximum and minimum temperatures.

Projections for rainfall vary much more, but in general a reduction in autumn, winter and spring rainfalls for much of southern Australia and in particular the south-west are projected (Howden *et al*. 2003). Decreased rainfall and increased evaporation will lead to more frequent drought (Kothavala 1999, Walsh *et al*. 2001), a reduction in many Australian river flows (Schreider *et al*. 1997, Arnell 1999), and a drying out of wetlands, lakes and moist riparian zones (Howden *et al*. 2003). In the south-west, rainfall and river flows have already declined – there was a sharp and sudden 10 to 20% decrease in winter rainfall in the mid-1970s (Indian Ocean Climate Initiative 2002). This decline is expected to continue with rainfall projected to

decline by as much as 60% from 1990 levels by 2070 (CSIRO 2001). Sea levels are expected to rise, potentially in the range of nine to 88 cm by 2100 and extreme weather events are also projected to increase. Changes in ground moisture, temperatures and vegetation may lead to more vigorous fire behaviour in traditionally cooler months and more restricted burning seasons which is likely to have fire management implications (Howden *et al*. 2003).

Impacts of Climate Change

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

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

The impact of climate change on native species and ecosystems may also be exacerbated by non-climatic stresses such as habitat fragmentation/modification, competition by introduced species, diseases, salinisation, changes in hydrology and altered fire regimes (Pouliquen-Young and Newman 2000). The combination of these, such as drought and inappropriate fire regimes for example, can place considerable stress on ecological systems (J Young *pers. comm.*). Species and communities that may be more vulnerable include those:

- with limited or restricted climatic ranges or that are already located at the limit of their climatic ranges;
- with limited dispersal ability;
- with very specialised habitat requirements; and
- with small populations and/or low genetic diversity (Department of Environment and Heritage 2004).

Although the reduction of greenhouse gas emissions is a global issue and the effects of climate change may not be apparent over the lifetime of this plan, long-term planning on a regional scale is necessary to limit the potential impacts as much as possible, particularly as the south-west has been identified as a region with medium to high vulnerability to climate change impacts such as loss of biodiversity (Pouliquen-Young and Newman 2000, IPCC 2001b).

Responses to Climate Change

Given the significant potential adverse effects of climate change, the issue has been the subject of intense international and national focus. Responses to climate change involve a number of global, national, State and local initiatives including for example, the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the National Greenhouse Strategy. 'Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases' has been identified as a key threatening process under the EPBC Act (Environment Australia 2001d). At the State level, the *Western Australian Greenhouse Strategy* (WA Greenhouse Taskforce 2004) facilitates fulfilment of the State's responsibilities regarding national and international agreements on climate change.

The issue of projecting and responding to climate change is complicated by significant knowledge deficits and uncertainty. These are numerous but include for example, uncertainty

about the interplay of natural climate variability and human-induced climate change, future levels of global greenhouse emissions and region-specific impacts to natural environments. In view of these uncertainties, management strategies (Hansen *et al*. 2003) to cope with climate change need to:

- use active adaptive management principles (see Section 48 *Research and Monitoring*) that generate better understanding of the interaction between taxa and community resilience and climate factors;
- be flexible to allow use of better knowledge as it is generated;
- promote the resilience of taxa and communities to climate change by limiting or reducing those non-climate pressures over which the Department has some management control;
- manage for uncertainty (e.g. by extending the conservation reserve system as appropriate and providing buffers, corridors and climate refugia; and
- monitor changes to taxa and community structure and representation over time.

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

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

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

15. Climate and Climate Change

Key Points

- Projections for climate change suggest that by 2030, annual average temperatures will be 0.4 to 2 °C higher over most of Australia, with slightly less warming in some coastal areas. By 2070, it is projected that annual average temperatures will increase by 1 to 6 °C (0.8 to 5 °C in the south-west).
- In the south-west, rainfall and river flows have already declined, and this is expected to continue with rainfall projected to decline by up to 60% from 1990 levels by 2070.
- The potential impacts of climate change are vast and dramatic. The south-west has been identified as a region with medium to high vulnerability to climate change impacts such as loss of biodiversity.
- A number of management actions, such as reserve creation, introduced predator and weed control, fire management and translocation programs, could help improve the resilience and adaptability of species and ecosystems, and decrease their vulnerability to climate change.

The objective is to understand, and adaptively respond to, the effects of climate change on the planning area.

This will be achieved by:

1. continually reviewing and adapting management in response to new knowledge and understanding of climate change and its impact on biodiversity;
2. investigating the potential vulnerability of the planning area's species and communities to climate change, including where practicable identifying climate thresholds for threatened species and communities in the planning area;
3. extending the conservation reserve system as appropriate and providing buffers, corridors and climate refugia;

4. implementing strategies within this plan that increase the extent of vegetation and its ability to sequester carbon;
5. incorporating the potential for climate change impacts into threatened species and communities recovery plans, and developing effective response strategies;
6. limiting non-climate stresses for all species and communities, including those that are vulnerable to climate change;
7. wherever possible, aiming to reduce greenhouse gas emissions and improve energy efficiency when designing infrastructure and facilities; and
8. applying adaptive management where extreme or unexpected weather conditions or events occur.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

16. GEOLOGY, LANDFORMS AND SOILS

Geology and Landforms

The planning area lies within the Proterozoic Albany-Fraser Orogen (a geological province) (Figure 3). One part of the Albany-Fraser Orogen, the Nornalup Complex, comprises a large body of intruded granite, granodiorite gneiss and migmatite (Burnside Batholith), partially overlain by consolidated and unconsolidated marine sediments, dominated by Pallinup Siltstone, sandstone and limestone.

This forms an almost continuous 10-25 km wide strip from Northcliffe to the Hay River and inland to Mt Frankland, and underlies most of the planning area. The 'Nornalup Complex' is part of an eroded mountain chain formed mostly during the Mesoproterozoic (1345 to 1140 million years ago) when two ancient continental land masses (the WA Craton and the Mawson Craton) collided with each other (Copp 2001). Granite is the dominant rock type along the coast and was formed during this period when magma squeezed into the older gneisses forming large bodies or batholiths. These rocks contain quartz, feldspar, biotite mica, garnet and hornblende. These are exposed on the coast as large rounded weathered boulders, such as those at William Bay National Park. These processes have resulted in a spectacular coastline in the planning area with sheer cliffs, headlands, bays and peninsulas. The known minerals in the area include coal (at Coalmine Beach), heavy mineral sands, industrial minerals, gold, peat, kaolin, silica sand and graphite, although there is some mineral potential for zinc, lead, silver and tungsten (see Section 37 *Mineral and Petroleum Exploration and Development*).

The planning area is part of the 'Ravensthorpe Ramp' physiographic land unit[2], which in turn is the lower south-west portion of ancient Yilgarn Craton of WA. The Ravensthorpe Ramp was created 30 million years ago, when a southwards tilting event created a gentle slope towards the south coast and lowered sea levels, resulting in the formation of the southward flowing rivers that are characteristic of the planning area. As with most other land surfaces in WA, the planning area has been subjected to a long and complex history of weathering without glaciation, which is reflected in the nutrient-deficient soils, flat topography and hydrology (Wilde and Walker 1984, Churchwood *et. al.* 1988).

Landforms in the planning area are grouped according to:

- units developed on granitic rocks and associated unconsolidated sediments (plateau elements, hills and hilly terrain, and swampy terrain);
- units developed on siltstones and sandstones (plateau elements and swampy terrain);
- units developed in coastal Aeolian and fluviatile sediments (dune systems and coastal swampy terrain); and
- units associated with drainage lines (major valleys and minor valleys).

[2] Physiographic land unit is a prominent landform as considered in relation to its origin, cause, or history.

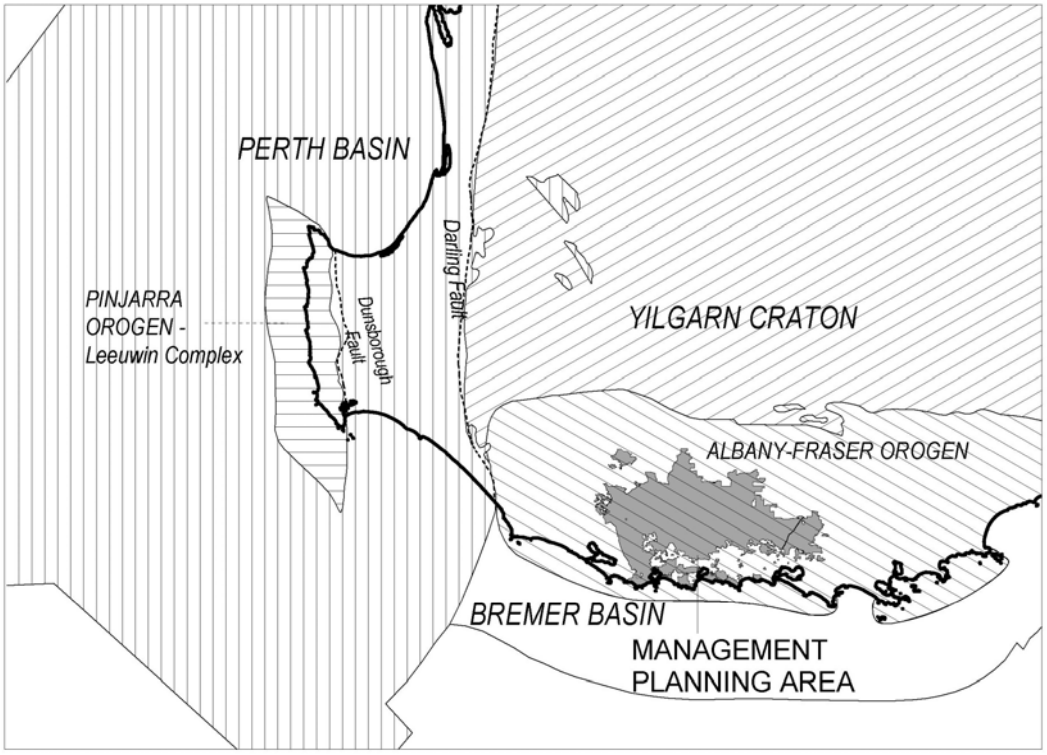

Figure 3. Geology of the South-west

The northern section of the planning area consists of an undulating plateau on deeply weathered granitic rock, with some broad sandy drainage zones. The central part of the planning area is dominated by a complex of ridges of granitic rocks alternating with broad sandy plains that are low-lying, with numerous small lakes, wetlands, swamps and inundated flats (Churchward *et al*. 1988). The ridges are often 100 m above the plains, which in turn may be over 160 m above sea level towards the northern section of the planning area. Many prominent granite domes and mountains emerge above the plains, including the Beardmore Ridge, Mt Frankland (416 m), Mt Roe (319 m) and Mt Lindesay (459 m) (Map 5). In the south-west, there are extensive sandy tracts, including the Pingerup Plains around Broke Inlet (not in WW). From north and east of the Irwin Inlet across to the Hay River, the granitic bedrock is covered by a mantle of dissected Cainozoic laterite. This laterite has developed by the weathering of underlying crystalline (granite) or sedimentary rocks.

The areas to the east and west of the lower Frankland River, such as around Irwin Inlet, are partially overlain by Eocene marine sediments of the Plantagenet Group consisting of Pallinup Siltstone. The marine sediments are typically a white to grey-brown sandstone and siltstone layer up to 200 m thick. These rocks are usually massive and structureless, and are covered with white quartz sand (Churchward *et al*. 1988).

On the coastal fringe, Tertiary and Precambrian crystalline and sedimentary rocks are overlain by a broad ridge of Tamala limestone, and/or unconsolidated Aeolian sand. This limestone was formed during the Pleistocene (10 000 years - 1.8 million years BP). These rise up to 100 m and may act as barriers behind which estuaries such as the Walpole and Nornalup Inlets and the Irwin Inlet have been formed. A dune system, originating from the Holocene (10 000 years ago to present), extends from the coast and overlaps these limestone ridges, alluvial deposits and granitic basement rock. These dune systems are vulnerable to erosion when exposed. Older dunes are found further inland. Coastal areas are dominated by small bays, with exposed granitic headlands, linked by ridges and steep cliffs of Tamala limestone, such as those at Hush Hush Beach and Conspicuous Cliff. Long stretches of beach (e.g. Bellanger Beach) are common, as are blowouts of mobile dune sand at Circus Beach, Blue Holes and Conspicuous Cliff. These are comprised of pale-brown calcareous sand, which is extremely sensitive to the impacts of human activity and climate (Christensen 1992, CALM 1992).

Soils

Soil units in the planning area have been grouped according to whether they are associated with granitic rocks or sedimentary formations. The Department of Agriculture and Food maintains a system of reference sites for soils across the south-west.

The hills and hilly terrain is comprised of brown gravely duplex soil over a subsoil of yellow-brown and red-brown clay. Examples of these soil types can be found in Frankland and Giants blocks and they generally support high open forest of karri and marri.

Shallow brown gritty loamy soils are associated with the granite outcrops, including Mt Roe, Granite Peak and Mt Frankland. These outcrops are comprised of intensely formed gneiss, which are highly sensitive to human disturbance. On these outcrops, highly fragile plant communities grow in small pockets of soil or in moss sheets on exposed rocks. In low-lying areas, pockets of podzols[3] with a grey peaty sand surface and a mottle clay soil underneath, are found. Quartz stone is also often associated with this form of podsol, with quartzite underneath (Christensen 1992, CALM 1992).

Yellow duplex soils are also found in the hills and hilly terrain, predominantly around Giants block. In the gentle slopes and the head of the broad swamp valleys, these duplex soils have a grey brown surface structure, with shallow unconsolidated sandy sediments and humus podzols on deeper sands.

Laterites and ironstones, which are common on the Darling Scarp, are not as typical in the planning area. They are found in a thin dissecting capping over rocks in the area, formed as a result of weathering in situ of underlying rock. These laterites can be large and cemented to loose uncemented pisolites. Areas where these soils occur are typically on ridges and upper slopes, which are highly susceptible to diseases caused by *P. cinnamomi* (Kinal *et al*. 1993).

The limestone coastal dunes that extend inland from the coast consist of cemented calcrenite with unconsolidated calcareous and siliceous sands. Inland of these coastal dunes are flat, poorly drained plains. These are dominated by humus and peaty podzols and extensive sands and clays. These areas are often poorly drained and can be susceptible to inundation. These soils can also warm up quickly when there is only a thin layer of leaf litter. Soils at warmer temperatures are more susceptible to *P. cinnamomi* (Kinal *et al*. 1993).

Highly variable alluvial soils, formed less than 10 000 years BP during the Holocene, are found in narrow bands along the main drainage lines. They typically have a high organic content, a medium texture and are dark brown or dark grey. River valleys range in depth from 10-60 m and are incised into the granitic plateau. The deeper valleys are predominantly red earths, but there are also minor occurrences of yellow earths, red or yellow duplex soils and brown sandy loams on terraces. The shallower valleys of the smaller streams that traverse the swampy areas are dominated by loamy and silty sands. These areas are highly sensitive to human activity and erosion.

Soil Erosion

When the soil surface is disturbed or vegetation removed, the process of soil erosion can be accelerated, resulting in changes in landform, soil structure and nutrient loss. Many human activities can accelerate the process of erosion. For example, the construction and use of roads and facilities for public and management purposes can increase soil erosion. Four-wheel driving in the planning area, the use of horse and walk trails, picnic areas and campsites can cause soil disturbance resulting in erosion, compaction and degradation. Soil erosion also has the potential for downstream impacts on creeks, rivers, lakes, and the estuarine and marine environments. Water-borne erosion increases the supply of sediments to rivers.

[3] Podzols are soils with certain materials leached from the surface layer into the lower levels.

Some of the soils and landforms within the planning area (Churchward *et al*. 1988) are more susceptible to erosion, waterlogging and compaction, particularly:

- the coastal plain, which is affected by wind and water erosion. The younger dunes near the ocean are particularly sensitive to erosion, and dunes that lack vegetation or have steep slopes are also susceptible to severe degradation;
- the extensive flats and wetlands, which are highly prone to erosion when disturbed;
- the loam soils of the dissected plateau areas, which have a moderately high susceptibility to water erosion; and
- the gravelly soils of the lateritic uplands, which are affected by water erosion with some also prone to wind erosion.

The susceptibility of soils to erosion and degradation has serious implications for management of the planning area. While the inherent erodibility of soils, which is a factor of soil structure, is difficult to decrease, erosion associated with human activity can be reduced by appropriate management (e.g. the hardening of recreation sites and the temporary or permanent closure of tracks). This, combined with education of visitors about the effects of erosion and the use of appropriate codes of practice, guidelines and on-site investigations prior to any changes in land use, can minimise erosive activity.

Acid Sulphate Soils

Acid sulphate soils are found underlying coastal areas and are soils that contain iron sulphides. When undisturbed and waterlogged, the iron sulphides in these soils are harmless. However, if the soil is disturbed and exposed, the iron sulphides react with oxygen in the air to form sulphuric acid, iron precipitates and concentrations of dissolved heavy metals such as aluminium, iron and arsenic (WA Planning Commission 2003).

The release of these acids into the soil can have severe impacts upon ecosystems. Oxidation of potential acid sulphate soils can occur through disturbance (such as through excavation) or through changes to hydrology, which allows previously inundated acid sulphate soils to become exposed to air. The rate of oxidation is accelerated by drainage, which may cause large amounts of acidic groundwater to be released rapidly into waterways. Impacts include wetland degradation, fish kills and disease, localised loss of habitat and biodiversity, deterioration of surface water and groundwater quality and invasion of acid tolerant water plants. Land also becomes more prone to flooding and waterlogging. There are also human health concerns if groundwater or surface water resources used for drinking water or recreational activities become contaminated with sulphuric acid or heavy metals (Sammut 2000). The risk of environmental degradation in the planning area due to the exposure of acid sulphate soils can also occur from regional groundwater use, short-term dewatering activities or excavation of large areas within or adjacent to the planning area (National Working Party on Acid Sulphate Soils 1999).

Acid sulphate soils are best managed by avoiding disturbance to or draining the soils containing iron sulphide layers. Iron sulphides will not impact on the environment while covered by water. To avoid disturbing the iron sulphide layer, it is important to know where it is likely to be found. It is sometimes necessary to take soil cores to find out the exact location and depth of the iron sulphide layer. Recognition of the iron sulphide layer is also important in order to avoid disturbing these areas (Sammut 2000). Department guidelines for managing acid sulphate soils where disturbance or dewatering is planned require the proponent to undertake detailed site investigations to determine the depth, extent and acid status of soil. This information is used by the proponent to develop a management plan that avoids oxidation of potential acid sulphate soils and manages any acidity where disturbance is unavoidable. The WA Planning Commission also has developed a series of planning guidelines for the re-zoning, subdivision and development of land which contains acid sulphate soils, as a precursor to a more detailed planning policy (WA Planning Commission 2003).

The locations of acid sulphate soils have been recently mapped in the planning area (WA Planning Commission 2003). However, they are likely to be found in, though not limited to, the following locations:

- areas depicted in soil, geology or geomorphological mapping that indicate geologically recent shallow tidal, estuarine, marine, wetland, floodplain or waterlogged areas where deposition of fine sediment may have occurred or may be occurring;
- areas depicted in vegetation mapping as wetland dependent vegetation;
- coastal areas where the following pre-disposing factors exist:
  - areas known to contain peat or a build up of organic material;
  - permanently inundated wetlands;
  - seasonally or occasionally saturated or inundated floodplains;
  - areas where the pH of the soil or water is less than five.
- areas where a combination of all the following pre-disposing factors exist:
  - organic matter;
  - iron minerals;
  - waterlogged conditions or a high water table (within three metres of the surface); and
  - sulphides.

The removal of peat by burning could expose acid forming soils to oxidation, only if acid sulphate soils are substrates to peatlands. This could result in a drop in pH, which may have effects on the surrounding biota including aquatic communities.

Geoheritage

Geoheritage refers to geological features of the Earth that are considered to be unique and of outstanding value within Western Australia and to have significant scientific and educational values. A Register of State Geoheritage Sites for Western Australia is being developed.

There are no geoheritage sites that have been nominated by or to the Geological Society of Australia (WA Division) within the planning area. However, the V and C Semeniuk Research Group (1997) outline a number of 'potential nominations for geoheritage sites' in the planning area. Sites of geoheritage significance on the State Geoheritage Sites Register will be protected.

16. Geology, Landforms and Soils

Key Points

- Geological features of the planning area are dominated by an undulating plateau on deeply weathered granite in the north and granite ridges alternating with broad sandy swampy plains in the centre. There is a broad ridge of limestone along the coast.
- Soils and landforms that are sensitive to wind and water erosion and disturbance include the coastal plain (in particular the younger dunes near the ocean and the dunes that lack vegetation or have steep slopes), the extensive flats and wetlands that are highly prone to erosion when disturbed, and to a lesser extent the loam soils of the dissected plateau areas and the gravelly soils of the lateritic uplands.
- The poorly drained flats and wetlands and lateritic soils are also susceptible to infection by *P. cinnamomi*.
- Human activities where there are sensitive soils need to be managed to ensure the effects of these activities are reduced.
- Iron sulphides were formed in soils thousands of years ago. When these soils are disturbed, the iron sulphides oxidise to form sulphuric acid, which can be released from these soils after heavy rains. Impacts on surface and groundwater can be severe.
- There are no geoheritage sites in the planning area.

The objective is to maintain and encourage the appropriate use of the geodiversity and geoprocesses of the planning area and protect sites of known geoheritage.

This will be achieved by:

1. identifying geological features and soil types vulnerable to environmental damage and potentially threatened by human use, and protecting these areas;
2. identifying and, where feasible, managing erosion and geomorphic hazards initiated by human actions to prevent or reduce any adverse impact;
3. continuing to liaise with other agencies to map the extent of potential acid sulphate soils in the planning area, and undertaking assessment for acid potential (including iron acidity as well as acid sulphate soils) prior to significant works being undertaken;
4. assessing potential impacts on sites with geodiversity values that may arise from scientific research, recreational or other proposed developments within the planning area, and permitting these activities where they are consistent with the conservation and protection of the values of the planning area;
5. preventing or minimising adverse impacts arising from human activities on geoheritage values in the planning area;
6. providing appropriate information and interpretation on geology within the planning area, its relationship with landforms, soils and vegetation and their vulnerability to damage (see Section 46 *Information, Interpretation and Education*); and
7. continuing to support the collection and recording of information about sites of geoheritage value in the planning area.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
16.1 Area of erosion within the planning area	16.1a No new areas of erosion as a result of human activities	After 5 years
	16.1b Identification of existing erosion within 3 years	
	16.1c Repair of 90% of existing erosion within the life of the plan	

17. HYDROLOGY AND CATCHMENT PROTECTION

Hydrology

The hydrological water systems in the planning area are of considerable regional significance for the creation and maintenance of biotic and aquatic systems, provision of recreation opportunities (see Part F *Managing Visitor Use*) and potential development of public water supplies (see Section 45 *Water Resources*). Hydrology of the south coast is characterised by relatively short coastal rivers with greatly fluctuating flow rates and water levels, and a large number of permanent or ephemeral water bodies, including lakes and flats (Commonwealth and Western Australian Regional Forest Agreement Steering Committee 1998). The surface water hydrology in these areas consists of drainage systems that exhibit a distinct southerly trend as a result of the gentle inclination towards the Southern Ocean of the Ravensthorpe Ramp (see Section 16 *Geology, Landforms and Soils*) (Pen 1999).

Rivers

The main river systems within the planning area (Map 6, Appendix 4) are:

- Deep and Weld Rivers;
- Walpole River;
- Frankland River;
- Bow River;
- Kent and Styx Rivers;
- Denmark and Quickup Rivers; and
- Hay and Mitchell Rivers.

Many of these rivers, such as the Deep, Weld, Walpole, Bow, Quickup and Mitchell rivers, have catchments that lie mostly with the planning area.

Twenty six wild rivers[4] have been identified in WA (Williams *et al*. 1999). While there are no pristine or near pristine wild rivers in the planning area, the Deep and Inlet rivers (the northern tributaries of which flow into the planning area) have been identified as relatively natural (priority 2) for management purposes (Map 6). Conservation guidelines for the management of wild rivers have been published by Environment Australia (1998).

Estuaries and Inlets

Several inlets are located adjacent to the planning area such as the Walpole and Nornalup Inlets, Irwin Inlet, Parry Inlet and Wilson Inlet, and these are interconnected with drainage systems located within the planning area.

The Walpole-Nornalup estuary system consists of the two coastal lagoons of the Nornalup Inlet and the Walpole Inlet together with the tidal reaches of the Deep, Frankland and Walpole rivers. Junior River and Collier Creek also drain into the Walpole Inlet. A channel between the steep rocky headlands of Rest Point and the Knolls connects the two inlets. The inlets share a common connection to the ocean by a single channel located near the Depot. During summer, the Nornalup Inlet has salinity levels similar to the ocean, but during winter, this drops as a result of freshwater run-off from the Deep, Walpole and Frankland rivers. Habitats surrounding the inlets are varied and support a high diversity of waterbirds and shorebirds and the riparian zones of the Deep, Frankland and Walpole Rivers, which flow into the inlets, are in good condition. Currently, planning is occurring for the establishment of a marine conservation reserve in the Walpole and Nornalup Inlets (see Section 3 *Planning Area*).

The Irwin Inlet is located on the eastern edge of the Walpole-Nornalup National Park on a narrow coastal plain between hills, dunes and rocky coastal headlands. The Bow and the Kent Rivers, together with Kwokalup Creek, Crow Creek and Karri Creek, flow into the Irwin Inlet. The amount of water flowing into the inlet is not sufficient to keep the inlet open all year round and the inlet is blocked with a sandbar for most of the year. However, following winter rains, enough water flows into the inlet to open it to the ocean and it can stay open until mid summer. Sediments flowing into the inlet from the Kent and Bow Rivers are making it progressively shallower and it is gradually developing into a swampland.

Wetlands

There are many significant wetlands in the planning area: some that are nationally recognised or that are named (below), and many that are un-named but are equally important for their natural values. Wetlands also have Indigenous (see Section 26 *Indigenous Heritage* and Section 36 *Indigenous Customary Activities*) and non-Indigenous (see Section 18 *Landscape*) cultural value.

The condition of many wetlands is declining due to a number of threatening factors (May and McKenzie 2003) such as vegetation clearing elsewhere in the catchments, changed hydrology and fire regimes, and the impact of feral animals, diseases (*P. cinnamomi*) and weeds.

Owingup Swamp and Boat Harbour Lakes

Owingup Swamp is located about six kilometres east of Irwin Inlet in Quarram Nature Reserve (Map 6). The Kent River flows into the north-west end of the swamp, which acts as a sediment and nutrient trap, before the river flows into the inlet. This swamp has a sandy bed in open water and is muddy around the fringing vegetation. The Kent River catchment also contains the three 'Boat Harbour' Lakes, (A, B and C) in Owingup Nature Reserve, and several nearby swamps. These lakes appear to be linked (flows occur from Lake C to Lake A and Lake B to Lake A) and are probably areas where groundwater has come to the surface.

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[4] Wild Rivers are defined as *those rivers which are undisturbed by the impacts of modern technological society. They remain undammed and exist in catchments where biological and hydrological processes continue without significant disturbance. They occur in a variety of landscapes, and may be permanent, seasonal or dry watercourses which flow only occasionally*" (Williams *et al*. 1999).

Suspended in Lakes A and B about a metre under the surface is a gelatinous mass of organic material, including diatoms, blue-green algae, invertebrates and their faecal pellets. Lakes B and C both have a sandy bottom.

This swamp system is significant, as it is a good example of a permanent freshwater system of lakes and marshes. It also has a well-developed lake delta and an outflow river at Owingup Swamp, both of which are uncommon in WA wetlands. The extensive areas of suspended gelatinous material in the Boat Harbour Lakes are also uncommon. The system also supports the threatened Australasian bittern *Botaurus poiciloptilis* and may be a breeding site for this species. Many other waterbird species use this site on an annual basis, including migratory species and species listed under international treaties. It appears to be a major nursery area for many estuarine fishes. Owingup Swamp has a very high diversity of wetland plants, with a total of 53 plant species recorded in the area (V and C Semeniuk Research Group 1998). The swamp system is listed in the Directory of Important Wetlands in Australia (Environment Australia 2001a).

Threats to these wetlands include salinisation, eutrophication and siltation from the Kent River, herbicides and fertiliser from agricultural and plantation uses, *Phytophthora* dieback in adjacent heaths (see Section 24 *Diseases*), and environmental weed species such as typha, exotic grasses and clovers (see Section 22 *Environmental Weeds*) (May and McKenzie 2003). Inappropriate fire regimes, in particular frequent lethal or infrequent intense fires (see Section 25 *Fire*), are a threat to the fringing *Taxandria juniperina* forest around Owingup Swamp.

Mt Soho Swamps

The Mt Soho swamps are located east of the Frankland River in the Mount Roe National Park and listed in the Directory of Important Wetlands in Australia (Environment Australia 2001a). These permanent freshwater wetlands consist of swamps on Boronia, Mountain and Middle Roads, fed by runoff from the nearby hills in Soho, Crossing, London and Surprise blocks. They are significant in that they contain several of the 13 known populations of the threatened sunset frog (see Section 20 *Native Animals*). In the past, these wetlands have been impacted by road construction and erosion of the road verge, which has resulted in increased siltation of the Boronia Road Swamp. Feral pigs also impact upon parts of the wetlands, which dry out during the summer. Potential threats also include inappropriate fire regimes and the loss of vegetation due to *P. cinnamomi*, which could then result in hydrological changes impacting upon the wetlands (May and McKenzie 2003).

Other Lakes and Wetlands

Crystal and Boggy Lakes are located in the Walpole-Nornalup National Park in a low-lying interdunal area on the sandy coastal plain in the Nuyts area. As a result of the sandy soils, which have limited drainage, water collects in these areas forming permanent freshwater lakes. Other lakes and wetlands in the planning area include Blue Lake in Clear Hills block, Lake Williams and Lake Anderson in William Bay National Park and Lake Surprise in Surprise block. Lake Williams supports a high level of invertebrate diversity (V and C Semeniuk Research Group 1998).

Dams

The Quickup Dam is located on Quickup River in Hay block, east of the Denmark-Mount Barker Road and about seven kilometres north-east of Denmark. The dam was constructed in 1990 and is currently the only drinking water source for Denmark. Water quality from the Quickup Dam is relatively fresh, as the entire catchment is fully vegetated. Several other potential water reservoirs have been identified within the planning area (see Section 45 *Water Resources*).

Groundwater

In the planning area, groundwater is generally scarce and often of low quality. The underlying granites and gneisses in the planning area are not good aquifers. Groundwater in the planning

area generally occurs in (i) fractures in the upper parts of these granites and gneisses in inland areas, and (ii) coastal areas. The groundwater that occurs in the deep fractures and in the weathered layers beneath the surface of the granites and gneisses are of low volumes and randomly distributed, which makes locating and using significant supplies of groundwater within the planning area difficult. In winter, shallow perched groundwater systems develop above impermeable layers, which contribute to the majority of the stream flow.

The Tertiary sediments of the Plantagenet Group, which occur to the east and west of the Frankland River, have some moderate aquifers in coarse sandstone. These groundwater resources may be useful where they occur closer to the coast and to the west, where the rainfall is higher and the groundwater is fresher. The distribution of the sediments is dependent on the original surface on which sediments were laid down and the more recent erosion of these sediments. Both of these factors can be highly variable, so locating groundwater in these areas can also be problematic.

Better groundwater exists in coastal parts of the planning area. In the coastal areas, sand dunes from the Pleistocene era have been cemented into the limestone. This limestone is usually highly permeable and can act as a good aquifer, especially if overlain by more recent sand dunes, which collect and transmit water. In the coastal and wetland areas, the groundwater systems respond more rapidly to rainfall. In the wetland areas, the water table lies within a metre of the surface. On the sandy coastal areas, large unconfined aquifers contribute to perennial seepage areas and small streams (e.g. Crystal and Boggy Lakes).

The groundwater gradient is very gentle, with many flat or undulating areas of internal drainage, so groundwater flows are very small, in the order of several metres per year.

Water Quality

Under section 33(1)(dc) of the CALM Act, a function of the Department is to promote the conservation of water, both in terms of quality and quantity, on the land it manages (see Section 45 *Water Resources*).

The State Water Quality Management Strategy No.1 (Government of WA 2003b) gives guidance for the management of water quality[5] within the planning area. The Department of Water is the lead agency responsible for sustainable management of WA's water resources and carries out monitoring programs on rivers, wetlands and estuaries in the planning area. These monitoring programs provide water quantity and quality status and trend information for a variety of purposes including private and public water source planning, salinity and eutrophication management, floodplain management, waterway restoration and State of the Environment and other reporting programs.

The water systems in the planning area vary considerably in their water quality and degree of disturbance, although information about these systems is limited and only the Weld, Deep, Kent, Denmark and Mitchell river catchments have gauging stations. Some rivers, such as the Deep and Bow rivers, remain relatively undisturbed, while others, such as the Frankland (the largest river in the south coast region), Kent and Denmark rivers, are fairly degraded and have been a focus for catchment-wide protection from salinity in recent years. Many factors both inside (e.g. road maintenance, recreational use and development, fire, and disease spread) and outside the planning area (e.g. clearing, altered drainage lines, abstraction and fertilising within the catchments) have the potential to affect the quality of water systems. Some of the disruptions to hydrological processes in the region that may affect the planning area include salinisation, nutrient enrichment, sedimentation, degradation or loss of fringing riparian vegetation, contamination and loss of river health.

[5] Water quality is the physical, chemical and biological measures of water.

The salinity of watercourses and wetlands in the planning area varies considerably (Appendix 4). Much of the planning area is within a high rainfall area where the risk of salinity is generally low. However, as a result of increases in salinity in the catchment area, rivers can become saline when saline water is discharged into them. The Walpole, Deep, Weld and Bow rivers are relatively fresh (Appendix 4). The Deep and Walpole Rivers have long-term average salinities of 170 mg/L and 350 mg/L respectively. The salinity of the Bow River is slightly higher at 450 mg/L (CALM 1992). Salinity measurements in the Weld River have indicated that this has been fresh since measurements began in the 1970s, ranging between zero and 500 mg/L. The Frankland, Kent and Hay Rivers are saline (measurements of >5000 mg/L) in their upper reaches and brackish (1000-5000 mg/L) closer towards the coast. The Denmark River was fresh (salinity below 500 mg/L) in the mid-1970s. While salinity levels significantly increased peaking at 1520 mg/L in 1987, since 1991 salinity has been decreasing by eight milligrams per litre each year (Bari *et al.* 2004). The Denmark and Kent rivers and Owingup Swamp (although currently fresh) are all at high risk of developing shallower water tables. Many of the nature reserves to the north of the planning area in the Frankland and Kent upper catchments are showing symptoms of salinisation, which may have long-term impacts on the planning area.

Increased sediment loads in waterways are a consequence of soil disturbance, loss of fringing vegetation and catchment clearing. This may result from timber harvesting activities in adjacent State forest and plantations, through the erosion of vehicle and walking tracks and river banks, day use sites and campsites, through turbid run-off caused by roadworks, vegetation clearing and wildfires and through activities in agricultural areas. In addition, in cleared farmland grazing can easily disturb soil, which is then transported into river systems during floods. Rivers with high sediment loads include the Frankland and Kent Rivers and large parts of these catchments have been cleared for agriculture (Appendix 4). The use of fertilisers, herbicides and pesticides in these catchments may change the water quality in the lower reaches that are within the planning area.

Nutrient enrichment or 'eutrophication' may also affect water quality values of waterways in the planning area. Eutrophication occurs when there is an increase in the concentration of nutrients in a water body (usually a result of animal and horticultural industries and wastewater discharges into water bodies), which can result in blooms of cyanobacterium (sometimes referred to as 'blue-green algae'). Although the nutrient levels in most waterways in the planning area are low to moderate, which may be a result of dilution as the river passes through the high rainfall zone near the coast, blooms of cyanobacterium remain a potential threat to watercourses such as the larger river pools on the Frankland River.

Catchment management is important to ensure that the health of rivers, swamps and estuaries is maintained or improved. The Department plays a key role in ensuring the natural values of catchments are protected and enhanced. Natural resource management, including landcare and rivercare, has become a major focus in areas where agriculture is a major landuse. State Government initiatives such as the State Salinity Strategy (State Salinity Council 2000) and the Natural Resource Management Council ensure a cooperative approach between Government agencies, local governments and regional communities towards improving the conditions of waterways and catchments. Erosion, salinisation and degradation of riparian vegetation in the upper Denmark River and Kent River has led these catchments to be identified as 'Water Resource Recovery Catchments' in the Salinity Action Plan (State Salinity Council 1996) for additional research and management to combat salinity. Change in land use adjacent to the planning area has the potential to significantly improve water quality within surface waters within the planning area. For example, considerable investment on community and Government recovery actions in the Denmark catchment (Bari *et al.* 2004), such as protection of existing remnant vegetation and tree planting, has improved water quality to the extent that there is now potential for the supply of potable water for the town of Denmark and other areas within the Great Southern region by 2020 (see Section 45 *Water Resources*). This is significant in that it is the first time in Australia that river salinity levels have been reversed due to these actions (Bari *et al.* 2004).

Major revegetation is highlighted as a priority area for salinity management under the Salinity Strategy. Increasing areas of commercial blue gum timber plantations are being established and managed by commercial, private and community groups, particularly in the catchment areas adjacent or close to the eastern and northern boundaries of the planning area.

Water Quantity

The use of water in the planning area needs to take into account the requirements of the environment as well as social and economic requirements (see Section 45 *Water Resources*), and is based on the premise that the environment is a user of water and has a right to adequate water supply for water-dependant ecosystems and to sustain key ecological functions. The amount of water required to maintain ecological values of water dependent ecosystems at a low level of risk is known as the 'ecological water requirement' and is determined through scientific investigation and community consultation.

Changed hydrological flow regimes has been identified as a potential threat to many wetland systems in the planning area (May and McKenzie 2003). In particular, water is required to sustain the health of riparian vegetation which provide stabilisation to the lower embankments. Many lakes, flats, wet heaths, peat wetlands, woodlands of swamp banksia *Banksia littoralis* and melaleuca, threatened flora and fauna such as the Walpole burrowing crayfish, invertebrates, narrow endemic, waterbird and other species depend on seasonal or permanent water. Water flow, velocity and quality is particularly important in sustaining native fish species such as the western minnow *Galaxias occidentalis* and nightfish *Bostockia porosa*. These species undergo a reproductive migration and as such, barriers to movement can impact on the completion of their life history. These species require flows that stimulate migration, allow the 'drowning-out' of obstacles and enable the attachment and continued wetting of attached eggs (URS 2004). A major requirement for the maintenance of fish populations is also the presence of permanent water during all months of the year.

The 'environmental water provision' is the amount of water that can be allocated from a resource to meet an environmental water requirement. Environmental water provisions must be maintained before any allocation is made to consumptive use. The guiding principles of how water is allocated are illustrated in the Department of Water's *Environmental Water Provisions Policy for WA*, which is based on the *National Principles for the Provision of Water for Ecosystems* (ARMCANZ/ANZECC 1996). There is generally a lack of detailed knowledge about the biodiversity and natural ecological processes within water dependent ecosystems and their ecological water requirements, and more information is required to refine water dependent ecosystem characteristics and the associated ecological water requirements.

17. Hydrology and Catchment Protection

Key Points

- The hydrological systems in the planning area and their water quality and quantity are vital for the creation and maintenance of biotic and aquatic systems, provision of recreation opportunities and the potential development of public water supplies.
- The major surface water systems are the Deep and Weld Rivers; Walpole River, Frankland River; Bow River; Kent and Styx Rivers; Denmark River; and Hay and Mitchell Rivers. There are also a number of significant wetlands in the area.
- Water quality in the planning area varies and water quality issues include increased sedimentation, eutrophication and salinisation.
- While salinity is a low threat in the planning area, several rivers, such as the Kent River, have shown significant increases in salinity.
- Some catchments are managed as Water Resource Recovery Catchments. Catchment boundaries extend beyond the planning area requiring integrated catchment-wide approaches for water protection and management. Salinity levels in the Denmark River have been reversed due to a number of community and Government actions in the catchment.

The objective is to protect and conserve the quality and quantity of water within the planning area.

This will be achieved by:

1. liaising with relevant agencies regarding the management and monitoring of surface water flows, groundwater levels and water quality and providing advice and direction as necessary to ensure values of the planning area are protected;
2. assessing the potential effects of Departmental operations or developments on hydrological values of the planning area and identifying and implementing strategies to prevent or mitigate adverse effects;
3. consulting with adjoining landowners, local authorities, agencies and other stakeholder groups to request and recommend that activities within adjacent areas do not significantly affect the hydrological values of the planning area and, if necessary, requesting EPA assessment of activities where there may be significant impact on these values;
4. encouraging research into environmental water requirements of ecosystems and hydrological processes, particularly those that are sensitive to changes in the water regime;
5. ensuring land and water-based activities in the planning area are managed so that the risks to public health associated with water quality remain acceptable;
6. effecting those Departmental responsibilities relevant to the Denmark River Catchment and identified by the Denmark River Salinity Situation Statement for implementation within the life of the plan;
7. contributing to collaborative integrated catchment management and natural resource management approaches in the catchments; and
8. identifying sites where acid groundwater occurs and has killed areas of vegetation, and undertaking site amelioration using revegetation with acid tolerant plants, organic matter replacement and other experimental techniques.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
17.1 Condition of the Mt Soho swamps and Owingup Swamp system wetlands of national significance	17.1 No further decline in, and where degraded restoration of, the condition of the Mt Soho swamps and Owingup Swamp system wetlands of national significance	After 5 years

18. LANDSCAPE

Landscape management is based on the premise that the visual quality of any landscape[6] is a resource in its own right and can be assessed and managed in much the same way as other values, such as fauna, flora, water and recreation. The role of landscape management is to ensure that all uses and activities are planned and implemented to complement rather than detract from the inherent visual quality of the environments in which they occur.

In a recreation and tourism context, the term 'visual landscape' refers to the appearance or visual quality of an area - the segment of the environment that is perceived, interpreted and responded to by people. For many, visual appearance is the most direct way visitors will experience an area and, therefore, is often the criterion by which land management practices are judged.

[6] Landscape can be defined as an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors (Council of Europe 2000). Landscape not only includes terrestrial, but also coastal and marine environments, and the less-commonly used term of 'seascape' is included in any subsequent reference to landscape.

The Department's Visual Landscape Management method is a systematic inventory and assessment of physical and social components of landscape. Zones of priority for landscape management are derived from consideration of the visual characteristics of landscape, the relative visual (scenic) quality of physical character, levels of public sensitivity and human exposure to the landscape.

Landscape Character Types

Landscape character types are broad-scale areas of landscape with common distinguishing visual characteristics (CALM 1994b). Delineation of each landscape character type is based on an inventory of physical components. The overall visual appearance is presented as an amalgamation of landform, vegetation, climate, water, cultural and land use patterns. Delineation of landscape with common visual character helps people differentiate one place from another and provides a sound basis for comparisons of relative degrees of visual quality. The landscape character types within the planning area, and the proportion of the planning area that they make up, are:

- Darling Uplands (67%);
- Pemberton Slopes (23%);
- Scott Coastal Plain (9%); and
- Dryandra Uplands (1%).

Visual Quality

Visual (or scenic) quality refers to the visual character of landscape based on physical elements, such as landform, vegetation patterns and waterform expressed as a measure of importance held by society after perceiving the landscape (R. Hammond *pers. comm.*). In order to systematically classify degrees of visual quality within a character type, descriptive frames of reference provide indicators of high, moderate and low visual quality. These are typically based on diversity, uniqueness, prominence and naturalness of landform, vegetation and waterform (CALM 1994b).

Landform

High visual quality landform areas within the planning area generally include:

- isolated peaks or hills with distinctive form and visual dominance that become focal points, such as Mt Lindesay (Map 5);
- granite domes, outcrops or groups of boulders;
- undulating and steeply sloping terrain of distinctive shape and abrupt appearance;
- well defined V-shaped or U-shaped valleys, heavily dissected steep slopes and/or number and configuration of lateral irregular tributaries;
- the deeply defined river valleys;
- cliffs and headlands; and
- offshore and estuarine islands.

Vegetation

High visual quality vegetation areas within the planning area generally include:

- distinctive stands of vegetation creating unusual forms or striking displays of seasonal colour e.g. kangaroo paws;
- strongly defined patterns in areas of native vegetation with openings of a natural appearance, associated with wetlands and rock forms and unbroken stream valleys;
- areas of remnant native vegetation of a natural appearance exhibiting an attractive diversity of colour height and species;
- single plants, trees or patches of forest that become focal points due to contrasting or conspicuous shapes, colour isolation or position in the surrounding landscape, e.g. karri trees;

- strongly defined patterns of vegetation associated with granite outcrops, swampy low lands and forested higher grounds, e.g. in the vicinity of Mt Frankland;
- vegetation showing distinctive displays of seasonal colour;
- windshaped, gnarled or dwarfed vegetation unusual in form, colour or texture eg coastal heath;
- strongly defined and contrasting patterns of coastal heaths, peppermint/paperbark woodlands and dune vegetation.

Waterform

High visual quality waterform areas within the planning area generally include:

- watercourses with changing flow characteristics and features such as rapids and or waterfalls, e.g. the Frankland River;
- permanent river pools, e.g. Circular Pool; and
- reservoirs, estuaries, inlets, lakes and wetlands with dominant natural characteristics, (e.g. extensive fringing vegetation, such as Walpole and Nornalup Inlets).

In general, most of the planning area has high to moderate scenic quality.

Public Sensitivity

Public sensitivity refers to how people experience and interact with the landscape. Levels of sensitivity, ranging from level one to level four, are determined for all travel routes and public use areas based on criteria including visitor volumes, significance factors and community perceptions, and these ratings are used in planning visitor facilities and access.

In general, much of the south and west of the planning area has high sensitivity.

Visual Exposure

Visual (or public) exposure refers to how the landscape is viewed by members of the community. This includes classification of the total area potentially seen from travel routes and use areas, and delineation of distance zones: foreground (up to 500 m), middle-ground (500 m to 6.5 km), and background (6.5 km to 16 km). This rating is used in assessing the visual impacts of developments.

Visual Landscape Management Zones

The Visual Landscape Management Zones are areas of relative importance for their inherent visual characteristics and social values. They are the result of a systematic amalgamation of physical and social/cultural factors within which management priorities, objectives and plans can be formulated.

Zone A:

- areas of high visual quality with high to moderate public exposure and/or sensitivity; and
- areas of moderate scenic quality with very high public exposure and/or sensitivity.

Zone B:

- areas of moderate to low scenic quality with high public exposure and/or sensitivity; and
- areas of high scenic quality with low public exposure and/or sensitivity.

Zone C:
Areas of moderate to low scenic quality with moderate to low public exposure and/or sensitivity.

Visual landscape management zones have been established for the planning area (Map 7). A substantial proportion (30%) of the planning area is classified as Zone A, reflecting a landscape rich in naturalness, diversity and components of high visual quality and a significant

number of travel routes and use areas with high levels of public use and sensitivity. Significant areas within the planning area located within Zone A include conservation areas around and viewsheds from the Walpole and Nornalup Inlets, mountain peaks such as Mt Lindesay, Mt Frankland, Granite Peak and Mt Roe, and tall forest or scenic corridors such as the Valley of the Giants, Denmark-Mount Barker and William Bay roads and major highways.

The visual landscape management zones will guide recreation planning and management operations. Department Policy No. 34 – *Visual Resource Management of Lands and Waters Managed by DEC* provides broad-scale guidance for visual resource management to those considering changes to the landscape. Reference to the visual landscape management zone provides an indication of the relative level of concern for the visual landscape, with Zone A having greatest concern for the landscape. As a general guideline, management operations or planning proposals which may affect Zone A landscapes require more detailed analysis of the potential impacts on landscape values, whereas proposed changes to Zone C landscapes are unlikely to require any additional assessment of potential impacts on landscape values. Successful integration of buildings, roads, utilities, gravel pits, recreation sites, signs and other infrastructure into the landscape requires awareness, sensitivity and skill. While every setting and project is different, the following statements should guide planning and construction within sensitive landscapes.

- Changes should borrow from the character of the landscape, primarily scale, form, line, colour and texture.
- Specific visual landscape factors should be assessed in the planning phase prior to management activities.
- Roads, recreation sites and walking tracks should focus views onto distinctive features by selecting optimum siting and alignment, for example Fernhook Falls and Mt Frankland day use areas.
- Road design and construction should remain subordinate to landscape elements (subject to achievement of minimum safety and road standards) by utilising minimum design standards, limited cuts and fill, minimum clearing widths, undulating edges and sensitive alignment.
- Interpretive and explanatory signing should be utilised before and during operations that alter landscape character, such as new recreation site development, control burning adjacent to travel routes and walking trails.
- Where structures are required they should be sympathetic in design, materials and colour to complement surrounding landscape elements and be carefully sited away from major natural focal points, out of viewer sight-lines and where vegetation or landform screening can be used, such as at the Tree Top Walk.
- Essential firebreaks should follow natural landform, vegetation, or land use patterns/lines in the landscape, wherever possible.
- Prescribed burning should be carried out by employing prescriptions that minimise visible impacts.
- Previously disturbed areas within high visual landscape zones should be given the highest priority for rehabilitation until the desired standard of visual quality is attained (e.g. the Mt Lindesay walk trailhead area on Denmark River).
- Timber harvesting still continues in some areas, such as Weld and Mossop blocks, adjacent to western and northern parts of the planning area, and these operations should be compatible with management of the planning area, particularly landscape management should be carefully considered in and, where possible, incorporated into harvesting proposals.

18. Landscape

Key Points

- Landscape management refers to the appearance or visual quality of an area, and the premise that it is a natural resource and the values of which can be maintained, restored or enhanced.

- The planning area contains a number of landforms, vegetation types and waterforms with high visual quality. These include Mt Lindesay, granite outcrops, river valleys, distinctive vegetation, especially that with seasonal colour, watercourses with features such as rapids and waterfalls, permanent river pools, estuaries, inlets, lakes and wetlands.

The objective is to identify, protect and conserve the visual landscape qualities of the planning area.

This will be achieved by:

1. applying the general management guidelines set out in Department Policy No. 34 – *Visual Resource Management of Lands and Waters Managed by DEC* in assessing any proposed management activities and development of facilities to determine their impact on visual landscape values;
2. ensuring that visual landscape management is considered for all developments in the planning area and for timber harvesting operations on adjacent State forest;
3. providing access and recreational opportunities to areas of high visual landscape quality where this is environmentally sustainable, compatible with other values and in accordance with management settings;
4. planning fire management programs so that there is an appropriate balance between ecological imperatives and the minimisation of negative visual impacts, with appropriate weighting depending on the specific characteristics of a site;
5. liaising with neighbouring landowners and local governments to ensure visual landscape management guidelines are considered in any development they may undertake, and provide advice upon request; and
6. encouraging sensitive management of visual resources along the access corridors to tourist destinations and features.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

19. NATIVE PLANTS AND VEGETATION

Plant Communities

Phytogeography

Plant communities or vegetation types can be, and have been, described in a number of different ways (Mattiske and Havel 1997). Beard (1980) divided the State into botanical provinces, districts and sub-districts on the basis of ecological, climatic, geological and soil characteristics. The planning area lies predominantly within Beard's Warren Botanical sub-district, which occupies the southern portion of the Darling Botanical District, a division of the South West Botanical Province (Figure 4). The South West Botanic Province has a rich diversity of plants[7] as well as a high degree of threat, and is recognised as the only Australian representative area in the list of 25 recognised biodiversity 'hotspots' in the world (Myers *et al*. 2000). The Warren sub-district encompasses the entire karri forest belt, tingle forests and most of the coastal areas between Busselton and Albany.

Vegetation

The vegetation of the planning area is a mosaic of forest, woodland, shrubland, wetland and coastal dune vegetation types. The diversity in floristic composition, adaptive characteristics displayed by plants, patterns of groupings and the structural features of plant communities coincide with changes in environmental conditions across the planning area, principally variations in climate (see Section 15 *Climate and Climate Change*), landform and soils (see Section 16 *Geology, Landform and Soils*).

[7] Plant names in this document are from the WA Herbarium.

The vegetation of the coastal belt varies from largely bare mobile sands to thick low peppermint forest. Wetland areas and low plains are characterised by open low woodlands, thickets and low sedges. The periodic inundation of water in these areas excludes the presence of taller forest type species. There are a large number of species within these areas, including the predominant species of holly-leaved banksia *Banksia ilicifolia*, swamp banksia, *Xanthorrhoea* spp., *Jacksonia* spp., and various rushes and sedges.

Laterite areas support the taller forests and woodlands, with species such as karri, jarrah and tingle being prominent in these areas. The tall forest dominated by karri occurs in many western and southern parts of the planning area. Its distribution is closely associated with loamy soils derived from granite and gneiss. Pure karri and jarrah stands occur among stands where these species are associated with other species, such as marri and various locally endemic tingle species.

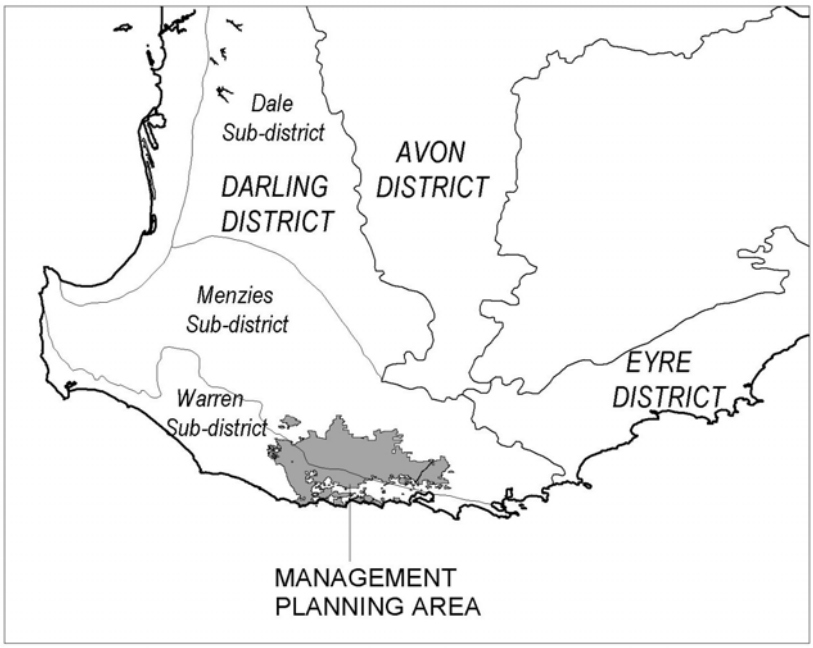

Figure 4. South West Botanical Province

The open structure of the canopy in the tall karri forest allows sufficient light penetration for the development of a substantial understorey of small trees and shrubs. In some parts of the forest, karri wattle *Acacia pentadenia* forms an impenetrable thicket more than two metres high, particularly after being burnt. In other areas, hazel *Trymalium floribundum*, karri oak *Allocasuarina decussata* and water bush *Bossiaea aquifolia* are major components of the forest understorey. *Agonis* and *Banksia* species and occasionally native willow *Callistachys lanceolata* occur along the stream and swampy watercourses.

This wide variety of vegetation provides a range of habitats for native animals (see Section 20 *Native Animals*), and contributes significantly to the planning area's high conservation and scenic values (see Section 18 *Landscape*). Being located in the high rainfall south-west, the planning area contains a number of species that are geographically restricted to this zone.

Beard (1980) identified vegetation associations across the State, and there are 35 vegetation associations within the planning area. Of these, 13 vegetation associations meet or exceed the criteria for significance such as reservation level and extent of association used by Hopkins *et al*. (2002) (Appendix 5).

During the WA Regional Forest Agreement process, vegetation for the forested area in the south-west was considered at the 'forest ecosystem' (see Section 14 *Biogeography*, and Map 4), 'ecological vegetation system' and 'vegetation complex' levels (Mattiske and Havel 1998), with vegetation complexes being the 'finest' scale of classification. While the *Forest*

Management Plan 2004-2013 identified formal CAR conservation reserve system targets for biodiversity in terms of forest ecosystems, the *Forest Management Plan 2004-2013* also identified and made provisions for the management of less well reserved vegetation complexes. In the area considered in the RFA, 312 vegetation complexes were identified, with 81 of these located in the planning area. Of these, 52 vegetation complexes contain rare and/or priority flora species. Further work is required to determine whether any additional vegetation complexes within the planning area require special consideration because they:

- now only exist as small fragmented areas compared to previous distributions;
- are naturally restricted in size or distribution;
- are threatened in some way;
- are located within conservation estate that was not considered during the RFA;
- represent a significant percentage of the total of that vegetation complex on conservation lands; or
- contain high levels of endemic, relictual or disjunct flora.

In this management plan, the plant communities of the planning area are mainly referred to in terms of these vegetation complexes. The vegetation complexes also provide the basis for determining landscape conservation units for fire management within the planning area (see Section 25 *Fire*).

Native Plants

Species Richness

The high rainfall and low evapotranspiration of the region is unique in WA. This, together with nutrient deficient soils, has resulted in rampant speciation in the south-west and a highly endemic biota has emerged (May and McKenzie 2003), in particular, suites of endemic vascular flora (*Myrtaceae*, *Rutaceae*, *Proteaceae*, *Papillionaceae*, *Restionaceae* and *Sterculeaceae*) (Lyons *et al*. 2000). The vascular flora of the south-west is diverse and has a high level of endemism, with about 25% of about 8000 species estimated to be endemic to the south-west (Hopper 1992).

The Warren bioregion is important as a centre of diversity for herbaceous perennial species and for the conservation of high rainfall flora (Lyons *et al*. 2000). Based on predictive modelling, the area of shrub, herb and sedgelands and mixed tingle forest between the Shannon River east to Denmark is one of two main species-rich areas within the south-west (Hearn *et al*. 2003) (Map 8) and the impacts of fire other disturbance vectors on species within this area should be considered and analysed.

There are about 1996 native vascular flora taxa[8], representing 197 families and 689 genera recorded in the planning area. Many studies in the region have contributed records to the native plant species list including studies by Barrett (1996), Lyons *et al*. (2000), Havel and Mattiske (2000), and Hearn *et al*. (2003). While the plant species list for the planning area is probably a significant under-estimate, given that a comparable comprehensive study to Lyons *et al*. (2000) has not been compiled for the Jarrah Forest Bioregion and many small areas still lack detailed botanical exploration (Lyons *et al*. 2000), there may also be variations in the data due to incorrect geo-coding and taxonomic errors.

The largest number of species belong to the family *Orchidaceae* (orchid family - 235 species), followed by *Myrtaceae* (eucalypt and paperbark family - 214 species), *Proteacea* (banksia and grevillea family - 157 species), *Papilionaceae* (pea family - 153 species), *Epacridaceae* (heath family - 137 species) and *Cyperaceae* (sedge family - 120 species). Major genera include *Stylidium* (76 species), *Acacia* (74 species), *Caladenia* (70 species), *Leucopogon* (61 species), *Eucalyptus* (45 species), *Drosera* (43 species) and *Hibbertia* (42 species). The diversity of vascular flora is comparable to other species-rich areas in nearby south-west conservation

[8] Records obtained from the Western Australian Herbarium, 2006, and do not include exotic environmental weed species.

reserves, such as Stirling Range National Park and Fitzgerald River National Park (Burbidge 2000). The Warren bioregion has a higher proportion of the monocotyledon families such as *Orchidaceae*, *Cyperaceae* and *Restionaceae* than the rest of the State (Green 1985).

The planning area also contains more than 500 species of non-vascular flora, although mosses, liverworts, fungi and lichens, have not been well studied within the State, and many un-named and unknown species exist. The greatest diversity and abundance of moss species in the State occur in regions of high rainfall (over 800 mm) such as in the south-west, in settings such as granite outcrops, fern gullies and sclerophyll woodlands (Stoneburner and Wyatt 1996, Hopper 1992). Moss and liverwort species of the south-west have a strong affinity with species of southern Australia, but are less diverse (May and McKenzie 2003). Endemism of WA moss species is 2% (four species, including *Drepanocladus aduncas*, *Rhacocarpus rehmannianus* var. *webbianus* and *Sphagnum novozelandicum* known from within the planning area), which compared to vascular plants is very low. However, 25% of the moss species in WA are restricted to Australia, showing a significant level of continental endemism (Stoneburner and Wyatt 1996).

It has been estimated that there may be 250 000 species of fungi in Australia, including about 5000 mushrooms and similar types (Pascoe 1991). Perhaps only five to 10% of Australian fungi have been named, and another 10% are known but not named (Bougher and Syme 1998). Most of the fungi that have been named are known from very few locations, which reflects the low knowledge base and attention given to fungi and is not an accurate representation of their distribution (Bougher 1997). In WA, about 500 species of larger fungi have been recorded, mostly from the south-west (Hilton 1982, 1988). 206 named fungi species have been recorded in the Frankland/Kent area, although another 434 unnamed species and 61 unnamed genera have been recorded from this area (Syme 2004). A regional survey of fungi and non-vascular flora has not been undertaken.

Climate change (see Section 15 *Climate and Climate Change*) could place a large part of the flora at risk, particularly those species usually associated with wet ecotypes. The harvesting of wildflowers or other plant parts can reduce the available seed stock and, by reducing the numbers of flowers available for cross-pollination, may reduce genetic diversity. In order to protect plant species and communities, the CALM Act prohibits the removal of flora and fauna from national parks and nature reserves. Uncontrolled or unauthorised vehicle access may also inadvertently spread *P. cinnamomi* (see Section 24 *Disease*) and increase fire risk (see Section 25 *Fire*).

Rare and Priority Flora

The Commonwealth's EPBC Act provides a listing of nationally threatened flora species. There are six 'endangered' and 15 'vulnerable' flora species listed under the EPBC Act that occur in the planning area. All of these species except three (*Corybas limpidus*, manypeaks sundew *Drosera fimbriata* and *Pleurophascum occidentale*) are also listed as 'Declared Rare Flora' under the State's *Wildlife Conservation Act 1950*).

At a State level, the Department has the statutory responsibility under the *Wildlife Conservation Act 1950* for flora conservation, and all native flora in WA is protected under this Act. Nominated threatened flora species normally go through a review process, then through a Ministerial endorsement process. The WA Threatened Species Scientific Committee is an independent scientific advisory body established by the Minister, which assesses the conservation status of species and makes recommendations to the Minister regarding approval.

A Flora Management Plan is currently being developed for the Department's Warren Region that will provide guidance on threatened flora recovery and operations management.

Declared Rare Flora

Native flora that is presumed to be extinct in the wild, or likely to become extinct or rare are afforded special protection by being declared to be 'rare flora' under the *Wildlife Conservation Act 1950*. These specially protected flora are sometimes referred to as 'threatened' or 'Declared Rare Flora' (DRF), and are declared by the Minister for the Environment by notice in the Government Gazette. A permit from the Minister is required before such flora can be disturbed in any way.

The 19 DRF species that occur within the planning area are *Asplenium obtusatum subsp. northlandicum*, Good's banksia *Banksia goodii*, Albany banksia *Banksia verticillata*, *Caladenia christineae ms*, *Caladenia harringtoniae*, *Caladenia winfieldii ms*, grass conostylis *Conostylis misera*, tall donkey orchid *Diuris drummondii*, glossy-leaved hammer orchid *Drakaea elastica*, *Drakaea micrantha ms*, blue bade-in-a-cradle *Epiblema grandiflorum var. cyaneum ms*, Northcliffe kennedia *Kennedia glabrata*, *Meziella trifida*, South-coast mignonette orchid *Microtis globula*, *Rhacocarpus rehmannianus var. webbianus*, mountain paper-heath *Sphenotoma drummondii*, sandplain sun orchid *Thelymitra psammophila*, *Verticordia apecta*, and *Verticordia fimbrilepis subsp. australis*. Almost half of these species are orchids.

Priority Flora

In addition to declared rare flora, the Department also refers to 'priority'[9] species. Although priority species do not have the special legislative protection provided to rare flora, the priority flora list is maintained as a mechanism to highlight flora of special conservation interest and encourage appropriate management activities.

In the planning area there are 15 Priority 1 flora species, 50 Priority 2 flora species, 49 Priority 3 species and 31 Priority 4 species, at the time of publication.

Few non-vascular plants are included in WA threatened and priority listings. These flora are poorly known in a taxonomic and conservation sense (it is estimated that only 1% of WA's non-vascular flora is formally named), and their low representation on threatened and priority lists does not reflect their true conservation status (Brown *et al*. 1998). There are three rare

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

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

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

c are conservation dependant (Priority 5).

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

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

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

Priority 4 species are categorised as either Rare, Near Threatened and other species in need of monitoring:

a Rare: species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

b Near Threatened: species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent (Priority 5), but that are close to qualifying for Vulnerable.

c Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

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

and three priority non-vascular species known to occur within the planning area, all of which are bryophytes (i.e. mosses and liverworts).

The status of many species remains in doubt and it is likely that many P1 and P2 species may be listed as DRF when further assessment is undertaken.

Endemic, Disjunct and Relictual Flora

The planning area is one of only a few areas within the south-west where high species richness overlaps with areas that are important for endemic, relictual and disjunct flora species. The planning area contains 57%, 73% and 26% of the south-west's relictual taxonomic, relictual monotypic and threatened endemic species, respectively (Hearn *et al*. 2003).

There are 93 species occurring in the planning area that have narrow ranges of less than 150 km between the two outermost populations, or restricted habitat requirements (Hearn *et al*. 2003). 63% of these are also listed as rare or priority species. These narrow or 'locally' endemic taxa are the most vulnerable to change (climate, hydrological or disease induced), or catastrophic events such as fire (Townsend Peterson and Watson 1998). Some of the most notable endemic flora species only found in their natural habitat within the planning area are the tingle tree species (red tingle, yellow tingle *E. guilfoylei* and Rates tingle), *E. virginea* and the red flowering gum. Red flowering gum is of international importance as it is one of the most widely grown ornamental trees in the broader *eucalyptus* family. One of the two habitat areas important for endemic flora species in the south-west occurs over a large part of the planning area between the Frankland River and Denmark (Hearn *et al*. 2003) (Map 8).

Species with distinctly separate or 'disjunct' distributions, as a result of physical, geological or biological isolation, have been very significant in the development of the south-west flora (Hearn *et al*. 2003). Breeding isolation over extended periods can lead to the eventual evolution of new species. There are 39 species in the planning area with disjunct distributions (Hearn *et al*. 2003), and 55% of these are also listed as rare or priority species. Three of the eight habitat areas important for disjunct flora species in the south-west (Hearn *et al*. 2003) (Map 8) are:

- mixed jarrah and shrubland north of Mt Pingerup and towards the Deep River;
- mixed yellow tingle forest north of Walpole; and
- mixed jarrah and shrubland between the Frankland and Kent rivers, centred on Lake Surprise.

Relictual flora include taxa with primitive reproductive systems (e.g. gymnosperms and ferns), 'monotypic' genera (with a single species in it - often considered to be end-of-the-line taxa of almost extinct genera), and taxa considered to be primitive within their 'taxonomic' families/genera/subgenera (Hearn *et al*. 2003). Even though many relictual taxa may be common, the relatively low number of taxa in these taxonomic groups and their genetic distance from the dominant modern flora makes them important for biodiversity and conservation.

There are 26 relictual-taxonomic species and 32 relictual-monotypic species within the planning area (Hearn *et al*. 2003). Of these total number of relictual species, 24% are also listed as rare or priority species. Concentrations of relictual flora species (Hearn *et al*. 2003) occur in the planning area (Map 8) within:

- mixed jarrah and shrubland north of Mt Pingerup in D'Entrecasteaux National Park extending into the planning area;
- mixed jarrah and shrublands around Granite Peak in the Mount Frankland National Park;
- karri/yellow tingle forests west of Walpole and karri and red tingle forests east of Walpole;
- mixed jarrah and shrubland between the Frankland and Kent rivers, centred on Lake Surprise;

- mixed jarrah and shrubland in the headwaters of the Styx River and on Mt Lindesay; and
- an area to the west of Denmark, on Nature Reserve 18340 and surrounding private lands.

Relictual taxa may be associated with sites of high moisture such as wetlands, rivers and the bases of granite outcrops (Hearn *et al*. 2003, Main and Main 1991).

The areas that are centres for endemic, disjunct and relictual species within the planning area offer the best opportunity to represent and protect a large number of these taxa in the conservation reserve system within concentrated areas. Protection of these species in these concentrated areas should focus on considering and analysing the impacts of fire other disturbance vectors on these areas (Hearn *et al*. 2003) (see Section 48 *Research and Monitoring*).

19. Native Plants and Vegetation

Key Points

- The South West Botanic Province is recognised as an internationally significant biodiversity 'hotspot'. A high diversity of vascular plant species occurs over much of the southern part of the planning area. The Warren bioregion is important as a centre of diversity for herbaceous perennial taxa and for the conservation of high rainfall taxa.
- At the time of publication, there are about 1996 native vascular plant species recorded in the planning area.
- At the time of publication, there are 19 DRF, 145 priority species, 93 locally endemic species, 58 relictual species and 39 species with disjunct populations within the planning area.
- There are 81 vegetation complexes in the planning area, representing 26% of all complexes in the RFA area (Mattiske and Havel 1998).
- It is prohibited to remove flora from the parks and reserves in the planning area.

The objective is to identify, protect and conserve the diversity and distribution of specially protected and other native plants and plant communities within the planning area.

This will be achieved by:

1. providing statutory protection for threatened species by listing them under the *Wildlife Conservation Act 1950* and/or EPBC Act, subject to satisfaction of the criteria for listing;
2. managing native plants and plant communities according to Department policies;
3. assessing proposed operations and developments (e.g. road construction/maintenance, facility development, prescribed burns) for potential impacts on declared rare and priority species;
4. supporting the preparation of and implementing recovery and translocation plans for DRF species identified in, or re-introduced into, the planning area as appropriate;
5. identifying native plants and plant communities that may require special protection and minimising the impacts on these from threatening processes;
6. maintaining records of species, populations and threatening processes, and ensuring that information is reviewed and updated on an annual basis at the District, Region and State Herbarium levels;
7. supporting research and undertaking monitoring of species of conservation significance and the threats to them (such as susceptibility to disease, response to fire, reproduction biology, taxonomy and age to maturity), and adapting management accordingly;
8. encouraging further vegetation and flora surveys to be undertaken in the planning area, particularly within Quarram Nature Reserve, William Bay National Park, Willmott-Quindinillup blocks and Boyndaminup National Park;
9. considering and analysing the impacts of disturbance on the centres for endemic, disjunct and relictual species and in areas of high flora species richness within the

planning area through research, adaptive management experiments and monitoring;
10. liaising with neighbouring land managers to promote compatible management on adjoining lands; and
11. providing appropriate information and interpretation on native plants and plant communities in the planning area and their vulnerability to impact to promote awareness, appreciation and understanding.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
19.1 Population size[10] and/or number of populations of critically endangered flora species located within the planning area	19.1 Increase in population size and/or number of populations of critically endangered flora species located within the planning area	After 5 years, or as per recovery plans if applicable
19.2 Populations of endangered or vulnerable flora species within the planning area	19.2 No loss of a single population of endangered or vulnerable flora species within the planning area	After 5 years, or as per recovery plans if applicable

20. NATIVE ANIMALS

In general, there has been a decline in native fauna[11] abundance within the south-west since European settlement from threatening processes including vegetation clearing, changes to fire regimes (see Section 25 *Fire*), introduced predators such as the red fox *Vulpes vulpes* (see Section 23 *Introduced and Other Problem Animals*) (Burbidge and McKenzie 1989). However, compared to other areas of the south-west, the planning area has relatively intact fauna populations, probably due to the size, condition, relative isolation and continuity with adjoining conservation lands. The planning area also provides a wide range of habitats and corridors for dispersal, along with diverse landforms and high rainfall.

Christensen *et al*. (1985) suggested that fauna of the south-west forests were distributed along a temperature/moisture gradient, particularly in a north/south direction, with secondary factors such as vegetation, landforms and soils affecting distribution on a local scale. The more xeric[12] fauna, such as reptiles, are more frequent in the warmer, drier areas and the mesic fauna, such as amphibia and fish, reach a peak of development in the cooler, moister south. A high percentage are dependent on habitat elements provided by trees in a mature or derelict state, or by fallen logs for nesting or shelter, especially mammals and birds.

Surveys of the vertebrate fauna of the WA southern forests in the period 1970 to 1982 included five survey locations in the planning area (Christensen *et al*. 1985). In the period 1992 to 1993, additional surveys along the south coast of WA were carried out (Jaensch 1992a, 1992b, 1992c, 1993) for waterbirds, frogs, fish and invertebrates within wetlands on Crown lands, and involved 6 sites within the planning area. On an ongoing basis, the Department conducts regular monitoring of native vertebrate species as part of the *Western Shield* program (see Section 23 *Introduced and Other Problem Animals*). However, fauna information within the planning area is still very limited, particularly information on the distribution, ecology and conservation status of reptiles, amphibians and invertebrates.

[10] Population size is defined as the number of mature/reproducing plants.
[11] Fauna names in this document are from the WA Museum.
[12] Tolerating or adapted to dry conditions

Mammals

There are at least 27 species of native mammals within the planning area. This includes five macropods, four species of possum, five dasyurids, two species of native rodent and seven species of bat. Three species of seal have been recorded in coastal areas of the planning area. The planning area has retained many of its original mammal species and has a relatively high diversity of mammals comparable with other large conservation reserves in the south-west, such as Fitzgerald River National Park (22 species) and Stirling Range National Park (20 species). However, it is thought that three mammals have become extinct within the planning area: boodie *Bettongia lesueur*; dalgyte or bilby *Macrotis lagotis*; and Gilbert's potoroo *Potorous tridactylus gilberti* (Christensen 1992). The populations of many species have declined and now exist only as small isolated populations (How *et al*. 1987).

Most of the mammal species that have contracted in range are within a 'critical weight range' (mammals with a mean adult body weight between 35 grams and 5.5 kilograms), which renders them particularly susceptible to predation by foxes. Remaining populations have limited distributions, with many species with quite specific habitat requirements persisting in refugial habitats such as densely vegetated thickets in river, stream and wetland systems, which also provide corridors for migration. Examples of critical weight range mammals within the planning area that have declined include the quokka, woylie *Bettongia penicillata ogilbyi* and chuditch *Dasyurus geoffroii*. The geographic range of the quokka has dramatically declined since European settlement (Kitchener 1995, Hayward *et al*. 2003) but, with fox baiting, it now occupies valley riparian areas extending up and across the landscape even after fire (G. Liddelow *pers. comm.*) (see Section 25 *Fire*). The woylie has contracted in range from 40% of the Australian mainland to less than 1%. The chuditch now occupies less than 2% of its former range (Environment Australia 1996a). Species that are larger or are habitat generalists, such as the western grey kangaroo *Macropus fuliginosus*, brush tailed possum *Trichosurus vulpecula* and the mardo *Antechinus flavipes*, are much less affected by predation by the fox and are relatively common throughout the south-west (Havel 1989).

Fox control as part of the *Western Shield* program (see Section 23 *Introduced and Other Problem Animals*), statutory protection and adaptive management is required to maintain and/or increase native mammal populations, particularly threatened species, within the planning area.

Birds

There are at least 144 species of native birds within the planning area. This relatively high diversity of birds, particularly within open forests, open woodlands and low open woodlands, represents about 79% of the birds listed for the forest areas of the south-west (Christensen *et al*. 1985). The planning area is important to south-west forest birds because of the range of different habitat types, including coastlines, rivers, inlets and forests and the structural diversity within them (Christensen 1992).

The high open karri forests are the predominant habitat of parrots and cockatoos. The western rosella *Platycerus icterotis* is very common in the karri forest. Likewise, the white-breasted robin *Eopsaltria georgiana* and the red-winged fairy wren *Malurus elegans* are also common in the karri forest. The low open woodland, shrub, heath and sedgelands are areas where species of honeyeaters are common, probably due to the abundance of flowering plants. The shrub, heath and sedgelands in particular, are areas commonly inhabited by the fairy wrens, such as the splendid fairy wren *Malurus splendens* and the birds of prey. Quails are also found in abundance in these areas (Christensen *et al.* 1985, Christensen 1992). Rivers and streams are also areas of high bird diversity, as a result of the range of vegetation structure and food resources in these areas (CALM 1992).

The distribution of many bird species has changed since European settlement. A comparison of bird distribution in the Field Atlas (1977 to 1981) and the New Atlas (1998 to 2000) shows that 161 species have increased their range, such as the purple swamphen *Porphyrio porphyrio*, elegant parrot *Neophema elegans* and Australian raven *Corvis coronoides*, and 65

species have decreased their range (Abbott 1998, Barrett *et al*. 2003). Thirteen birds show a substantial and systematic reduction across Australia, five of which occur in the planning area: white-necked heron *Ardea pacifica*, great cormorant *Phalacrocorax carbo*, Richard's pipit *Anthus novaeseelandiae*, black swan *Cygnus atratus* and wedge-tailed eagle *Aquila audax* (Environment Australia 2001b). Populations and their habitats within the planning area contribute to the maintenance of populations of these species across Australia.

The optimal habitat for waterbirds includes extensive open water, some bare land and extensive tall sedges or low shrub thickets inundated at the base by water 50 to 100 cm deep (Jaensch 1992a). Owingup Swamp and other lakes in Quarram Nature Reserve and lakes in William Bay National Park are recognised as some of the most important wetlands for waterbirds across the south coast, based on rankings of the number of species, breeding pairs and number of individuals (Jaensch 1992a). Owingup Swamp and nearby Boat Harbour Lakes are important wetlands for refuge and breeding for the rare Australasian bittern (Jaensch 1992a).

Birds Australia (formerly the Royal Australasian Ornithologists Union), a community organisation that is dedicated to the conservation, study and enjoyment of Australia's native birds and their habitats, has an effective working relationship with the Department. Members often participate in bird surveys for particular areas. The Department will continue to liaise with this group on issues affecting birds within the planning area, particularly regarding the improvement in understanding of the distribution and abundance of birds.

Reptiles

Reptiles are poorly represented in the planning area, with only 32 species of native reptiles recorded. While the planning area has a large number of skinks (20 species) and snake species (six elapids or front-fanged venomous snakes), there are only low numbers of goannas, geckos and tortoises.

Coastal dunes, flats, swamps and areas of more open vegetation are more favourable habitats for reptiles in the planning area, with few found in the karri and tingle forests due to the lack of light and heat penetrating to the forest floor (Christensen *et al*. 1985, Christensen 1992, CALM 1992).

Amphibians

There are at least 19 species of frogs within the planning area. Substantial areas of swamps, sedgeland and shrubland/forest, such as the Mt Soho and Owingup swamps, support one of the richest areas for frogs in WA. The moaning frog *Heleioporus eyrei*, slender tree frog *Litoria adelaidensis*, motorbike frog *Litoria moorei* and the western banjo frog (bullfrog) *Limnodynastes dorsalis* are quite tolerant to changes in the environment and are common to a range of habitats throughout the planning area (Christensen *et al*. 1985, Christensen 1992, CALM 1992). However, some species such as the Nornalup frog *Geocrinia lutea*, the sunset frog and the roseate frog *Geocrinia rosea* are more restricted in their occurrence (see Fauna of Conservation Significance).

Fish

There are at least 14 species of native fish found within the planning area. The minnows (*Galaxiidae*) are well represented, with four species known to occur. Most fish species are found in forest streams, although some are not generally found in fresh water, such as the bigmouth goby *Afurcagobius suppositus*, which spends a large proportion of its lifecycle in estuaries and the sea (Christensen *et al*. 1985, Christensen 1992).

Invertebrates

Knowledge of the invertebrate fauna of the area is more limited. In terms of freshwater invertebrates, Christensen (1992) reports three species of freshwater crayfish in the region, *Cherax crassimannus*, *C. glaber* and the smooth marron *C. cainii*. However, it is likely that only the smooth marron is found in the planning area, as the other two species are not as

common and have different habitat requirements (P. Mawson, *pers. com.*). Three, possibly four, species of terrestrial crayfish of the *Engaewa* genus are also found in the planning area. These are distributed in a narrow, 30 km strip along the coast between Walpole and Dunsborough. The fourth species is found in a small area to the east of Denmark (Christensen 1992).

Pusey and Edwards (1990) surveyed aquatic invertebrates from the acid peat flats[13] of the karri forest streams and pools and recorded three molluscs, one annelid, 11 arachnids, 20 species of crustacean, and 108 species of insect. This survey indicated that many invertebrates found in the region are similar to those of the jarrah forest streams.

Horwitz (1997) examined peat and shrubland in the planning area, and other areas in the region for six groups of aquatic invertebrates and found twenty-three taxa of Oligochaetes (freshwater worms), 23 water mites, two types of isopod, nine taxa of decapods (shrimps, crabs and crayfish), 121 taxa of flies (Diptera) and 22 taxa of Odonata (dragonflies).

Abbot (in press) described 1743 insect species, from 228 families in 24 orders known to occur in the region. About 23% of these are only known from the karri forest, and half from the region. Orders that have very high levels of diversity in the area include the Odonata (dragonflies), Coleoptera (beetles), Diptera (flies) and Tricoptera (caddis flies). The total number of insect species in the planning area is unknown, but it is suggested that it could be in the vicinity of 15 000 to 20 000 in the region (Abbott *et al*. 1992).

Van Heurck *et al*. (2000) completed a survey of invertebrates in the Walpole-Nornalup National Park and collected more than 700 species. Beetles were the most common taxon collected, followed by flies, wasps and bees, spiders, mites and springtails. The jarrah forest had the highest levels of species richness, followed by the tingle, then karri forests. These varying levels of diversity appeared to be related to the plant composition and species richness of each area. The different types of forest also supported a different diversity of insects. Jarrah forests contained the greatest diversity of wasps, bees and ants, as well as spiders and beetles. Snails and bugs had the greatest diversity in the karri forest, whereas springtails, mites and flies were the most diverse group in the tingle forests. There was also a high variety of spiders and beetles in the tingle forests. Knowledge of invertebrates in the planning area is currently the subject of several major studies in the Walpole-Nornalup National Park to determine the insect species composition in forest leaf litter in areas long unburnt, recently burnt in a wildfire and adaptively managed as a frequently burnt mosaic. Van Heurck et al. (2007) recently reported that of 264 beetle species collected in a four year survey of the Nuyts Wilderness, 107 species were only collected from forest burnt in a recent wildfire while another 93 were only collected from nearby long unburnt forest sites, many of these species are undescribed and possibly locally endemic.

Fauna of Conservation Significance

The Commonwealth's EPBC Act provides a listing of nationally threatened fauna species. There are three 'endangered' and 10 'vulnerable' vertebrate species listed under the EPBC Act that occur in the planning area. All of these species, except the sub-Antarctic fur seal *Arctocephalus tropicalis*, are also listed as threatened under the State's *Wildlife Conservation Act 1950*.

Threatened and Other Specially Protected Fauna

At a State level, the Department has the statutory responsibility under the *Wildlife Conservation Act 1950* for fauna conservation, and all native fauna in WA is protected under this Act. Nominated threatened fauna species normally go through a review process, then through a Ministerial endorsement process. The WA Threatened Species Scientific Committee is an independent scientific advisory body established by the Minister, which

[13] Acid peat flat is a large level area with acidic, humus-rich soil that contains a large amount of peat.

assesses the conservation status of species and makes recommendations to the Minister regarding approval. The *Wildlife Conservation Act 1950* provides for the Minister to declare (via the *Wildlife Conservation [Specially Protected Fauna] Notice 2005*) fauna species to be specially protected for the following reasons:

- Schedule 1 – fauna that is rare or likely to become extinct – the 13 species that occur in the planning area are the 'endangered' Muir's corella *Cacatua pastinator pastinator*, Baudin's cockatoo *Calyptorhynchus baudinii* and Carnaby's cockatoo *Calyptorhynchus latirostris*; and the 'vulnerable' quokka, chuditch, forest red-tailed black-cockatoo *Calyptorhynchus banksii naso*, western ringtail possum *Pseudocheirus occidentalis*, malleefowl *Leipoa ocellata*, Australasian bittern, western bristlebird *Dasyornis longirostris*, sunset frog, Walpole burrowing crayfish and the tingle trapdoor spider;
- Schedule 2 – fauna presumed to be extinct – the two species listed that may be rediscovered in the planning area are the Lewin's rail *Rallus pectoralis clelandi* and the rufous bristlebird *Dasyornis broadbenti*, although the boodie, dalgyte and Gilbert's potoroo may also occur;
- Schedule 3 – birds protected under an international agreement – while no species from this schedule occur in the planning area, there are species that are covered under other international agreements (see Section 7 *Legislative Framework*); or
- Schedule 4 – other specially protected fauna – the four species that occur in the planning area are the New Zealand fur seal *Arctocephalus forsteri*, Australian sealion *Neophoca cinerea*, peregrine falcon *Falco peregrinus* and the carpet python *Morelia spilota imbricate*.

In addition to specially protected fauna, the Department also maintains a list of priority fauna species (see footnote in Section 19 *Native Plants and Vegetation*). In the planning area there are two Priority 1 species, three Priority 2 species, three Priority 3 species, ten Priority 4 species, and three Priority 5 species, at the time of writing.

The proposed Department Policy No. 9 – *Conserving Threatened Species and Ecological Communities* (subject to final consultation) provides management direction for specially protected fauna.

The Department, often in collaboration with other State and Federal agencies and other parties, prepares recovery plans for the most threatened species. Species within the planning area that have recovery plans include the sunset frog (Burbidge and Roberts 2002), chuditch (Orell and Morris 1994) and woylie (Start *et al*. 1995). Interim recovery plans are also available for the western ringtail possum and the quokka.

Possible Translocations of Threatened and Priority Fauna

The planning area is one of the Department's '*Western Shield*' fauna re-construction sites. The area once supported many formerly widespread species including critical weight-range mammals and ground-dwelling birds. In recent years, the *Western Shield* program has delivered sufficient control of introduced predators (see Section 23 *Introduced and Other Problem Animals*) to enable the recovery of extant populations of species, as well as the translocation of a number of species within the planning area, including:

- woylie;
- tammar;
- chuditch;
- quokka;
- brush-tailed phascogale;
- ringtail and brushtail possums;
- quenda; and
- western bristlebird.

Many of these and other threatened species that have been and may be relocated or translocated have specific habitat requirements (e.g. the quokka occupies riparian zones that are in the mid to late seral post-fire stages), and other threatening processes such as inappropriate fire regimes (see Section 25 *Fire*) and *P. cinnamomi* (see Section 24 *Diseases*) also may need to be managed.

International Conventions and Agreements

There are 16 bird species that have been recorded within the planning area that are listed on the national *List of Migratory Species* and covered under international conventions or agreements (see Section 7 *Legislative Framework*). The curlew sandpiper *Calidris ferruginea*, the sharp tailed sandpiper *Calidris acuminata*, the red necked stint *Calidris ruficollis* and the common greenshank *Tringa nebularia* are listed under each of CAMBA, JAMBA and ROKAMBA. Birds listed solely under CAMBA found in the planning area are the caspian tern *Sterna caspia* and the white bellied sea eagle *Haliaeetus leucogaster*. The fleshy-footed shearwater *Puffinus carneipes* is listed under both JAMBA and ROKAMBA. The bridled tern *Sterna anaethetus* is listed under both JAMBA and CAMBA. The Pacific golden plover *Pluvialis fulva* is listed solely under ROKAMBA. The crested tern *Sterna bergii*, also listed under JAMBA, is also listed under the Bonn Convention. Other species listed under the Bonn Convention are the black-browed albatross *Diomedea melanophris* and the osprey *Pandion haliaetus*. The Pacific golden plover, malleefowl, Muir's Corella and the Western ground parrot are also migratory species under the EPBC Act that occur within the planning area.

The Department keeps a 'Seabird Breeding Islands' database for WA, and the flesh-footed shearwater, along with the little shearwater *Puffinus assimilis*, are recorded as occurring on Saddle Island within the planning area.

The hooded plover *Charadrius rubricollis*, listed as a marine species under section 248 of the EPBC Act, occurs on several beaches in the planning area, such as parts of Quarram Beach, Bellanger Beach and Circus Beach. The breeding and survival of this species can be affected by some recreational activities on these beaches, and it is recommended that monitoring of this species continue with a view to seasonal closure of some beach access in consultation with the community, should the status of this species become more endangered.

Endemic Fauna

The vertebrate fauna of the planning area show a range in the levels of endemism. In total, there are 43 species of vertebrate fauna that occur in the planning area that are endemic to the south-west of WA. Of the mammal species, nine out of 27 species (i.e. 33%) are endemic to the south-west, including the kwoora or western brush wallaby *Macropus irma*, quokka, western ringtail possum, honey possum *Tarsipes rostratus*, mardo, common dunnart *Sminthopsis gilberti*, grey-bellied dunnart *Sminthopsis griseoventer*, Gould's long eared bat *Nyctophilus gouldi* and the western false pipistrelle *Falsistrellis mackenziei*.

There is a lesser degree of endemism in the avifauna, with only Baudin's black-cockatoo, Carnaby's black-cockatoo, red capped parrot *Platycercus spurius*, western rosella, western ground parrot, white breasted robin, red-winged fairy wren, western thornbill *Acanthiza inornata* and the red-eared firetail *Stagonopleura oculata* being endemic to the south-west.

While only two species of snake in the planning area, the short nosed snake *Elapognathus minor* and square nosed snake *Rhinoplocephalus bicolor* are endemic to the south-west, the skinks show a high level of endemism, with 13 of the 20 skink species (i.e. 65%) being endemic to the south-west. There are three notable endemic species of amphibians in the planning area. These are the Nornalup frog that is only found within a radius of 12 km from Walpole, the sunset frog that is only known from peat swamps north and east from Walpole, and the roseate frog that is found in the high rainfall zone of the lower south-west.

The aquatic fauna of the region generally show a similar, if not stronger pattern of endemism than the flora (Traylor *et al*. 1996). The freshwater fish species also show a high level of endemism, with seven of the 14 species found in the planning area being endemic to the south-west. A notable example is the salamander fish *Lepidogalaxas salamandroides*, which is confined to peat swamps and belongs to the endemic monotypic family *Lepidogalaxiidae*.

The freshwater invertebrates also show a high level of endemism. The nine species recorded in the planning area are all endemic to the south-west. One of these, the Walpole burrowing crayfish is only known from hillside seepages, peatlands and swamps on the Valley of the Giants Road near Bow Bridge. In a study of peatlands and shrublands in the area, Horwitz (1997) found 36 out of 142 taxa of aquatic invertebrates to be regionally endemic (known to be endemic to the south-west, but not restricted to the study area) and 11 to be locally endemic (taxon restricted to the study area).

Disjunct Fauna

There is little known about disjunct fauna species in the south-west. However, one notable disjunct species occurring in the planning area is the bardick *Echiopsis curta*. This snake is found throughout the south-west from Kalbarri to the Great Australian Bight, and there are also other populations in South Australia, western Victoria and south-western New South Wales. Populations in WA have been found to be disjunct from those in eastern Australia.

Relictual Fauna

A range of Gondwanan relictual fauna species occur in the Warren Region (Main and Main 1991). Most (70%) of the 17 species of relictual vertebrates occurring in the planning area are amphibians, and most (63%) of the amphibians in the planning area are relictual species. Significant examples are the Nornalup frog, the roseate frog and the sunset frog.

The remaining five relictual vertebrates are fish species, including three species of minnow (which are also endemic), the salamander fish and the pouched lamprey *Geotria australis*. Main and Main (1991) also document 39 species of relictual invertebrates, including a number of freshwater crayfish and mussels, land snails, dragonflies, caddis flies, scorpions, harvest spiders, trapdoor spiders and 'true' spiders. These types of invertebrates favour habitats that are moist throughout the year, including litter, moss, humus, under bark in tree butts, in hollows and overhangs of rotten logs, gullies, hilltops and hills with southerly aspects and in coastal heath where summer fog is prevalent. Species such as these are vulnerable to fire. The tingle trapdoor spider lives in shallow burrows and the heat of a wildfire will kill them. Another taxon *Chasmocephalon* lives in the damp hollow butts of trees in unburnt forest and does not retreat into the leaf litter during a fire. However, many species have survived fire and climate change over a long period of time and more studies are required to determine their vulnerability to fire.

Even though many of the relictual species are common, the relatively low number of taxa in these groups and their genetic distance from the dominant modern fauna makes them important for biodiversity and conservation. In addition, because of their restricted habitats, reliance on high rainfall and low dispersal rates, Gondwanan relicts may suffer the most as a result of climate change (Pouliquen-Young and Newman 2000).

20. Native Animals

Key Points

- The planning area is valuable for fauna conservation due to its good condition, size, relative isolation of many parts, habitat diversity and continuity with adjoining conservation estate. As a result, the native fauna within the planning area is highly diverse, and includes a high level of endemism and many relictual species.
- There are 27 mammal, 144 bird, 32 reptile, 19 amphibian and 14 fish native fauna species recorded in the planning area. Knowledge of invertebrate species in the area is fairly limited.

- There are 19 threatened and other specially protected fauna species occurring in the planning area that are specially protected under the *Wildlife Conservation Act 1950*. A further 21 species are listed as priority fauna.
- The management and removal of introduced predators has assisted the recovery and translocation of many native species.

The objective is to identify, protect and conserve specially protected and other native fauna and their habitats within the planning area.

This will be achieved by:

1. managing native animals and habitats according to Department policies;
2. providing statutory protection for specially protected species by listing them under the *Wildlife Conservation Act 1950* and/or EPBC Act, subject to satisfaction of the criteria for listing;
3. protecting fauna and fauna habitats, particularly specially protected species, from threatening processes in ways that do not compromise other conservation objectives;
4. assessing proposed operations and developments for potential impacts on fauna values, including surveying for the occurrence of specially-protected and priority species;
5. maintaining inventories (e.g. location records) of fauna values for specially protected and priority fauna species;
6. supporting the preparation of and implementing recovery and translocation plans for specially protected species, and where necessary other species in decline, identified in or re-introduced into the planning area as appropriate;
7. maintaining fauna monitoring programs to monitor biodiversity and specifically long-term changes in the distribution and abundance of species as a result of threatening processes, such as climate change;
8. encouraging further systematic fauna surveys across the planning area;
9. supporting research and monitoring of the ecological and life history data, fire effect and response data, and the effects of threatening processes on susceptible specially protected, priority and other fauna species, such as invertebrates, and adapting management accordingly;
10. monitoring the hooded plover on beaches in the planning area, with a view to seasonal closure of some beach access in consultation with the community should the status of this species become more endangered;
11. liaising with neighbouring land managers to promote compatible management on adjoining lands; and
12. providing appropriate information and interpretation on native animals and their habitats in the planning area and their vulnerability to impact to promote awareness, appreciation and understanding.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
20.1 The conservation status of threatened fauna species located within the planning area	20.1a No decline in the conservation status of threatened fauna species in the planning area. 20.1b Translocated fauna species are successfully established as viable breeding populations	After 5 years, or as per recovery plans if applicable

20.2 Range and number of populations of locally endemic fauna species: Walpole burrowing crayfish, tingle trapdoor spider, Nornalup frog and sunset frog	20.2 The range and number of populations of locally endemic fauna species: Walpole burrowing crayfish, tingle trapdoor spider, Nornalup frog and sunset frog will be maintained or increased	After 5 years, or as per recovery plans if applicable

21. ECOLOGICAL COMMUNITIES

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

- a community that is restricted in its extent;
- particular habitats or ecosystems that contain sensitive species;
- communities that are threatened (e.g. Threatened Ecological Communities); and
- communities that are species-rich or contain aggregations of endemic, disjunct or relictual flora species (see Section 19 *Native Plants and Vegetation*).

The planning area contains a number of different types of ecological communities and, given the size and location of the planning area, many of these are very important for local, regional, state and international biodiversity conservation, particularly in the face of a range of current and potential threatening processes such as *P. cinnamomi* (see Section 24 *Diseases*) and climate change (see Section 15 *Climate and Climate Change*).

Threatened Ecological Communities

The Commonwealth's EPBC Act provides a listing of threatened ecological communities (TECs) and legislative protection is currently provided for TECs listed under this Act. There are no TECs within the planning area currently listed under this Act. Threatened ecological communities are categorised under similar definitions in the EPBC Act and at the State level (Appendix 5).

At the State level, nominated TECs normally go through a review process, then through a Ministerial endorsement process. The WA Threatened Ecological Communities Scientific Committee is an independent scientific advisory body established by the Minister, which assesses the conservation status of communities and makes recommendations to the Minister regarding approval. There is one Ministerial-approved TEC within the planning area called the *Mt Lindesay-Little Lindesay Granite Community* (Appendix 5 and Map 9) and a recovery plan for this 'endangered' community is currently being developed. Given its conservation status, it is important that over the life of the plan there is no loss of the flora species that comprise this community.

May and McKenzie (2003) also identified other ecological communities of conservation significance in the planning area (Appendix 5), such as relictual peat communities (see below). These ecological communities are maintained in a list of informal priority ecological communities (PECs) by the Department. While these communities currently do not have the same conservation status as Ministerial-approved TECs, it is nevertheless important over the life of the plan to ensure there is no decline in the condition of these communities as a result of management action.

Threatened ecological communities are afforded protection by the Department through endorsement procedures, the development and implementation of recovery plans and prior ministerial approval for disturbance. Some protection is provided under other State legislation, such as the *Environmental Protection Act 1986*.

Once a community has been endorsed by the Minister, it can be forwarded to the relevant Commonwealth Minister to be listed under the EPBC Act. It is likely that over the period of this management plan more TECs and PECs, such as relictual peat communities (Appendix 5, see also below), will be identified, Ministerial-approved and protected under Commonwealth legislation.

With the implementation of the Government's 'Protecting Our Old Growth Forests' Policy, the 'Medium forest; jarrah-marri/Low forest; jarrah' community remains poorly reserved and is a priority for reservation (May and McKenzie 2003). This ecosystem is essentially located on that land east and west of Denmark considered suitable for agriculture and is consequently extensively cleared or alienated. A few pockets remain and should be sought for reservation or protected from clearing. Options for covenanting or land acquisition are strategies to assist in the conservation of these important communities.

Significant Habitats

Some habitats, such as granite outcrops, wetlands and ecologically mature forest, are types of ecological communities that are significant for the abundance and diversity of flora and fauna habitats they provide.

Granite Outcrops

Small, isolated and disjunct granite outcrop communities are interspersed throughout the planning area. Notable examples within the planning area include Mt Frankland, Mt Roe, Mt Lindesay and Granite Peak. These granite outcrops contain a high diversity of plant life, similar to other areas within the south-west, and give rise to herblands with *Borya* (resurrection plants), orchids and species of *Stylidium* (trigger plants) and *Drosera* (sundews). On the deeper soils, heath vegetation typically occurs. Granite outcrops are significant to the region as they are geographically separated from similar outcrops to the west, such as Mt Pingerup and Mt Chudalup, and to the east, such as the Porongorup and Stirling Ranges.

The diversity of microhabitats and soil moisture regimes supported by granite outcrops has facilitated the persistence of refugial species beyond their main range and evolution of several endemic species in the south-west (Hopper *et al*. 1997). For example, 16% of orchids and 24% of eucalypts on south-west granites are endemic (Hopper *et al*. 1997). Barrett (1996) concluded that the unusual shrubland communities of granite outcrops in the planning area potentially supported endemic species. Other species potentially seeking refuge in granite outcrops are skinks and obligate seeder species, which are protected from frequent fire by rock barriers (Hopper 2000).

Granite outcrops also support a high proportion of rare flora because of the sensitive habitat, its refugial qualities and unique characteristics. Granite outcrops contribute 32 taxa (9.8%) to the State's threatened flora list (Brown *et al*. 1998). Within the planning area, outcrops support a number of threatened species, including four species of DRF, one Priority 1 species, nine Priority 2 species, two Priority 3 species, and one Priority 4 species. However, granite outcrops have not been well surveyed, and may potentially contain other rare, priority and other flora of conservation interest.

Granite outcrop communities are susceptible to weed invasion, grazing and disturbance by feral animals and intense summer fires. Inappropriate recreation can also result in infection of the area by *P. cinnamomi*, vegetation loss, soil compaction and loss of infiltration leading to increased water runoff and hence the potential for erosion. Vehicle tracks on moist soil on some outcrop aprons can also leave a visual scar lasting for decades.

Wetlands and Riparian Habitats

States and Territories may list wetlands as 'nationally important' in the Directory of Important Wetlands in Australia. The third edition of this directory (Environment Australia 2001a) lists 851 sites as being nationally important. There are two of these wetlands in the planning area:

Mt Soho swamps and the Owingup Swamp system (Map 6) (see Section 7 *Legislative Framework*, and Section 17 *Hydrology and Catchment Protection*).

The Mt Soho swamps are significant because they contain three of the 13 known extant populations of the threatened sunset frog.

The Owingup Swamp system within Quarram Nature Reserve has a number of significant values and has been identified as meeting two Ramsar criteria for listing as a *Wetland of International Importance* (Jaensch and Watkins 1999).

Peat communities, currently listed as a Priority 1 threatened ecological community (Appendix 5), occur in scattered pockets within the planning area, such as Lake Surprise. Studies by Wardell-Johnson and Roberts (1993), Horwitz (1997), Storey (1998) and Gibson and Keighery (1999) have demonstrated the significance of peat communities for restricted and rare species, particularly flora and invertebrate species. Specific threats to peat communities include changed fire regimes, salinity, changed physical hydrology, pollution (eutrophication) and mining (May and McKenzie 2003). To assist in protecting them from these threats, particularly of fire, peat communities will be located, mapped and studied further to determine their specific flora and invertebrate species composition.

Other important wetland habitats exist as seasonally or permanently inundated features along drainage systems and low-lying areas of the planning area. Riparian habitats occur along the main rivers and creeks of the planning area, which provide valuable habitat and act as wildlife corridors. For example, riparian vegetation is favoured by some small mammals such as the specially protected quokka and the quenda because it offers shelter and protection from predators.

Wetlands and riparian habitats in general can also be impacted upon by a range of other threats such as environmental weeds, salinisation, climate change and unmanaged human access. Problem animals such as pigs also have the potential to damage riparian vegetation. The Department will endeavour to apply fire regimes appropriate to the maintenance of ecosystem function and the maintenance of biodiversity to protect wetland systems of the plan area (see Section 25 *Fire*).

Old Growth Forest

Ecologically mature or 'old-growth' forest has high biological and social (see Section 18 *Landscape*) value. The overstorey of old growth forest is in a late mature to senescent growth stage and provides habitat for a range of species, especially those requiring large tree hollows (Christensen 1992).

The planning area is significant in that it contains about half (48%) of all the old growth forest within the south-west of WA (Table 5). About 49% of the jarrah old growth forest and 53% of the karri old growth forest in the south-west is within the planning area.

Within the planning area, almost half (42%) of the total area consists of old growth forest (Table 5, Map 9). Several reserves in the planning area contain high proportions of old growth forest, such as Boyndaminup National Park (64%), Mount Frankland National Park (65%), Mount Frankland North National Park (69%) and Mt Shadforth Nature Reserve (82%). Most old growth forest (84%) consists of jarrah forest types, such as the 'Jarrah Forest South' forest ecosystem (see Section 14 *Biogeography*), and Mount Roe National Park contains most of the old growth jarrah forest, while Mount Frankland National Park contains most of the old growth karri forest. Much of the remainder of the planning area in coastal and fragmented areas east of the Frankland River has ecological communities that do not carry stands of trees. With the fulfilment of the Government's 'Protecting Our Old Growth Forests' Policy and the gazettal of new national parks within the planning area this old growth forest, along with areas in other new national parks throughout the south-west, will be protected.

A reduction in suitable tree hollows caused by land clearing outside the planning area, and competition for hollows from introduced species such as the honeybee *Apis mellifera* highlights the habitat value of old growth forest within the planning area.

Table 5. Old growth forest in the planning area[1]

	Total Old Growth	Old Growth by Species	
		Jarrah	Karri
Planning Area	133 159 ha	126 341 ha	33 803 ha
South-west	333 197 ha	257 382 ha	63 728 ha

1 = Figures are confined to the RFA area, are rounded, and are based on ecologically mature forest data at January 2005.

Regrowth Forest

The timber industry, which began in the early days of European settlement, grew rapidly in the 1890s and into the twentieth century. Many patches of forest, particularly in the central and eastern parts of the planning area, were selectively harvested for the highly durable and valued jarrah timber. Although more intensive harvesting practices have developed in recent decades, there has only been limited intensive harvesting in the planning area due to the longer distances from processing centres and the development of the conservation reserve network. About 2% of the planning area has been intensively harvested for timber, with patches of 'post-harvest' regrowth totaling 5500 ha of karri and 1300 ha of jarrah concentrated in western parts of the planning area within Thomson, Lochart, Wye, Deep, Dawson, Frankland, Swarbrick and Keystone blocks.

Changes in Government policy, through the implementation of the 'Protecting Our Old-Growth Forests' Policy, ceased timber production from many parts of the planning area in 2001. Regrowth forest within the planning area will be managed the same as the rest of the vegetation within the planning area. However, in some areas young post-harvest karri regrowth may require specific action through the Master Burn Plan process to exclude them from prescribed burning, until the regrowth can withstand protective fuel reduction burning (see Section 25 *Fire*).

Tingle Forest

Tingle forests are ecological communities that are restricted in their extent, and contain sensitive species. The planning area is noted for the high numbers of locally endemic dominant, large forest eucalypts such as Rates tingle, red tingle and yellow tingle (Wardell-Johnson and Coates 1996). These species are restricted to a narrow climatic zone with steep environmental gradients, with red tingle forests being the most geographically restricted occurring no more than 10 km from the coast. These forests are considered relicts of climatic or soil regimes that were once more widespread than at present, and are indicators of a small scale, high rainfall, non-mobile, relictual biota. Three fire sensitive flora species are found within communities that contain tingles (see Section 25 *Fire*) (Smith 1996), and small Gondwanan spiders such as the endangered tingle trapdoor spider (see Section 20 *Native Animals*) inhabit the thick, fibrous and spongy bark at the base of tingle trees. Inappropriate fire, climate change and *P. cinnamomi* may be the most important considerations in these ecological communities (Wardell-Johnson and Coates 1996).

Ecotones

Ecotones are the transition zones between adjacent but different environments (e.g. habitats or forest ecosystems). Ecotones regulate interactions between environments by modifying the flow of species between them, particularly in response to changes in climate or disturbances. Ecotones are often narrow areas of land that have a high number and variety of species, making them vitally important for biodiversity conservation and as repositories of genetic diversity. Consequently, ecotones provide a source of material for rehabilitation of adjacent environments if and when these areas lose species (Volis *et al*. 1998, Kark *et al*. 1999). An example of ecotones within the planning area might be the transition zone between a wetland or granite outcrop habitat, and the surrounding forest. These areas are often vulnerable sites

for recreation development because of their diversity and scenic quality (see Section 18 *Landscape*). Where possible, developments such as recreation sites should avoid ecotones.

Ecotones are also important in providing soil boundaries during wildfire or prescribed fire events (see Section 25 *Fire*). The change in moisture levels or availability of vegetation fuels in ecotones regulates the degree to which fire crosses the transition zone, and can be important in providing fine-grained protection of habitats.

Islands

There are a number of small islands off the coast of the planning area that are Crown reserves and vested as part of the existing Walpole-Nornalup and William Bay national parks (see Section 3 *Planning Area*). These islands, such as Saddle Island and the Casuarina Islands and several islands between William and Madfish bays, provide specific habitat for a variety of different and unique flora and fauna.

Little is known about the significance of these islands and their ecological communities, apart from information provided from visits to Saddle Island by W.N. Clark in 1841, and DEC staff in 1990 and 2005 (Abbott et al. 2006). Some of the islands, such as Saddle Island, provide breeding habitats for seabirds such as fleshy-footed shearwaters and little shearwaters (Andrew Burbidge *pers. com.*). Further investigations should examine island ecology and the relationship to terrestrial communities within the coastal parts of the planning area.

21. Ecological Communities

Key Points

- There is one Ministerial-endorsed threatened ecological community in the planning area, although there are a large number of communities, habitats and areas of ecological significance.
- There are two nationally important wetlands in the planning area: the Owingup and Mt Soho swamps, although all wetlands in general are also of ecological significance.
- The rock outcrops and mountains within the planning area provide significant habitat for an abundance and diversity of flora and fauna.
- Old growth forest within the planning area is extensive, and has high biological and social value.

The objective is to identify, protect and conserve threatened and other ecological communities of conservation significance within the planning area.

This will be achieved by:

1. identifying and protecting threatened ecological communities in the planning area by listing them under appropriate legislation, such as the Commonwealth's EPBC Act or the proposed State Biodiversity Conservation Act;
2. assessing proposed developments that may impact on the natural values of threatened ecological communities, or communities of other conservation significance, including old growth forests;
3. reducing the threats to ecological communities and significant habitats, including granite outcrops and tingle forests, by reducing the impact of threatening processes such as environmental weeds, inappropriate fire regimes, introduced animals, and disease;
4. supporting research and undertaking monitoring of the habitat and ecology of threatened ecological communities and other communities susceptible to threatening processes and adapting management accordingly;
5. improving knowledge about the islands in the planning area, particularly the terrestrial ecological communities and threats to them; and
6. providing appropriate information and interpretation on ecological communities and

significant habitats in the planning area and their vulnerability to impact to promote awareness, appreciation and understanding.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
21.1 The flora species that comprise the Mt Lindesay - Little Lindesay Granite threatened ecological community	21.1 No loss of flora species that comprise the Mt Lindesay - Little Lindesay Granite threatened ecological community	After 5 years, or as per recovery plan if applicable
21.2 The location and species composition of the poorly known 'relictual peat' threatened ecological communities within the planning area	21.2 The location and flora and invertebrate species composition of the 'relictual peat' threatened ecological communities will be identified	After 5 years, or as per recovery plan if applicable

22. ENVIRONMENTAL WEEDS

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

Environmental Weed Management

An integrated approach to environmental weed management was developed in the *Environmental Weed Strategy for Western Australia* (CALM 1999a). As part of this strategy, environmental weeds are rated 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 spread elsewhere in the world; and
- *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 *Environmental Weed Management* policy (subject to final consultation) is used in conjunction with the *Environmental Weed Strategy* to guide the approach and priority setting for the control of environmental weeds on lands and waters managed by the Department. 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 environmental weeds rated under the *Environmental Weed Strategy* as high, moderate, mild and low in decreasing priority as resources allow.

Options for environmental weed management include prevention, eradication, control, containment, or do nothing. It is the preferred option to prevent the introduction of environmental weeds through appropriate management, as eradication is rarely feasible. Methods of control include managing disturbance, the use of herbicides, biological control, manual control, and control through the application of fire. Effective control programs encourage the growth of native species and the suppression of weeds with the overall aim of boosting the area's resilience to further weed invasion.

Environmental Weeds in the Planning Area

Within the planning area, weeds and non-native plants have been introduced as a result of European settlement and use of the parks and reserves. Many of these species have a very localised distribution, only occurring at the site where they were introduced, but some of the more effective colonisers have become widespread. Weeds are often transported by a number of vectors including flowing water, the faeces of animals and seed-eating birds, human transport, and wind-borne spores or seed. The unsanitised use of equipment also significantly contributes to the distribution of weeds. To maintain or enhance the natural environment of the planning area, it is essential that these introduced plants are managed appropriately.

There are more than 340 species of environmental weeds within the planning area. Sixty plant families are represented, with the largest numbers of species belonging to *Poaceae* (63 species), followed by *Asteraceae* (32 species) and *Papilionaceae* (30 species). Over 60% of the weeds in the planning area are herbaceous plants or grasses.

Under the *Environmental Weed Strategy* the highest rating environmental weeds comprise about 5% of the total weeds within the planning area and almost half of the weeds (43%) are rated as 'Low'. Some environmental weeds occurring within the planning area may have different invasiveness, distribution or environmental impact characteristics within this particular environment than the *Environmental Weed Strategy*, which is a factor taken into account when assessing and undertaking control. Those species that are current priorities for control are listed in Appendix 6.

Landholders, including the Department, are legally responsible for eradicating plants 'declared' under the *Agriculture and Related Resources Protection Act 1976*, although the Act does preserve the Department's right to decide priorities and the level of control according to resources. Several declared plants under the *Agriculture and Related Resources Protection Act 1976* occurring in the planning area are current priorities for control (Appendix 6). The blackberry *Rubus fruiticosis*, whilst rated low in the *Environmental Weed Strategy*, is a 'Weed of National Significance' and a Strategic Plan has been prepared for its management (ARMCANZ and ANZECC 2000).

Many non-native environmental weed species, such as yellow stringy bark *Eucalyptus muelleriana*, pinaster pine *Pinus pinaster* and radiata pine *Pinus radiata*, are also present within the planning area in some regrowth areas, on rehabilitated gravel pits and disturbed areas, and also within former research trials (see Section 48 *Research and Monitoring*). These non-native and introduced weed species, and any associated wildings, should be progressively eradicated (see Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*) and the areas rehabilitated with native species (Section 41 *Rehabilitation*).

There are few significant weed infestations in the forested areas of the planning area. However, on parts of the coast, which have had a history of grazing and disturbance, infestations of annual herbs and grasses persist. Marram grass *Ammophila arenaria*, an introduced species that was used in the 1930s to stabilise foredunes along many parts of the coast, has now established itself on foredunes and other destabilised coastal dune areas. Native species, such as dune thistle *Actites megalocarpus* and hairy spinifex *Spinifex hirsutus* , which are also vigorous colonisers and are common along much of the coastline, should be used in preference to marram grass to stabilise foredunes where marram grass has not been established (see Section 41 *Rehabilitation*).

22. Environmental Weeds

Key Points

- Weeds displace native plants and plant communities and alter ecosystems, particularly on disturbed sites.
- There are over 340 environmental weed species in the planning area. Fourteen have

been rated as high priority weeds.
- Bridal creeper *Asparagus asparagoides* and blackberry are 'weeds of national significance' that occur within the planning area.
- There are 12 declared weeds under the *Agriculture and Related Resources Protection Act 1976* in the planning area.
- Many of the weed species are localised and have been introduced as a by-product of adjoining land practices.

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

This will be achieved by:
1. considering the *Environmental Weed Strategy for Western Australia* and local knowledge to assess invasiveness, distribution and environmental impact;
2. managing environmental weeds according to Department policies;
3. maintaining information on weeds including a register of weeds, details of distribution, relevant biological information and history of control;
4. developing a weed control plan that addresses:
   - prioritizing weeds by species and location;
   - impacts on key values including threatened species;
   - controlling weeds by appropriate mechanical, chemical or biological methods; and
   - eradicating new and emerging weeds before they become established.
5. controlling environmental weeds in accordance with the control plan;
6. limiting the opportunity for weeds to be introduced and established by:
   - applying appropriate hygiene practices as required to machinery entering the planning area;
   - minimising disturbance of soil while carrying out management activities, particularly in areas adjacent to sources of weeds; and
   - restricting the importation of soil into the planning area to only those sources with strict soil quarantine.
7. liaising with relevant agencies and neighbouring land managers to facilitate effective, coordinated weed management in the planning area and surrounding areas;
8. progressively eradicating non-native environmental weed species, including wildings, from regrowth areas, rehabilitated gravel pits and disturbed areas, and former research trials, and rehabilitating these areas with native species;
9. supporting research and undertaking monitoring of environmental weeds, and adapting management accordingly; and
10. providing appropriate information and interpretation on the adverse impacts of environmental weeds and their impacts on key values to promote awareness, appreciation and understanding.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
22.1 The extent of weed species at priority sites, including former research trials of introduced tree species, and with a 'High' rating in the *Environmental Weed Strategy*, or deemed as a local priority.	22.1 Decrease in the extent of weed species at priority sites, including former research trials of introduced tree species, and with a 'High' rating in the *Environmental Weed Strategy*, or deemed as a local priority.	After 5 years

23. INTRODUCED AND OTHER PROBLEM ANIMALS

Problem animals can be either native species that impact on natural values or adjacent land uses, or introduced animals (feral or exotic species) that have become established as wild or naturalised populations outside their natural range of occurrence. Problem animals have potential for serious impact on natural systems through direct effects such as predation, habitat destruction, competition for food and territory, and through environmental degradation by selective grazing and the spread of weeds and diseases.

An objective of the Department is to achieve sustained strategic management of problem animals as per the Department's proposed *Management of Pest Animals on CALM-managed Lands* policy (subject to final consultation). Under sections 39 to 41 of the *Agriculture and Related Resources Protection Act 1976,* the Department also has responsibilities on lands that it manages for the control of animals 'declared' under section 37 of this Act.

A number of species (such as the red fox, feral cat, feral pig and rabbit) and the processes by which they impact on biodiversity, are listed as key threatening processes under the Commonwealth's EPBC Act. Threat abatement plans provide national coordination to manage the impacts on biodiversity.

Introduced and other problem animal species in the planning area are listed in Table 6.

Table 6. Introduced and other problem animals recorded in the planning area

Common Name	Species	Management Priority
Mammals		
Feral pig[1]	*Sus scrofa*	High
Red fox[1]	*Vulpes vulpes*	High
Feral cat	*Felis catus*	High
Feral dog[1]	*Canis familiaris familiaris*	Low
Dingo[1,2]	*Canis familiaris dingo*	Low
Rabbit[1]	*Oryctolagus cuniculus*	Low
House mouse	*Mus musculus*	Low
Black rat	*Rattus rattus*	Low
Horse	*Equus caballus*	Low
Fallow deer	*Dama dama*	Low
Red deer	*Cervus elaphus*	Low
Fish		
Redfin perch	*Perca fluviatilis*	Low
Mosquito fish	*Gambusia affinis*	Low
Rainbow trout	*Oncorhynchus mykiss*	Low
Brown trout	*Salmo gairdneri*	Low
Birds		
Laughing kookaburra[2]	*Dacelo novaeguineae*	Low
Invertebrates		
Feral honeybees	*Apis mellifera*	Low
Various molluscs	*Includes Oxychilus sp.*	Low
Yabby	*Cherax destructor*	Low

1 = Declared species under the *Agriculture and Related Resources Protection Act 1976* (as of April 2001).
2 = Considered 'acclimatised' and protected under the *Wildlife Conservation Act 1950*.

The control of problem animals in the planning area needs to be a balanced approach that weighs the risks of the presence and impacts of species with other factors such as the control effort, resource availability and priorities. Many problem animals are highly mobile, and consideration also needs to be given to the most suitable control method in determining how to manage them. Options include shooting, trapping, baiting and biological control. However, there may be limitations on, or advantages in, the application of particular control techniques depending on a number of factors, including:

- legal restrictions (social and safety);
- variability in the effectiveness of control of species (e.g. aerial baiting may suit control of foxes, whereas shooting or trapping is more appropriate for pig control);
- size of and accessibility within wilderness areas (e.g. boundary control surrounding a small wilderness area may be quite effective, although the closure of roads could restrict some control techniques);
- the level of information and research on the effectiveness of control techniques, particularly in large or remote areas;
- risks to other animals;
- risks to visitors; and
- impacts on other introduced animals (e.g. successful fox baiting may lead to an increase in rabbit populations in an area, therefore management approaches need to be integrated).

The shooting or trapping of introduced species may be authorised, subject to Director General approval, on lands and waters managed by the Department. Hunters must have:

- a licence to carry firearms on lands managed by the Department under the CALM Act and *Firearms Act 1973*, and
- written authorisation allowing the licensee to hunt introduced animals on lands managed by the Department.

Within the planning area, written authorisation is given to hunt a variety of introduced animals that are declared under the *Agriculture and Related Resources Protection Act 1976*, such as the feral pig, red fox and rabbit. However, this is often conditional on a number of other restrictions that consider the protection of the environment and the safety of visitors. Trapping of introduced animals also occurs, particularly of pigs.

In the planning area, the Department works closely with some agency and community-based groups on the control of some introduced animals, such as feral pigs, and these working relationships will continue to be developed.

Red Foxes and Feral Cats

The red fox is a major threat to small to medium sized mammals and ground-nesting birds (Environment Australia 1999c, Burbidge and McKenzie 1989). The feral cat is also thought to have been responsible for the extinction of small to medium sized ground dwelling mammals and ground-nesting birds in some parts of the State, such as some islands and in arid areas (Burbidge and McKenzie 1989). Even though anecdotal evidence suggests otherwise (D. Algar *pers. comm.*), strong documented evidence that the feral cat has a significant effect on native wildlife in the south-west is scarce (Environment Australia 1999b, Dickman 1996).

The Department commenced the *Western Shield* program in 1996 in order to control predators such as the red fox and feral cat. The program involves aerial and ground baiting of lands managed by the Department using 1080[14] poison baits to (a) enable selected native wildlife populations to recover, and (b) allow the reintroduction of native animals to former habitats once foxes and cats have been controlled.

Aerial baiting under the *Western Shield* program occurs in the planning area four times a year and allows the Department to cost-effectively bait large areas (see above and Section 20 *Native Animals*). The Department maintains a bait-free buffer against private property and around recreation sites within the planning area. Additional hand baiting is used to supplement the aerial program to protect specific habitats, known populations of rare animals or new release sites. This control method will continue as a means for fox control in wilderness areas, as well as in surrounding areas. The current 1080 bait is not particularly

[14] 1080 is a naturally occurring toxin (sodium fluoroacetate) found in native Western Australian *Gastrolobium* plants known as 'poison peas' and many native animals have developed a natural resistance to this poison.

effective against the feral cat, and research is continuing to develop a more attractive bait and approach to trapping.

Feral Pigs

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

Feral pigs have become a problem in many parts of the planning area, and move frequently into/from neighbouring properties. They have the potential to be very destructive to vegetation, particularly in wetter areas, 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 and encourage weed invasion. In the planning area, feral pigs may affect species and communities of conservation significance, such as the quokka, sunset frog and Walpole burrowing crayfish and Mt Lindesay and *Reedia* swamp ecological communities (Freegard 2005, Appendix 5). Pigs also have the potential to spread *P. cinnamomi* (Environment Australia 2003). Water quality may also be significantly affected by the activities of feral pigs as they can increase the turbidity of the water and cause siltation effects downstream. In addition, they may also pose a risk to water quality in public drinking water catchments by excreting water-borne pathogens into water supplies (Freegard 2005). Furthermore, damage to sensitive wetland and riparian habitats can be more significant when these areas are affected by other impacts such as recent fire.

Populations of pigs have spread across the majority of the northern and central blocks within the planning area, including within or close to the two proposed wilderness areas. Genetic research has shown that pigs have also been introduced into various parts of the planning area by recreational hunters (Hampton 2003). Illegal pig hunting compounds the impacts of pigs and can compromise key values. For example, the introduction of hunting dogs and the use of firearms threatens visitor opportunities to recreate in safety. Illegal pig hunters may also spread weeds, as well as *P. cinnamomi* where they access disease risk areas. They may also compromise trapping programs by disturbing trap sites and scattering animals being targeted by strategically-placed traps.

The Department conducts annual trapping, baiting and shooting programs as part of its ongoing management of feral pigs. Management guidance is provided by the draft *Feral Pig Management Strategy* (Freegard 2005), which outlines the approach and priority setting for control of feral pigs according to the protection of specific values. Ongoing feral pig control efforts across the WW should be continued in consultation/cooperation with other land managers and local community groups, such as the Denbarker Pig Eradication Group and the Sporting Shooters Association of Australia (Albany Branch) (Higgs 2002). Trained domestic dogs aid in the control of feral pigs by locating and flushing feral pigs from thick vegetation, and will be permitted to be used in the planning area to facilitate the control of feral pigs, with appropriate controls such as permits and training. Patrolling and education are strategies that may also be of benefit in the control effort.

Trout

Brown trout were first introduced into WA near Albany in 1876, and rainbow trout in 1936 to streams in the Warren catchment (Department of Fisheries 2002) to provide recreational fishing (see Section 30 *Visitor Activities and Use – Marroning and Fishing*). While there is evidence that some of these populations are self-sustaining, trout stocks are largely maintained by restocking as there is an absence of suitable natural spawning sites (Arthington and McKenzie 1997, Morgan *et al*. 2004). Trout were released into the Denmark and Frankland

Rivers prior to 1970 and, although none has occurred since, they may still be present in these rivers (Department of Fisheries 2002).

Trout are voracious predators that are thought to be responsible for severely impacting the populations of native fish, amphibians, aquatic snails, aquatic insects and crustaceans such as marron, koonacs *Cherax plebejus* and gilgies (Department of Fisheries 2002).

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 developing future stocking strategies for the recreational trout fishery. The Department is represented on this committee. As part of this process, the Department of Fisheries is finalising a management plan for the translocation of trout into and within WA (Department of Fisheries 2004). 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, in consultation with the Conservation Commission, will 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 the Department of Fisheries and other key stakeholders.

Feral Honeybees

Honeybees were introduced to WA in 1846 from England to pollinate plants grown by early settlers for food. Self-sustaining, wild populations of feral honeybees (*Apis mellifera*) are now established throughout most of the south-west. Managed apiary sites for the production of honey also occurs (see Section 42 *Beekeeping*).

Feral honeybees may impact on the natural values of the planning area in the following ways (Scheltema 1981, Matthews 1984, Paton 1993, Gross and Mackay 1998, Pyke 1999, NSW National Parks and Wildlife Service 2002):

- by competing for tree hollows. Many birds and tree-dwelling mammals use tree hollows for breeding sites and shelter, which is already a limited resource. Once occupied, feral honeybees can remain in tree hollows for 20 to 50 years. Recent observations by the WA Museum show that both Baudin's Cockatoo and the Forest Red-tailed Black Cockatoo are losing nesting hollows to feral honeybees;
- by competing with native species for floral resources, such as pollen and nectar. Feral and managed hive honeybees can remove 80% or more of the floral resources (Paton 1996, 2000);
- by affecting pollination and seed set of native species, due in part to inefficient transfer of pollen (Schwarz and Hogendoorn 1999) or the physical damage to flowers; and
- by increasing seed-set in some weeds.

Visitors to popular recreation sites may also encounter feral honeybees. Honeybees seek water during hot weather and alternative food sources when nectar and pollen become scarce. On very few occasions, a build up in numbers can increase the risk of people being stung.

Although feral honeybees have existed in the south-west for the last 150 years and consequently most impacts would have already occurred, the removal of feral colonies would still have nature conservation and recreation benefits. However, the feasibility of completely removing feral honeybees is low, as localised eradication would probably be followed by re-colonisation 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*).

Other Problem Animals

The rabbit was introduced to WA as early as 1827, and is widespread throughout the planning area occurring most commonly in coastal areas and in small populations along boundaries with private property. However, the rabbit does not appear to reach significant numbers in forest areas. Their grazing pressure and destabilisation of the soil can have significant localised impacts, especially where this is exacerbated by events such as wildfire. 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, as such, action by the Department has not been necessary. However, controlled baiting or fencing options may be employed where conservation values are threatened.

WA is the only state in Australia without significant populations of deer established in the wild. Deer can damage native plants and may also play a role in the transmission of exotic livestock diseases (Department of Agriculture 2001). Deer are known to occur within the planning area and were probably established as a result of introductions and escapes from private property into the parks (R. Simmonds *pers. comm.*). There have been few sightings in the parks to date and they are not expected to be a problem.

There are frequent horse sightings and signs of horses in the Lake Muir, Rocky Gully and upper Shannon areas. Horses, and to a lesser extent deer, can cause some problems in wet areas by trampling and barking trees, and also spreading weeds and *P. cinnamomi*. However, horses may have bloodlines that are considered historically important according to the Outback Heritage Horse Association of WA (OHHAWA). The Department has a Memorandum of Understanding with OHHAWA to work cooperatively to ensure the humane removal of horses with identified heritage value, the assessment of which is the sole responsibility of OHHAWA.

It is the subject of debate whether the dingo is introduced or native, especially as fossil records date back thousands of years. However, the dingo is considered native fauna, protected on conservation estate under the *Wildlife Conservation Act 1950*. Dingoes have been known to occur in the planning area in the past, however it is unlikely that they persist in the area as a pure strain. Dingoes readily hybridise with feral dogs and there have been sightings of hybrid feral dogs/dingoes by rangers in the past few years. Dingoes/wild dogs are susceptible to 1080 poison, and sightings of feral dogs have dramatically reduced since the introduction of baiting to control foxes in the planning area.

The laughing kookaburra, native to south-eastern Australia, was introduced into WA in 1897 in an effort to control snakes, rodents and insects in agricultural areas of the State (Long 1988). In order to stop the introduced bird from being shot, it was declared to be 'native' under the *Wildlife Conservation Act 1950* and so remains protected under the Act. Populations of the kookaburra are now firmly established across the south-west in forested areas from Jurien Bay to Albany (Environment Centre of WA 2002). The kookaburra eats native species and competes for food with other carnivorous native birds (e.g. butcherbirds). Although the impacts of the kookaburra are not well studied, Long (1981) considers the kookaburra to cause little damage to other birds and probably only a negligible contribution to any decrease in small bird populations. In order to control populations of these birds, damage licences must be issued by the Department.

Redfin perch were originally introduced to Australia from Europe in the 1860s and into WA at Albany in the 1890s, as a recreational fishing species. They spread rapidly and are now present in most rivers in the south-west, continuing to be targeted as a recreational species (Penn *et al.* 2005). Redfin perch can rapidly invade and dominate a river or dam to the detriment of local species. This is due to their fast growth rate, high fecundity and feeding habits. Redfin are predators and will voraciously consume other smaller animals including marron, gilgies, frogs, and insects. Their diet also includes many of the fish species native to the south-west (Penn *et al.* 2005). While control has been attempted at Waroona Dam, there are currently no realistic control options for redfin perch in the planning area.

Mosquito fish were introduced to WA from Central America in 1934 to control mosquitoes and for their ornamental value. However, it was soon realised that mosquito fish only eat mosquito larvae when all other food sources are depleted. Mosquito fish prey on a wide range of food sources, in particular fish larvae as well as 'grazing' invertebrates (such as *Daphnia*) that control the growth of algae and may indirectly result in toxic algae blooms that affect the populations of native fish (Morgan *et al*. 1998). Mosquito fish directly affect native fish species by fin-nipping and other antagonistic behaviours, resulting in fin damage, loss of fitness and reduced reproductive success. Mosquito fish have also been shown to prey on young tadpoles leading to a reduction in the number of some frog species in areas where the mosquito fish populations are high. Mosquito fish are widespread in the waterways and wetlands of the planning area (Department of Fisheries 2004). Control programs have been implemented elsewhere in the State in small, contained waterbodies using anaesthetic, however, this method would be impractical for the planning area.

Yabbies were introduced into WA from central and eastern Australia in 1932, and can now be found in rivers and irrigation dams throughout the south-west. Yabbies are a threat to marron because they are a prolific breeder, compete with or prey upon other fauna in the community, may alter riverine habitats through their burrowing activities, and may carry diseases such as the freshwater crayfish infection *Thelohania* that affect other freshwater crayfish (see Section 24 *Diseases*). Consequently, a zoning system administered by the Department of Fisheries, has been established to minimise the further spread of *Thelohania*. The planning area lies within the range of wild marron populations and hence yabbies are not permitted to be moved into this area, although it is believed that yabbies have been introduced into some waterholes (usually fire water points) in the planning area.

The introduction from Europe of the carnivorous snail *Oxychilus sp*. and other molluscs to the area is thought to have been a key factor in the extinction of two species of native snails (*Helicaryon castanea* and *Occirhenea georgiana*) that may well have occurred in the planning area. Introduced molluscs remain a threat to native species.

23. Introduced and Other Problem Animals

Key Points

- There are a number of introduced animals in the planning area that can out-compete, prey on, or alter the habitat for native animals. The most significant of these introduced animals within the planning area are foxes and pigs.
- Other introduced species present within the planning area include rabbits, deer, horses, feral dogs/dingoes, trout, redfin perch, mosquito fish, honeybees, introduced molluscs and yabbies.
- There are a range of methods that can be used to control introduced and other problem animals including trapping, shooting and baiting. Hunting can be a valuable means of controlling some introduced and other problem animals, but must be authorised in terms of carrying a firearm and access to lands managed by the Department to undertake this activity.

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

This will be achieved by:

1. managing introduced and other problem animals according to Department policies and operational guidelines (such as the Department's Training Manual for *Safe and Effective Use of 1080 for Vertebrate Pest Control*);
2. maintaining information on introduced and other problem animals including a register of animals, details of distribution, relevant biological information and history of control;
3. developing an introduced and other problem animal control plan that addresses:

- prioritizing animals by species and location;
- impacts on key values including threatened species;
- controlling animals by appropriate methods including trapping, shooting and baiting; and
- eradicating new introduced and other problem animals before they become established.

4. controlling introduced and other problem animals in accordance with the control plan, including permiting the use of dogs to facilitate hunting of feral pigs, with appropriate controls such as permits and training;
5. continuing to undertake appropriate fox control as part of the *Western Shield* program to protect native fauna, particularly specially protected species, from introduced predators;
6. eradicating colonies of feral honeybees from around recreation sites and across the planning area;
7. liaising with relevant agencies and neighbouring land managers to facilitate effective, coordinated management of introduced and other problem animals in the planning area and surrounding areas;
8. establishing guidelines, in consultation with the Conservation Commission, to assist in the 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 issues to the Department of Fisheries and other key stakeholders;
9. supporting research and undertaking monitoring of introduced and other problem animals, and adapting management accordingly;
10. working with the OHHAWA under the Memorandum of Understanding to ensure the humane removal of horses with identified heritage value; and
11. providing appropriate information and interpretation on the adverse impacts of introduced and other problem animals and their impacts on key values to promote awareness, appreciation and understanding.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
23.1 Number or number of populations of feral pigs in the planning area	23.1 No increase in the number or number of populations of feral pigs in the planning area	After 5 years

24. DISEASES

Plant Diseases

Phytophthora dieback

A significant threat to biodiversity within the planning area is the epidemic of plant disease known as 'dieback' caused by a microscopic pathogen, the water mould: *Phytophthora cinnamomi*. It is thought that this pathogen was introduced during European settlement of WA by hosting on plants brought over for cultivation and in the soil around their roots. Once infected, susceptible plants are killed and in many cases susceptible species are eliminated from the site leading to dramatic and permanent changes to native plant communities and their dependent fauna. At worst, mass collapse of ecosystems occurs along with significant interference to important ecological processes.

Dispersal

P. cinnamomi is able to move autonomously by producing small motile[15] spores that are either distributed over long distances through surface and sub-surface water movement or grows and

[15] Motile means exhibiting or capable of movement.

moves from root to root through the soil to infect new roots. The pathogen can be spread in soil and plant material by humans, vehicles and animals. In response to unfavourable conditions, such as extended periods of hot dry weather, the pathogen can produce a spore which is resistant to desiccation that can itself produce further spores or mycelium when conditions are wet and warm.

Through these dispersal methods, *P. cinnamomi* is continuing to spread through the south-west. The pattern of *P. cinnamomi* distribution is strongly related to vegetation and other site factors such as the presence of watercourses and other water gaining sites, tracks and roads, with infestation being most common where human activities have taken place in the absence of a hygiene regime[16].

Effects

The affect of *P. cinnamomi* upon the health of plant communities, and upon the species in them, varies greatly. In many places, lethal root-disease destroys the structure of many native communities, reduces their floristic diversity, decimates their primary productivity and destroys habitat for much dependant native fauna (Table 7). In some places, the pathogen causes little damage at all. Unfortunately in the south-west it is more common to find susceptible communities in vulnerable environments than not. Shearer *et al.* (2003) commented that about 52% of plant species, on average, in many parts of the south-west are susceptible to the disease, and that species that are highly susceptible are often common and structurally dominant where they occur. Hence, the irreversible effects of the decline of these species are often dramatic and associated with a much reduced diversity of flora and diminished ecosystem condition and function.

It is evident that among the variety of plant communities occurring within the high rainfall areas of the south-west (>800 millimetres mean annual rainfall), there are several types of distinctive response to the pathogen, each presenting a different problem requiring a separate management response:

- *no obvious symptoms of disease* – this includes those areas of karri and wandoo forest which contain no floristic elements of the dry sclerophyll (jarrah) forest type and to plant communities on the calcareous soils of the Spearwood and Quindalup Dune Systems and of the Swan Coastal Plain and pedogenically related landscapes;
- *an extremely destructive epidemic of root rot* – this applies within the highly susceptible understorey elements of the jarrah forest, in banksia woodland and in heathland on podsols, podsolic and lateritic landform;
- *a variable epidemic* – this applies to the dominant jarrah tree component of the forest with all variants in the response of jarrah are coincident with, or preceded by, mass deaths in susceptible elements of the understorey.
- *An endemic pathogen* – this applies where *P. cinnamomi* has been long established in sites formerly dominated by jarrah/banksia forest and it persists at low inoculum levels as a component of the modified community where it takes on the role of helping to maintain it in the new depauperate state.

Fire can reduce ground cover and remove organic matter from the soil, which can alter soil microbial and nutritional status, affect soil radiation and therefore soil temperature, and can locally affect soil water relations due to a decrease in evapotranspiration for a short period after fire (see Section 25 *Fire*). These conditions are present for a short period and can favour the development of *P. cinnamomi*, if it is on site. This may contribute to heightened impact on susceptible vegetation occurring on that site. However, greater soil moisture and higher inoculum levels in the soil would also increase the likelihood of surface & subsurface movement of the pathogen.

[16] Hygiene regime is a planned strategy of minimising human vectoring of the pathogen, usually by deploying the tactics of restricting access to uninfested areas and cleaning equipment and vehicles prior to entering them.

The planning area is within a zone vulnerable to the establishment and persistence of *P. cinnamomi*. It was first recorded in the planning area in the 1960s (J. Young *pers. comm.*). Limited surveys and mapping in parts of the planning area indicate that *P. cinnamomi* is likely to be present across a significant amount of the planning area, particularly within coastal heaths, swampy flats and lowlands, shrublands and woodlands, and possibly old roads.

P. cinnamomi can also have a major impact on faunal habitats (Table 7). Species such as the honey possum are dependent on plant communities such as the banksia woodlands, which are highly susceptible to diseases caused by *P. cinnamomi*. Such dependent species will be reduced in number or disappear as the autonomous spread of *P. cinnamomi* continues to modify critical habitats. Impacts may be accelerated if the vectoring of the pathogen by humans into uninfested areas in the planning area is not minimised. Table 7 shows some effects that a pathogen can have on fauna.

Table 7. Possible effects on fauna due to the presence of a plant pathogen in a vegetation community

Effects on Vegetation	Effects on Fauna
Loss of susceptible plants in the understorey and midstorey	Direct loss of food sources such as seeds, nectar, pollen
	Indirect loss of food sources such as invertebrates
Decline in plant species richness and diversity	Loss of food for species that prefer floristically rich vegetation
	Loss of seasonal food
Decrease in plant cover, increase in bare ground, erosion	Loss of habitat for species dependant on thick ground cover
	Increased predation risk
	Changes to microclimate
Decrease in canopy cover	Loss of food for arboreal species
	Loss of habitat for arboreal species
Decrease in litter fall	Decline in litter invertebrates
	Decline in invertebrate food sources for insectivores
Post infection increase in frequency of resistant species	Change of food resources

Source: based on Wilson et al. (1994).

Management

Effective management of introduced plant diseases requires accurate identification of the pathogens and their hosts, as well as the nature and extent of genetic variation, which affects the capacity of the pathogen to establish and cause permanent damage (virulence), its environmental tolerance and the capacity of the host to resist infection (Podger *et al*. 1996) and the likelihood that it will become epidemic.

Management for *P. cinnamomi* is described in the Department Policy No. 3 – *Management of Phytophthora and Disease caused by it* and the accompanying *Best practice guidelines for the management of Phytophthora cinnamomi*, and the Department's Manual: *Phytophthora cinnamomi and disease caused by it* (CALM 2003b). Dieback disease caused by *P. cinnamomi* is listed as a key threatening process under the EPBC Act and a threat abatement plan has been prepared (Environment Australia 2001c).

The Department aims to:

1. progressively identify significant uninfested (protectable[17]) areas and protect them by minimising human access to them and managing hygiene on entry to them;

[17] Protectable areas, including areas of high conservation and/or socio-economic value, are those areas within the vulnerable zone that:

2. manage already infested areas in a manner which sustains an appropriate level of environmental and social benefits;
3. protect threatened flora, threatened ecological communities and threatened fauna habitat using the protective chemical phosphite;
4. implement programs of interagency research and liaison;
5. encourage community interest and participation; and
6. manage the residual natural values of infested areas by considering restoration of serious environmental damage in infested areas, including recovery or re-introduction of populations of threatened flora and, where necessary, ex-situ conservation of genetic resources.

A '*Phytophthora* Dieback Management Plan' will be developed for the planning area that undertakes risk assessment and response planning to (i) develop priorities based on the natural and cultural values of 'protectable areas', and (ii) reduce both the rate of vectored spread and the incidence of initiation of new centres of infestation. At the landscape scale:

- probable disease spread across the planning area will be mapped using aerial photographic interpretation;
- large 'protectable areas' (albeit they may have infested pockets within them) will be identified for priority protection; and
- more intensive work will be planned and implemented for these large 'protectable areas' on a priority basis including the analysis of values, more detailed mapping of infested/uninfested areas, and the planning and implementation of risk mitigation and, where appropriate, recovery actions.

At the finer, more site-specific scale, a broad range of tactics may be deployed across the planning area including:

- planning and implementing hygiene regimes for all works or activities within uninfested areas;
- more detailed mapping of infested/uninfested areas;
- minimising and/or prohibiting access into uninfested areas under certain conditions, such as clean on entry and entry at times when soil movement is unlikely (see Section 29 *Visitor Access*);
- applying phosphite (see below); and
- reducing vectoring by feral animals (such as pigs) by taking action to reduce populations.

The Department has joined with 'South Coast NRM' on "Project Dieback" to map probable disease spread across the planning area primarily for the area east of the Frankland River. Although further work is required to identify strategically important protectable areas for priority protection, some examples of areas that have high conservation value and may rate highly for protection include the proposed and potential wilderness areas, Quarram Nature Reserve, Kordabup and the Kent River nature reserves, and the southern portions of Denmark and Powley blocks. While most areas within the planning area are likely to have small isolated occurrences of the disease, particularly in those areas lower in the profile, the planning area also has large areas of vegetation and old growth forest that are relatively undisturbed by Europeans, with many blocks containing few internal roads. The planning area may include some of the most significant disease-free areas in the region (J. Young *pers. comm.*). The maintenance of the predominantly disease-free status of these areas is very

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- are situated in zones receiving >600mm per annum rainfall or are water gaining sites (e.g. granite outcrops, impeded drainage or engineering works which aggregate rainfall) in the 400-600mm per annum rainfall zone;
- do not have a calcareous soil (e.g. not a Quindalup dune system);
- have been determined to be free of the pathogen *P. cinnamomi* by a qualified Disease Interpreter (all susceptible indicator plant species are healthy, no plant disease symptoms normally attributed to *P. cinnamomi* are evident);
- are positioned in the landscape and are of sufficient size (e.g. >4 ha with axis >100m) such that a qualified Interpreter judges that the pathogen will not autonomously engulf them in the short term (a period of a few decades);
- consist of areas where human vectors are controllable.

important for the long-term survival of some species and the maintenance of biodiversity, particularly in the face of other landscape-scale threatening processes.

Actions taken during emergency situations (wildfire suppression or visitor search and rescue), have the potential to spread *P. cinnamomi* into uninfested parts of the planning area. Risk mitigation is still possible by liaising with and education of those most likely to require emergency access into the planning area and ensuring that action is taken to minimise moist soil (in summer most likely in swamps and creek crossings) being picked up and transported long distances.

The chemical 'phosphite' has been shown to reduce mortality caused by *P. cinnamomi* in many susceptible native plants in the wild, provided there are repeated applications to maintain the concentration of the chemical in the plants. As susceptible threatened species, threatened ecological communities and the habitats of threatened native fauna in the planning area are identified, a program of repeated applications of phosphite may be developed to help maintain them. In addition, germplasm[18] from threatened native plants may be collected for cryogenic storage[19] and, where appropriate, use in recovery and translocation programs.

Recommendations stemming from the 1996 WA Dieback Review Panel report (Podger *et al*. 1996), the EPA review (EPA 2001), the Expert Working Group report (Conservation Commission 2003a) and the Conservation Commission review (Conservation Commission 2003b) are being implemented by the Department. Through these bodies, a framework (or Protocol) has been developed for identifying 'protectable areas' and their priority for management, and this focuses on:

- determining a site's vulnerability to *P. cinnamomi*;
- identifying 'protectable areas'; and
- determining the priority for management action.

Disease Risk Areas

In the 1970s, the then Forests Department established a taskforce to review research findings and operational practices to restrict the expansion of areas diseased by *P. cinnamomi*. A time lag was found between infection by the pathogen and expression of disease symptoms. Limiting access into healthy forest was seen as an effective way of preventing the spread of *P. cinnamomi*. Following these findings, quarantine areas were established to allow the detection of the disease. These were established under section 82 of the CALM Act as 'Disease Risk Areas' (DRA) and were planned to be maintained with restricted access until areas of disease outbreaks within them could be mapped. Some 750 000 ha of State forest were subsequently proclaimed as DRA by the Governor.

Thousands of signs were erected and gates installed at the entrances to DRA across the south-west in an effort to limit access into DRA. Numerous Regulations were proclaimed including that requiring a person taking a potential carrier (of a forest disease) into a DRA to have and take with them a written authorisation to do so. A permit system was implemented that specified the conditions under which DRA could be entered, approved routes, and wash-down facilities were developed to ensure the cleanliness of vehicles. Boundary roads were regularly patrolled on the ground and supported by surveillance from aircraft to detect and deter unauthorised entry into the DRAs. Staff were trained in hygiene practices and a hygiene manual was produced.

[18] Germplasm is the genetic material, with its specific molecular and chemical makeup, that comprises the physical foundation of hereditary qualities.
[19] Cryogenic storage is storage at very low temperatures.

In the planning area, Deep, Johnson, Wattle, Burnside, Boyndaminup, Sharpe, O'Donnell, Mitchell, Collis, Soho, Crossing, Roe, Peak, Rocky and Long blocks lie within proclaimed DRAs that were established in 1977 (Figure 5). Vehicle access to these areas is through locked and signposted gates.

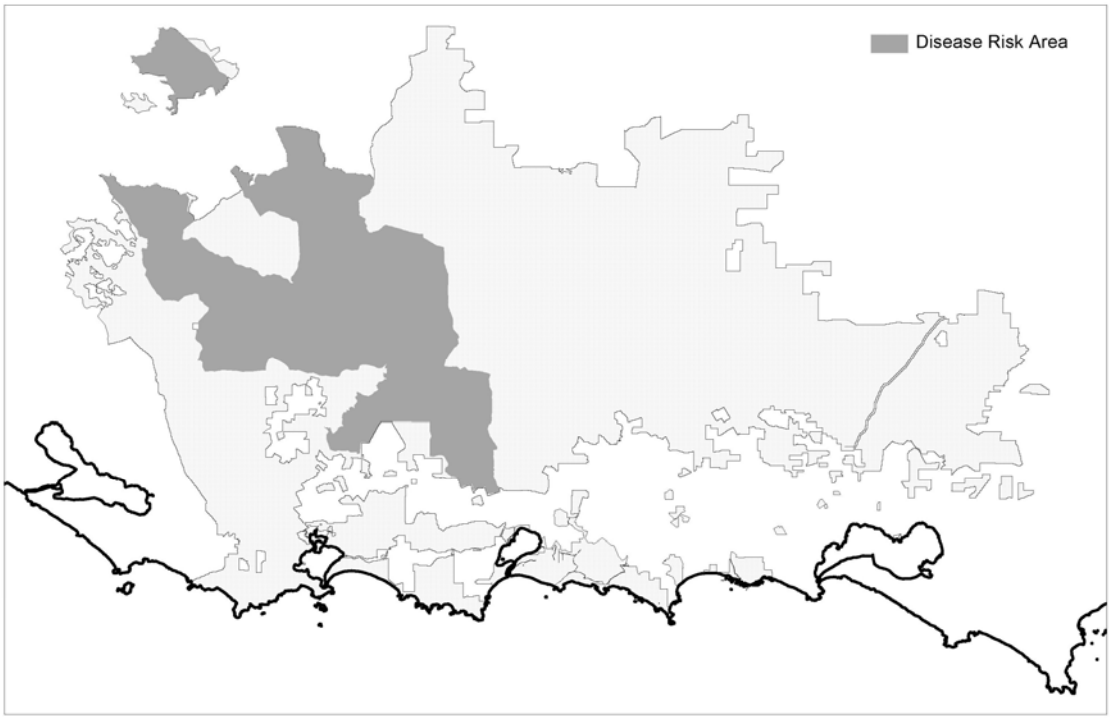

Figure 5. Disease Risk Areas within the planning area

Since their establishment in the south-west forests, many areas within DRA have been mapped for the presence of *P. cinnamomi* in association with timber harvesting, mining, utility and recreation site development, fire management operations and hygiene tactics utilised (clean on entry; minimum soil movement; use of uninfested materials when building or maintaining roads in uninfested areas). These areas will remain as DRA unless extended, reduced or abolished by order of the Governor. There have been no further proclamations of new DRAs since 1977 and only minor reductions in existing DRA due to changes in vesting.

Disease management has evolved to the extent that the imprecise approach of identifying and enforcing DRAs has been largely superseded by a more wide spread Departmental response program that includes mapping and monitoring of disease fronts; phosphite treatments of threatened flora, ecological communities and the habitat of threatened native fauna; collection and storage of rare flora germ-plasm, and translocation of species. While the restriction of access within DRA areas, reinforced by specific Regulations including the power to enforce compliance and set penalties where a person is convicted of an unlawful act, is a useful strategy, there is a need to ensure a consistent dieback management system across the entire planning area, which may include a review of DRA boundaries. The relevance of DRA, including the possibility of replacing them with 'limited access areas' as prescribed under section 62(1) of the CALM Act, will also be reviewed.

The restriction of access within or around wilderness areas is considered advantageous in helping to prevent *P. cinnamomi* from entering into or spreading more widely within wilderness areas. Under the Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas*, mechanised transport into wilderness areas will not be permitted, except for emergency or essential management operations. DRA also currently lies over the proposed wilderness area within Peak, Roe, part Crossing, part Rocky, and part Long blocks (see Section 12 *Identification and dedication of Wilderness Areas*) (Figure 5). The risk of spreading disease caused by *P. cinnamomi* and management tactics are evaluated before entry into DRA is authorised. Further mapping and survey work is required before the range

of control strategies can be more broadly deployed. Access into wilderness areas for the purposes of conducting surveys or the application of phosphite will, where practicable, be on foot only. The use of aircraft for disease management purposes will be minimised. Specific risk mitigation plans should be developed for wilderness areas classified by the Minister for the Environment.

Other Plant Diseases

The south-western ecosystems are being impacted by a high number of plant diseases (Shearer 1994, Wills and Keighery 1994). However, knowledge about the biology of the pathogens and their epidemiology is still very rudimentary with much more work required on disease occurrence, the disease organism itself and both short and long term impacts on natural values, the host and its susceptibility, and environmental processes that may facilitate spread and degree of impact.

Hopper (1994) suggests that there are four factors that in particular may have contributed to the susceptibility of the south-west flora to disease epidemics:

- a flat landscape with predominantly acidic, highly leached and nutrient deficient soils with slow drainage;
- a rich vascular flora that has been geographically isolated for a long time, with many adaptations for nutrient deficient soils, many involving symbiotic partnerships with microorganisms such as fungi – consequently, a diverse range of vulnerable hosts for diseases;
- a climatic regime where drought is common, which may stress flora thereby increasing the susceptibility to disease; and
- the rapid and ongoing human development of the landscape following European settlement including direct destruction or alteration of habitat by fragmentation, altered landscape processes, and introduction of numerous weeds and pests, which also may have increased the susceptibility of flora to disease.

There are eight species of *Phytophthora* in Western Australia and, while *P. cinnamomi*, is the most damaging often causing major permanent change in ecosystems it infects, the other species (e.g. *P. megasperma*, *P. citricola*, *P. drechsleri* and *P. cryptogea*) generally cause only very localised and minor damage in native vegetation, which often recovers fully.

Rusts are the second most frequent pathogens encountered on native plant taxa in south-western Australia (Shearer 1994), and the gall rust *Uromycladium tepperianum* commonly affects *Acacia* species producing galls.

The endemic soil-borne fungus armillaria root rot *Armillaria luteobubalina* is widespread in forests, woodlands and the coastal heath of the south-west, including the planning area. This fungus infects a wide range of plant species (at least 50 families and more than 200 species), although there is very little information on the presence of resistant or tolerant species. The highest impact of the disease is in regrowth karri, marri and jarrah forests as a result of the harvesting and thinning operations which provide stumps that armillaria root rot can readily colonise and then infect regrowth saplings and residual trees. Many species that resist infection by *P. cinnamomi* are susceptible to armillaria root rot.

Despite a prolific production of spores, the main mode of spread is by root to root contact between healthy and infected plants. The fungus is unlikely to spread through the soil by its own devices, although it is thought to be able to survive in soil for up to 50 years. Symptoms of the disease include dieback of plant limbs and branches, yellowing of foliage, splits in the trunk, poor vigour, the leaking of sap from the trunk, scars on the trunk and darkening of larger roots. The timber of infected trees often has a pitted appearance. The fungus fruits at the base of infected plants in autumn, and are olive brown to yellow in colour, up to 12 cm in diameter and usually less than 15 cm high. The stalk has an obvious ring of tissue around it.

Factors that stress trees, such as drought, flooding and the compaction of soil, weaken their defence systems and increase the chances of the disease developing. No simple method exists for controlling localised epidemics of disease caused by *Armillaria*. Prevention is the best treatment. Hygiene is essential for ensuring the disease is not spread from infested sites to uninfested sites. There are no effective chemicals to control the disease in trees (Pearce *et al*. 1986, Shearer and Tippett 1988, Shearer *et al*. 1997a, 1997b, 1998).

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

These mostly endemic pathogens can have significant localised impact and in some cases even kill plant hosts. However, in healthy and robust ecosystems they do not appear to be a serious threat to the long-term maintenance of biodiversity. Unless evidence exists that human intervention has triggered an epidemic that is impacting (or will impact) to a predetermined unacceptable level on the values of the planning area or the Precautionary Principle otherwise dictates, the management response will be to monitor the occurrence and impacts. Introduced pathogens that impact (or are likely to impact) on the values of the planning area will be eradicated where feasible or controlled.

Animal Diseases

Diseases in native animals can be a major contributing factor to poor population health, reduced fertility and local extinctions. Under the *Animal Welfare Act 2002*, proposals by the Department involving the care and use of animals for scientific purposes must be referred to the Animal Ethics Committee for approval. The Department's Administrative Instruction No. 67 *Animal Welfare Act and Animal Ethics Committee* provides guidelines and standard operating procedures for establishing appropriate hygiene and quarantine protocols and reducing the risk of disease transmission in field practice. Different levels of protocols may be required according to the level of concern for a particular species. Staff and carers handling wildlife can also be at risk of being exposed to animal diseases.

Birds

Psittacine circoviral (beak and feather) disease is endemic in wild Australian parrot species and is known to affect more than 20 species. The disease causes a moult in birds and new feathers either do not grow back or are misshapen or not properly formed. Most affected birds die because of secondary infection as a result of this baldness (Brown 1997). The disease is a key threatening process affecting endangered psittacine species under the Commonwealth's EPBC Act (Environment Australia 2004). While this disease naturally occurs in wild populations, it has little adverse impact on most species and has not been confirmed in the threatened Muir's corella or Carnaby's black-cockatoo.

Amphibians

The chytrid frog fungus *Batrachytrium dendrobatidis* lives as a parasite in the skin of frogs and other amphibians. It has been known internationally since 1996 and was confirmed to occur in WA in 1998 (testing of historical material has shown the earliest occurrence of the fungus in the Albany region in around 1985). The fungus can cause sporadic death in some populations or 100% death in others (Environment Australia 2002). Studies have shown that there is a broad geographic zone of infestation from just north of Geraldton, south to Augusta and east to Esperance, however this does not imply that all frog populations are infected within this zone (Aplin and Kirkpatrick 2001). Four species of frogs have been shown to be infected more frequently than most other species. Two of these species are found within the planning area; the slender tree frog and the western banjo frog. Populations of these frogs should be monitored to detect any significant decline in numbers. The infection of amphibians with this fungus is a key threatening process under the EPBC Act (Environment Australia 2002, CSIRO 2003). This fungus may also pose a threat to populations of threatened and endemic amphibians including the sunset frog and the Nornalup frog, although little is known about this disease at present.

Invertebrates

The freshwater crayfish parasite *Thelohania* is present in some yabbies. *Thelohania* is a microscopic parasite that invades the muscle tissue, and may eventually cause the death, of freshwater crayfish (Department of Fisheries 2001). Currently there are no treatments available. It is spread when healthy individuals feed on an infected one. This disease may pose a threat to the smooth marron if yabbies are introduced or spread into the area from the headwaters of the Frankland and Kent rivers that run through the planning area.

24. Diseases

Key Points

- *P. cinnamomi* is the most significant plant pathogen within the planning area: it kills susceptible plants, irreversibly changing the composition of many plant and animal communities in the area. Jarrah forest and woodlands, flats and swamps in the planning area are vulnerable to infection by *P. cinnamomi* and are continuing to change as a result of the invasion by it.
- *P. cinnamomi* is spread by water and soil movement, and persists and grows in plant roots.
- *P. cinnamomi* can be managed using a variety of strategies, including restricting access, implementing hygiene practices and phosphite treatments of areas of high conservation value.
- Disease Risk Areas (DRA) currently exist in the western part of the planning area, although this system requires review and extension.
- Other plant pathogens that have limited impact also occur, including armillaria root rot.
- Some fauna may be at risk of infection with the chytrid frog fungus, psittacine circoviral (bird beak and feather) disease, and *Thelohania* freshwater crayfish disease.

The objective is to identify the extent of *P. cinnamomi* within the planning area, protect both threatened species and communities and protectable areas, and minimise the further spread and impact of *P. cinnamomi* and other diseases within the planning area.

This will be achieved by:

1. developing a '*Phytophthora* Dieback Management Plan' for the planning area that undertakes risk assessment and response planning to (i) develop priorities based on the natural and cultural values of 'protectable areas', and (ii) reduce both the rate of vectored spread and the incidence of initiation of new centres of infestation;
2. at the landscape scale:
   - mapping *P. cinnamomi* occurrence across the planning area;
   - identifying large protectable areas within the planning area for priority protection;
   - progressively planning and implementing on a priority basis more intensive work for these large protectable areas including the analysis of values, more detailed mapping of uninfested areas, and the implementation of risk mitigation and, where appropriate, recovery actions;
3. managing diseases according to Department policies and operational guidelines;
4. minimising human vectoring of *P. cinnamomi* in uninfested areas by planning and implementing hygiene regimes and requiring Director-level approval for all works and activities, such as recreation facilities, roads, firebreaks and tracks or any operation that requires soil or plant material movement;
5. identifying, evaluating and, where practical and reasonable, implementing effective and efficient measures for the maintenance and restoration of infested areas with serious environmental damage. This includes treating threatened plant populations, threatened ecological communities and habitats of threatened native animals with phosphite, and trialling the reconstruction of ecosystems by rehabilitating badly affected areas using local dieback resistant species appropriate to the soil and climate characteristics of the area;

6. implementing as necessary seasonal road closures to minimise the risk of vectoring the pathogen;
7. evaluating the need for and levels of scientifically-based *P. cinnamomi* monitoring and audit the implementation of methods for *P. cinnamomi* control;
8. encouraging research on diseases, such as the effects that *P. cinnamomi* and other pathogens are having on the plant and animal associations and the natural values within the planning area, taxonomy, biogeography and ecology of the disease agents, hosts and associates, undertaking monitoring of diseases, and adapting management accordingly;
9. continuing to implement the training and accreditation program to ensure that all who enter protectable areas, are fully aware of what is required of them for *P. cinnamomi* management compliance;
10. reviewing current Disease Risk Areas, including the need to reduce, increase or maintain the numbers and size of these areas, particularly in relation to the identification of uninfested and protectable areas above, and re-classification of remaining Disease Risk Areas to a more appropriate land classification under section 62(1) of the CALM Act, such as a 'limited access area';
11. providing appropriate information and interpretation on diseases, particularly *Phytophthora* dieback, and their adverse impacts on key values to promote awareness, appreciation and understanding, particularly about the need to be clean on entry to uninfested areas and to stay on approved roads and tracks, and other ways to minimise the impacts of disease;
12. monitoring infestations of other plant diseases, such as armillaria root rot;
13. restricting the movement of armillaria root rot via affected material by establishing quarantine areas depending on the scale of infestation and threat to natural values; and
14. documenting any outbreaks of new diseases (plant or animal) within the planning area and implementing management responses as appropriate.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
24.1 The identification and establishment of protectable areas that are a priority for protection	24.1 Protectable areas that are a priority for protection have been identified and established	After 5 years
24.2 Development of further dieback KPIs	24.2 Further dieback KPIs have been developed	After 2 years
24.3 Knowledge of plant species and ecological communities at risk from *P. cinnamomi* in the planning area	24.3 Identification of plant species and ecological communities threatened by *P. cinnamomi* and at high risk from short term vectoring	After 5 years, or as per recovery plans if applicable
The Key Performance Indicator KPI 20.2 also applies to this section		

25. FIRE

Fire is on the one hand an ancient ecosystem process essential for the conservation of biodiversity and on the other, a phenomenon capable of threatening natural values, human life and community assets (Burrows and Wardell-Johnson 2003, 2004). As a result, the management of fire is integral to the Department's activities and core management responsibilities. The challenge for managers is to devise practical and affordable fire regimes[20] that conserve biodiversity at agreed spatial and temporal scales, and minimise the adverse impact of wildfires on social, economic and natural values.

[20] A 'fire regime' is a description of fire in terms of (i) fire frequency (how often it occurs on a site), (ii) fire intensity (how much heat energy is released), (iii) season (what time of year it occurs), (iv) scale (how big it is), and (v) spatial diversity (how patchy it is at both a landscape and local scale).

The Department's management of fire, including the use of fire, fire suppression and wildfire prevention, is regulated by legislation (e.g. *Bush Fires Act 1954*, CALM Act and precedents established under common law). It is also guided by the Department's Policy No. 19 – *Fire Management Policy*, which includes a number of scientific principles (Burrows and Friend 1998, Fire Ecology Working Group 1999, Burrows and Abbott 2003).

Given the large scale and great diversity of the planning area, it is not appropriate to provide extensive detail about the fire management of each patch of land in this document. However, it is appropriate to describe the values of the planning area that may be affected by fire and the fire management outcomes that are desirable over the life of the plan. Experience of managing fire within the planning area will also be used to guide future management.

This management plan provides the strategic framework that the Department will use to accommodate the requirements of ecological fire regimes and strategic protection from wildfire for the planning area. It recognises the special situation of the planning area, such as the sizeable area, the presence of highly valued biodiversity and natural areas, high-value community assets and high visitation. Over the life of this plan, increasing scientific knowledge about the vital attributes and life histories of key fire response flora and fauna species will enable the Department to develop appropriate ecological fire regimes that ensure the protection of natural values as well as life and community assets.

Fire History

Pre-European Settlement

Fire, climate and vegetation have a long association on the Australian continent (Churchill 1968, Singh *et al*. 1981, Kershaw *et al*. 2002, Hassell and Dodson 2003). Evidence of frequent fires in the south-west of WA dates back to 2.5 million years ago, indicating that fire has been a major evolutionary influence since at least that time (Dodson and Lu 2000, Dodson and Ramrath 2001, Hassell and Dodson 2003), and possibly as early as the mid Miocene, about 15 million years ago. The former date coincides with a major climatic change from subtropical to Mediterranean, which is thought to have led to an associated increase in fire, as evidenced by charcoal in sedimentary deposits. Rainforest species characteristic of the subtropical climate of the Tertiary period (about 65-1.5 million years ago) were replaced by scleromorphic species with lignotubers, and large persistent woody fruits that were pre-adapted to nutrient deficient soils (Main 1996). These adaptations were ideally suited to the drought and fire conditions that were to become more prevalent. The dependency of many plant species on the products of combustion, especially smoke and heat, to cue germination and stimulate reproduction is further evidence of the long evolutionary significance of fire in this environment (Dixon *et al.* 1995, Burrows and Wardell-Johnson 2003).

Before the arrival of Aboriginal people, most fires were started by lightning and may have burnt for days or weeks before being extinguished by rain or running into areas previously burnt and devoid of fuel. The arrival of Aboriginal people, probably within the last 60 000 years, led to dramatic changes in fire patterns and the fire environment (Hallam 1975, 2002, Kershaw 1986, Pyne 1991, Hassell and Dodson 2003, Burrows and Wardell-Johnson 2003). Intervals between fire appear to be much shorter in areas regularly occupied by Aboriginal people in contrast to some areas of the south-west that were historically unoccupied (e.g. offshore islands) (Hassell and Dodson 2003). These regimes presumably evolved with the economic and ecological needs of the people (Hassell and Dodson 2003), varying from group to group and for different localities and occasions. While debate continues as to the extent of Aboriginal burning there is little doubt that Aboriginal people utilised fire to their advantage, opening up dense vegetation for ease of access, encouraging new plant growth to improve hunting and foraging opportunities, protection of camping spots and areas of high resource value, and for ceremonial purposes (Hallam 2002). Other evidence of the use of fire by Aboriginal people comes from the journals and diaries of early explorers during the period 1696-1890, which reveal that in some coastal and forested areas of the south-west, Aboriginal people lit fires, principally in summer, which could burn up to hundreds of hectares at three to

five-year intervals (Abbott 2003, Bunbury 1930). This would have varied depending on moisture levels of habitats (e.g. steep south-facing slopes, rock expanses or riparian vegetation in higher rainfall areas may have only burnt in those years experiencing severe drought) and prevailing weather. Fire history research utilising balga stem analysis techniques has indicated that parts of the south-west of WA were exposed to fire over a short rotation prior to European settlement (Ward *et al.* 2001, Lamont *et al*. 2003). Further research (Burrows and Wardell-Johnson 2003, Wells *et al.* 2004, Enright *et al*. 2005, Miller *et al.* 2007) has questioned the validity of the balga technique (and its widespread application) and highlighted the need for validation using alternative methods such as remote sensing and examination of fire occurrence records. Debate on differing conclusions is not uncommon in an area of active scientific research. Further research, including rigorous testing of the method across a variety of sites, is required before firm conclusions can be drawn about the validity of the technique and the inferred fire history associated with the results of stem analysis.

Post-European Settlement

Colonists and later graziers spread south assessing the country in terms of the suitability for stock. Parts of the planning area have a long history of grazing and frequent burning by graziers. Graziers would '…take their cattle to the coast during the summer months bringing them back around April-May, then continue to run them in the bush.' (D. Drage *pers. comm.*). The Muir family, who settled in the district in 1856, drove cattle to the coast along what is now Deeside Coast Road (Crawford and Crawford 2003) and between Forest Hill and Parry's Inlet and Quarram. Open flats were burnt every three years keeping them open and providing feed for both stock and wildlife, and allowing the flats to dry out after heavy rains (D. Drage *pers. comm.*). Areas of higher ground were burnt in patches every six to seven years. Cattlemen mimicked what they believed to have been the traditional burning methods of Aboriginal people. These practices continued until about the 1940s (D. Drage *pers. comm.*).

Although the passing of the *Forests Act 1919* brought improved management and protection of forests, fires continued to burn over considerable distances before they were controlled, or eventually extinguished by rains (Underwood and Christensen 1981). There were very extensive wildfires in February 1937 from Lake Muir to Walpole and Denmark (Bellanger 1980). In 1954, wildfires burnt all summer between the Kent and Denmark rivers (White 1987). Evidence of these historic wildfires can still be seen in the planning area today in the widespread distribution of dead tree tops.

Limited prescribed burning under controlled conditions aimed at reducing forest fuels began in 1954 (Anon. 1969, Crawford and Crawford 2003, Underwood and Christensen 1981), and was adopted more widely after the severe wildfires that burnt throughout much of the south-west in 1961 (Armstrong 2004). The regular use of low intensity prescribed fire to reduce fuel loads, and consequently reduce wildfire severity (size and intensity), has continued to the current time. Broad scale prescribed burning became more widespread with the use of aircraft for aerial ignition in 1965 (van Didden 1983) and the first large-scale aerial burn occurred later that year on the Pingerup Plains near Walpole. Within a few years the aerial burning program was operational in WA, with more than 180 000 ha of forest prescribed burnt in the spring of 1967. The implementation of the Denbarker inter-agency fire protection scheme in the late 1970s was principally established to coordinate fire control on the large area of unallocated Crown land (UCL) that is now within Mount Roe National Park.

Since the 1960s, low intensity aerial and ground burning at five to 10-year intervals has been applied to ensure a variable mosaic of fuel ages across the landscape. The interval and frequency of planned and unplanned fire has been quite patchy across the planning area, where some areas for example have been burnt three to four times in order to protect community assets whilst others, often in moist or 'low-fuel' areas, remain long unburnt. Post-burn patchiness is also achieved within individual burns. This program of prescribed burning has been effective in reducing the occurrence of large, damaging wildfires, which are likely to continue to periodically occur (Table 8) where lightning strikes coincide with severe fire weather conditions and large areas with fuel accumulation (McCaw *et al*. 1992, McCaw and

Hanstrum 2003). These can have severe impacts on some components of the biota and fire sensitive values, as was the case with the lightning fire in the Nuyts area within Walpole-Nornalup National Park in 2001 (Middleton 2001).

The high number of deliberately lit illegal fires (Table 8) is of particular concern. Education has a key role in countering arson and the Department will cooperate with agencies responsible for public education and law enforcement, such as FESA and the WA Police.

Table 8. Summary of wildfire causes in the planning area 1989/90 to 2004/05

	Causes[1]				
	Lightning	Human			Unknown[4]
		Accidental[2]	Deliberate	Escape from Department Prescribed Burns[3]	
Number	45	46	46	12	8
Area (ha)	42 279	23 176	26 908	22 118	31 412

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

The arrival of Aboriginal people and European colonists, combined with considerable alterations of the landscape over the past 100 years, have brought about significant changes in fire regimes to the point that historical regimes may no longer meet modern day fire management objectives. Such regimes, including prescribed burning since the 1960s, may have already contributed to changes in biodiversity. In response to these concerns, the Department revised its Policy No. 19 – *Fire Management Policy* to protect and promote the conservation of biodiversity and natural values whilst also providing for protection of human life and community assets. While knowledge of traditional Aboriginal use of fire can be important in understanding the fire regimes under which ecosystems persisted for thousands of years, scientific evidence is required to develop and implement ecologically appropriate fire regimes (see *Fire Research* below). Although this knowledge is incomplete, it has advanced over several decades as a result of ongoing research and the Department now introduces fire to achieve conservation objectives.

Fire Ecology

Fire ecology is the study of the interaction of fire, the biota (plant and animal species), and the habitats in which they live. Knowledge of the impacts of this interaction is integral to protecting biodiversity. Fire is a natural environmental factor that can have both destructive and beneficial effects. Numerous studies report on the changing species assemblages, species diversity, vegetation composition and structure, and habitat characteristics in response to time since last fire, fire season, fire interval, or fire intensity, and on the ways in which fire can influence ecosystem processes such as nutrient cycling (Gill *et al.* 1981, Trabaud 1987, Johnson 1992, Whelan 1995, Bond and van Wilgen 1996, Trabaud and Prodon 2002, Bradstock *et al.* 2002, Abbott and Burrows 2003). However, not enough is known about local fire ecology, and fire management will continue to evolve with accumulated knowledge and management experience (Burrows 2004).

Adaptation of the Biota to Fire

While not adapted to fire *per se*, biota have evolved critical physical and longevity characteristics (or vital attributes) that determine their ability to survive different fire intervals (Burrows and Wardell-Johnson 2003). Three main groups of vital attributes are recognized, relating to the method of persistence of species during a disturbance and to their subsequent arrival, to their ability to establish and grow to maturity following the disturbance, and to the

time taken for them to reach critical stages in their life history (Noble and Slatyer 1980). These attributes contribute to the 'life history strategies' that biota have employed to adapt to fire. Attributes such as the time it takes to flower after germination, the time to senescence and death, how a plant regenerates (from seed or re-sprouting, or both), where the seed is stored (in the canopy or in the soil, or both), how this seed is triggered to germinate etc provide valuable clues to understanding what might be the most appropriate fire regime for that species in terms of fire frequency, intensity, season and scale. Determining vital attributes of species will enable fire regimes to be determined for their conservation.

For many species, reproduction and regeneration are stimulated by fire (Burrows and Wardell-Johnson 2003). 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 (Figure 6, see *Vital Attributes of Fauna*) and, while many species are resilient to a range of fire regimes, some species have more specific fire regime requirements (Table 9). Examples of species in the planning area that have specific fire regime requirements include some serotinous flora species such as the Albany banksia (parent plant killed by fire, regenerates only from canopy-stored seed), fauna species such as the quokka (requires specialised habitats), and communities such as peat swamps (prone to burning when they dry out) and *Reedia* swamps (prone to modification by fire).

Table 9. Typical vital attributes of species that are sensitive to frequent fire (key fire response or fire sensitive species)

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

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

Some species are sensitive to fire, but may survive low intensity fire. It is precautionary to assume that these species are fire sensitive because the consequences of inappropriate fire may be unacceptable. For example, Albany banksia is vulnerable to fire because it regenerates only from canopy-stored seed and, while it may not always be killed by fire, the risk to the species can be reduced if it is assumed and treated as if the species is fire sensitive.

Typically, fire sensitive species are generally confined to more mesic or less flammable parts of the landscape such as riparian zones and some wetlands, granite outcrops and tingle forests where fire is less frequent (see Section 19 *Native Plants and Vegetation*, and Section 20 *Native Animals*). 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 to fire (Burrows *et al.* in press). Extreme regimes, such as frequent lethal or infrequent intense fires, are more likely to be most damaging to natural values (Burrows and Friend 1998, Burrows and Wardell-Johnson 2003), and will be avoided through wildfire suppression and prevention, implementation of burn programs and exclusion of fire from some Conditional Burn Areas (see *Fire Management* and Appendix 7).

Vital Attributes of Flora

The flora of the planning area possesses 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; and
- seed stored in the soil and in woody fruits.

Using knowledge of the vital attributes of plants to help define fire regimes, especially minimum and maximum intervals between fires, is appropriate because plants are primary producers in natural ecosystems and almost all other life forms depend on them. The rate at which plant species produce adequate viable seed for regeneration after fire is an important consideration in determining the minimum inter-fire period for a particular plant species or ecosystem. 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, broad valley floors and rock outcrops, 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). This has implications for fire management. On the basis of current knowledge, doubling the juvenile period (which is defined as the time it takes for at least 50% of the population to reach flowering age) of the slowest maturing fire sensitive species at a particular site will allow for the replenishment of seed banks and provides a conservative guide to the interval between fires that are sufficiently intense to be lethal to adults of that species (Figure 7). Populations will survive more frequent fires provided the intensity of these fires is insufficient to kill the entire cohort of parent plants.

The fire response patterns such as post-fire regeneration syndromes, 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% 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% of species classified as 'fire sensitive', being obligate seed species with longer juvenile periods (> three years), mostly occurred in lower rainfall zones where fuel accumulation rates are slower, or in habitats within the landscape that were less prone to fire because they remained moist for a longer period, or because surface fuels were inherently sparse and discontinuous. Knowledge of the distribution and habitat preferences of these fire sensitive species will be used to develop and implement fire regimes based on the vital attributes of these species (see *Managing Fire based on Vital Attributes of Key Fire Response Species* below).

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.

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 will also depend on the presence of predators where displaced species have to travel across open ground to find suitable habitat (Friend 1999).

For mammals at least, the post-fire response of populations is reasonably predictable and consistent (Figure 6), and could be considered in terms of their life history characteristics based on shelter, food and breeding requirements, and the scale, intensity, season, interval and patchiness of the fire (Burrows *et al*. 1999, Friend 1999). Responses are largely dependent on vegetation structure and floristic composition, which simplifies the prediction of fire impacts (Friend 1999, Friend and Wayne 2003, Burbidge 2003, Bamford and Roberts 2003). Friend

(1999) also noted that the post-fire response patterns of reptiles were less predictable, and that the response of amphibians was extremely variable.

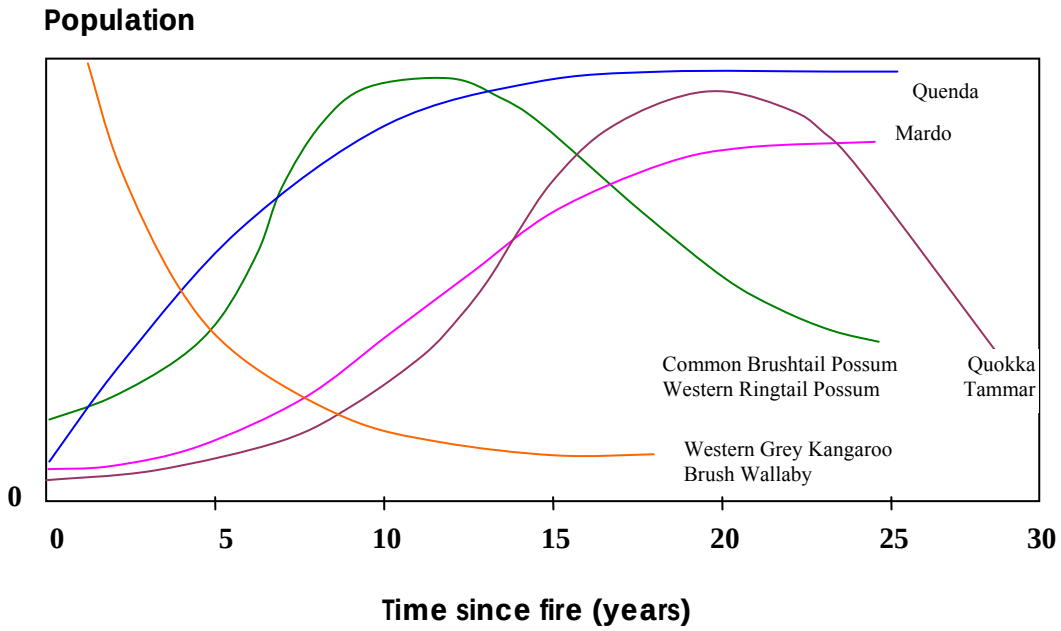

Figure 6. Idealised relationship between the abundance of various forest mammal species and time since fire
Source: N. Burrows *pers. comm.*.

Four mammal species in the planning area that have been identified as having particular fire requirements are the quokka, honey possum, mardo and western ringtail possum (see Section 20 *Native Animals*). Christensen (1997) noted that late successional species such as the quokka, honey possum and mardo, can take up to 10 years to fully recover from fire, although they 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.*). The intensity of fire is a key factor in the management of the nguara, where one of the main habitats of peppermint is susceptible to canopy scorch. These species however, survive well where low intensity, patchy burns are employed, as their moist habitats tend to burn less frequently and result in a patchwork mosaic of vegetation structure. Also, low intensity fire does not physically harm the animals in the same way that a high intensity fire does (Inions *et al* 1989, Wayne 2005).

The effects of fire on bird fauna are difficult to predict as each species responds differently to fire (Burbidge 2003). Generally though, bird communities are relatively resilient to single fire events of a small scale and low to moderate intensity. In the planning area, too frequent and/or intense large fires in coastal areas may have caused the localised extinction of several bird species (Yates *et al*. 2003). However, fire may only be one of many factors, such as feral animals, that has led to the disappearance of these species.

The fire effects on amphibians and reptiles are often complex and less predictable (Friend 1999, Bamford and Roberts 2003). The effect on reptile species may be related to that species' association with structural characteristics of the environment (Bamford and Roberts 2003). Fire may promote breeding activity in the sunset frog (Bamford and Roberts 2003), although further research and monitoring is required (Burbidge and Roberts 2002).

Invertebrate fauna of dry sclerophyll forest appears to be resilient to more regular and frequent fires (van Heurck and Abbott 2003). Invertebrate diversity however, is greatest where there is a wide range of post-fire successional stages in the vegetation (van Heurck and Abbott 2003). Wetlands and wet sclerophyll forest, such as karri and tingle, are often important habitats for relictual taxa (van Heurck and Abbott 2003) as moist conditions restrict the period when the

vegetation is susceptible to more intense wildfires to two to three months of each year. Due to the rudimentary knowledge of invertebrate taxonomy and ecology, a precautionary and adaptive approach to fire management by the maintenance of a diversity of post-fire successional stages is warranted.

Riparian Zones and Wetlands

Considerable riparian and wetland environments exist within the planning area (see Section 17 *Hydrology and Catchment Protection*). Mesic sites (e.g. wetlands and riparian zones) play an important role as refugia for components of the biota that are relatively fire sensitive (Burrows and Wardell-Johnson 2003). The *Reedia* ecological community in the planning area is particularly vulnerable to modification from severe or frequent fire regimes. Results so far suggest that adult vegetative reproduction is the main regenerative mechanism for the species post fire. Reproduction via seedlings appears to be spatially patchy and dependent on the amount of peat remaining post fire. These fire regimes, coupled with the impacts of climate change, may have detrimental impacts on riparian zones and wetlands. Over the past 30 years, winter rainfall in the south-west, particularly early winter from May to July, has declined by 15 to 20% (Indian Ocean Climate Initiative 2002). This has had the effect of a sharp fall in stream flow in the south-west, and drying out of some wetlands, peat swamps and riparian zones, predisposing them to fire for a longer period. As a result, these areas may burn earlier in spring, and remain drier for longer in autumn months. This has important implications for the protection of some inland wetlands and riparian ecosystems and especially for the conservation of peat swamps, which may take many thousands of years to recover if completely burned (N. Burrows *pers. comm.*). Organically-rich peat swamps can be altered permanently or at least disrupted by the application of inappropriate fire regimes (Horwitz *et al.* 2003). For example, frequent hot fires or regimes that remove organic matter can burn the soil and alter the soil by exposing anaerobic soils to air (Horwitz *et al.* 2003). This may increase the risk of acidification (see Section 16 *Geology, Landforms and Soils*). Riparian ecosystems, especially organically-rich peat swamps, should be considered when determining prescribed burning prescriptions.

The extent or patchiness of fire in riparian zones of the planning area is important for fauna that persist in relatively small, linear habitats along these drainage lines. Large-scale fires that burn entire habitats could be detrimental to some species that utilise these corridors, particularly along major river systems such as the Deep, Frankland, Kent and Denmark 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 both destroy and create tree hollows (Inions *et al.* 1989). 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).

Granite Outcrops

There is an exceptionally high concentration of granite outcrops in the planning area, equal to, or exceeding that found on the Darling Range south of Perth. Although comprising a relatively small proportion of the total landscape, these biotic islands are very important for biodiversity conservation due to the combined effects of biological isolation, soils, moisture regime and fire regime. Unique assemblages of flora and fauna, including many fire sensitive taxa, are often associated with granite outcrops.

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 (Burrows 2005). Large granite outcrops (monadnocks), such as Mt Frankland, Granite Peak, Mt Roe and Mt Lindesay, may therefore act as refuges for rare or 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%) 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 more frequent intervals between fires are more probable due to the higher biomass in the forested regions (N. Burrows *pers. comm.*). However, the effectiveness of soil controls, such as are presented by granite outcrops, are strengthened by low intensity fire in a low fuel load matrix and weakened by intense fire in a high fuel load matrix (Jurskis *et al*. 2003, Burrows 2005). Lightning strikes are known to have started fires in vegetation on some granite outcrops in the planning area, such as at Mt Frankland in January 2002. To enable rock outcrops to function as fire refuges, and to decrease the probability of these fire refuges being damaged by large, intense wildfires that sweep onto and over them from the surrounding flammable forest, it is important that fuel build-up in the surrounding forests is managed. Prescribed fire will be introduced under mild conditions such that the rock outcrops do not entirely burn in any one fire event.

The Mt Lindesay-Little Lindesay Granite threatened ecological community is vulnerable to modification from frequent fire regimes and does not recover well from fire in dieback-infected areas. Further work is required to research the recovery of the community from fire and develop fire management guidelines for this community.

Tingle Forests

Tingle forest communities near Walpole have restricted distributions, presumed to be as a result of a combination of climatic and geological factors (Smith 1996, Wardell-Johnson 1997). Higher moisture levels in the coastal environments around Walpole tend to limit the length of the fire season or reduce the spread of fire compared with surrounding environments. However, some tingle forests are long unburnt because they occur near high value community assets and have been protected from high intensity fire. Threatened flora and fire sensitive taxa are often associated with habitats that are moist, such as tingle forests (Burrows and Wardell-Johnson 2003), and three fire sensitive species are known to be found within communities that contain tingles. Red tingle forest also has a similar ratio of fire sensitive obligate seeders to resprouters as other damp community types occurring in peat swamps and minor valleys and the non-forest vegetation around granite outcrops (Smith 1996, Hopper 2000, Burrows and Wardell-Johnson 2003). Being wetter, the presence of several relictual taxa and the high proportion of obligate seed species within the tingle mosaic suggests that these habitats have experienced less frequent fire. While local endemism does not necessarily correlate with fire sensitivity (Wardell-Johnson 2000), fire sensitive species are usually confined to areas of unusual habitat that are naturally burnt less frequently than the surrounding landscape (Burrows and Wardell-Johnson 2003, Burrows *et al*. in press).

Although none of the tingle species are fire sensitive, responses differ both within and between species (Wardell-Johnson 2000). The structure of some red tingle stands may be altered by too frequent fires under dry conditions due to the loss of structural strength of hollow butts and exacerbated by the rapid litter accumulation around the stems (Wardell-Johnson 2000, Burrows and Wardell-Johnson 2003). Restricting prescribed burning to periods when moisture content through the litter profile is high (of the order of 50%) and offering protection to the base of accessible hollow butts can reduce the incidence of further stem damage or collapse.

There has been community interest in the fire management of tingle and red flowering gum ecotypes in the planning area, particularly the retention of long unburnt reference areas of these types. However, these ecotypes lie in close proximity to towns and settlements (e.g. Walpole, Nornalup and Peaceful Bay) and a range of other assets (e.g. Tree Top Walk), and fuel loads in these areas also need to be managed to ensure long-term protection to these community assets. The Department will review burning practices within these ecotypes and develop, with the advice of the Conservation Commission, specific guidelines for managing

fire in tingle and red flowering gum forests. The Master Burn Plan process will include assessment of the fire history of tingle and red flowering gum forests to ensure a spread of recently burnt through to long unburnt fuel ages will be maintained across the variety of these species associations at all times.

Coastal Vegetation Communities

Coastal dune and heath vegetation is vulnerable to wind erosion, particularly following intense or frequent fire or where a large proportion of the vegetation is removed through fire. While dune systems are generally well adapted to fire and rehabilitate quickly, careful application of fire and protection from wildfire is required to ensure erosion does not occur.

The 'Showgrounds' within Quarram Nature Reserve is one of the last remaining native coastal grassland communities in the south-west and, as such, is a Priority Ecological Community (see Appendix 5, Section 21 *Ecological Communities*). This small area of remaining native grassland, once much more wide spread than its current occurrence, has declined in extent due to shrub encroachment (T. Middleton *pers. comm.*). More infrequent fire in recent times has allowed shrubs to mature, set seed and store large amounts of seed in the soil, leading to them being able to out compete grasses by virtue of the sheer quantity of their stored seed, in addition to the parent plants re-sprouting from lignotuber stocks following fire. There is a need for burning to address this imbalance, and further research is required to confirm the extent of the decline and determine the fire management requirements of this ecological community.

The Department will consider fire management in these areas with caution, seeking to (i) develop fire management guidelines for these ecological communities, and (ii) apply low intensity fire that doesn't remove all vegetative cover and ensures that the entire landscape is not burnt. Wind-driven buffers in these areas will only be used where surrounding fuels are sufficiently low to offer protection to areas outside planned burns.

Regrowth Forest

Patches of predominantly karri and jarrah young regrowth forest occur in the planning area (see Section 21 *Ecological Communities*). While jarrah has a greater capacity to regenerate and survive fire from a seedling stage (Burrows and Wardell-Johnson 2003), young post-harvest karri regrowth is vulnerable to damage by fire until such time as the tree crowns grow substantially taller than the understorey layer and the bark on the lower stem consistently exceeds 15 mm in thickness (L. McCaw *pers. comm.*). Should fire occur before young karri regrowth has reached this stage then there is a high likelihood that many of the trees will experience severe damage or be killed outright. While the former would influence stand structure, the latter could result in loss of karri altogether, particularly if seed set has not yet occurred. Either outcome could result in a decrease or loss of natural values including habitat, biodiversity and ecosystem health. Within the life of only this management plan, some areas of young post-harvest karri regrowth established from 1995 onwards, mostly within Lochart, Thomson and Wye blocks, may require specific consideration when developing prescribed fire plans. In most cases, this will only require intervention until regenerated stands reach an age of 15 to 25 years. All burn programs (see *Development of Burn Programs* below) will identify young post-harvest karri regrowth areas and their age, within proposed prescribed burns. Individual burn prescription documentation will record if special protection from the prescribed burn is planned and the reasons why. However, through the Master Burn Plan process, priority protection of other significant natural values (such as threatened flora, fauna and communities) will be provided over young karri regrowth unless these other values do not occur adjacent to these areas of regrowth.

Fire Management in the Planning Area

Fire management within the planning area will aim to:

- maintain biodiversity;
- reduce the threat that wildfire presents to life and community assets; and

- increase knowledge through fire research, operational experience and monitoring.

Maintaining fire in the landscape at appropriate temporal and spatial scales is fundamental to successful fire management and achieving these aims.

Scales of Fire Planning

The issue of the most appropriate scales at which to manage fire is a complex one 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 the following spatial scales for fire planning:

Landscape (30 000 to 100 000 ha) Scale

Fire planning is based on the principle that diversity and variability in fire regimes at the landscape scale helps maintain biodiversity (Burrows and Abbott 2003). Management of fire at this scale is based on 'landscape conservation units' (LCUs), which are defined as a mosaic of local ecosystems and landforms repeated in a similar form across a wide area (measured in kilometres). Mattiske and Havel (2004) identified 26 LCUs in the south-west, based on amalgamations of the 315 Mattiske and Havel (1998) 'vegetation complexes'. The planning area contains seven LCUs (Map 10).

Objectives and targets set at the landscape scale will be used to guide prescribed burning at the more detailed and operational Logical Burn Unit (LBU) scale. The fire management objectives for the LCUs are to:

- maintain fire diversity, and hence biodiversity, through space and time;
- maintain a diverse representation of forest structures, seral states and habitats through space and time (see *Managing Fire for Diverse Post-fire (Seral) Stages* below);
- protect ecologically sensitive areas and niches such as riparian zones, aquatic ecosystems, wetlands, peat swamps, valley floors, granite outcrops, steep south-facing aspects, other non-forested complexes from frequent fire or large intense wildfire; and
- protect life and community assets.

It is possible that this scale of fire planning may change over the life of this plan, although planning at a finer landscape scale is currently not feasible.

Logical Burn Unit (500 to 5 000 ha) Scale

Landscape Conservation Units can be subdivided into Logical Burn Units (the boundaries of which will vary through time) that represent feasible burning units (usually bounded by roads and tracks that serve as functional fire boundaries). When determining the prescription for when and how a LBU will be burnt, a fire regime based on vital attributes is devised for the most fire-prone (least sensitive) components of the LBU (Armstrong 2004) (see *Managing Fire based on Vital Attributes of Key Fire Response Species* below). This regime will then be modified to incorporate the requirements of threatened species and communities (see *Managing Fire based on the Vital Attributes and Life Histories of Threatened Species and Communities* below), and significant habitats that require specific fire regimes (e.g. peat swamps, granite outcrops, grasslands and tingle forests, see *Fire Ecology*).

Managing Fire for Biodiversity Conservation

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 natural values, life and other community assets from inappropriate fire regimes. Actively applying prescribed fire in managed ways can achieve many benefits for biodiversity that outweigh the risk of uncertainty and can also contribute to the better understanding of ecosystems over time. This

management plan adopts a precautionary and adaptive approach that seeks to devise, implement and monitor a range of fire regimes based on:

- vital attributes and life histories of threatened species and communities;
- vital attributes of key fire response species;
- creating and maintaining diverse post-fire (seral) stages, or functional habitat types; and
- fuel accumulation rates.

One or a combination of these fire regimes is likely to apply to appropriate parts of the planning area. As there are gaps in current knowledge, protection of threatened species and communities will take priority when devising fire regimes to conserve biodiversity. As information on the vital attributes of species and significant habitats that require specific fire regimes becomes available, this will be incorporated into the prescribed burning program.

Managing Fire based on the Vital Attributes and Life Histories of Threatened Species and Communities

Threatened flora and fauna and threatened ecological communities are protected by State and Commonwealth legislation, which imposes requirements in relation to how fire management activities are conducted. It is appropriate to devise and implement fire regimes specific to particular threatened species or communities based on their known vital attributes to ensure their persistence. For example, Burrows and Liddelow (2004) have developed fire management guidelines for the threatened quokka that describe how fire is applied to LBUs that contain this species (or its riparian habitats that are in the intermediate to late seral post-fire stages) to protect extant species and/or suitable habitat, or to regenerate suitable habitat that begins to senesce some 25 to 35 years after fire. However, where fire ecology interactions of threatened species or communities are not well understood, they will be protected from fire regimes that are known to or are likely to cause a decline, and no discrete/isolated or sole population should be impacted upon by a single fire event. Inappropriate fire regimes may include long periods of fire exclusion, large and intense wildfires, and sustained frequent burning. Where no fire ecology information exists for a threatened species, carefully monitored experimental burning might be considered. Often, prescriptions for threatened species are developed as part of a recovery plan.

Adopting an approach based on threatened species is especially legitimate when the species is also an umbrella species, which means managing for this species is most likely to accommodate the needs of other species in the ecosystem. However, developing fire management based on single species ecology needs to be closely evaluated and monitored for possible adverse impacts on other species and communities.

Managing Fire based on Vital Attributes of Key Fire Response Species

Scientific knowledge of vital attributes of key fire response plant and animal species known or likely to occur within each LBU will be used to derive appropriate fire regimes for the planning area, especially acceptable intervals between fires. Knowledge of the juvenile period, longevity and 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 the 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 fire regimes based on plant attributes, these regimes 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. However, consistent with an adaptive management approach, knowledge will be gained and fire management improved by on-going research (see *Fire Research* below) and by monitoring of operational programs.

In any LBU, there will be a variety of interlocking ecosystem components or habitats with different fire response patterns. For each LBU, a standard ecological fire regime (Figure 7) based on vital attributes of key fire response species is devised for the most fire-prone (least fire sensitive) components and to protect the least fire-prone (most fire sensitive) components.

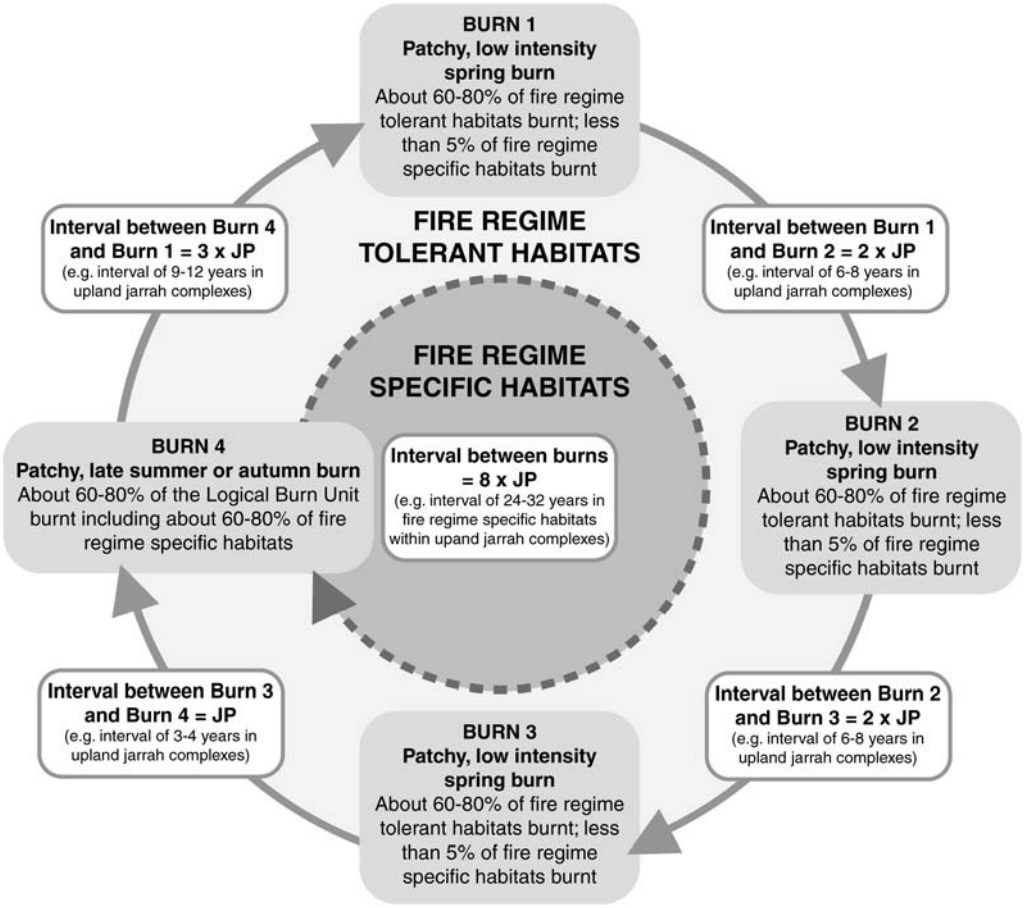

Figure 7. Example of an ecological fire regime for managing ecosystems based on vital attributes

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

This typically requires consideration of two landscape components, although this may vary depending on the fire response of flora and fauna species in the area:

- the drier, more flammable fire regime tolerant habitats, which generally contain flora species that are mostly resprouters and have relatively short juvenile periods and fauna that do not require mature or medium to late successional state vegetation; and
- fire regime specific habitats (e.g. granite outcrops and valley floors) will generally contain flora that are fire sensitive with relatively long juvenile periods and fauna that prefer mature, medium to late successional stages of vegetation.

The Department is preparing specific fire management guidelines for significant habitats occurring across the landscape that require specific fire regimes, such as granite outcrops, peat swamps, grasslands, old growth forest, tingle and red flowering gum forest types. These guidelines will be different from the standard ecological fire regime, and will inform fire planners of strategies and tactics for a prescribed burn to accommodate the needs of fire regime-specific species. Initially they will be generic, but will become more specific and give greater consideration to values/risks (e.g. acid sulphate soils) associated with the planning area as information becomes available.

Managing Fire for Diverse Post-fire (Seral) Stages

Maintaining a diversity of post-fire fuel ages, seral stages or functional habitats through space and time is fundamentally important for ecosystem health and enhances biodiversity. The process of post-fire vegetation change is continuous, and the rate of change will depend on the severity of the fire and local soil and climatic conditions. Figure 8 shows that at least three broad post-fire seral stages can be recognised – early, intermediate and late, based on the rate of change of the understorey vegetation structure[21] and floristics. Each seral stage is characterised by a combination of species richness and vegetation cover, height and amount of litter, although habitat is still provided through each stage. This relationship applies generally across the landscape.

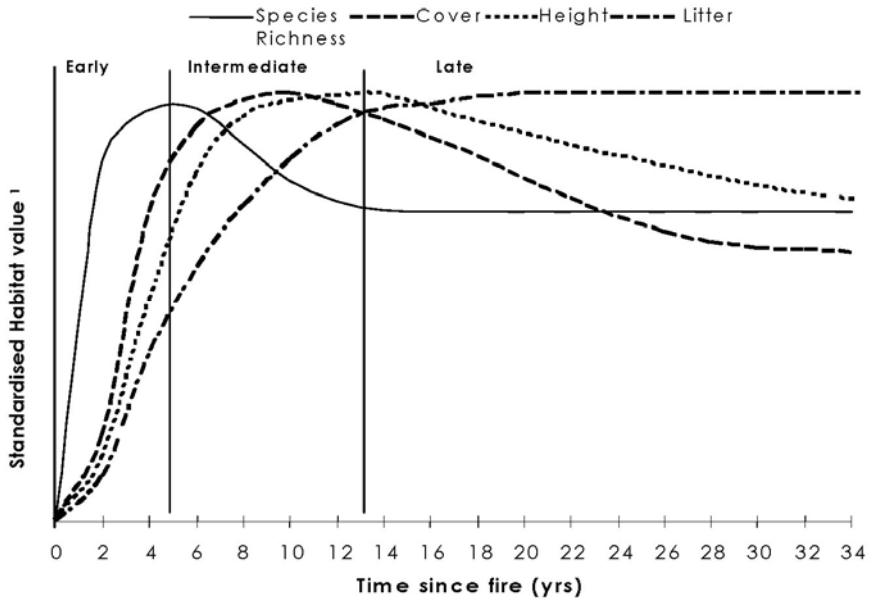

Figure 8. Relationship between changes in vegetation properties and time since fire for an upland jarrah forest

(Burrows 2008).
[1] = Standardised habitat value – the graphs are standardised from a zero value (minimum) to a peak value (maximum) for each characteristic.

The transition from one seral stage to the next is somewhat variable, but is based on the vital attributes of species and can be estimated using the juvenile period[22] of the slowest maturing fire sensitive plant species within the major vegetation type (Burrows 2008). In a low rainfall upland jarrah forest for example (Figure 8), the juvenile period (JP) of the key fire response species is about four years, which is similar to the period recognised as the 'early' seral stage for that ecological unit. The 'intermediate' seral stage for the same ecosystem is from about four years to 12 years post-fire, or from JP to 3JP (where JP = juvenile period = four years), and the 'late' seral stage is from about 12 years to about 30+ years, or from 3JP to about 8JP.

In any one landscape, all of these functional habitat characteristics and seral stages are desired. The question of the relative proportion of each seral stage within the landscape may best be determined by examining recent approaches to ecosystem and fire management (Weir *et al*. 2000, Tolhurst and Friend 2001). These approaches aim to produce disturbance-induced mosaic patterns across the flammable parts of the general landscape, which are thought to resemble those produced by natural disturbance events. These patterns are based on

[21] Forest overstorey species of the south-west are very resilient to fire and so 'stand replacement' fires, or fires that kill the overstorey, are relatively rare and therefore most changes in the seral stage occurs in the understorey vegetation.
[22] In south-west Australian ecosystems, there is a strong relationship between rainfall, site productivity and juvenile period (Hopkins 1985, Burrows *et al*. in press), so juvenile period is a useful indicator of the post-fire rate of change of floristic composition and structure for a given ecological unit.

achieving a spread of recently burnt through to long unburnt fuel ages at all times across a LCU, as indicated in (Figure 9) (Burrows 2008).

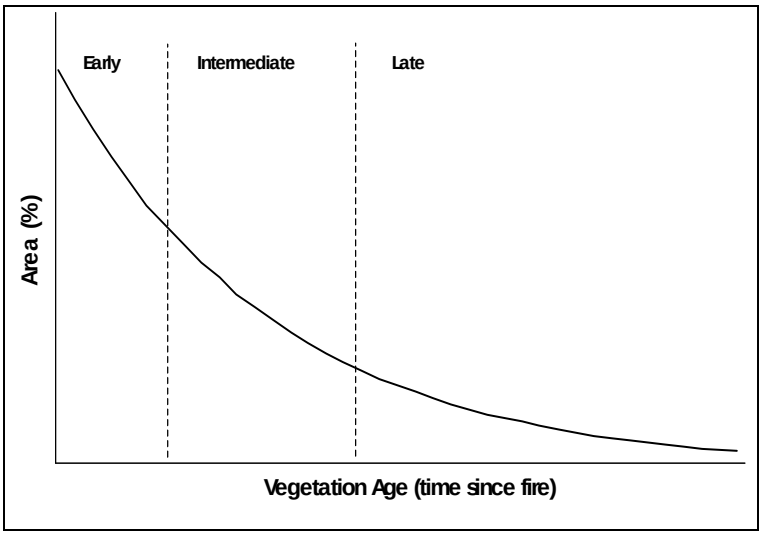

Figure 9. Theoretical distribution of a stable time-since-fire spatial mosaic for general flammable parts of a landscape conservation unit

The proportion of each seral stage in the landscape is influenced by the fire frequency, with older seral stages less abundant than young because they must remain unburnt for much longer periods of time. The transition between seral stages is determined from the relationship in Figure 8. The relationship in Figure 8 and the fuel age distribution in Figure 9, which determines what proportions of the landscape the Department aims to have at the various seral stages, will guide decisions on where, how much and when to apply the various fire regimes.

On a smaller scale, significant habitats within the landscape (such as granite outcrops, grasslands, coastal dune and heath vegetation, wetlands [including peat swamps], riparian zones, tingle and red flowering gum forest types), may have a different fuel age distribution to Figure 9 and, while there is not sufficient information at present to describe what distributions might best represent fuel ages for different specific fire sensitive ecosystems, the development of guidelines for these ecosystems will improve knowledge about these fuel age distributions.

Managing Fire based on Fuel Accumulation Rates

Intense summer wildfires damage, degrade or threaten natural values, including species and communities that are threatened or are fire sensitive (Burrows 2008). Less intense, smaller and less frequent wildfires can produce some longer term benefits to ecosystems, such as reducing flammable fuel levels, promoting habitat regeneration (Catling *et al*. 2001), increasing the quantity of dead wood (logs and dead standing trees) and promoting hollow formation (Inions *et al.* 1989). With adequate resources and knowledge, land managers can achieve these benefits by the controlled use of fire without the risk to natural values and uncertainty associated with uncontrolled wildfire (Abbott and Burrows 2003).

The Department will seek to reduce the threat of wildfire to significant biological values by employing a mosaic of fuel age classes or post-fire seral stages across the landscape, and specific fuel-reduced buffers to reduce fuels around biological values.

Managing Fire in Wilderness Areas

The Department's Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas* aims principally to maintain biodiversity in wilderness areas by protecting it from threatening processes and maintaining ecological processes. Fire in wilderness areas is acceptable to achieve these biodiversity outcomes and strategic protection of conservation values in and outside of wilderness areas. The Department will apply prescribed fire to wilderness areas. A range of fire management strategies (above) and tactics will be considered during the life of the plan for the conservation of biodiversity values within wilderness areas, including consideration of longer inter-fire intervals within wilderness areas and, hence, shorter inter-fire intervals in surrounding areas. The introduction of fire into wilderness areas will be planned and managed within the Master Burn Plan process. The Master Burn Plan process will focus on achieving ongoing fire management that protects the natural values and ecological processes of the area and surrounding areas.

Wilderness areas do not have any internal access, so they must be considered as a much larger single LBU. Where possible, fuels within surrounding blocks will be managed so that the risk of a fire entering a wilderness area or escaping from a wilderness area into surrounding forest is minimised and the values of wilderness areas are protected.

In the event of a wildfire occurring within a wilderness area, the Regional Manager will determine on a case-by-case basis whether to allow a wildfire to burn out to existing roads and tracks or to carry out ground disturbing activities to contain the wildfire. In many cases, the former may be the more acceptable option. However, if the latter is judged to be the best option, then approval for mechanised access for wildfire suppression will be sought from the Department's Director General.

Managing Fire for Community and Asset Protection

Intense summer wildfires can potentially threaten life and damage property and other community assets. Managing fire based on a risk assessment process is important to protect life and community assets within and adjoining the planning area, such as towns and settlements such as Walpole, Nornalup and Peaceful Bay, adjoining farmland and tree plantations, built infrastructure such as the Tree Top Walk and other developments, and the increasing numbers of visitors to natural attractions of the area.

Fuel reduction burning, the practice of purposefully prescribing low intensity fires under defined conditions of fuel, weather and topography to consume a proportion of available fuels, aims to reduce the severity (scale and intensity) of wildfires by reducing their potential intensity, thus reducing damage and increasing opportunities for safe suppression (Underwood *et al*. 1985, Cheney 1994). Fuel reduction by prescribed burning aims to maintain fine surface fuel quantity below about eight to nine tonnes per hectare and 19-20 tonnes per hectare for jarrah and karri forests respectively over about 60 to 80% of the burn area. The time taken for fuels to reach these levels, hence the interval between prescribed fires, depends on the rate of fuel accumulation. This varies from about five to 10 years, depending on site productivity and rainfall (Sneeuwjagt and Peet 1985, Burrows 1994). For example, in most jarrah forests, fine surface litter fuel quantity reaches *quasi*-equilibrium in 15 to 17 years (Figure 8). Fuel reduction by burning rarely prevents wildfires, but where a significant proportion of the landscape is managed this way, wildfire severity and scale, and consequently the impact on life and community assets, can be significantly reduced.

Identifying significant fire vulnerable community values within the planning area and determining the acceptable outcome in the event of a wildfire, will assist in managing the risk of high intensity wildfires. Often prescribed burning can have multiple benefits and, in many cases, applying prescribed burns for biodiversity conservation can also achieve community asset protection. Where community asset protection coincides with high biodiversity conservation needs, variations in the standard ecological fire regime (Figure 7) may occur. In some parts of the planning area, such as around Walpole and Peaceful Bay, fuel reduction to

protect life and community assets will be a primary objective and have higher priority, whereas in other areas the conservation of biodiversity will have higher priority.

Risk is dependent on (i) the likelihood of an ignition event occurring (past fire history), (ii) the capacity to mount an effective suppression response (detection, travel time and access for suppression forces and the quantum of those resources), and (iii) the potential intensity of the wildfire event (fuel, landform, weather). The risk assessment process, called a 'Wildfire Threat Analysis' (Muller 1993), aims to:

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

A wildfire threat analysis for the planning area is used to modify fire management for each LBU, where necessary, to minimise the risks associated with wildfire. In the absence of effective suppression, most of the planning area will be affected by wildfire from lightning and other sources over the life of the plan (see *Fire History*, Table 8, Muller 2001). The suppression capability within the planning area is affected by the relatively long travel times to fires from the base at Walpole (Muller 2001), although during fire season work hours suppression forces are often distributed around the planning area. Large areas of shrublands in the planning area (see Section 14 *Biogeography*, Map 4) may influence the relatively high potential fire intensity and rate of spread shown for many parts of the planning area (Muller 2001, McCaw *et al.* 2003), although any reduction of fuels significantly affects the potential fire behaviour. As a result of these risks, the Department will seek to reduce the threat of wildfire to significant community assets by maintaining a variable mosaic of fuel ages across the planning area, and specific fuel-reduced buffers to reduce fuels around significant community assets.

Fire Access

Strategic roads and tracks that form part of the access network for the planning area will be maintained to ensure safe access for the fire fighting vehicles and to permit effective fire management, except within wilderness areas (see Section 13 *Management of Wilderness Areas*). Some of these roads and tracks are also used for a variety of other access requirements (see Section 29 *Visitor Access*).

Where appropriate, fires may be contained within LBUs defined by existing roads, rather than by constructing new firelines around the perimeter of the fire. Where temporary roads, firebreaks or firelines are constructed during fire suppression activities, these should be rehabilitated after the fire event (see Section 41 *Rehabilitation*) to minimise the threat of soil erosion, weeds or spread of dieback and unauthorised use of the access.

Development of Burn Programs

Biodiversity conservation and protection objectives are achieved across the landscape by applying the Master Burn Plan process (Armstrong 2004). The Master Burn Plan process (i) brings together all available information gathered at both the landscape and LBU levels, (ii) juggles regimes applied to LBUs to ensure the mosaic of interlocking LBUs with different fire histories within each LCU is consistent with the principles of fire management (Burrows and Abbott 2003), and (iii) produces a 'rolling three-year' indicative burn program.

From the 'rolling three-year' indicative burn program, an 'annual' burn program for the forthcoming year is derived. Both programs are reviewed and updated twice each year to account for work completed or postponed due to difficulty in safely achieving burn objectives,

the occurrence of wildfire and improving conservation knowledge. The 'rolling three-year' indicative burn program allows sufficient lead-time for planning and preparing annual burn programs well ahead of the operation, and also provides the public with an opportunity to see what is being planned for implementation and provide their input into program planning.

Once LBUs are identified for burning on these programs, a Prescribed Fire Plan is developed for each burn. Prescribed Fire Plans contain and involve substantial documentation, including the specification of the purpose and objective(s) of the burn, the success criteria for each objective, implementation and post-burn inspection/monitoring requirements (relative to achievement of the burn objectives), checklists, approvals, records of statistics associated with the burn, and post burn assessments.

The management plan addresses fire management at a strategic level and allows for flexibility at the operational scale. The timing, area and location of prescribed burns over the planning area is an important operational objective and considers the often rapid variations in both existing and predicted weather and fuel conditions. Where these variations occur and are adverse to safely achieving burn objectives, postponement of that burn will take priority. This is consistent with the strategic objectives of this management plan.

Community Involvement

Engaging with the public is vital if the role and effects of fire, the application of planned fire and fire suppression operations are to be understood, and community concerns considered. There is interest in the community about the planning process and outcomes associated with prescribed fire management. To aid community awareness and engagement, the 'rolling three-year' indicative burn program and 'annual' burn program are made publicly available through the Department's *NatureBase* website (see Nomenclature) and at local community meetings. While there is much information available about managing fire for biodiversity conservation and community protection, little is known about the Master Burn Plan process due to its complexity, and education of the public about this will be developed over the life of the plan. The Department will continue to ensure that (i) appropriate community involvement programs are developed and supported to provide an effective interface in relation to the prescribed burn programs, and (ii) planning and operational processes for prescribed burning are documented and made readily available to the public (EPA 2004).

Much of the southern, eastern and northern boundaries of the planning area interface with private agricultural lands, tree plantations and settlements. Consultation with neighbours will continue in developing and implementing fire management programs, particularly in the context of dealing with a range of cross-boundary management issues, such as firebreaks, fire access, access to water supplies and cooperative fuel management programs.

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

As well as effective public liaison, education and awareness programs, the enforcement of legislation and compliance management is essential. The Department will co-operate with agencies responsible for public education and law enforcement, such as FESA and the WA Police.

Fire Research

Fire management and the development of ecologically-based fire regimes within the planning area should take into account all available knowledge and adapt to new knowledge gained through research, monitoring and experience, including unforeseen events such as wildfires (see Section 48 *Research and Monitoring*). The Department is improving the knowledge about the science of fire and its interaction with the biota through the establishment of two fire research projects in the planning area.

Fire Mosaic Project

The creation of smaller-scale 'fine-grain' mosaics (see *Fire History* above) by frequently introducing fire into the landscape has not been trialed, evaluated and properly monitored over a large area anywhere, and may enhance biodiversity and provide protection against large fires by creating a fuel pattern that will reduce the scale and intensity of fires. The frequent and targeted introduction of fire into the landscape should, in time, result in a fine-grain shifting mosaic of patches at different post-fire stages ranging from recently and frequently burnt to long unburnt (Burrows and Wardell-Johnson 2004). Regular introduction of fire into a particular landscape does not equate to 'frequent burning' of the landscape or of the ecosystems therein because of the patchy nature of the vegetation and fuels. The regular introduction of fire into a landscape will ensure many elements of the landscape will escape fire or will be protected from fire by adjacent natural low fuel areas or recently burnt patches (Burrows and Wardell-Johnson 2004). Only a relatively small proportion of the landscape will carry fire.

The long-term landscape-scale 'Fire Mosaic Project' (Burrows *et al*. 2004) within London and Surprise blocks has been established in collaboration with the Universities of Queensland and Western Australia (see Map 10 and Section 48 *Research and Monitoring*) and aims to:

- determine whether a fine-grained mosaic of interlocking patches of vegetation at different stages of post-fire development can be created by the frequent introduction of fire into the landscape;
- monitor the impacts of the various treatments on selected threatened and fire sensitive taxa; and
- monitor the impacts of this mosaic and other fire treatments, including fire exclusion, on selected elements of the biota, such as geophytes, the abundance of fire regime specific fauna and condition of associated habitats, and various plant and animal assemblages at both the patch scale and the landscape scale.

Fire Regimes for Biodiversity Project

The Department is a core partner in the Bushfire Cooperative Research Centre (CRC), which is a major research initiative involving research institutions, fire authorities and land management agencies from around Australia. As part of its contribution towards the Bushfire CRC, the Department is undertaking research in parts of the London, Surprise, Rate, Table Hill, Willmott and Quindinillup blocks in the planning area to improve the understanding of fire regimes at a landscape scale by comparing patterns of biota in areas that have experienced different fire regimes over the past five decades. Aligned with FORESTCHECK (see Section 48 *Research and Monitoring*), results will be used to:

- identify patterns of change in species abundance and composition as a result of different fire regimes;
- produce a framework for developing retrospective studies on the impacts of fire regimes on ecosystems with known fire records;
- extend the database on 'fire response syndromes' for taxa in southern forested ecosystems.

Other areas identified for research, or in which fire may be conditionally applied or excluded, are classified as 'Conditional Burning Areas' (Appendix 7). The establishment of Fire Exclusion Reference Areas (FERA) across the landscape are of particular value to scientific study as these long unburnt areas, which are broadly representative of vegetation in each LCU, allow for a comparison to fire regimes under prescribed conditions. It is proposed that each LCU will contain at least one FERA, although this may not necessarily be located within the planning area.

Consistent with principles of adaptive management (see Section 48 *Research and Monitoring*), fire management across the whole planning area will be reviewed and, if necessary, adjusted in response to the results of these projects.

25. Fire

Key Points

- The Department's management of fire is regulated by legislation, and guided by the Department's Policy No. 19 – *Fire Management Policy*, which includes a number of scientific principles.
- There has been a long history of fire occurrence in the planning area, and fire is an important disturbance factor that has influenced, and continues to influence, the biodiversity of all natural ecosystems. Many taxa possess a variety of traits that enable persistence in this generally fire-prone environment.
- Unplanned fire will continue to periodically occur in the planning area, and planning for fire is important in the protection of biodiversity as well as the community.
- Fire sensitive species and ecosystems are most typically associated with moister parts of the landscape (e.g. wetlands and riverine communities) and areas with discontinuous vegetation (e.g. granite outcrops).
- Extreme fire regimes, such as frequent lethal or infrequent intense fire regimes, are more likely to be most damaging to natural values.
- A fire management system for the planning area will aim to maintain a diversity of seral stages across the landscape based on vital attributes of key fire response species. Biodiversity will be maintained by varying interval, season, intensity and placement of fire throughout the landscape, and accounting for wildfires. Patchiness of burning is an important factor in providing environmental heterogeneity at a local level.
- Fire will also be used in a planned way to reduce the potential severity of wildfire events and, in turn, provide safety to fire fighters, neighbours and visitors as well as protection of community assets.
- The Master Burn Plan process will achieve strategic biodiversity conservation and community protection fire management objectives in the planning area through the production of indicative rolling three-year and one-year burn programs, which are modified each year on the basis of what was burnt previously, improving conservation knowledge and community input.
- Fire management of wilderness areas aims to protect and maintain natural values and processes, and fire in wilderness areas is acceptable to achieve these outcomes. The Department will manage fire in wilderness areas through the Master Burn Plan process and in accordance with Department policies by implementing a range of strategies and tactics, including consideration of longer inter-fire intervals within wilderness areas and, hence, shorter inter-fire intervals in surrounding areas.
- Research projects (i.e. 'Fire Mosaic Project' and 'Fire Regimes for Biodiversity Project') in the planning area are improving the knowledge and understanding of fire regimes and the vital attributes of key fire response species.

The objective is to protect and promote the conservation of biodiversity and natural values and to protect human life and community assets.

This will be achieved by:

1. managing fire in the planning area through implementation of the Master Burn Plan process and according to Department policies, principles, guidelines and available knowledge;
2. maintaining a diversity of post-fire (seral) stages across each LCU by approximating the fuel age distribution in Figure 9;
3. improving linkages between prescribed burn objective/s, implementation and post-burn inspection relative to achievement of the burn objective/s;
4. ensuring that a wildfire threat analysis is incorporated into all risk analyses for work proposed in the planning area, and that appropriate risk mitigation work is undertaken during developments;
5. maintaining roads and tracks used for fire management according to Department

standards;

6. liaising with relevant agencies, local Bushfire Brigades and neighbouring land managers to facilitate effective, coordinated management of fire in the planning area and surrounding areas by encouraging cooperative arrangements and ensuring community protection from fire is at an appropriate level;
7. providing appropriate information and interpretation on (1) the Department's fire planning and management, (2) the damaging effects of wildfire on key values of the planning area, (3) fire risk, and (4) the safety and survival of people and property; to promote awareness, appreciation and understanding;
8. providing opportunity for the public to have input into burn programs;
9. undertaking and supporting research (such as the Fire Mosaic Project), and adapting management accordingly;
10. ensuring that at least one Fire Exclusion Reference Area is established in each LCU occurring in the planning area;
11. developing and implementing, with the advice of the Conservation Commission, specific fire management guidelines for protecting and conserving significant habitats of the planning area, such as grasslands, coastal dune and heath vegetation, wetlands (including peat swamps), riparian zones, granite outcrops and tingle and red flowering gum forests;
12. managing young post-harvest karri regrowth by:
    - identifying young post-harvest karri regrowth forests within the planning area in all rolling three-year and annual burn programs;
    - recording in individual burn prescriptions whether special protection from prescribed burning is required or not and the reasons why;
    - providing priority protection to other significant natural values over young karri regrowth unless these other values do not occur adjacent to these regrowth areas;
13. managing fire in wilderness areas through the Master Burn Plan process and in accordance with Department policies by implementing a range of strategies and tactics, including consideration of longer inter-fire intervals within wilderness areas and shorter inter-fire intervals in surrounding areas; and
14. assisting local governments in fire management planning for local settlements that are surrounded or within close proximity of conservation estate.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
25.1 The extent of fire diversity measured by the diversity and scale of post-fire fuel ages within a Landscape Conservation Unit	25.1 The distribution of post-fire fuel ages (time since fire) for each Landscape Conservation Unit approximates the fuel age distribution in Figure 9	Annually
25.2 The impact on human life or significant community assets	25.2 No loss of human life or significant community assets, or serious injury attributable to the Department's fire management	
25.3 The extent to which fire management guidelines for significant habitats requiring specific fire regimes are addressed in burn objectives	25.3 Burn objectives are met for significant habitats requiring specific fire regimes	
25.4 The extent to which fire management guidelines have been prepared for significant habitats requiring specific fire regimes	25.4 Development of published fire management guidelines for significant habitats requiring specific fire regimes	After 2 years

PART E. MANAGING OUR CULTURAL HERITAGE

The Australia ICOMOS Burra Charter (Australia ICOMOS 1999) is a charter for 'the conservation of places of cultural significance' (see Section 7 *Legislative Framework*), and has a series of guidelines for managing cultural heritage.

The *Register of the National Estate* contains a list of places with national value. The Register is a record of important natural, cultural and Indigenous heritage places but offers no statutory protection. Under the Commonwealth's EPBC Act, a new national heritage system was introduced in 2004 to strengthen protection for the nation's natural, Indigenous and historic heritage, including statutory protection to places listed on the National and Commonwealth Heritage lists. Actions that are likely to have an impact on the heritage values of a National or Commonwealth Heritage listed place require approval from the Australian Minister of the Environment and Heritage. The planning area contains one registered site, five indicative places and 20 interim places listed on the *Register of the National Estate* (Appendix 8).

In WA, legislation exists to protect both Indigenous and non-Indigenous cultural heritage. The *Aboriginal Heritage Act 1972* protects sites and objects used by, or traditional to, the original inhabitants of Australia. All Aboriginal sites and objects are protected, including those sites not yet registered with the Department of Indigenous Affairs. Under the Act, it is an offence for anyone to alter in any way an Aboriginal site or object without the relevant Minister's permission. As the register is not a comprehensive listing of all sites, assessments will be necessary prior to any operations where there is potential to inadvertently damage sites. Appropriate approvals under the *Aboriginal Heritage Act 1972* are required to proceed with any works that may affect Indigenous heritage values. In addition, the provisions of the *Native Title Act 1993* require that native title claimants and representative bodies are notified when major public works are undertaken. Works may include buildings or fixed structures, roads, railways, bridges, water bores or well or any major earthwork.

The *Heritage of Western Australia Act 1990* provides for the registering and protection of places of historic interest as 'heritage places'. These sites are registered on the WA 'Register of Heritage Places' database. Places listed under the Act are afforded statutory protection and must not be damaged or altered unless a permit to do so has been granted by the Heritage Council of WA. The Act also requires local government authorities to maintain an inventory of places of heritage significance in their area, referred to as the 'Municipal Inventory'.

The Department's draft Policies – *Aboriginal involvement in nature conservation and land management* and *Management of non-indigenous cultural heritage on lands and waters managed by the Department of Conservation and Land Management* provide further guidelines for managing indigenous and non-indigenous cultural heritage. The Department's 'Recreation and Tourism Information System' (RATIS) database is also used to record sites and places of cultural heritage significance.

Best practice in cultural heritage management requires that all aforementioned registers and databases are consulted prior to undertaking any potentially damaging management operations. The provision of training and information is important in maintaining the expertise of Departmental staff in heritage identification and management.

26. INDIGENOUS HERITAGE

There is evidence that Aboriginal people have occupied the areas around the planning area for at least the past 6000 years. Material from around the Northcliffe area has been dated between

6780 and 3080 years old. However, archaeological evidence from Devil's Lair near Margaret River suggests that Aboriginal people have occupied the south-west for up to 48 000 years (Turney *et al*. 2001). As a result of this long association with 'country', there is an overwhelming desire of Aboriginal people to increase their involvement with the planning area to maintain their traditional ties with the land and ensure that their culture is transferred to future generations (see Section 8 *Management Arrangements with Aboriginal People*).

At the time of European settlement, the south-west was inhabited by 13 different socio-linguistic groups. These groups shared traditions and a common language, and are collectively known as Nyoongars. The word 'Nyoongar' translates to mean "man" or "person" and relates to the language spoken in the area to the west of a line from the coast south of Geraldton to the Great Australian Bight, east of Esperance. However, considerable variation existed within this group. The group which lived in the planning area were known as the 'Murrum' (Crawford and Crawford 2003). These people occupied an area from King George Sound, north to the Stirling Range and the Shannon River and on the coast from West Cliff to Boat Harbour and Palingup River. They also lived around Mount Barker, Nornalup, Wilson Inlet and the Porongorup Range (Tilbrook 1983, McDonald, Hales and Associates 1994).

Evidence from the south-west suggests Aboriginal people were very transient (Brown 1831). Some suggest that this movement was seasonal, with groups congregating on the coast in the summer and dispersing inland during the winter, although others suggest that patterns of travel were more complex than this. It is also thought that the coastal areas, with a high diversity of plants and animals particularly along riverbanks, lakes and swamps, were more extensively used than the forest or woodland plateaus. People moved along defined 'track ways', and junctions of these were the most frequently occupied. These 'track ways' connected camping areas and places where food and other materials were collected such as ochre. These 'track ways' were frequently burnt to keep them open and also to encourage new plant growth, which attracted animals, and to allow the soil to rejuvenate (McDonald, Hales and Associates 1994, Crawford and Crawford 2003, Hallam 1975, 1978, 1987).

Nyoongar people of the south-west built huts for shelter. These were waterproof and were built quickly from whatever materials were available in the area. Between two and seven people slept in these huts or used them for shelter when the weather was bad. Most other activities were carried out in the open area. Huts were inhabited for several days and then abandoned when groups moved on and were never reoccupied (McDonald, Hales and Associates 1994).

Food for Nyoongar people came from a variety of resources. It appears that many animal species in the south-west may have been eaten, including kangaroos, wallabies, possums, birds, snakes, lizards, frogs and fish. However, the number of coastal Aboriginal heritage sites found to date suggests that fish provided an important food resource for at least part of the year (McDonald, Hales and Associates 1994). Rame Head, Nornalup Beach and Point Irwin are known to be fishing spots. Grinding patches along the coast were used to crush shellfish, which was used for burly when fishing. Midden[23] sites are known in a small bay west of Conspicuous Cliff. Plants were divided into groups according to their uses, which included wooden implements, medicine, ornaments and food. All types of plant seeds, fruit, roots, bulbs, tubers, nectars, gums, lerps and insect gall and witchetty grub sources are also thought to have contributed to the diet (McDonald, Hales and Associates 1994) (see Section 36 *Indigenous Customary Activities*).

Different Aboriginal groups would meet for social, ceremonial and trade reasons. These were for corroborees (which generally involved dances, ceremonies and singing) and also fighting incidents, which were used to settle disputes. Elders decided the circumstances and the need

[23] Midden is a mound or deposit containing shells, animal bones and other refuse that indicates the site of a human settlement.

for ceremonies and the availability of food resources determined their locations. The size of the gathering depended on its purpose, the distance people travelled and the food available (McDonald, Hales and Associates 1994).

The traditional way of life was dependent on an intimate knowledge of the land. This knowledge was important for knowing which areas were rich in resources at what times of year. Nyoongar people used a deep understanding of the land, its attributes and behaviour to acquire food, medicines and the requirements for life. Nyoongar people lived and cared for the land with one fundamental and important understanding that people were a part of the environment, and not separate from it (McDonald, Hales and Associates 1994).

To Aboriginal people, the planning area is significant because of previous occupation and because they have a cultural obligation to understand and care for the area. Aboriginal 'caring for country' is about the whole of the landscape and the interconnected nature of sites, people and environment. Awareness of these sites facilitates the passing on of knowledge from generation to generation and the plan aims to support this process.

Nyoongar people are interested in ensuring the long-term protection and conservation of Aboriginal heritage, cultural and natural values associated with country, and recognising the benefits associated with employment and training of Aboriginal people for land management and cultural interpretation activities. Aboriginal people are particularly interested in visiting and using the planning area more often for traditional practices such as camping (see Section 31 *Visitor Accommodation – Camping*), hunting (see Section 36 *Indigenous Customary Activities*), fishing (see Section 30 *Visitor Activities and Use – Marroning and Fishing*), collection of medicinal materials (see Section *43 Flora Harvesting*), and the holding of ceremonies. Any joint management arrangements will help facilitate this. Areas may need to be nominated (subject to approval by the District Manager) where Aboriginal people can go and safely light fires for cultural purposes (see Section 25 *Fire*).

There are currently 11 permanent sites and 21 interim sites on the *Aboriginal Site Register* under the *Aboriginal Heritage Act 1972* within the planning area. These sites are mostly located near the coast, and include artefacts or scatters, grinding patches, quarries, middens and man-made structures. Currently, there are no Indigenous heritage sites on the *National Heritage List* or the *Register of the National Estate* within the planning area. However, a more thorough indigenous survey across the planning area has not been undertaken.

26. Indigenous Heritage

Key Points

- Aboriginal people have occupied the vicinity of the planning area for at least the past 6000 years. However, evidence from other parts of the south-west suggests this occupation has been as long as 48 000 years.
- Nyoongar people were transient, but occupied coastal areas more than forests.
- Traditional lifestyle for Nyoongar people had close links to and understanding of the land.
- There are Aboriginal sites registered with the Department of Indigenous Affairs. Sites are protected under the State's *Aboriginal Heritage Act 1972*. Indigenous sites are also listed in the Commonwealth's Australian Heritage Council's *Register of the National Estate* and the *National Heritage List*.

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

This will be achieved by:

1. complying with provisions of the *Aboriginal Heritage Act 1972* and the Commonwealth indigenous heritage legislation prior to commencing any potentially

damaging operations to prevent damage to known or identifiable culturally significant places and objects;
2. complying with provisions of the *Native Title Act 1993* which requires that native title claimants and representative bodies are notified when major public works are undertaken;
3. on an ongoing basis, consulting with Aboriginal people to prevent damage to culturally significant places and objects;
4. where practicable, conducting ethnographic/archaeological surveys across the planning area to increase and contribute to the knowledge and understanding of Aboriginal heritage of the area;
5. providing appropriate information and interpretation on Aboriginal cultural heritage, including incorporating information into the communication plan of the planning area (see Section 46 *Information, Interpretation and Education*);
6. consulting with Aboriginal people to identify areas for Aboriginal cultural and ceremonial purposes based on traditional occupation and use;
7. encouraging connection to country by way of hunting, camping and other cultural activities through the Aboriginal representative body and any joint management arrangements;
8. encouraging training, employment and economic development through any joint management arrangements and the Aboriginal representative body;
9. consulting with Aboriginal people on development and implementation of burning programs; and
10. requiring approval from the District Manager where fire is required for cultural and ceremonial purposes.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
26.1 Protection of known or identifiable heritage sites and values	26.1 No disturbance without formal approval	After 5 years

27. NON-INDIGENOUS HERITAGE

The first recorded maritime exploration of coastal areas in the vicinity of the planning area was in the 1600s. The Dutch ship, the 'Leeuwin' made the first recorded account of the south coast in 1624, probably passing past Point D'Entrecasteaux and Point Nuyts. Three years later, the 'Gulden Zeepaard', skippered by Francoise Thyssen sailed 1600 km along the south coast, east from Point D'Entrecasteaux. None of the crew landed on the mainland, but the coastline and prominent features were sketched past King George Sound, the Recherche Archipelago and into the Bight. In the years following settlement at Botany Bay, a number of French and British explorers further charted the coastline in the area (Fernie and Fernie 1989).

A number of beaches and bays named in the area (such as Aldridge Cove, Hush Hush Beach and Lost Beach) are listed on the Department's 'Moveable Heritage and Cultural Heritage Sites' database.

Sealers were working along this coastline prior to and just after settlement at King George Sound in 1826. Sealers Cove in Nornalup Inlet was probably one of their base camps. American and French whalers also fished the waters in the area (Fernie and Fernie 1989).

The first inland exploration of the area was by Dr Thomas Braidwood Wilson, a member of the Royal Geographic Society, who explored the area from Albany in 1829. He was accompanied by an Aboriginal guide, Mokare, and four others. They climbed Mt Lindesay and named three distant mountains after Surveyors General of Australia. These include Mt Roe (after John Septimus Roe from Western Australia), Mount Mitchell (after Sir Thomas Mitchell from New South Wales, although this peak was later renamed Granite Peak and the name Mount Mitchell was given to another peak not seen from Mt Lindesay) and Mt

Frankland (after George Frankland of Tasmania). Most of these sites are listed on the Department's 'Moveable Heritage and Cultural Heritage Sites' database for their heritage values. The party also discovered and named the Denmark River (named in honour of Dr Wilson's fellow ship's surgeon), Mt Hallowell, Mt Shadforth and the Hay River. Their expedition also explored Wilson Inlet, which was later named in Dr Wilson's honour by Governor Stirling. Later, Surveyor Roe produced the first map of the area. Throughout the 1830s and 1840s further exploration of the area was carried out by Captain Bannister, on his overland trip from Perth to King George Sound in 1830-1, Alfred Hillman in 1833 (who named Nornalup Inlet after the Aboriginal name Nor-Nor-Nup, meaning place of the Norne or black snake), William Nairne Clark in 1841 and Lieutenant Frank Helpman (RN) in 1842 (Fernie and Fernie 1989, Pearson 1997, Glover 1979).

Settlement of the Denmark area first occurred in 1835 when Sir Richard Spencer, a former Navy Lieutenant who immigrated to Australia in 1833, established a farm on the Hay River. In subsequent years, George Egerton Warburton, John Herbert, James Arber, John Hassall and Andrew Muir also established farms in the Hay River area. The Muir family in particular developed a number of other stations, including 'Forest Hill' along the Hay River and explored west (along what is now the Muirs Highway) to establish farms at Nabegup, Lake Muir and Deeside, by 1858. Sheep were predominantly farmed for their wool and in the 20 years since settlement, exports of produce from the Hay Region were strong. Throughout the 1860s and 1870s, settlers moved further north, south-east and west of the Hay River. Government-assisted immigration schemes brought more immigrants to WA between 1884 and 1903. Many settled in the vicinity of Mount Barker, Perillup and Rocky Gully and established orchards, ran sheep and cattle and bred horses. The Muir and Moriarty families ran mobs of cattle and horses in open bushland. Cattle were often mustered to coastal areas to obtain variety in their feed (Glover 1979) (see below, 'Protection of Non-indigenous Cultural Values in Wilderness' and Section 30 *Visitor Activities and Use – Horse riding*).

Settlement in the Walpole area proved more difficult. Settlement was first attempted in 1845, when the Landor brothers unsuccessfully tried to establish fishing, vegetable growing and boat building enterprise on the island off the mouth of the Deep River (Newdegate Island) in Nornalup Inlet. Others also tried to settle in the area in the early 1900s, but its remoteness ensured these were a failure (Fernie and Fernie 1989). After initial difficulties also because of the area's isolation, timber cutting started in the area in the 1880s, as the timber resources of the south-west were opened up. This initially occurred around the Rest Point area and the sawpit site here is a listed example of this historic activity in the area. The timber was shipped along the coast to Albany for export to Europe or the east coast of Australia (Pearson 1997). At the same time, the area around Mount Barker was being settled. The Muirs settled in the vicinity of Deeside and Lake Muir in the 1860s and opened up the area for grazing. The Moirs were granted pastoral leases in coastal areas between Long Point and Point Nuyts, (the site that is now Crystal Springs) as well as blocks at Mount Barker, and on the Gordon and Frankland Rivers in the 1870s. This particular lease was later held by the Giblett family and then the Doust family (Fernie and Fernie 1989). The first successful settlement in the Nornalup area was by the Bellanger family in 1909, which established on the banks of the Frankland River (Bellanger 1980). Bellanger Beach is named after Pierre Bellanger in honour of his first settlement in the district.

Around this time, the area's social, aesthetic and natural values were first recognised and the area around the Frankland River became one of WA's first park lands to be gazetted in 1910. More reserves were added in 1921 and became the Nornalup National Park, managed by the Nornalup Reserves Board. Tom Swarbrick was the first Ranger of the Park, appointed in 1927 (Fernie and Fernie 1989, Pearson 1997) and Swarbrick Block is named in his honour.

Following World War I was a period of economic prosperity and, combined with the wider use of motor vehicles, improvements to roads and the increasing popularity of the south coast as a summer holiday destination, resulted in the beginnings of a tourism industry around Nornalup Inlet. People visited from Perth and stayed in cottages and tents provided by the

pioneering families of the area. Tourism was further expanded in 1929 when a railway linking Albany with Denmark opened. More guesthouses were opened by the McIntosh, Thompson, Swarbrick and Burnside families. Popular sites included the Peppermints Campsite, Rocky Point and the Depot at the entrance to the Nornalup Inlet. In the 1930s, unemployed married men were moved from Perth to establish a settlement, which would later become Walpole. The townsite was gazetted in 1933. During World War II, American servicemen based in Albany, regularly visited Nornalup Inlet and carried out kangaroo shooting. Following the war, more tourists were attracted to the area, especially timber mill workers who spent holidays in the area (Fernie and Fernie 1989, Pearson 1997).

Following World War I, the timber industry boomed and jarrah and marri forests around Perillup, Amarillup, Pardelup and Forest Hill were cleared for houses, fences, telegraph poles and railway sleepers (Glover 1979). However, during World War II, there were also significant wood shortages, which lead to the cutting of timber in the Shannon area in the late 1940s where prior to this there had been no timber cutting in this area (Pearson 1997). Another major timber mill was located at Walpole owned by Bunnings Forest Products, which also utilised forests in the local area until it later closed.

In 1951, the resident Forestry Officer in Walpole, John Rate was appointed Honorary Ranger of the Nornalup National Park. He did a large amount for park management and was instrumental in getting the first full-time ranger (Lionel Gunsen) appointed to the park. The John Rate Lookout is named in his honour. The Nornalup Advisory Committee was established to provide local input into the management of the park. In 1972 the park was expanded to form the Walpole-Nornalup National Park and cattle grazing within the park ceased (Fernie and Fernie 1989, Pearson 1997, CALM 1992).

The history of European settlement in the region has given rise to several notable sites of historic significance. Eleven cultural heritage sites in the planning area are registered on local shire *Municipal Inventories* and on the Western Australian *Register of Heritage Places* (Appendix 8). These include Monastery Landing, Muir's Hut and yards, Rest Point saw pits, Sandy Beach and Tree Top Walk.

The planning area contains one site that is registered on the Australian Heritage Council's *Register of National Estate*. The proposed 'South Coast National Park' (as recommended by the EPA in 1976) includes mostly the present Walpole-Nornalup and the D'Entrecasteaux national parks. While the general area has long been recognised for its natural values, the subsequent creation of these national parks has reduced the relevance of this registered site.

Eighty sites within the planning area are listed on the Department's *Moveable Heritage and Cultural Heritage Sites* database. Most of these were identified as part of non-Indigenous cultural heritage assessments and workshops as part of the Regional Forest Agreement. These include constructed sites such as huts, cairns, bridges, house ruins, fire lookouts, saw pits, scenic drives and shipwrecks. Natural sites are also listed and include beaches, lakes, pools, rivers, waterfalls, forests, peaks, inlets and caves (Appendix 8).

Some old research plots in the planning area may have historic value (see Section 48 *Research and Monitoring*) and these should be assessed and recognised for their heritage values. However, these plots contain exotic tree species that are environmental weeds (see Section 22 *Environmental Weeds*) and also affect landscape values, and should be progressively rehabilitated (see Section 41 *Rehabilitation*, and Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*).

Interpretation of sites of cultural significance can assist in maintaining a sense of place and informing visitors about the values of an area (see Section 46 *Information, Interpretation and Education*).

In wilderness areas under the Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas*, structures will be removed unless:

- the only method of removal significantly reduces the qualities of the area in the long term, in which case they will be allowed to deteriorate naturally;
- they are essential for visitor safety, resource protection and/or management operations; or
- they are listed as being 'significant' by the National Trust of Australia or Government heritage bodies where they will be "protected as far as practicable". Where sites have not yet been assessed or listed, but may still have cultural significance[24], advice will be sought from relevant heritage bodies.

In the proposed wilderness areas, reference trees (or 'shield' trees) should be left to overgrow, as long as they do not have a negative impact on the planning area, which would be consistent with enhancement of wilderness quality. Remains of a fire lookout tower and towerman's huts on Granite Peak, which were constructed in the early 1950s (Evans 1993) are listed on the Department's *Moveable Heritage and Cultural Heritage Sites* database and will need further assessment for heritage value before consideration of future management.

Local community groups have nominated on the WA *Register of Heritage Places* (under the *Heritage of Western Australia Act 1990*) recently rediscovered old stock routes that pass through eastern parts of the planning area. While the recognition of the heritage values of these stock routes is consistent with the Department's draft policy *Management of non-indigenous cultural heritage on lands and waters managed by the Department of Conservation and Land Management*, local interest groups have also indicated a desire to re-open them as equestrian trails (see Section 30 *Visitor Activities and Use – Horse riding*). One of these stock routes passes through the proposed Willmott-Quindinillup wilderness area and, while the Department recognises the heritage value of the trail and supports its heritage listing, active horse riding will not be permitted under the Department's wilderness policy.

27. Non-Indigenous Heritage

Key Points

- Non-Indigenous heritage sites are protected under the *Heritage of Western Australia Act 1990*. Heritage sites are listed in several places, such as the WA *Register of Heritage Places*, the Commonwealth's *Register of the National Estate*, and the Department's *Recreation and Tourism Information System* (RATIS) database.
- European coastal exploration of the area first occurred in the 1600s by the Dutch, then the French and British in the late 1700s.
- The first inland exploration of the area was by Dr Thomas Braidwood Wilson a member of the Royal Geographic Society, who explored the area from Albany in 1829.
- Timber harvesting and agriculture were important industries following settlement, and many ordinary hardy pioneers made a significant contribution to the settlement and progress of local communities.
- Part of the area, which was to become the Nornalup National Park, was reserved in 1910. This was expanded to form the Walpole-Nornalup National Park in 1972.

The objective is to identify, protect and conserve the non-indigenous cultural heritage of the planning area.

This will be achieved by:

1. protecting and maintaining non-indigenous sites of cultural heritage significance

[24] Under the *Heritage of Western Australia Act 1990*, the term 'conservation' relates to the management of a place in a manner that will enable the cultural heritage significance of that place to be retained; and yield the greatest sustainable benefit for the present community without diminishing the cultural heritage significance of that place. Conservation may include the preservation, stabilisation, protection, restoration, reconstruction, adaptation, and maintenance of that place in accordance with relevant professional standards, and the provision of an appropriate visual setting.

according to State and Commonwealth legislation and the Burra Charter;
2. identifying where possible, areas of non-indigenous cultural heritage based on historical occupation and use;
3. progressively updating and collating information on cultural heritage sites located in the planning area and maintain a current register of sites on the Department's RATIS database;
4. consulting the *Register of Heritage Places*, *Register of the National Estate*, relevant municipal inventories, and the *Moveable Heritage and Cultural Heritage Sites* database, and consider any cultural heritage management requirements prior to undertaking any operations or works;
5. providing appropriate information and interpretation on non-indigenous cultural heritage, including incorporating information into the communication plan of the planning area (see Section 46 *Information, Interpretation and Education*); and
6. protecting non-indigenous cultural heritage during any new developments or management programs.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
27.1 Protection of known or identifiable heritage sites and values.	27.1 No disturbance without formal approval.	After 5 years

PART F. MANAGING VISITOR USE

There is a growing demand for outdoor recreation and 'nature-based' tourism. Research shows that today's travellers are more environmentally conscious, and are seeking new experiences and more information about the destinations that they visit. In doing so, this contributes significantly to the social, psychological, physical, environmental and economic well-being of the community. The public conservation estate managed by the Department has a great capacity to contribute to this demand for recreation and tourism, with a subsequent benefit being that people develop greater attachment to, regard for and understanding of conservation places by spending time in them.

An assessment of the economic value of recreation and tourism undertaken for the Warren Region between Manjimup and Walpole (Carlsen and Wood 2004) found that:

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

Based on the average of these three variables, 88% of all visitor expenditure in this area can be attributed to the national parks, marine parks and forests in the Warren Region. This equates to $61.9 million per year when 201 100 overnight visitors per annum is multiplied by the average spend of $89 per person per day over an average length of stay of 3.9 days (Carlsen and Wood 2004). These economic impacts occur as a result of visitor spending on products and services such as accommodation, food and fuel in the local community. Additional economic impact can be generated by the development of opportunities for private enterprises such as commercial concessions (i.e. leases and licences). These benefits can lead to greater cohesion within communities, a more focused identity and a greater a sense of ownership of the natural area by the local community.

The number of visitors to the State's parks and reserves system increased markedly over the past decade, from 4.8 million visits in 1992-3 to more than 11 million in 2004-5. The reason for such significant interest is that the conservation estate managed by the Department covers an area of more than 24 million hectares of lands and waters protecting unique landscapes, geological formations, plants and animals, and cultural sites. In addition, there is a worldwide recognition that healthy outdoor activity is good for people physically and psychologically (Maller *et al.* 2002). For these reasons, the planning area provides numerous recreation opportunities for local communities, as well as regional, national and international tourism.

Conserving these lands and waters for future generations, and managing them for use by the present one, is a complex process. A number of policies, available from the Department on request, provide guidance for recreation and tourism management, including:

- No. 18 – *Recreation, Tourism and Visitor Services*;
- No. 34 – *Visual Resource Management of Lands and Waters managed by CALM*;
- No. 53 – *Visitor Risk Management*;
- No. 62 – *Identification and Management of Wilderness and Surrounding Areas*.

The Nature Based Tourism Strategy for Western Australia (Tourism Western Australia 2004) also provides guidance on the sustainable development of the visitor experience.

Public expectations are as diverse as the environments the Department manages. For example, many special interest groups such as bushwalkers, cyclists, four-wheel drivers and horse riders, have a strong interest in increasing their use of the planning area. Secondly, the desire to interact with these unique environments can lead to impacts on the natural environment; such as

soil compaction and erosion (see Section 16 *Geology, Landforms and Soils*); increased turbidity and sedimentation of waterways (see Section 17 *Hydrology and Catchment Protection*); damage to flora (see Section 19 *Native Plants and Vegetation*) and fauna (see Section 20 *Native Animals*); and the introduction and spread of weeds (see Section 22 *Environmental Weeds*) and *P. cinnamomi* (see Section 24 *Diseases*); as well as impacts other visitors and the use of water resources (see Section 45 *Water Resources*).

Conflicts between different types of visitors can also occur, such as where there are interactions between walkers, dogs, horse riders, cyclists, vehicles and/or trailbike riders, inappropriate use of generators and rave parties. Conflicts may be minimised by designating areas for specific visitor groups, or providing adequate information to allow facilities to be used by a variety of visitors.

This management plan addresses these issues, at the same time ensuring that visitors gain an appreciation and understanding of the area's values, with the aims of fostering an appreciation for conservation and ensuring that visitor behaviour is consistent with conservation objectives. This plan allows for some increase in the capacity of camping and overall visitation to the parks over the life of the plan, but will ensure that a stronger conservation/education message is delivered, that visitors are better informed about sites and activities in the parks, and that environmental impacts are minimised by developing and directing visitors to more robust sites and providing a wide range of opportunities to distribute visitor pressures. The seasonally wet nature of much of the planning area requires that there is adequate information for visitors about the safe access into and within the parks and reserves (see Section 29 *Visitor Access*, and Section 34 *Visitor Safety*).

Any new developments need to consider the full range of natural and cultural values outlined in preceding chapters, and consider ways of mitigating any adverse impacts that may result. Recreation and tourism activity and development should be compatible with the vesting purpose of the land and water or the established land/water use priority. For example, State forest has a multiple use purpose and provides for the greatest range of recreation opportunities, whereas nature reserves are set aside for the 'conservation of flora and fauna' and provide for the least amount of recreation development (see Section 3 *Planning Area*).

Prior to the development of recreation sites, the Department uses a detailed process of planning and design to assess the potential impacts of new sites. This process has a number of steps including (i) project initiation, (ii) inventory and assessment, (iii) planning and design, (iv) implementation, and (v) monitoring and review. The inventory and assessment phase is the point at which the full range of environmental, social and cultural factors are examined for the potential impacts of the site. These include geological, topographic, hydrological, biological (flora and fauna), accessibility, land use, and visual and cultural values. If the potential impacts are significant, then either the site design may be modified to overcome these impacts, other options developed or another site chosen. Recreational development projects will be prioritised according to (i) visitor risk, (ii) environmental impacts, (iii) social benefit, (iv) equity, (v) public demand, and (vi) potential economic benefit.

The major foci for recreation and tourism for the period of this management plan are to:

- maintain a wide range of recreation opportunities to provide for a wide range of visitors;
- develop the Walpole Wilderness Discovery Centre to interpret perspectives of the wilderness, natural environment and human interaction, and to provide visitors with orientation to the whole WW and its facilities;
- increase the recreation opportunities for visitors in the eastern and northern parts of the planning area;
- increase the range of trails, including the provision of the Munda Biddi cycle trail, iconic Frankland walk trail and an eastern multi use trail;

- develop key interpretive sites with a range of activities; and
- protect the significant natural values in the Mt Lindesay area from the impact of visitors through completion of recreation master planning.

The management of recreation and visitor use is adaptive (see Section 48 *Research and Monitoring*) where the plan utilises best available knowledge to develop practices aimed at meeting specific management objectives, and monitoring, regular review and analysis of management outcomes and ongoing research continuously improves the management of visitor use in the planning area.

28. VISITOR OPPORTUNITIES

The size and location of the planning area make it regionally important for recreation and tourism in the south-west of WA. The planning area is located within the highly visited 'Australia's South West' Tourism WA region. Tourism WA (2005) estimated that in 2003/04 an annual average of about 2.15 million visitors stayed over-night in the region. Several main travel routes, such as the South West, South Coast, Albany and Muir highways, provide ready access to a variety of natural environments and attractions of the planning area. Visitor opportunities are also particularly important to local and regional communities, especially within the local government areas of Manjimup, Denmark, Plantagenet and Albany. While the area is recognised as a focus for recreation in a remote and natural environment, the majority of visitors to the area stay between one and three days, and the most popular activities undertaken include sightseeing, visiting the Tree Top Walk, bushwalking and visiting national parks (Carlsen and Wood 2004).

The planning area is regionally significant because of the large areas of natural and relatively remote forests with significant wilderness qualities, which are uncommon within the south-west of WA. The planning area also has unique natural and scenic values, extensive tracts of tall old growth karri and tingle forests, red flowering gums, the coast and inlets, rivers and wetlands, and mountains, the combination of which set it apart from other areas in the south-west.

The planning area provides a range of coastal recreation pursuits such as fishing, swimming and surfing, but also incorporates the forested hinterland extending the range of recreation opportunities, such as bushwalking, remote camping and four-wheel driving. Bushwalking is one of the more popular activities within the planning area with tracks ranging from short, developed trails to demanding, multi-day treks which provide a range of opportunities for visitors to appreciate the region's remote and natural beauty. The 'Bibbulmun Track', which stretches from Perth to Albany and passes through the area, is one of the State's most popular nature-based tourist attractions. Similarly, the planning area contains highly acclaimed and popular attractions such as the Tree Top Walk in the Valley of the Giants. Other major attractions within the planning area include Hilltop Giant Tingle Tree, Circular Pool, Coalmine and Conspicuous beaches, Knoll Drive, Greens Pool, Mt Frankland and the Fernhook Falls camping and day-use area. The Walpole Wilderness Discovery Centre will complement existing facilities, but add significantly to the understanding and experience of wilderness. There are few recreation facilities in eastern and northern parts of the planning area but there will be further investigation into establishing some level of facilities in these areas.

Many recreational activities within the planning area focus on water bodies such as rivers, lakes and estuaries/inlets. Many of these water bodies are located on tenures managed by the Department. The Department is obliged to protect water quality as part of managing recreation and tourism within the planning area. Some areas, such as the Walpole Weir and Denmark River Catchment Areas (see Section 45 *Water Resources*), are proclaimed as public drinking water source areas under the *Country Areas Water Supply Act 1947*. Guidance for managing recreation in proposed Public Drinking Water Source Areas is provided by Statewide *Policy 13 – Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown*

Land (Water and Rivers Commission 2003), and there may be restrictions on certain recreational activities (see Section 30 *Visitor Activities and Use*). Some water bodies and other areas currently used for recreation may be desired as public drinking water sources in the future and recreation activities may need to be reviewed as a result. This may place additional pressure on other areas.

Some recreational opportunities take advantage of the physical attributes of the region. For example, rock climbing and abseiling occur at a few sites within the planning area. Camping areas are widespread throughout the region, but there is a high demand and shortage of designated sites in riverine areas, with the exception of Fernhook Falls. Some activities associated with riverine areas such as marroning and fishing, have reached their capacity in many river systems. The ongoing demand for outdoor recreation for these and other recreation opportunities means that visitors demand and expect new facilities and access into undeveloped areas of conservation estate. If such demands are progressively met, a time may come when the natural and remote characteristics of the planning area may be diminished to the extent that these qualities are no longer available or recognised (see 'Visitor Management Settings' below). Therefore, while further opportunities may need to be provided for people to experience the area, these should be in keeping with the objective of protecting and maintaining natural, cultural and wilderness qualities.

The planning area contains a large number of national parks and reserves. For these parks to all continue to attract visitors, it is important that the uniqueness or special attractions of each park or area are identified and enhanced, and management aims to maintain the individuality of each area rather than inadvertently allowing them all to gradually offer similar experiences.

In some cases, the provision of facilities and activities may be better undertaken on areas outside and adjacent to the planning area, particularly where they can be located in less fragile areas and can provide a different recreational experience. Some opportunities may be explored in a regional context, such as regional planning for canoeing and horse riding.

Visitor Profile

Visitor Numbers

Visitation to the planning area for nature-based experiences has increased over the past decade, based on visitor information statistics collected from the Walpole Tourist Bureau, the Tree Top Walk and several recreation sites in the planning area[25]. Automatic traffic and pedestrian counters continuously monitor vehicle and people numbers at major points along vehicle and walk tracks and have improved estimates of visitor numbers in recent years. The Tree Top Walk recorded 188 000 visitors in 2003/04. The numbers of vehicles recorded at other recreation sites in 2003/04 range from 1824 (Mt Lindesay) and 2994 (Mt Frankland) to 12 643 (Rate Lookout), 19 577 (Hilltop Road) and 54 430 (William Bay Road). Numbers of registered walkers on sections of the Bibbulmun Track (Hillier, Coalmine and Giants) vary between 100 and 1000 walkers per year. The Nuyts section of the Bibbulmun Track recorded 1800 walkers in 2003/04.

Visitation levels within the planning area are highly seasonal. The main visitation to the planning area is between October and April, with peak visitation generally being in December and January. While visitors can be classed as locals, non-locals and special interest groups, statistics are often considered at the "domestic" and "international" levels. Domestic and overseas visitation to the south-west varies at different times of the year, with domestic visitation highest in January and April (14% and 11% of visits respectively), and international visitation highest in October to December (34% of international visits) (Tourism WA 2005). Interstate domestic visitation, in particular, appears to have dramatically increased in recent

[25] This does not include much of the through traffic along the South West and South Coast highways.

times (Tourism WA 2005). For much of the year, many locals from nearby towns and farms recreate on the coast and hinterland on weekends. During school holidays and long weekends, there is also a substantial influx of tourists sightseeing, visiting the Tree Top Walk and bushwalking (Carlsen and Wood 2004). In summer and autumn, areas around the inlets, beaches and rivers are the focus of visitor activity, with sightseeing and water-based recreation prominent. The most important reasons for visiting the region are the natural environment, the Tree Top Walk and Gloucester Tree and forests (Carlsen and Wood 2004).

Visitor Trends

Tourism is expected to continue to grow both globally and nationally with a forecasted average annual growth rate in domestic and international visitors of 0.9% and 5.8% a year over the next 10 years, respectively (Tourism WA 2005). This trend has been reflected in visitation to national parks, State forests and other reserves in WA, which increased by more than 90% from 5.7 million to 10.9 million between 1994/95 and 2003/04.

Visitation to the planning area is also likely to continue to increase in the medium term, with potential growth opportunities in ecotourism as a result of:

- the establishment and promotion of the new national parks within the WW;
- the construction of the new Walpole Wilderness Discovery Centre sites;
- potential recreation developments; and
- the gazettal of wilderness areas.

The challenge for managers is preserving the experiences of 'unspoilt surroundings' and a sense of remoteness, whilst providing for increased visitation.

Visitor Management Settings

The Department aims to provide visitors with a wide range of nature-based experiences on the public conservation estate whilst ensuring that impacts on the environment are managed within acceptable limits. The Department's Policy No. 18 – *Recreation, Tourism and Visitor Services* outlines a number of techniques for managing visitor impacts under three categories:

- site management (e.g. hardening the site, channelling the use, and developing facilities);
- direct regulation of use (e.g. increasing policy enforcement, the use of zones, restriction of the intensity of use and the restriction of activities); and
- indirect regulation of use (e.g. altering physical facilities and setting eligibility requirements).

This approach is based on having a good understanding of why people visit particular areas, and what assets or values need to be managed and conserved in providing for visitors. It is important to note that recreation experiences are made up of physical (including the environment and facility provision), managerial and social attributes, and altering any of these attributes will change the experience. The concept of recreational succession[26] indicates that the very conditions of an area that attract recreational use may be inevitably changed by that use. As this occurs, the initial visitors are displaced by people who are more tolerant of the changed resource conditions, and the process may continue until a uniform high level of services and facilities are provided within the natural area. Hence, a foremost objective in providing for visitor facilities and services is effective management of visitor impacts in order to conserve natural values.

[26] Recreational succession is a process by which the quality or condition of recreation settings deteriorate and/or change as a consequence of the impacts of recreation use and/or the actions of management (Batt 1998).

The 'Recreation Opportunity Spectrum' developed by Clark and Stankey (1979) has been commonly applied as a standard planning tool in natural areas to prevent 'recreational succession'. It enables land managers to provide for the greatest possible range of recreation opportunities in a given area, while limiting unintended incremental development. The 'Recreation Opportunity Spectrum' involves classifying areas according to their conservation status and the recreation opportunities they can provide, then allowing for appropriate uses within each area. This ensures that high quality recreation opportunities are available through the provision of diversity of settings. This plan uses 'visitor management settings' to determine what sort of recreation development may be appropriate within each setting, as well as a range of site management strategies to manage visitor impacts.

Planning for future services and facilities is directly linked to the visitor management setting for a given area, and the predicted level and type of visitation. Although the criteria for the settings are still being finalised by the Department on a State-wide basis, Map 11 details the management settings according to the proposed criteria (Appendix 9). The allocation of an area to a particular setting does not necessarily mean the full extent of the setting has to be met. There will still be opportunities, however, for less developed facilities, and the campground types proposed in this management plan offer a range of sizes and social conditions (see Section 31 *Visitor Accommodation*). Any recreation site developments pursued within the life of this management plan will need to be consistent with management settings.

The Department's '*Warren Region Visitor Services Plan*' (CALM 2004) provides a regional framework for the development of recreation and interpretive facilities. Some parts of the planning area may require further detailed 'Master' or site planning in areas where there may be a concentration of current or planned activities and sites. These include William Bay National Park, Mt Lindesay, Falls of Forth/Nile Creek/Styx River, Quarram Nature Reserve, Giant Tingle Tree/Hilltop Lookout, Giants block, upper Frankland River, the west side of the Deep River between Fernhook Falls and Centre Road, West Knoll/Rest Point, Tinglewood/Shedley Drive and Long Point.

Visitor opportunities within wilderness areas are guided by Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas* and consist of low-impact opportunities for solitude, inspiration and self-reliant recreation within the planning area (see Section 13 *Management of Wilderness Areas*), including:

- pedestrian access for a number of low-impact activities, such as bushwalking, rock climbing, recreational fishing, minimal impact and remote camping, education and recreation expeditions, picnicking, and day-use, in wilderness areas (see Section 30 *Visitor Activities and Use*);
- water access by non-powered craft, such as canoes and kayaks, provided that access to watercourses is via existing tracks outside of the wilderness area (see Section 30 *Visitor Activities and Use – Boating*); and
- flying in accordance with a 'Fly Neighbourly Advice' for the planning area (see Section 30 *Visitor Activities and Use – Flying and Hang Gliding*).

The Department's 'Caring Code for the Bush' (see Section 13 *Management of Wilderness Areas*) outlines a number of safety measures to prepare visitors for their visit to wilderness areas and to minimise their impact on the environment. A visitor's book, track registration or similar system for visitors entering wilderness areas may assist the Department and emergency services in search and rescue operations. The Department will work with Tread Lightly! Australia, Leave No Trace and other organisations to inform and promote responsible actions by visitors to enhance the environmental sustainability of the area, particularly through materials specifically developed for the planning area.

28. Visitor Opportunities

Key Points

- Overall visitation to the planning area is increasing, with visitors valuing the natural environment, the Tree Top Walk and the forests, and the sightseeing, bushwalking, swimming, camping, boating, and fishing opportunities provided by the planning area.
- The challenge for managers of natural areas is in preserving the unspoilt surroundings, sense of remoteness and the individuality or special features of each park and reserve whilst visitation continues to grow.
- Recreational succession can be minimised by assigning areas to different 'visitor management settings' for the life of the plan. These determine appropriate recreation developments for the planning area.
- The planning area lies near the main travel routes linking the south-west of the State and is easily accessible from Manjimup, Walpole, Denmark, Mount Barker, Rocky Gully, Northcliffe and Albany.
- Wilderness areas provide a number of low-impact opportunities for solitude, inspiration and self-reliant recreation.

The objective is to provide visitors with a range of sustainable nature-based experiences to the extent that they are consistent with conserving the natural and cultural values of the area and minimising conflict between visitors.

This will be achieved by:

1. ensuring recreation and tourism developments are consistent with Department policy and visitor management settings (Appendix 9), and are designed to minimise environmental impacts;
2. minimising the impact of recreational practices and maximising compliance with regulations, where appropriate;
3. liaising with regional Tourism Associations, including the provision and exchange of information;
4. establishing suitable criteria for assessing the environmental impacts of recreation and tourism developments and visitor activities;
5. developing a monitoring and analysing system for visitor satisfaction across a range of activities and sites based on existing visitor satisfaction forms;
6. encouraging major tourism infrastructure off-site, and focusing on the provision of opportunities within the planning area that cannot be catered for elsewhere; and
7. liaising with Tread Lightly! Australia, Leave No Trace and other organisations to inform and promote responsible actions by visitors through various caring codes of practice to enhance the environmental sustainability of the planning area, particularly through materials specifically developed for the planning area.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
28.1 Visitor satisfaction levels of nature-based experiences within the planning area	28.1 Visitor satisfaction levels of nature-based experiences within the planning area are maintained or increased from 2008 levels	After 5 years
28.2 The range and number of visitor opportunities	28.2 The range and number of visitor opportunities is consistent with visitor management settings	After 5 years

28.3 Social, economic and environmental visitor impact indicators	28.3 Social, economic and environmental visitor impact indicators will be developed during the life of the plan	After 5 years

29. VISITOR ACCESS

The public conservation estate is generally available for a variety of recreational uses where conservation values are not unduly compromised. Provision of access is the main management tool the Department uses to enable visitors to recreate in these areas. This can include 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 may need to be restricted due to concerns over 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 further access and the cost of maintenance also needs to be considered.

The type of access provided to an area affects the level and nature of use. Access therefore needs to be carefully managed in consultation with visitors and according to the management settings, in order to protect environmentally sensitive areas and retain qualities of naturalness and remoteness. People are interested in using the planning area for a variety of activities, including four-wheel driving, camping, cycling, horse riding, marroning and walking, and each of these activities may require different standards or types of access. It is important to manage access to ensure that activities are undertaken in appropriate areas and are consistent with each other and do not create conflicts for other users.

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 30 *Visitor Activities and Use*).

Motor Vehicle Access

There are two types of roads within the planning area: dedicated public roads and roads managed by the Department. Dedicated public roads are those which have their own reserve which is managed either by local government or Main Roads Western Australia, such as the South Western Highway, North Walpole Road and Boat Harbour Road. Roads managed by the Department under the CALM Act and vested in the Conservation Commission make up the majority of roads within the planning area.

All motor vehicles accessing the planning area need to be licensed under the *Road Traffic Act 1974* and all drivers must possess a current driver's licence. Vehicles are restricted only to roads and tracks that are open public access, and driving off roads and tracks is not permitted. Any vehicle registered under the *Control of Vehicles (Off-road Areas) Act 1978* is not permitted to operate in the planning area, except under exceptional circumstances such as to enable access for a disabled person with permission from the District Manager.

Current vehicle access has developed from a number of factors such as past land uses (e.g. timber harvesting), the need for strategic management of fire, access to coastal recreation destinations and old stock routes, and access associated with agriculture. For example, Thomson Road is significant for its current and historical connection between Walpole and Lake Muir communities (see Section 27 *Non-Indigenous Heritage*). Little of the access within inland parts of the planning area were put in specifically for recreational pursuits. However, recreation is now a major use of much of the access, with research showing that 69.8% of visitors travel to the region in their own motor vehicle (Carlsen and Wood 2004).

Public access may be restricted (either temporarily, seasonally or permanently) for reasons of safety, cultural sensitivity, disease control, protection of natural values and water quality, or

maintenance of roads and tracks. The seasonally wet nature of the planning area physically restricts access during the winter and spring months, particularly where major rivers such as the Deep, Frankland, Kent and Denmark Rivers traverse the area. Occasionally areas may be temporarily closed because of the need to manage prescribed burns or wildfires or other activities, and the inherent threat to the safety of visitors that these management activities may pose. Dieback can be spread by most forms of access (by vehicle tyres, feet or animals), and some areas are permanently restricted so that high value areas remain free of the disease (see Section 24 *Diseases*). Vegetation growth naturally restricts some access over time and, although the access may still be open to public use, it may not be physically accessible until the access is required for management purposes.

The maintenance of access is expensive and there will be a focus on those areas in the plan that are strategic or have a high priority for management purposes or for recreation use. The strategic roads and tracks open to the public for the life of the plan are shown on Map 12. However, there are many more roads and tracks present that are open to the public than are shown, which are on more detailed maps available at Department offices. A road or track may not be actively maintained, but as long as it is not signposted to indicate otherwise, or physically closed by a gate, drain or felled tree, then it is publicly accessible.

The provision of access, including maintenance, upgrading, re-alignment, closure, rehabilitation or development of further access, may be required within the life of this management plan, and will need to be consistent with Departmental policies, codes of practice, visitor management settings and the protection of key values, and subject to appropriate environmental assessment and public consultation. Not all of the strategic roads and tracks may receive management attention over the life of the plan. No priorities are assigned to works on strategic roads and tracks, and access may only receive attention, subject to further detailed site and environmental assessment, according to the recreational development criteria of visitor risk, environmental impacts, social benefit, equity, public demand, and potential economic benefit, and other management criteria (such as access for fire management and disease risk). The amount of funding available will also determine priorities and affect what is achieved.

The fragmented nature of the reservation within Weld and Mossop blocks means that it may be necessary to transport logs through parts of the planning area. The timber industry had developed a network of log-haulage roads in this part of the planning area. Many of these roads have now been closed to log trucks and may be downgraded, not maintained or closed and rehabilitated (see Section 41 *Rehabilitation*) to minimise soil erosion, prevent unnecessary access and spread of dieback, and maintain the visual amenity of the forest environment. However, some roads may still serve a number of other important public and/or management purposes, such as fire management.

Many unused Crown road reserves (see Appendix 3, Section 11 *Proposed Tenure, Purpose, Vesting and Boundary Changes*) are not best located to satisfy access requirements, are unnecessary or no longer required. These road reserves should be rationalised through consultation with local authorities, Main Roads Western Australia and private property owners to ensure that local access requirements are best satisfied and to protect the environmental and landscape values of the planning area. Crown road reserves no longer required will be investigated with the view to adding these to the planning area's conservation estate.

The Shire of Manjimup is seeking excision of a corridor through Walpole-Nornalup National Park adjoining the current powerline and wastewater pipeline to allow for construction of a road linking Walpole Townsite and Allen Road (Landvision and Land Assessment 2003). This proposal should be subject to strategies outlined in Section 40 *Public Utilities and Services* and is likely to provide beneficial outcomes in co-locating existing and proposed utilities into the one corridor hence minimising impacts on natural and other values.

Two-Wheel Driving

The planning area is highly accessible by two-wheel drive vehicles, with most visitors using the South West Highway in the west, the South Coast Highway in the south and east, the Muir Highway in the north, and the Denmark-Mount Barker Road in the east to access the planning area. There is year-round two-wheel drive access in many parts of the planning area, including the coast, such as Rest Point Road (to Sandy Beach), Knoll Drive (to Coalmine Beach), Conspicuous Beach Road, Peaceful Bay Road, Boat Harbour Road, William Bay Road, North Walpole Road, Thomson Road, Nornalup Road, Valley of the Giants Road and Beardmore Road. However, there is relatively little two-wheel drive access within the central part of the planning area, which is valued for its remote qualities. Many unsealed gravel roads may not be accessible for some hire cars depending on hire agreement conditions, or at wetter times of the year.

Scenic and recreational driving is a very important component of tourism in the south-west. In the planning area, much of the sightseeing usually involves travel to an attraction or recreational site (see Section 30 *Visitor Activities and Use – Scenic and Recreational Driving*), although drive trails such as the Valley of the Giants are becoming increasingly popular. Sometimes the end point of the two-wheel drive access is the starting point for another form of travel, such as walking to the top of Mt Frankland or canoeing from Fernhook Falls. It is important to encourage visitors to enter and travel through the planning area with safe and enjoyable access to major developed visitor facilities and popular day-use sites (such as Tree Top Walk, the Walpole Wilderness Discovery Centre sites, Fernhook Falls, Greens Pool and Circular Pool). However, improving access to locations by upgrading from four-wheel drive to two-wheel drive roads is expensive, increases visitation (placing additional pressure on end point facilities and the natural environment) and reduces the feeling of isolation.

This management plan proposes a strategic network of primary all weather and primary seasonal access for two-wheel drive vehicles to encourage visitor access around and through the planning area (Map 12). Some of these routes will become interpretive drive trails (see Section 30 *Visitor Activities and Use – Scenic and Recreational Driving*) where, at entrances to the planning area along these major access routes as well as key visitor sites and parking bays, information will be provided to the public on the values of the planning area (see Section 46 *Information, Interpretation and Education*). Primary all weather access for two-wheel drive vehicles on lands managed by the Department will be maintained to at least 2WD standards (for sealed and unsealed access), including those year-round two-wheel drive access routes described above such as Conspicuous Beach Road, Thomson Road, Beardmore Road and Valley of the Giants Road. Access that is proposed to be upgraded to 2WD standards (Map 12) will be subject to an assessment and review process prior to works being undertaken.

Four-Wheel Driving

Many four-wheel drivers are attracted to the isolation, peaceful bush settings, scenic driving opportunities and sense of freedom associated with travelling on tracks that, by virtue of the more difficult access, are less visited and offer a different and more challenging experience. Typically these tracks include scenic viewpoints, rugged landscapes and picturesque settings. The planning area has many of these qualities.

Ownership of four-wheel drives has increased significantly in recent years and subsequently a growing number of people are enjoying this type of activity. In 1973 there were 2000 new four-wheel drives sold in Australia, a figure that had risen to 180 103 by 2002 (Federal Chamber of Automotive Industry figures). Sales of new four-wheel drive vehicles in Australia have increased by 31% over the last five years. The demand for this activity is forecast to continue increasing over the life of this plan.

The increase of four-wheel drive use has placed significant pressure on the natural values of the planning area. Tracks to the coast between Walpole and Peaceful Bay are a favourite area for four-wheel driving. However, heavy use and increasing traffic volumes, combined with sensitive landforms that may have steep slopes, be seasonally inundated or easily eroded, may accelerate erosion. As a consequence, the condition of some tracks has deteriorated (see Section 16 *Geology, Landforms and Soils*). With unrestricted use and no routine maintenance, some tracks may not be able to sustain four-wheel drive activities in the long term and management intervention may be needed to minimise these impacts. *P. cinnamomi* occurs extensively across the planning area, with vehicles being a major factor in its spread (see Section 24 *Diseases*). A stable end-point is also required and where this is not achievable, an access track may need to be closed. Tracks available for four-wheel drive use are shown on Map 12 (see Section 29 *Visitor Access*).

Continuing to educate visitors on the appropriate techniques for four-wheel driving in the planning area (e.g. reducing tyre pressure on coastal tracks and dunes) could aid in reducing the impacts of four-wheel driving. However, in some cases access may need to be restricted by either closure (permanent or seasonal) or by use of permits.

The WA 4WD Association and Trackcare, who represent members of the public that recreate in four-wheel drive vehicles, have developed an effective working relationship with the Department. Cooperative work, such as the rehabilitation of some of the eroded tracks, is often undertaken between the Department and four-wheel drive groups. The Department will continue to liaise with these groups on a range of four-wheel drive issues, such as design access and rehabilitation.

Motorcycling

Motorbikes share the same public access roads and motor vehicle tracks as many other forms of travel and, in the planning area, are permitted to use public roads and motor vehicle tracks shown on Map 12 (see Section 29 *Visitor Access* and Section 30 *Visitor Activities and Use – Enduro, motorcycle and trail bike riding*).

Unauthorised trailbike use is often prevalent towards park boundaries and on tracks that have been closed to the public, which may lead to environmental degradation and the spread of weeds (see Section 22 *Environmental Weeds*) and disease (see Section 24 *Diseases*). The provision of this activity in the plan may encourage trailbikes to use areas and public access motor vehicle tracks that cater for this activity and have a low risk of spreading *P. cinnamomi*.

Access for Visitors with Disabilities

The Australian Bureau of Statistics estimates that 18% of the population has a disability. Based on these figures, it is likely that over a million visits per year are made to the public conservation estate by people with some form of disability. The *Disability Services Act 1993* defines a disability as a condition which is attributable to an intellectual, psychiatric, cognitive, neurological, sensory or physical impairment. Catering for visits by people with disabilities will also have subsidiary benefits to the aged, parents with young children and the carers of people with disabilities.

Departmental aims within its *Disability Services Plan* (2001-6) and Policy No. 18 – *Recreation, Tourism and Visitor Services* include:

- making visitor facilities and recreation areas as accessible as possible to people with disabilities, where practicable and appropriate; and
- ensuring information and services provided by the Department are adapted to become accessible to people with disabilities.

Strategies identified to help achieve these aims include:

- progressively updating recreation sites based on visitor numbers, costs and ease of modification of existing facilities, as funding permits;
- ensuring that, wherever practicable, new recreation facilities are accessible to people with disabilities;
- enhancing access of information regarding Departmental services to people with disabilities;
- ensuring information is clear, visible and complies with the required standards; and
- making management plans available in different formats.

Existing and proposed access within the planning area needs to be reviewed over the life of the plan to determine the possibility of encouraging greater access to recreation sites for disabled visitors. The Tree Top Walk, John Rate Lookout, Giant Tingle Tree, Fernhook Falls and the recently upgraded Circular Pool recreation sites currently meet standards for universal access. Current site construction or upgrade of facilities in the Knolls/Coalmine area and at the Swarbrick and Mount Frankland Walpole Wilderness Discovery Centre sites is also catering for disabled access.

In addition, the Department's *NatureBase* website (see Nomenclature) is an alternative means by which the public can access information on management plans and make submissions on plans that are open for public comment.

Management Access

There is often a requirement for some access within natural areas to be closed to the public for management purposes. These roads and tracks are predominantly needed for fire management, but may also be located within disease risk areas or used for flora and fauna monitoring, controlling feral animals, water monitoring, access for maintenance, and for weed control. Management access within Disease Risk Areas may be accessible to the public seasonally following written authorisation by the local District office (see Section 24 *Diseases*). While further assessment is required (see Section 24 *Diseases*), management access is not likely to dramatically change from that existing at present.

Often whenever public vehicle access to a track is removed, vandalism occurs to gates at newly closed tracks, or new tracks around barriers are formed. This issue needs to be considered and managed when amending access in the planning area. Access that is closed to the public for 'management vehicles only' will be signposted in the field.

29. Visitor Access

Key Points

- There is considerable access to and within the planning area for a variety of destination-based and activity-based access types, from walking to water and aircraft and ground-based motor vehicles.
- Access needs to be carefully managed to ensure that it does not compromise the many natural, cultural, wilderness and recreation qualities valued by visitors.

The objective is to provide a range of access types that do not adversely impact natural or other values and facilitate visitor appreciation of these values.

This will be achieved by:

1. providing access according to Map 12 and as required, consistent with Departmental policies, codes of practice, visitor management settings and the protection of key values, and subject to appropriate environmental assessment and public consultation;

2. rehabilitating tracks that are deemed unnecessary and where there is an adverse impact on the environment;
3. negotiating with private property owners, Main Roads Department and local authorities to ensure that road reserves in the planning area are best located to protect the natural and landscape values of the planning area and satisfy owners access requirements;
4. negotiating to cancel unnecessary road reserves within the planning area and adding these to the planning area (see Section 11 *Proposed Tenure, Purpose, Vesting and Boundary Changes*);
5. ensuring 'management vehicle only' tracks are effectively closed to the public, and only permitting limited public access subject to meeting the criteria for sustainable track use and the written approval of the Department's District Manager;
6. continuing to prohibit vehicles driving off established roads unless authorised in exceptional circumstances by the District Manager, with the exception of wilderness areas;
7. ensuring that stream crossings of tracks are minimised, are designed to reduce the possible impacts of erosion and hydrocarbon contamination, and appropriately advise visitors of risks associated with crossing;
8. improving facilities and services for disabled visitors, consistent with the Department's *Disability Services Plan*, by:
   - reviewing access within the planning area over the life of the plan to determine the possibility of encouraging greater access to existing recreation sites; and
   - considering disabled visitors in the design of new facilities; and
9. providing appropriate information and interpretation on appropriate four-wheel drive techniques, such as the Department's 'Caring Code for the Bush' and the WA Four Wheel Drive Association Code of Ethics to promote awareness, appreciation and understanding.

Key Performance Indicators:
The Key Performance Indicator KPI 28.2 applies to this section.

30. VISITOR ACTIVITIES AND USE

Abseiling and Climbing

In recent years there has been a marked increase in abseiling and, to a much lesser extent, rock climbing in WA. These activities are usually undertaken in organised groups, often on a commercial basis (see Section 33 *Commercial Operations*). Abseiling as a motivational or team building exercise is also becoming more common. This, plus the rise in the number of adventure tourism companies, has led to an increase in requests for access to the cliffs and granite monadnocks in the planning area for these activities.

Abseiling can involve large groups of beginners under instruction. The participants do not necessarily have experience in mountain safety and climbing, and group instructors have a responsibility to ensure that all members of the group observe safety, environmental and ethical standards. This requires certain minimum standards of experience and competency in instructors and acceptable student-to-instructor ratios.

Recreational abseiling and climbing occur at Mt Frankland, Thompson's Cove and Elephant Rocks and a number of other informal sites in the planning area, as well as in adjoining areas, such as West Cape Howe (Richardson 1998). Mt Frankland is a popular site for day visitors and bushwalkers, and conflicts may occur where walking tracks pass close to climbing and abseiling areas. Potential problems may arise from rocks and other dislodged material falling onto walkers or walkers creating distractions for climbers. This issue may be alleviated with signage at the site. Commercial tour operators are not permitted to use Mt Roe because it is located within the proposed Peak/Roe wilderness area (see Section 13 *Management of Wilderness Areas*). Recreational rock climbing and abseiling will be permitted within the planning area at

Mt Frankland, Thompson's Cove and Elephant Rocks and a number of other informal sites in the planning area subject to Department Policy No. 18 – *Recreation, Tourism and Visitor Services*.

A Threatened Ecological Community is located on the upper slopes and summit of Mt Lindesay (see Section 21 *Ecological Communities*). While recreation activities have been identified as one of the main threats to this ecological community through erosion, trampling and the spread of *P. cinnamomi*, these impacts will be addressed as part of site redevelopment of a more formalised walking track. However, similar impacts could occur with climbers accessing areas away from walking tracks. Therefore, climbing is not considered an appropriate activity within the Mt Lindesay area.

The Climbing Association of WA (CAWA) has adopted a 'climbers code of ethics', which addresses safety, environmental and social impacts of climbing, and all climbers are required to observe this code when climbing on lands managed by the Department. All commercial operators as well as not-for-profit groups conducting rock climbing and abseiling with dependent participants (such as school groups, scout groups, community groups, or youth groups) will be required as part of the conditions applying to their licence or other approval to be registered under the *National Outdoor Leader Registration Scheme* or hold current equivalent accreditation recognised by the Department's Director General. A permit or booking system may be applied in areas where there are environmental, social or safety concerns about the numbers of visitors using a site.

30. Visitor Activities and Use – Abseiling and Climbing

Key Points

- Recreational rock climbing and abseiling opportunities exist within the planning area at Mt Frankland, Thompson's Cove, Elephant Rocks and other informal sites.
- A threatened ecological community occurs on the upper slopes and summit of Mt Lindesay and rock climbing or abseiling will not be permitted at this site.
- Commercial operators and organised groups who conduct rock climbing and abseiling activities on Department managed lands must book and obtain a permit. Commercial operators and organised groups will not be permitted to conduct rock climbing and abseiling activities at Mt Roe.
- CAWA has a 'climbers code of ethics', which addresses safety, environmental and social impacts of climbing. All climbers are required to observe this code when climbing on lands managed by the Department.

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

This will be achieved by:

1. permitting recreational rock climbing and abseiling at Mt Frankland, Thompson's Cove, Elephant Rocks and other informal sites, subject to ongoing assessment and Department policy;
2. applying a permit or booking system in areas where there are environmental, social or safety concerns about the numbers of visitors using a site;
3. introducing management controls, particularly in natural areas, where disease concerns may threaten reserve values, including the provision of cleaning stations, issuing of permits, temporary resting, re-alignment or closure of tracks;
4. permitting rock climbing and abseiling with commercial operators at Mt Frankland, Thompson's Cove and Elephant Rocks, where groups have first obtained a commercial activity licence; and
5. promoting the CAWA Code of Ethics.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

Boating

The main water bodies within the planning area used for boating are the Deep and Frankland Rivers. A number of other waterways, such as the Walpole, Nornalup, Irwin and Parry inlets, lie adjacent to and are accessed from launch areas through lands managed by the Department. A variety of boats and water craft access these water bodies including powercraft (powerboats and jet skis), sail-craft and canoes/kayaks/rafts. Individuals, family, community and school groups, activity associations, commercial tour operators and competitions/events often access these water bodies for fishing, canoeing, water-skiing, jet-skiing and gaining access to destinations such as The Depot, Newdegate Island and the Southern Ocean.

A management plan is being prepared for the Walpole and Nornalup Inlets Marine Park (see Section 3 *Planning Area*). As visitors require access through parks and reserves to the Walpole and Nornalup Inlets for boat-launching, there will be a need to ensure consistent and integrated management of both the marine and terrestrial parks.

A range of boating also occurs beyond the rivers and inlets to the Southern Ocean. Visitors require access to the Southern Ocean through William Bay National Park, and boat launching, day-use and camping facilities within the national park. Sea kayaking is growing in popularity in Australia, and is known to occur between Parry Inlet and Parry Beach, Mazzoletti Beach and Greens Pool in William Bay National Park. Sea kayakers will require access to the coast through the Walpole-Nornalup and William Bay national parks, as well as camping facilities and suitable areas for launching.

Operational safety for boating activities is provided by the Department for Planning and Infrastructure under the *Shipping and Pilotage Act 1967*, the *Shipping and Pilotage (Mooring Control Areas) Regulations* made under that Act, and the *Navigable Water Regulations* of the *Marine Act 1982*. The CALM Act enables the Department to determine where boating may occur on waters managed by the Department, although the *Navigable Waters Regulations* and *Shipping and Pilotage (Mooring and Control Areas) Regulations* still apply.

The Walpole Yacht Club is located at Coalmine Beach, where a section of the beach has been leased for clubrooms, toilets, boat launching area, picnic facilities and jetty (see Section 33 *Commercial Operations*). This club has been in operation since 1964. The previous *Walpole-Nornalup National Park Management Plan* (CALM 1992) recommended the redevelopment of the Coalmine Beach Area, in conjunction with the club and the long-term renewal of the Walpole Yacht Club lease. This re-development is ongoing and the lease will be periodically renewed on a future needs basis as negotiated between the club and the Department.

The *Walpole-Nornalup National Park Management Plan* (CALM 1992) highlighted camping by canoeists on riverbanks and launching as significant issues. Recommendations were made to maintain existing boat ramps within the park, provide canoe-launching facilities at Nornalup, and provide more information to canoeists at launching sites. Canoe launching facilities have been constructed at 602 Road and Monastery Landing, and information has been provided at Fernhook Falls. However, there is demand for similar facilities elsewhere in the planning area. There are visitor safety issues associated with paddling, and the provision of appropriate information is critical in informing visitors and managing risks.

Canoeing and other forms of non-motorised boating will be allowed on the Deep and Frankland rivers and on other rivers in the planning area where these craft can safely be used. A draft 'Paddling Management Strategy' for the Warren Region has been prepared by the Department in ongoing association with other agencies and paddling groups (such as Canoeing WA), which

will provide guidance on the provision of paddling opportunities, facilities and management. However, generally:

- a wide range of opportunities for paddlers will be provided, depending on community demand;
- water bodies will be progressively assessed according to a number of boating criteria (including the degree of difficulty to paddle; water levels and flow rates; trip grades; the protection of natural and cultural values; susceptibility of river bank soils to erosion and disturbance; risks to water quality; the overuse of sensitive areas; past history of use and compatibility with Departmental operations; and the use of the water body in an appropriate management setting), and current and future use of these water bodies will be based on the results of these assessments;
- low risk paddling opportunities should be considered and promoted; and
- paddling opportunities that provide economic benefit to the community will be promoted.

Motorised boating is generally not permitted on inland waters where its use is not already established. Motorised boat use, albeit negligible, may occur at particular times (such as during peak flows) and locations on the Frankland and Deep rivers, and this situation will continue to be allowed. However, it is recognised that it may be necessary for motorised boats to operate on waterways elsewhere in the planning area. These may include Departmental and search and rescue operations, scientific research, inspections by agencies and for safety purposes during organised non-motorised boating events (see Section 30 *Visitor Activities and Use – Special Events*). In these instances, approval of the Department for Planning and Infrastructure and the District Manager is required and a permit may be issued.

30. Visitor Activities and Use – Boating

Key Points

- Non-motorised boating within the planning area occurs on the Frankland and Deep rivers.
- A number of other waterways, such as the Walpole, Nornalup and Irwin inlets and the Southern Ocean, lie adjacent to and are accessed from launch areas through lands managed by the Department.
- A management plan is being prepared for the Walpole and Nornalup Inlets Marine Park.

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

This will be achieved by:

1. progressively assessing water bodies within the planning area according to a number of boating criteria, and providing a range of paddling opportunities within the planning area based on these assessments;
2. permitting non-motorised boat use along the Deep and Frankland rivers;
3. permitting motorised boat use on the Deep and Frankland rivers, where it is practicable and safe to do so;
4. permitting non-motorised boating events (see Section 30 *Visitor Activities and Use – Special Events*) following assessment and Departmental and Department for Planning and Infrastructure approval (where applicable);
5. permitting commercial operators to run non-motorised boating tours along the Deep and Frankland rivers, subject to visitor safety, maintenance of natural and cultural values and the relevant licensing conditions. Commercial operators will not be permitted to run boating tours through wilderness areas;
6. investigating strategies to separate incompatible activities, including boating activities,

as required;
7. liaising with other agencies and paddling groups on development of paddling opportunities and facilities, and on evaluating the sustainability of boating within the planning area; and
8. providing information, signs and interpretation opportunities at popular paddling launch areas, including information on hazards and boating regulations for visitors.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

Bushwalking

Bushwalking is an activity that can be enjoyed by people of varying ages, interests and levels of physical fitness and mobility. Bushwalking can encompass everything from a short, leisurely stroll to a major trek lasting days or weeks. In comparison with motorised or other assisted types of access, bushwalking enables visitors to experience the natural environment at close quarters. Australian Standard 2156.1-2001 provides guidance for walking track classification and signage in order to provide consistency of information to users of walking tracks, to minimise risk, preserve natural features and enhance recreation opportunities associated with the use of walking tracks (Standards Australia 2001). Six classes of walking tracks are recognised ranging from tracks where there is no modification to the natural environment (Class 6) to broad, hard surfaced tracks suitable for wheelchair use (Class 1).

A variety of bushwalking opportunities occur in the planning area ranging from short Class 1 and 2 tracks such as the very popular 'Tree Top Walk' and 'Ancient Empire' tracks at the Valley of the Giants to the Class 6 Nuyts overnight treks to Mt Hopkins, Boggy and Crystal Lakes.

The Bibbulmun Track (Map 12) is a long distance walking track stretching 963 km from Kalamunda in Perth to Albany and passing through coastal parts of the planning area. The Track has the best facilities, and is the most heavily used of all the longer bushwalking opportunities in the planning area. The Bibbulmun Track comprises a mixture of track classes.

Visitors to the planning area have requested a greater diversity and number of walking opportunities. These include opportunities to walk dogs close to towns (see Section 35 *Domestic Animals*) and more tracks in a wider variety of landscapes. There is also demand for walking track development to be linked with features of particular interest, such as the flora and fauna, sites of indigenous and non-indigenous cultural heritage (e.g. Captain Bannister's historical exploration route, see Section 27 *Non Indigenous Heritage*).

An increasing number of park visitors are looking for more remote 'off-track' experiences. The planning area has a large variety of vegetation types, landscapes, coastline and wetlands, providing a range of opportunities for walking tracks. While the Bibbulmun Track already provides a long distance walking track through the planning area, further day or two-day walks and loops with facilities within appropriate visitor management settings are proposed (Table 10), which will provide additional long walk opportunities and link in with this track. There are also Class 6 remote bushwalking opportunities within the two proposed wilderness areas (see Chapter C – *Managing Wilderness Values*). Visitors have also requested a greater provision of boardwalks (Class 1 trails), guided walks and loop tracks.

Existing and potential walking tracks within the planning area are outlined in Table 10. This listing of tracks may not be exhaustive, and other tracks may be provided that are consistent with visitor management settings and maintenance of other values within the planning area. Some of the potential tracks may also be classed as dual or multi-use to cater for other users such as cyclists (see Section 30 *Visitor Activities and Use – Cycling*). The management setting describes the zone within which the track is located, and not the setting of the track.

Not all of the development of potential tracks or re-development of existing tracks may be achieved over the life of the plan. No priorities are assigned to these tracks, and tracks may only be developed subject to further detailed area Master Planning and specific site planning, according to the recreational development criteria of visitor risk, environmental impacts, social benefit, equity, public demand, and potential economic benefit. The amount of funding available will also determine priorities and affect what is achieved. Some tracks may also need to be closed for reasons such as environmental impacts, low usage or the need to relocate the activity.

Table 10. Walking tracks within the planning area

Track Name	Length	Class(s) 1 - 6	Management Setting[1]
Existing Tracks that may Require Some Form of Minor Re-development			
Valley of the Giants - Tree Top Walk	600 m	1	Developed
East Knoll - West Coalmine to East Coalmine multi-use path	0.4 km	1	Developed
Fernhook Falls access path		1-2	Developed
Valley of the Giants - 'Ancient Empire'	800 m	2	Developed
Elephant Rock		2-3	Developed
Conspicuous Beach - Picnic Shelter and first lookout platform	200 m	1	Recreation
Conspicuous Beach - Beach Walk	80 m	2	Recreation
Conspicuous Beach - Whalewatch lookout	650 m	2	Recreation
Giant Tingle Tree Track	800 m	2	Recreation
Bibbulmun Track - Frankland River to Giants	14 km	4	Recreation
Bibbulmun Track - Giants to Rame Head	16 km	4	Recreation
Bibbulmun Track - Mt Clare to Walpole	10 km	4	Recreation
Bibbulmun Track - Peaceful Bay to Irwin Inlet	8 km	4	Recreation
Bibbulmun Track - Rame Head to Peaceful Bay	10.5 km	4	Recreation
Bibbulmun Track - Walpole to Frankland River	18 km	4	Recreation
Shelly Beach Walk Track	1.5 km	4	Recreation
Mt Burnett	946 m	3	Natural - Recreation
Bibbulmun Track - Boat Harbour to Parry Inlet	11 km	4	Natural - Recreation
Bibbulmun Track - Irwin Inlet to Boat Harbour	15 km	4	Natural
Bibbulmun Track - Long Point to Mt Clare	12 km	4	Natural
Bibbulmun Track - Parry Inlet to William Bay	9 km	4	Natural
Bibbulmun Track - William Bay to Denmark	15 km	4	Natural
Sealer's Cove/Circus Beach Walk	3 km	4	Natural
Nuyts Mt Hopkins Walk	18 km	4	Natural
Nuyts Overnight Walk (Aldridge Cove)	20 km	4	Natural
Nuyts Short Walk	7 km	4	Natural
Nuyts Walk Trail (Thompson Cove)	18 km	4	Natural
Nuyts overnight treks – Mt Hopkins, Boggy and Crystal Lakes.	20 km	6	Natural
Existing Tracks that may Require Some Form of Significant Re-development			
East Knoll - Coalmine Beach Heritage Track	6 km	2	Developed
Horseyard Hill	1 km	2	Developed
Mt Frankland Summit and round the rock walk	2 km	3	Developed
The Knolls Fishing Spot No. 1 access track	100m	3	Developed
The Knolls Fishing Spot No. 2 access track	100m	3	Developed
Circular Pool access path	500m	1-2	Recreation
Mt Clare Summit Walk	1 km	2-3	Recreation
Mt Lindesay Summit	8 km	4	Recreation
Sandy Beach Walk	3 km	3	Recreation
Sawpit Track	0.6 km	3	Recreation
The Knolls	3 km	3-4	Recreation

Track Name	Length	Class(s) 1 - 6	Management Setting[1]
Potential Walk Tracks			
Lake Byveld and William Bay Visitor Centre	<1 km	1-2	Developed
Mt Lindesay View walk	<1 km	1	Developed
Swarbrick plaza and exhibition walk	500m	1	Developed
East Knoll - Channels multi-use path	50m	2-3	Developed
Inlets Edge Walk	4 km	3	Developed
Swarbrick – other interpreted walking tracks	0.5-2 km	3	Developed
Swarbrick/Buster Road Dual Use Track (walk/cycle)		3	Developed
West Knoll Loop Walk	3.5 km	3	Developed
Mitchell River area walk track		3-4	Developed
Tower Hill Loop		3-4	Developed
Mt Frankland Caldyanup walk	500m	1	Recreation
Rest Point Inlet Walk	2.4 km	1	Recreation
Circular Pool	500m	1-2	Recreation
Millar's Basin Loop	<1 km	2	Recreation
Perillup Parking Bay walks	<1 km	2	Recreation
Hilltop to Giant Tingle Tree	7 km	2-3	Recreation
Walks in Thames Forest Conservation Area	various	2-3	Recreation
Rest Point View to Inlet's Edge Walk	60m	3	Recreation
Arboretum Walks, Bridge Road	1-6 km	3-4	Recreation
Bee Road walks	1-6 km	3-4	Recreation
Bridge Road walks	1-6 km	3-4	Recreation
Falls of Forth walk track		3-4	Recreation
Frankland Bridge/Myalgelup Pools Walk	23 km	3-4	Recreation
Greens Pool to Light's Beach coastal walk		4	Recreation
Greens Pool, Light's Beach, Lake William, Tower Hill Loop		4	Recreation
Hilltop Circular Pool Loop Walk	17 km	3-4	Recreation
Keystone Hill	various	3-4	Recreation
Lower Frankland Loop	12 km	3-4	Recreation
Mt Clare – Shedley Drive Loop	7 km	3-4	Recreation
Mt Lindesay trailhead to Turtle Rock	2-3 km	3-4	Recreation
Nornalup to Tree Top Walk Loop	13 km	3-4	Recreation
Peaceful Bay, Conspicuous Cliff and Irwin Inlet Loop		3-4	Recreation
Point Irwin Loop Walk	6 km	3	Recreation
Fernhook, Mt Chance, Mt Pingerup and Deep River Loop	26 km	3-4	Natural - Recreation
Woolbales – Centre Road Loop	33 km	4-5	Natural - Recreation
Fernhook Southern Loop	14 km	2-3	Natural
Smythe Hill Walk	3 km	3-4	Natural
Granite Peak summit	2-3 km	4	Natural
Long Point – Nuyts Loop	20 km	4-5	Natural
Mitchell River Loop Walk		4-5	Natural
Mt Lindesay Day Walk		4-5	Natural
Frankland Link Trail (Bandicoot Road to Mt Frankland)	34 km	4-6	Natural
Greater Mount Lindesay Loop		5	Natural
Wilderness walking	various	6	Wilderness
Bannister's Track	100 km	6	various
Deep River walking route (Shedick Road to Walpole)	69 km	3-5	various
Frankland River walking route (Muir Highway to Nornalup)	109 km	3-6	various

1 = Refer to Appendix 9 for a description of the settings.

Tracks that provide an assortment of opportunities in one area and provide links to other facilities and activities are often desirable to walkers. The provision of walking tracks will generally be integrated with the provision of vehicle access, other facilities, interpretive information (such as trailheads) and linkage to other activities (such as scenic driving and picnicking).

There can be safety risks associated with bushwalking, particularly on long distance hikes (see Section 34 *Visitor Safety*). Bushwalking safety can be enhanced through the provision of effective signs and visitor information programs designed to ensure walkers are adequately informed about and equipped to handle the conditions they will encounter. The Department's 'Caring Code for the Bush' (see Section 13 *Management of Wilderness Areas*) offers visitors a number of pre-trip safety guidelines, as well as guidelines during the trip, including rubbish disposal, toilet waste disposal and keeping to existing tracks. Not all bushwalking tracks are/will be actively maintained throughout the year, although the most frequented tracks may be inspected and/or maintained more often. Any areas not suitable for walkers need to be clearly identified, as bushwalkers often do not keep to marked tracks.

The Shires of Denmark (Maher Brampton Associates 1999) and Plantagenet (Malone and Antill 2006) have Trails Master Plans that include several potential areas for walking tracks within the planning area. The Department will work collaboratively with the Shires of Denmark, Manjimup and Plantagenet, and other walking interest groups such as local and adjacent Visitor Centres and Tourism WA on development of walking tracks in the planning area.

30. Visitor Activities and Use – Bushwalking

Key Points

- Bushwalking enables visitors to experience the natural environment at close quarters.
- There are a range of bushwalking opportunities within the planning area, within a diversity of landscapes and vegetation types. Close to 260 km of walking tracks of classes 1 to 6 exist within the planning area, and nearly 440 km of walking tracks are proposed.
- Although the impact of bushwalking on the environment is comparatively low, impacts on vegetation and the spread of weeds and diseases such as *P. cinnamomi* can occur.

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

This will be achieved by:

1. providing a range of bushwalking opportunities (Table 10) consistent with the criteria for each class of track and the appropriate management setting;
2. appraising visitor needs and environmental impacts as well as the availability of resources for construction and ongoing maintenance of walking tracks;
3. constructing and locating all tracks in accordance with established planning procedures, environmental controls and standards, such as:
    - tracks located so as to enhance visitor experiences of the range of natural values of the planning area and, where appropriate, interpretation opportunities;
    - alignments and grades selected so as to provide a range of standards to suit visitor requirements and safe access with minimum disturbance to the natural environment and minimum maintenance;
    - providing signage of the degree of track difficulty and length;
    - providing tracks of a consistent class where possible;
    - providing walking tracks where there is a minimum risk to the visitor and minimum interference to park values;
    - locating walking tracks in the planning area that complement or link up with tracks on adjoining lands, where practicable;
    - constructing interpretive walks and shorter loop paths to a standard suitable for use by people with disabilities, where practicable;
    - matching the class of the track to the appropriate management setting;

- providing boot-cleaning stations for disease control, particularly where tracks traverse between infested and uninfested areas; and
- combining trailheads with other facilities for best use of resources and security of parked vehicles;

4. introducing management controls including the issuing of permits, temporary resting, re-alignment or closure of tracks where walking threatens track values or the enjoyment of other visitors;
5. providing bushwalkers with a code of conduct that applies to bushwalking within the planning area, including:
   - recommended party size;
   - camping and campfire policy; and
   - waste disposal;
6. providing adequate information about walking from which visitors can choose the walk best suited to their needs and abilities;
7. controlling bushwalking in areas temporarily or permanently closed for reasons such as disease management, protection of threatened species, rehabilitation or wildfire; and
8. liaising with the Shires of Denmark, Manjimup and Plantagenet, and other walking interest groups such as local and adjacent Visitor Centres and Tourism WA on development of future walking tracks in the planning area.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

Caving

Caves can have special natural, cultural, scientific, aesthetic or recreational values, and require careful protection. Once damaged, cave decorations may never reform or may take thousands of years to re-establish.

A cave classification system was developed in the 1970s by the former WA Working Group on Cave Protection and Management, which recognises three categories of caves:

- restricted entry – where maximum protection should be afforded and access is restricted to experienced and responsible speleologists or scientists for research, monitoring or management purposes;
- adventure or wild – requiring general protection and requires the caver to either register at the cave entrance or to obtain a written permit prior to planning or commencing an excursion; and
- tourist – the cave is developed and managed for tourist use and/or as an educational resource. These caves should be clearly signposted with access restricted to specified times after payment of an appropriate fee at the time of entry.

Expertise on cave management in WA largely resides with the amateur speleological groups, *viz* the WA Speleological Group and the Speleological Research Group of WA, both of whom are affiliated with the Australian Speleologist Federation. Some individuals within the Department have considerable cave management experience and also belong to the Australasian Cave and Karst Management Association. Appropriate advice can be sought from these groups regarding ongoing classification, management and protection of caves and karst[27] features.

Hancock (1994) describes cave and karst features in the planning area (see Section 16 *Geology, Landforms and Soils*). However, caves within the planning area have not been classified according to the above system of cave classification.

[27] Karst is a limestone region with underground streams and many cavities caused by dissolution of the rock.

The Nuyts karst area contains several caves and is recognised as having high natural value with moderate to high human use. As such it is important to maintain and protect the natural deposition of the karst area and ensure that current and future activities in the area do not detrimentally affect these attributes.

Granite caves exist at a number of sites across the planning area, such as Granite Peak, Mt Mitchell and Mt Roe. However, there is little knowledge about them and they require further examination for their natural and heritage values. Possum Trapper's Cave, north west of Denmark, is a single open chamber in the side of a large granite monadnock. A possum trapper is believed to have inhabited the cave in the 1920s and, as such, it is important to protect the cave's heritage value.

Caving is not a popular activity in the planning area and, due to the natural and cultural significance of caves in the area, the caves are not considered tourist caves and visitor access to caves will not be actively encouraged. Caves can pose a risk to visitors, including the risk of falls on slippery rocks, laceration from sharp rock surfaces, flash flooding, rock falls, hypothermia, the potential to become lost, exhaustion from foul air (carbon dioxide), dehydration, and stings and bites from snakes and spiders. Some caves may require closure, or signs to make visitors aware of these hazards.

30. Visitor Activities and Use – Caving

Key Points

- Several caves of some scientific, historic and visitor interest exist within the planning area, although visitation and use of caves is only occasional.
- The conservation value of the caves and concerns for public safety need to be taken into account in planning and management of caves and potential public use.
- Public visitation to caves in the planning area will not be actively encouraged.

The objective is to sustainably manage the caves and karst systems in the planning area for their intrinsic natural, cultural and recreation values.

This will be achieved by:

1. classifying caves in the planning area according to the Department's cave management classification system;
2. only allowing registered speleological clubs that carry public indemnity insurance or certified tour operators to access caves within the planning area, subject to further work on classification;
3. alerting visitors to the potential hazards within caves;
4. considering possible adverse impacts on cave features when undertaking surface management operations, such as fire management; and
5. not encouraging the visitation of caves in the planning area or publicising cave locations on Departmental maps or in other publications; gating and locking caves (temporarily or permanently) if:
    - there is no practical alternative to preventing damage to the cave decorations, flora, fauna, or the cave itself;
    - there is no practical alternative to protecting significant decoration, scientific work undertaken, rehabilitation or protecting the general public from a particularly dangerous area;
    - it is practical to do so without damaging the cave; and
    - it is practical to do so without disturbing essential airflow and/or water flow for cave fauna (such as bats).

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Cycling

There has been a rapid growth in the popularity of cycling, particularly mountain biking, both 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 to this, the Department established a Mountain Bike Working Group and is working with the WA Mountain Bike Association, bike clubs and other groups/users to develop a classification system for developing sustainable, purpose-built mountain bike facilities throughout the State. The Department is developing Mountain Biking Management Guidelines that includes a classification and difficulty rating system based on the International Mountain Bicycling Association (IMBA) standards. Mountain biking styles that ride specialised bikes on off-road trails are (i) 'singletrack', (ii) cross-country, (iii) downhill, and (iv) freeriding. Trail types range from 'easiest' to 'extremely difficult', and are classified relative to the trail grade, surface type and width, technical trail features and trail obstacles to allow riders to match their riding ability with the appropriate trail, manage risks and minimise injuries, improve the recreation experience for a variety of visitors and to plan trail systems.

The impacts of cycling on the natural environment are generally minimal, providing this activity is confined to roads and trails that are appropriately located, designed, maintained and managed. The CALM Regulations permit cycling on public roads and vehicle tracks on lands managed by the Department (unless specifically prohibited), and on designated bicycle paths and shared paths. Cycling off public roads and tracks is not permitted unless in designated areas or on designated cycle trails. Cycling off public roads and tracks needs to be consistent with the purpose of a reserve and the likelihood of an activity being permitted, and will generally not be designated in nature reserves without consultation with the Conservation Commission. 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. Bicycles are also considered vehicles under the *Road Traffic Act 1974* and therefore are not to be ridden within Disease Risk Areas without a permit. Cycling events will be considered for approval on a case-by-case basis (see Section 30 *Visitor Activities and Use – Special Events*). Commercial bicycle tours and the operation of bicycle hire businesses may be permitted, subject to normal licensing and approval processes. The development of a Code of Conduct or trail use guide may be a useful way of guiding the use of bicycles in the planning area.

There are currently no specific cycling opportunities or designated areas/trails available in the planning area and cyclists have been using the South West Highway, which does not specifically cater for cyclists and is not considered safe. Hence, a range of potential cycling opportunities are suggested in Table 11. This listing of trails may not be exhaustive, and other trails may be provided. Trails need to be consistent with visitor management settings, adequate maintenance of conservation and other values, safety standards and the rights and enjoyment of other visitors. Some of the potential trails may also be classed as dual or multi-use to cater for other users such as walkers (see Section 30 *Visitor Activities and Use – Bushwalking*), although shared paths will be signposted accordingly. The management setting describes the zone within which the trail is located, and not the setting of the trail.

Not all of the development of potential trails or re-development of existing trails may be achieved over the life of the plan. No priorities are assigned to these trails, and trails may only receive attention, subject to further detailed area Master Planning and specific site planning, according to the recreational development criteria of visitor risk, environmental impacts, social benefit, equity, public demand, and potential economic benefit. The amount of funding available will also determine priorities and affect what is achieved. Some trails may also need to be closed for reasons such as environmental impacts, low usage or the need to relocate the activity.

Table 11. Potential cycle trails within the planning area

Trail Name	Trail type	Class
Munda Biddi cycle trail	Cycle	
'Round the Wilderness' Loop Cycle Trail	Cycle	
Coalmine Beach Heritage Trail	Dual Use	Easiest
Swarbrick/Buster Road dual use trail (walk/cycle)	Dual Use	Easiest
West Coalmine to East Coalmine multi-use path	Dual Use	Easiest
Hilltop – Circular Pool Loop path	Dual Use	Easiest
Channels Multi-use path	Dual Use	Easiest
Walpole to Rest Point trail	Multi-use	Easiest
Fernhook Falls loop trail in Wye and Deep forest areas	Cycle	Easy
Deep Valley Cycle Loop via Ordnance, Deep, Our and Pitcher Plant roads	Cycle	Easy
Giants trail	Cycle	Easy
'Thames on the Kent' trail	Cycle	Easy
Harewood trail	Cycle	Easy
Walpole-Nornalup Loop	Cycle	Easy

The Munda Biddi long distance cycle trail from Perth to Albany is proposed to go through the planning area linking cyclists with many forest attractions and towns including Manjimup, Pemberton, Northcliffe, Walpole and Denmark. The Department will work collaboratively with the Shires of Denmark, Manjimup and Plantagenet in the development of the Munda Biddi and other cycle trails. Planning for the Munda Biddi cycle trail will consider all options, and is expected to incorporate some additional loop trails and link with other potential cycle trails and recreation sites in the planning area. Some of these potential trails may be dual or multiple use to accommodate other users (see Section 30 *Visitor Activities and Use – Bushwalking* and *Horseriding*).

A multi-use trail along the alignment of the Denmark-Nornalup Rail Trail is being planned and constructed. Trail development and cycling within those parts of the trail that traverse lands managed by the Department will be consistent with Departmental policies and standards, visitor management settings, adequate maintenance of conservation and other values, recreational development criteria, safety standards and the rights and enjoyment of other visitors.

30. Visitor Activities and Use – Cycling

Key Points

- Most bike sales in Western Australia are mountain bikes.
- Impacts are minimal on well-maintained tracks, but may include damage to vegetation, soil erosion, conflict with other users or the spread of disease.
- The Department is developing Mountain Biking Management Guidelines that includes a classification and difficulty rating system based on the IMBA standards, which classifies trails relative to a trail's grade, surface type and width, technical trail features and trail obstacles to allow riders to match their riding ability with the appropriate trail, manage risks and minimise injuries, improve the recreation experience for a variety of visitors and to plan trail systems.
- The long-distance Munda Biddi cycle trail is proposed to traverse the planning area, providing visitors of a range of age groups and cycling abilities with the opportunity to enjoy the forest environment. Planning for this trail will consider all options. There is the potential for a range of other cycling trails.

The objective is to provide opportunities for cycling in the planning area that do not adversely impact on natural, landscape and other values.

This will be achieved by:

1. permiting cycling on public roads and designated trails in the planning area, consistent with Department policies, visitor management settings, adequate maintenance of natural and other values, safety standards and the rights and enjoyment of other visitors;
2. permitting cycling on dual/share use trails, subject to the safety and enjoyment of other visitors, adequate maintenance of the track surface, and appropriate signposting;
3. developing, where resources permit, the long distance Munda Biddi cycle trail and other potential trails through the planning area in consultation with the Shires of Denmark, Manjimup and Plantagenet and in accordance with recreational development criteria of visitor risk, environmental impacts, social benefit, equity, public demand, and potential economic benefit;
4. constructing and locating all tracks in accordance with established planning procedures, environmental controls and standards (see Section 30 *Visitor Activities and Use – Bushwalking*);
5. introducing management controls, particularly in natural areas, where disease concerns may threaten reserve values, including the provision of cleaning stations, issuing of permits, temporary resting, re-alignment or closure of tracks;
6. restricting cycling activity on tracks used by other track visitors, except where they are designated dual-use paths; and
7. providing appropriate information and interpretation for cyclists, particularly about the impacts on the environment and actions that can be taken to minimise these impacts, to promote awareness, appreciation and understanding.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Enduro, motorcycle and trail bike riding

There is reasonable demand by organised groups and individuals for access to lands managed by the Department for trial, trail and enduro motorcycle riding. These are held on approved courses elsewhere in the region, and are organised by a variety of clubs. Riding is mainly conducted for personal satisfaction and recreational sightseeing. However, motorcycle events are also capable of generating considerable economic revenue for surrounding towns.

There has been some interest in the use of the planning area for enduro, motorcycle and trail bike events by individuals and the Denmark Motorcycle Club. In the past, this group has used a number of blocks in the vicinity of Walpole and Denmark on an annual rotational basis (i.e. once a year). These include Wye, Keystone, Burnett, Swarbrick, Styx, Harewood, Sheepwash, Hay and Redmond blocks. The local Department office often receives requests from visitors seeking appropriate areas in which to ride trail bikes. The Denmark Motorcycle Club uses a code of conduct used by Motorcycling Australia, which has a WA based branch, Motorcycling Australia (WA). This code outlines appropriate behaviour of competitors, rather than guidelines for the use of natural areas.

Motorcycle and trail bikes will be permitted to use the roads and motor vehicle tracks open to the public within the planning area (Map 12, see Section 29 *Visitor Access*). Roads and motor vehicle tracks that are closed or 'management vehicles only' will be signposted in the field and will not be open for use by motorcycle or enduro riders, or any other vehicles.

Competitive rallies and other motor sport events are not permitted in nature reserves, national parks or conservation reserves, unless there has been a change in land tenure from State forest and there has been a history of competitive use. As Keystone block was previously State forest, it is recommended that these activities be permitted within Keystone block (outside of the PDWSA) in national park, but elsewhere in the planning area restricted to the forest

conservation areas, and subject to approval from the Department (and in some cases the Conservation Commission). Other relevant authorities, such as the Department of Water and Department of Health, may also have an interest in an application (see Section 45 *Water Resources*). Where requests are made to conduct special events for activities that are inconsistent with these policies, the event must be of national significance and approval is required from the Conservation Commission. Events should always use existing roads and motor vehicle tracks.

There have also been requests from the Denmark Motorcycle Club and other motorcycling stakeholders for the exclusive use of areas for motorcycles. Designating areas exclusively for motorcycle use within the planning area is not practical and would have a major impact on other activities and environmental amenity. However, it is proposed that motorcycle riders will be directed to some specific areas within Keystone block and the forest conservation area in Swarbrick block south of Bee Road. Signage and a network of one-way roads will be developed to ensure the safety of motorcycle riders and other visitors.

30. Visitor Activities and Use – Enduro, Motorcycle and Trail Bike Riding

Key Points

- There has been some historic use of parts of the planning area for motorcycle, trail bike and enduro events, and there is interest by organised groups and individuals for continued access for this activity.

The objective is to provide opportunities for motorcycle, trail bike and enduro riding in the planning area that do not adversely impact on natural, landscape and other values and the use of the area by other visitors.

This will be achieved by:

1. managing motorcycle riding on roads and motor vehicle tracks open to the public within the planning area in accordance with Department policy and the objectives of this plan;
2. restricting organised and competitive events to forest conservation areas within the planning area, and within Keystone block in national park, subject to approval by the Department and other relevant authorities;
3. introducing management controls, particularly in natural areas, where disease concerns may threaten reserve values, including the provision of cleaning stations, issuing of permits, temporary resting, re-alignment or closure of motor vehicle tracks; and
4. providing appropriate information and interpretation for motorcyclists, particularly about the impacts on the environment and actions that can be taken to minimise these impacts and developing a code of conduct for this activity, to promote awareness, appreciation and understanding.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Flying and Hang Gliding

Flying can bring great visitor enjoyment and understanding of natural areas through sightseeing of remote and coastal areas, and is often the most feasible way of experiencing the grandeur of large untracked natural areas. Flying allows disabled and elderly visitors to view and experience the planning area. Flying is also less intrusive on biophysical features than roads. However, recreation in remote areas often involves the search for peace and quiet and the safe enjoyment of the sounds and visions of nature. Research in the Kimberley Region has demonstrated that scenic flights can have significant impacts on the experience of ground-based visitors (J. Collins *pers. comm.*).

The operation of aircraft, both 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 within 500 feet (152 m) vertically or a radius of 600 m of any terrain or water body, except upon take-offs and landings. However, the regulations may be breached for inclement weather conditions, during search and rescue operations or if an exemption has been granted.

The exact extent of powered and unpowered flying activities within the planning area is unknown. Aircraft activities are currently confined to chartered or private flights over the planning area or to occasional landings. The Department's fire detection aircraft regularly fly over the planning area between November and May each year, often utilising the private landing strip (known as aeroplane landing areas, or ALAs, by the Civil Aviation Safety Authority) north-west of Walpole. The extent of other airstrips within close proximity to the planning area that may provide access to airspace is also largely unknown. There is also a landing strip on private property north of the Walpole townsite, which is used quite regularly. Ballooning, although not known to occur in the planning area, may be a potential nature-based commercial operation that is less intrusive on natural and social values.

Hang gliding in the planning area infrequently occurs at Point Hillier in Quarram Nature Reserve. Hang gliders launch from dunes and cliffs and land on Parry Beach. Hang gliding also occurs in the region in nearby West Cape Howe National Park at Shelley Beach and occasionally near Windy Harbour. The opportunity for using the same sites for parapenting, which is similar to hang gliding but utilises a fully controllable parachute to soar once launched from a cliff top, also exists. Any increased demand for hang gliding would need an assessment of the potential impacts and safety concerns before the development of a particular site for launching is approved.

'Fly Neighbourly Advice' (FNAs) have been implemented over a number of other remote natural areas in Australia. These are agreements between natural area managers and relevant aviation groups. These agreements encourage harmonious relations between aviation activities and environmental and conservation interests. The FNAs are a series of guidelines on appropriate flying over natural areas and usually recommend minimum flying altitudes over the natural area. As part of the implementation of the Department's Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas*, the development of FNAs over the proposed wilderness areas will be pursued.

30. Flying and Hang Gliding

Key Points

- Flying can bring great visitor enjoyment and understanding of natural areas and is less intrusive than roads.
- The operation of aircraft, both powered and un-powered, on or over lands and waters managed by the Department comply with relevant Federal and State air safety regulations and procedures.
- Powered aircraft often fly over and land in or near parts of the planning area.
- There is infrequent hang gliding activity at Parry Beach.
- A 'Fly Neighbourly Advice' has been implemented in other states.

The objective is to allow for safe flight over and within the planning area without damaging the environment or the public enjoyment of the planning area.

This will be achieved by:

1. developing, in consultation with commercial aircraft operators, aviation clubs, Federal and State aviation authorities and the Conservation Commission, a 'Fly Neighbourly Advice' for the planning area that encourages the restriction of aircraft flying over and landing within wilderness areas and in accordance with Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas*;
2. allowing continued aircraft landings and fly-overs in the planning area for:
   - search and rescue or other emergency operations;
   - fire detection and control operations;
   - flights necessary to implement management objectives of the planning area;
   - situations where flight safety necessitates overflying the area; and
   - Department-approved operations;
3. restricting aircraft landing within gazetted wilderness areas within the planning area according to Department Policy No. 62 – *Identification and Management of Wilderness and Surrounding Areas*;
4. continuing the use of the private airstrip (or aeroplane landing area) north-west of Walpole for emergency and Department-approved operations. Permission from the Department is required for any additional use of this airstrip. This will continue to be managed as a private airstrip;
5. encouraging the development of nature-based commercial operations that involve aerial scenic flights in areas not sensitive to environmental and social impacts;
6. continuing to allow hang gliding at Parry Beach, provided environmental impacts or conflicts with other visitors are minimised;
7. if demand increases for launch areas for hang gliding, developing ramps, safety barriers, railings and/or safety signs to protect natural values and the safety of visitors if required and in consultation with users; and
8. ensuring that all hang gliding in the planning area is in accordance with the rules and regulations of the Civil Aviation Safety Authority and the Hang Gliding Federation of Australia.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Horse riding

Horse riding in natural bush settings and scenic coastal areas is a popular recreational activity and is part of the cultural heritage of the south-west. Historically, many early south-west settlers used droving routes to move their cattle between the coast and inland properties on a seasonal basis, and many of these droving routes are still known.

Horse riding is managed on the public conservation estate so that such activities will not detract from the overall values of these natural areas. Horse riding is accepted as a suitable means of appreciating and enjoying those natural areas where environmental (Phillips and Newsome 2002) and social impacts can be kept to acceptable limits. Horse riding on dedicated public roads within lands managed by the Department must comply with the *Road Traffic Act 1974*, but horse riding on tracks and roads that are within national parks, nature reserves or State forest are subject to the Department's Policy No. 18 – *Recreation, Tourism and Visitor Services* and the *Conservation and Land Management Regulations 2002*. Under the Regulations, areas where horse riding is allowed need to be designated and published in the Government Gazette.

Horse riding will not be permitted in wilderness/remote areas, areas of special scientific or cultural value, or other areas requiring special protection, except with the approval of the Director General. Horse riding may be permitted in some cases in nature reserves, by way of an approved management plan where 'right of access' is recognised, or where the activity has been previously allowed and the impacts of the activity can be minimised and controlled. Horse

riding may be permitted in national parks, conservation parks, CALM Act section 5(1)(h) reserves by way of an approved management plan where the impacts of the activity can be minimised and controlled. Horse riding is permitted in State forest and timber reserves subject to *Conservation and Land Management Regulations 2002* and operational guidelines, and provided it does not conflict with other users. Horse riding needs to be consistent with the purpose of a reserve and the likelihood of an activity being permitted, and will generally not be designated in nature reserves without consultation with the Conservation Commission.

Within the region, horse riding is restricted in nearby Shannon and D'Entrecasteaux national parks to dedicated public roads (e.g. Deeside Coast Road) and one commercial tour operator. However, there are many old stock routes within the planning area where horse riding was historically used to move cattle, including:

- Lake Muir to My River and Crystal Springs;
- Cambellup to Peaceful Bay (Cambellup-Moriarty route);
- Forest Hill to William Bay (Forest Hill route); and
- a connecting trail between the Cambellup-Moriarty and Forest Hill trails (Moir route) (see Section 27 *Non-indigenous Heritage*).

In the *Walpole-Nornalup National Park Management Plan* (CALM 1992), horse riding was not allowed in the park on the basis that there was limited demand (although illegal use was known in the Crystal Springs and Peaceful Bay areas) and opportunities were provided in surrounding State forest areas. Areas of State forest have contracted within the region with the creation of a number of new national parks, including those within the planning area. There is also currently strong interest from a variety of groups for horse riding in the planning area, and horse riders occasionally use many parts of the planning area usually through approval of the District Manager. Each application is considered in detail weighing up the intended use against the natural values and potential impacts.

The Mount Barker branch of the WA Recreational Horseriders Association has proposed the establishment of a horse riding trail that follows two old stock routes, the Forest Hill and Moriarty-Camballup trails in the eastern part of the planning area. These trails were established in the 1870s and 1900s respectively. With the support of the Department and the Shires of Denmark and Plantagenet, information about these trails has been submitted to the Heritage Council of WA for entry onto the 'Register of Heritage Places' (see Section 27 *Non-indigenous Heritage*). The Cambellup-Moriarty trail has been used recently for recreational rides by the WA Recreational Horseriders Association. Parts of this trail go through proposed wilderness areas and sensitive, low-lying areas, and development of the full extent of the historical alignment as a recreational horse riding trail would not be appropriate. However, subject to further environmental assessment, a north-south long-distance horse riding route will be developed in the eastern part of the planning area, with links to the historical alignments of the stock trails.

Further horse riding opportunities will be recognised through the designation of horse riding areas on roads open to the public within all forest conservation areas (Map 2) and the following areas within national parks, provided the impacts of the activity can be minimised and controlled:

- continuation of the proposed east-west link from the Denmark-Nornalup Rail Trail (below) through boundary tracks and some areas west and north of Nornalup to Deeside Coast Road in Shannon National Park and areas of State forest north and west of the planning area on routes that do not conflict with other users or natural values;
- linking of the eastern north-south historical route (above) through the hinterland areas within Trent and Collis blocks;
- loop trails within Camballup, Amarillup areas; and

- some trails associated with public access roads in the upper Frankland River area in the vicinity of Bevan Road linking to State forest areas to the west.

The development of some camping sites (see Section 31 *Visitor Accommodation – Camping*) with associated facilities such as tether and water points, parking areas for support vehicles (e.g. horse floats), and short 'clover-leaf' loop trails associated with designated areas for horse riding may be appropriate, subject to assessment. The adoption or development of a code of conduct for horse riding on lands managed by the Department (through liaison with stakeholders), together with other interpretation, may enhance safety (see Section 34 *Visitor Safety*) and the understanding about this activity, and minimise any environmental impacts.

Commercial horse riding within designated areas of the planning area is appropriate, provided this activity is controlled and manageable. At present, there is no interest in commercial horse riding in the planning area, although a limited number of commercial operations under licensed conditions in areas designated for horse riding within the planning area may be permissible, subject to assessment on a case-by-case basis.

The old stock routes often ended at coastal areas such as Parry Beach. There is interest in using Quarram Nature Reserve for horse riding. However, given the tenure and ecological importance of this nature reserve, horse riding will not be permitted in this reserve. Beach riding within the planning area will be permitted on Foul Bay Beach at Peaceful Bay.

Horse riding will continue to be available on any dedicated public roads within the planning area (see Section 29 *Visitor Access*), and may be available on Shire-controlled roads and beaches such as Parry Beach, Mary-anne Beach at Boat Harbour and Peaceful Bay.

A multi-use trail along the alignment of the Denmark-Nornalup Rail Trail is being planned and constructed. Trail development and horseriding within those parts of the trail that traverse lands managed by the Department will be consistent with Departmental policies and standards, visitor management settings, adequate maintenance of conservation and other values, recreational development criteria, safety standards and the rights and enjoyment of other visitors. The Department will consult locally to create linkages to horse riding areas that may be established in the planning area, and to a longer distance trail similar to the Bibbulmun Track.

30. Visitor Activities and Use – Horse riding

Key Points

- There is a history of horse riding within parts of the planning area, particularly in the Denbarker, Lake Muir and coastal areas.
- Horse riding is permitted on dedicated public roads within the planning area.
- There is a demand from horse riders for the establishment of trails that follow old stock routes through the Denbarker area, boundaries with private property, and on existing trails in national parks and forest conservation areas in the planning area.

The objective is to provide horse riding opportunities in the planning area that minimise the impact on the environment and on other visitors.

This will be achieved by:

1. permitting horse riding, subject to further investigation, environmental assessment, the minimisation of impacts, Department policy and Dieback Management Plans (see Section 24 *Diseases*), along:
   - all public access roads designated for horseriding in forest conservation areas; and
   - some public access roads designated in national parks.
2. developing a north-south long-distance horse riding trail and associated facilities in the

eastern part of the planning area, with links to the historic stock route alignments;
3. permitting beach riding at Foul Bay Beach at Peaceful Bay;
4. allowing horse riding events, subject to Departmental approval (see Section 30 *Visitor Activities and Use – Special Events*);
5. allowing a restricted number of commercial horse riding operators under licensed conditions (see Section 33 *Commercial Operations*) in designated areas, which will be assessed on a case-by-case basis;
6. encouraging horse riding in areas outside the planning area that are able to sustain this activity;
7. where horse riding is permitted, encouraging use according to the Department Policy No. 18 – *Recreation, Tourism and Visitor Services*, including:
   - following only designated vehicle tracks where they exist;
   - using weed-free feed prior to, and during their use of the planning area;
   - yarding and tethering horses during rest periods; and
   - using designated campsites along bridle tracks when staying overnight or stopping for extended periods. These areas should be as small as possible and located at least 75 m from all rivers, streams and other water bodies.
8. where practical and necessary, purpose-building trails for horse riders, but not to the exclusion of other visitors;
9. restricting numbers of riders in certain places and at certain times (e.g. seasonal use) depending on the sensitivity of the environment, demand, and the results of monitoring; and
10. not permitting riding off established tracks within the planning area.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

Marroning and Fishing

Recreational fishing is managed by the Department of Fisheries throughout the State in accordance with the *Fish Resources Management Act 1994*. Recreational fishing is generally controlled through orders and regulations made under the fisheries legislation in respect to size and bag limits, gear controls, closed seasons and licensing. These controls vary around the State and are amended from time to time. Fishing is permitted in State forests, national parks, nature reserves and other parts of the terrestrial conservation estate in accordance with the *Fish Resources Management Act 1994*, any CALM Act management plan and the *Conservation and Land Management Regulations 2002*. Access to fishing sites is managed by the Department to prevent or manage environmental degradation of riverbanks and foreshores. Recreational fishing includes both freshwater fishing and coastal fishing.

Freshwater fishing is a popular activity in many parts of the planning area. Fish species sought include native species such as the smooth marron and the freshwater cobbler *Tandanus bostocki*, and introduced species such as brown trout, rainbow trout and redfin perch (see Section 23 *Introduced and Other Problem Animals*) (Penn *et al.* 2005).

Marron are largely restricted to the streams and pools in forested areas of the south-west where water quality is higher, and occur in the rivers and most of the permanent fresh water lakes in the planning area. Marroning is a popular activity during the open season (mid to late summer). Although the species has a high reproductive capacity, most marron populations are now being over-fished to the point where it is often difficult to catch specimens of legal size. Fishing for gilgies (*Cherax quinquecarinatus* and *C. crassimanus*) and koonacs (*C. plebejus* and *C. glaber*) also occurs in the planning area (Penn *et al.* 2005).

There are two main types of coastal recreational fishing in the planning area: beach fishing, where access is often gained directly onto or close to the beach by vehicle, and rock or reef

fishing. Rock and reef fishing sites usually have foot access tracks, some of which traverse steep cliffs or sensitive landforms prone to erosion or compaction. Some of these tracks are poorly located and constitute a threat to visitors, the environment or both. Rock and reef fishers will often go to extreme lengths and take great risks to access favoured fishing sites (see Section 34 *Visitor Safety*). Beach fishing is one of the most popular recreational activities in the planning area and is often associated with four-wheel drive access. Typically, beach fishers access a beach by four-wheel drive vehicle (see Section 30 *Visitor Activities and Use – Scenic and Recreational Driving*) and stay for a day or overnight on the beach (see Section 31 *Visitor Accommodation – Camping*), weather permitting. In salmon fishing season (usually March to May), beaches can become crowded. In the planning area, the key recreational fishing areas are Long Point, Aldridge Cove, Hush Hush Beach, Isle Road, Sandy Beach, Rest Point, Salmon Camp, the Knolls, Coalmine Beach, Blue Holes (Bellanger Beach), Conspicuous Beach, Point Irwin, The Gap, Salmon Camp (Peaceful Bay), Rame Head, Quarram and Madfish Bay. Major species sought for fishing in the estuaries include black bream *Acanthopagrus butcheri* and King George whiting *Sallaginodes punctata*. Beach fishing focuses on Western Australian salmon *Arripis truttaceus*, herring *Arripis georgeanus* and whiting (*Sallaginidae*).

A management plan is being prepared for the Walpole and Nornalup Inlets Marine Park. Although issues relating to the marine park are beyond the scope of this management plan, this management plan supports the existing types and levels of access to the oceans and estuaries that are currently provided in the planning area.

30. Visitor Activities and Use – Marroning and Fishing

Key Points

- The *Fish Resources Management Act 1994* has application to recreational fishing on lands and waters managed by the Department.
- Marroning and freshwater fishing is a popular pastime in the planning area, occurring in most rivers, streams and permanent freshwater lakes. However, in many areas marron may be under pressure from over fishing.
- Coastal fishing is also a popular pastime and occurs on beaches, rocks and reefs in the planning area.
- Rock or reef fishing in coastal environments present risks to both visitors and the environment.

The objective is to provide for marroning and fishing consistent with the *Fish Resources Management Act 1994* and the CALM Act, unless this leads to degradation of the environment or unacceptable levels of conflict between visitors.

This will be achieved by:

1. liaising with Department of Fisheries and providing increased ranger presence during the summer months to regulate fishing restrictions;
2. providing appropriate information and interpretation on trout and marron fishing and beach and rock fishing, particularly on the methods of reducing environmental impacts and on safe access points to the coast (see Section 34 *Visitor Safety*); and
3. ensuring inappropriately located access tracks are closed and rehabilitated, and replaced by more appropriately located access.

Key Performance Indicators:

The Key Performance Indicator KPI 28.1 applies to this section.

Non-commercial, Education and Not-for-profit Activities

Non-commercial, educational and not-for-profit groups have the potential to offer experiences and services to park visitors that would not otherwise be available, and use the planning area on a regular basis to conduct bushwalking, camping, leadership, outdoor education and personal development programs. They may also be able to provide access to visitors with special needs (for example, visitors with physical disabilities), deliver interpretation and education messages that foster appreciation and understanding of the planning area, or assist with other park operations.

The Department requires all organised non-commercial, educational and not-for-profit groups to gain permission from the local region or district office prior to undertaking their activities.

Groups using the planning area range from well-organised multi-national organisations that have trained staff and codes of practice to small school groups with varying levels of preparation and expertise. Areas within the planning area that offer the best conditions for such activities generally coincide with areas favoured by other visitor groups, which can lead to competition or conflict between groups wanting to use the same area, although some groups favour unhardened 'bush' camping in natural areas with no facilities.

The Walpole-Nornalup National Park is used for a variety of educational and non-commercial outdoor activities. Many school groups use parts of the Bibbulmun Track for activities. 'Outward Bound', a non-profit organisation engaging in personal development and outdoor education, uses a number of sites in the area, including the Deep River for canoeing activities. Similarly, a number of school groups use the Frankland, Deep and Denmark Rivers and the Walpole and Nornalup Inlets for canoeing activities, and Mt Frankland for rock climbing and abseiling. Some informal sites are only used by these groups, such as 'Outward Bound', and these will need to continue to be monitored for impacts.

30. Visitor Activities and Use – Non-commercial, Education and Not-for-profit Activities

Key Points

- The planning area is used regularly by non-commercial, education and not-for-profit groups.
- These groups have the opportunity to provide visitors with experiences that would not be available otherwise.
- Groups, such as these, usually favour low-key camping with no facilities at sites that often only they use.

The objective is to ensure that non-commercial, education and not-for-profit activities are compatible with other management objectives that extend the range of services and recreational experiences available in the planning area.

This will be achieved by:

1. ensuring that all non-commercial, educational and not-for-profit groups gain permission before undertaking activities in the planning area;
2. developing a booking and entry permit system for non-commercial, educational and not-for-profit groups to avoid overuse and conflict between visitors;
3. ensuring strategically-located designated group camping areas are provided that can be used by non-commercial, educational and non-profit groups, as well as the general public and other visitor groups;
4. developing specific codes of practice and guidelines for non-commercial, educational and not-for-profit groups using the planning area;

5. allowing the use of management access tracks for vehicle use by non-commercial, educational and not-for-profit groups strictly in emergency situations only, or where assisting the Department with management activities;
6. investigating partnerships between the Department and non-commercial, educational and not-for-profit groups that provide opportunities for the delivery of education and interpretation programs for park visitors; and
7. exploring opportunities for non-commercial, educational and not-for-profit groups to contribute to park management by organising or participating in service projects such as rehabilitation, weed control, rubbish collection or other activities.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

Picnicking, Barbecuing and Day-use

A 'day-use' area is any recreation site that is used specifically for day visits. These sites usually provide opportunities for picnicking and barbequing, but can often have other facilities such as lookouts, launching facilities and interpretation, and can also be the central focus for other nature-based leisure activities such as scenic driving, bushwalking and nature observation. Many camping areas also have a day-use function. The catering for more than one use at some day-use sites can occasionally lead to conflicts between visitors, unless adequate provision is made for the different visitor types. Day-use sites range from natural sites such as small clearings with little or no facilities to well-developed sites with many facilities that are generally provided in the more developed settings (see Section 28 *Visitor Opportunities – Visitor Management Settings*).

A variety of day-use experiences are provided at a number of recreation sites in the planning area so the variety of natural values in the area can be appreciated by a wider range of visitors. There are currently few developed day-use facilities within the eastern and northern parts of the planning area (other than William Bay and Mt Lindesay), and future recreation planning will need to consider the provision of a variety of day-use opportunities within these areas.

Existing and potential day-use sites for the planning area are shown in Table 12 and Maps 13 and 14. This listing of sites may not be exhaustive, and other sites may be provided that are consistent with visitor management settings and maintenance of other values within the planning area.

'Minor re-development' describes sites that are unlikely to change in their character, from sites that may not have any change to sites that may only have some minor modification (such as installation of a picnic table, fire ring or interpretation/signage). 'Significant re-development' describes sites that are likely to change in their character through substantial site modification (such as new buildings, substantial re-organisation of the site layout, or an increase in carpark size), or that may need to be closed for reasons such as environmental impacts, low usage or the need to relocate a site. The management setting describes the zone within which the site is located, and not the setting of the site.

Not all of the development of potential sites or re-development of existing sites may be achieved over the life of the plan. No priorities are assigned to these sites, and sites may only receive attention, subject to further detailed area Master Planning and specific site planning, according to the recreational development criteria of visitor risk, environmental impacts, social benefit, equity, public demand, and potential economic benefit. The amount of funding available will also determine priorities and affect what is achieved.

Table 12. Day-use sites in the planning area

Site	Type of Site/activity[5]	Management Setting[4]
Existing Sites that may Require Some Form of Minor Re-development		
East Knoll - Nornalup Inlet (Delaney) Lookout[2]	Interpretation	Developed
East Knoll - Coalmine West Lookout	Lookout, picnicking	Developed
Fernhook Falls[1, 2]	Picnicking, canoeing, sightseeing	Developed
Greens Pool[2]	Swimming	Developed
Walpole trailhead – Bibbulmun Track	Interpretation, walking	Developed
Blue Lake	Picnicking	Recreation
Caldyanup Crossing	Parking bays, turnarounds required	Recreation
Cape Hope	Picnicking	Recreation
Castle Rock	Sightseeing	Recreation
Centre Road Crossing[1, 2]	Picnicking, relocate site	Recreation
Circular Pool[2]	Lookout, walk trail, interpretation	Recreation
Conspicuous Cliff/Beach[2]	Fishing, swimming, lookout, walk trails	Recreation
Diamond Rock	Sightseeing	Recreation
Giant Tingle Tree[2]	Sightseeing, walk trail, interpretation, picnicking	Recreation
Giants Road BBQ	Picnicking	Recreation
Groper Bay	Fishing	Recreation
Hay River crossing – Sheepwash/Redmond[1]	Picnicking	Recreation
Hay River east	Picnicking	Recreation
Hay River west	Picnicking	Recreation
Hilltop Lookout[2]	Lookout	Recreation
John Rate Lookout[2]	Lookout	Recreation
Monastery Road jetty south	Picnicking, boating, interpretation	Recreation
Mt Clare[1, 2]	Picnicking	Recreation
Mt Lindesay Summit	Lookout, interpretation	Recreation
Nut/Ficifolia Lookout[2]	Lookout, picnicking, walk trail, interpretation	Recreation
Rame Head	Fishing, 4WD, picnicking, walking, swimming	Recreation
Sandy Beach	Picnicking, swimming, fishing	Recreation
Sapper's Bridge	Canoeing	Recreation
Soft Beach	Fishing, 4WD	Recreation
The Depot (WOW landing)[2]	Walk trail	Recreation
The Gap	Fishing, 4WD	Recreation
602 Road	Picnicking, boating/canoeing	Recreation
Crusoe Beach	Picnicking, sightseeing	Natural-Recreation
Gladstone Falls[1]	Picnicking, relocate road/site	Natural-Recreation
Kockallup Spring	Picnicking	Natural-Recreation
Mount Burnett	Picnicking, walking, interpretation	Natural-Recreation
Bellanger Beach (Blue Holes)	4WD, fishing	Natural
Circus Beach	Walking	Natural
Hush Hush Beach	Fishing, lookout	Natural
Lake Williams	Walking	Natural
Mazzoletti Beach	Fishing, 4WD, surfing	Natural
Newdegate Island	Picnicking, interpretation, boating, canoeing	Natural
Shanghai Gully	Picnicking, walk trail to tree	Natural
Lymburne Falls	Leave as a natural site	Wilderness
Mount Roe	Leave as a natural site	Wilderness

Site	Type of Site/activity[5]	Management Setting[4]
Existing Sites that may Require Some Form of Significant Re-development or Change		
East Knoll - Channels site[2]	Picnicking, interpretation, walk trail, sightseeing	Developed
East Knoll - Coalmine Beach day use site	Picnicking, boating, swimming, fishing	Developed
East Knoll – Walpole Yacht Club	Yacht club, boat ramp, interpretation	Developed
Mt Frankland[2]	Lookout, picnicking, walk trail, interpretation	Developed
Pioneer Park[2]	Visitor's Centre, interpretation, picnicking	Developed
Tree Top Walk[2]	Walk trail, picnicking, interpretation	Developed
William Bay Visitors Centre[2]	Community use, interpretation	Developed
Big Quarram	Fishing	Recreation
Elephant Rock	Sightseeing	Recreation
Irwin Inlet	Picnicking, interpretation, walking, boating	Recreation
Isle Road	Picnicking	Recreation
Kingy Rock	Sightseeing	Recreation
Little Quarram	Fishing	Recreation
Madfish Bay	Fishing, swimming, sightseeing	Recreation
Middle Quarram	Fishing	Recreation
Millar's Basin[1, 2]	Picnicking, interpretation, walk trail	Recreation
Monastery Landing[2]	Picnicking, interpretation	Recreation
Mt Lindesay -Denmark River trailhead[1, 2]	Picnicking, walk trail	Recreation
Northumberland Pool[1]	Picnicking	Recreation
Rest Point Park Site[2]	Picnicking, boating, fishing, walk trails	Recreation
Rest Point Sawpit	Interpretation, walk trail	Recreation
Styx River Falls[1]	Low-key site with interpretation of natural values	Recreation
Waterfall Beach	Swimming	Recreation
Eagles Nest	Fishing	Natural-Recreation
Easter Crossing[1]	Picnicking, hut, walk trail	Natural-Recreation
Sharp Rocks	Fishing	Natural-Recreation
Granite Peak	Picnicking, lookout, walk trail	Natural
Long Point[1, 6]	Picnicking, fishing, walk trails, interpretation	Natural
Turtle Rock[2]	Picnicking, lookout, interpretation, walk trail	Natural
Potential Day-use Sites		
Mt Lindesay –Denmark/Mount Barker/Nutcracker Road[1,2]	Key entry and interpretation site, universal access	Developed
Swarbrick and Buster Road area[2]	Key entry and interpretation site, walk trails, universal access	Developed
Tower Hill	Walking	Developed
Barge Butt Tree/Petticoat Lady	Cycling, picnicking	Recreation
Bee Road	Picnicking, walk trails	Recreation
Boronia Road stopping points	Picnicking, interpretation	Recreation
Bridge Road arboretum[2]	Picnicking, walk trails	Recreation
Falls of Forth Lookout[2]	Lookout, interpretation	Recreation
Gray's Soak	Picnicking	Recreation
Inlet View site	Picnicking, lookout	Recreation
Lower Kent River West	Picnicking, walk trail, interpretation, lookout	Recreation
Nornalup Road stopping points	Low-key sites with table, parking and interpretation	Recreation
Owingup Swamp Lookout[2]	Interpretation, picnicking	Recreation

Site	Type of Site/activity[5]	Management Setting[4]
Panelli's Mill	Picnicking, interpretation	Recreation
Perillup Parking Bay on Muirs Hwy	WW information site, picnicking	Recreation
Rates Road View	Cycling, picnicking	Recreation
Roe Road crossing on the Frankland River	River depth gauge required	Recreation
Soho Hills stopping point	Picnicking, interpretation	Recreation
Thames on the Kent[2]	Picnicking, walk trails	Recreation
Tom's Rock (Sharpe)	Lookout	Recreation
Twin Creek Road	Picnicking	Recreation
Upper Kent Cliffs	Lookout, picnicking	Recreation
Amarillup area	Picnicking, interpretation of heritage values	Natural-Recreation
Basin Road Heritage Stock Route site	Picnicking, interpretation	Natural-Recreation
Bevan Road crossing of Kent River	Picnicking, interpretation	Natural-Recreation
Quindinillup View	Lookout	Natural-Recreation
Watershed Road stopping points	Lookouts	Natural-Recreation
Granite Road stopping points	Lookouts	Natural
Kangarooda Lake	Picnicking, walk trail, lookout	Natural
Mitchell River bridge on Mount Barker-Denmark Road	Picnicking, interpretation	Natural
Nutcracker Road stopping points	Lookouts	Natural
Smythe Hill	Trailhead and walk trail to summit	Natural
The Pass (Hay River)	Picnicking	Natural

1 = Site also may have/has a camping function (see Section 31 *Visitor Accommodation – Camping*).
2 = Site also may have/has a key interpretive/educational function (see Section 46 *Information, Interpretation and Education*).
3 = Great Forest Trees Drive.
4 = Refer to Appendix 9 for a description of the settings.
5 = Sites may have more activities that are mentioned.
6 = Little long point is located on the border between Walpole-Nornalup and D'Entrecasteaux national parks.

Services provided by the Department at day-use sites vary throughout the planning area. The major management issues associated with day-use sites are litter, the provision of firewood for barbeques (see Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*), and the provision and servicing of toilets.

Rubbish bins are provided at some sites and emptied as necessary. However, this service requires the removal of the rubbish to the nearest town and may become cost prohibitive. Several options include (i) remove all rubbish bins from the planning area and request that visitors take their own rubbish home with them (this has proven a very cost-effective strategy in most cases, and has significantly reduced management costs), (ii) establish one or two collection points where visitors can place rubbish directly onto a trailer for removal, and (iii) continue with the current system of bins at some sites. Rubbish bins will continue to be provided at developed day-use sites, and elsewhere visitors will be encouraged to take their rubbish home.

Gas barbeques will be provided at developed day-use sites, and the provision of wood fires at other sites will be dependent on the development of options for providing firewood (see Section 31 *Visitor Accommodation – Campfires*), although visitors should be encouraged to bring their own fuel stoves and gas barbeques.

Toilet facilities are provided at a number of day-use sites. These include flushing, sealed vault, long drop, hybrid and 'rotaloo' composting toilets. The maintenance requirements of each type of toilet are considered when selecting the most appropriate facilities for the site.

30. Visitor Activities and Use – Picnicking, Barbecuing and Day-use

Key Points

- A 'day-use' area is any recreation site used specifically for day visits and includes picnic and barbecue sites, lookouts, interpretive stops, fishing spots, short walks and nature viewing sites. They can provide a focus for activities such as bushwalking or scenic driving.
- Day-use sites are also found at camping areas across the planning area.

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

This will be achieved by:

1. designing and developing day use sites in accordance with Departmental policy, site capability, environmental impact assessment and the management setting of the area;
2. where day-use and camping areas are coincident, designing these areas to minimise conflicts between different visitor types;
3. where practicable, designing and constructing picnic and barbecue areas and associated facilities to a standard suitable for use by everyone in the community, including people with disabilities;
4. providing litter bins depending on the need and resources to service the bins, but encouraging visitors to remove their own litter;
5. prohibiting campfires, unless with firewood provided by the Department or brought in from outside the planning area and lit only in provided fire rings (see Section 31 *Visitor Accommodation*);
6. providing fire rings or gas/electric barbecues at developed day use sites and other sites where necessary; and
7. providing toilet facilities where needed with a preference for environmentally sensitive systems where practical.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Scenic and Recreational Driving

Sightseeing is a popular activity on roads and tracks managed by the Department. Much of the experience and enjoyment that visitors gain from the natural environment is derived from two-wheel and four-wheel drive routes in areas of high scenic quality. It allows visitors to gain a greater understanding and appreciation of the intrinsic characteristics of natural areas. Natural areas often have rough four-wheel drive tracks, open sand dunes, creek and river crossings and diverse scenery that attract an increasing number of four-wheel drive clubs and enthusiasts.

Three classes of scenic drives are recognised in WA: State Tourist Drives, local scenic drives and local tourist routes. State Tourist Drives are signposted and promoted on maps. However, it is likely they will be superseded by themed travel routes, similar to the 'Savannah Way' in the north of Australia and the 'Golden Pipeline' from Northam to Kalgoorlie (E. Stankevicius *pers. comm.*). Although there are no State Tourist Drives in the planning area (the only State tourist drive in the region, Scotsdale Tourist Drive north of Denmark, is located outside the planning area), large numbers of visitors still experience the area and gain their enjoyment and appreciation of the natural environment through scenic driving. There is considerable interest in four-wheel driving in coastal areas, along a number of north-south tracks and in the interior of the planning area. In preserving the inherent scenic values of all public travel routes, selected primary access 2WD roads that have important scenic values and which afford outstanding

views of surrounding landscapes may be identified, promoted and managed as scenic drives (Map 12).

It is important that recreational driving on public conservation estate complies with Department regulations to avoid conflict with other visitors, damage to the environment, and damage or injury to visitors and their vehicles. Some four-wheel drive clubs regularly volunteer their time to environmental projects on conservation estate, such as rehabilitating tracks and clearing rubbish and weeds, which considerably assists park management. Unfortunately, there are still a small percentage of recreational drivers that are not aware of, or ignore the need to minimise environmental impacts.

Existing drives, currently promoted by local tourist bureaus, and potential drives for the planning area are shown in Table 13. This listing of drives may not be exhaustive, and other drives may be provided that are consistent with visitor management settings and maintenance of other values within the planning area. These may focus on short drives from population centres of Walpole, Denmark and Mount Barker or large campsites (e.g. Fernhook Falls), specialist drive tours with themes that focus on aspects of the natural environment such as wildflowers, or short interpreted four-wheel drive trails. Drive trails may be cooperative ventures with other agencies or community groups. The drive type and surface may vary along selected routes and are only an indication of the condition of the drive.

Not all of the development of potential drives may be achieved over the life of the plan. No priorities are assigned to these drives, and drives may only receive attention, subject to further detailed area Master Planning and specific site planning, according to the recreational development criteria of visitor risk, environmental impacts, social benefit, equity, public demand, and potential economic benefit. The amount of funding available will also determine priorities and affect what is achieved.

Table 13. Scenic drives in and around[1] the planning area

Scenic Drives	Drive Type[2]	2WD/4WD Loop/one-way	Surface
Existing Scenic Drives			
Conspicuous Beach Road, Ficifolia Road, Nut Road and Peaceful Bay Road	Local scenic drive	2WD loop	Gravel and bitumen
South-Coast Highway from Denmark to Greens Pool (William Bay National Park), Peaceful Bay, Valley of the Giants and return to Denmark	Day route	2WD one-way	Bitumen
Hilltop Road to Circular Pool and back to Walpole	Half-day route	2WD loop	Gravel and bitumen
Knoll Drive including Coalmine Beach	Half-day route	2WD loop	Bitumen
Muirs Highway	Secondary through route	2WD one-way	Bitumen
Denmark-Mount Barker Road	Secondary through route	2WD one-way	Bitumen
Mt Shadforth Road	Local scenic drive	2WD loop	Gravel and bitumen
North Walpole Road to Mt Frankland, Beardmore Road, South-West Highway back to Walpole	Day route	2WD loop	Gravel and bitumen
Scotsdale Road and Mcleod Road	State tourist drive		
South-West and South-Coast Highways linking Manjimup, Walpole and Denmark.	Major through route	2WD one-way	Bitumen
Valley of the Giants Road	Local scenic drive	2WD loop	Bitumen

Scenic Drives	Drive Type[2]	2WD/4WD Loop/one-way	Surface
Potential Scenic Drives			
Walpole to Valley of the Giants via Sapper's Bridge, Brainy Cut Off, Twin Creek Road and Howe Road.	4WD trail	4WD one-way	Gravel
Walpole to Mt Frankland via Swarbrick and Copeland Road	4WD trail	4WD one-way	Gravel
Walpole to Mt Frankland via Angove and Deep Roads	4WD trail	4WD loop	Gravel and bitumen
Swarbrick multi-use trail	4WD trail	4WD loop	Gravel
Fernhook to Tone and Shannon	Day route	2WD loop	Gravel and bitumen
'Farms and Forest' drive via North Walpole Road, Bridge Road, Hazelvale Road, Valley of the Giants Road and South-Coast Highway to Walpole	Day route	2WD loop	Bitumen
Long Point	4WD trail	4WD one-way	Gravel
Lower Deep to Mt Clare	4WD trail	4WD loop	Gravel
Tinglewood/Shedley drive	4WD trail	4WD loop	Gravel
'Salt to Sea' drive via Watershed Road	Day route	4WD one-way	Gravel
'Wilderness and Wildflowers' drive via Nornalup Road, Boronia Road to Mt Frankland, Thomson Road to Muirs Highway.	Day route	4WD loop	Gravel
'Fire and Conservation' drive from Rocky Gully to South Coast Highway via Nornalup Road	Day route	4WD one-way	Gravel
Mount Lindesay via Nutcracker and Scotsdale Roads to Denmark	Day route	4WD loop	Gravel
Mount Lindesay via Nutcracker and Watershed Roads to Muirs Highway then to Mount Barker	Day route	4WD loop	Gravel and bitumen
Scotsdale, Mt Lindesay, Break and Fernley Roads	Day route	2WD loop	Gravel and bitumen
Scotsdale Road, Parker Road and South Coast Highway	Day route	2WD loop	Bitumen
'Mount Lindesay Loop' via Break, Granite and Blue Lake roads	4WD trail	4WD loop	Gravel
'Men (and Women) of the Bush Heritage trail'	4WD trail	4WD loop	Gravel
Peaceful Bay Coastal trail via Soft Beach, Groper Bay, Cape Hope, Kingy Rock, Castle Rock, Diamond Rock and The Gap.	4WD trail	4WD loop	Gravel/sand
'Week in the Wilderness' drive around the whole planning area, accessing the Walpole Wilderness Discovery Centre, camping and accommodation opportunities and views of the proposed wilderness areas	4WD trail	Circular 2WD and 4WD	Gravel and bitumen

1 = within the vicinity of, or close proximity to, the planning area.
2 = State Tourist Drives and Local Scenic Drives are classified under the State Tourist Drive Policy.

Driving along beaches is a popular activity and is a method of accessing otherwise inaccessible areas. There can be conflict with natural values, such as the potential to interfere with nesting hooded plovers (see Section 20 *Native Animals*), dune and vegetation degradation, and erosion of beach access points. There are a number of beaches that can be accessed by four-wheel drives, including Bellanger Beach (Blue Holes), Rame Head Beach, Salmon Camp Beach, The Gap Beach, Groper Bay Beach and adjacent Shell Beach, Soft Beach, Quarram Beach, Foul Bay Beach (Peaceful Bay boat ramp to Irwin Inlet mouth) and Mazzoletti Beach (Parry Inlet to West Rock). These are the only beaches that should be used by visitors for four-wheel drive access.

The visual landscapes associated with these scenic travel routes will require management (see Section 18 *Landscape*).

30. Visitor Activities and Use –Scenic and Recreational Driving

Key Points

- The planning area is a very attractive and scenic area (see Section 18 *Landscape*), and much of the experience and enjoyment that visitors gain from the natural environment is derived from scenic and recreational driving in areas of high scenic quality.
- Large numbers of visitors to the planning area experience the area's natural values via two-wheel drive scenic routes and four-wheel drive tracks, and a range of opportunities are currently provided. Owners of four-wheel drive vehicles, in particular, seek driving experiences throughout the planning area.
- There are safety issues associated with river crossings and dangerous sections of some tracks (see Section 34 *Visitor Safety*).

The objective is to provide opportunities for scenic and recreational driving within the planning area that facilitate appreciation of the range of natural values but do not conflict with other visitors, damage the environment or cause damage or injury to visitors and their vehicles.

This will be achieved by:

1. continuing to provide vehicle access for scenic and recreational driving (Map 12, see Section 29 *Visitor Access*) and, using the existing network of roads, developing scenic opportunities in the planning area and linking these with surrounding natural areas where appropriate;
2. not permitting vehicles to drive off marked public access tracks or roads within the planning area;
3. maintaining a defined track to access designated beaches within the Walpole-Nornalup National Park and informing drivers that leaving the marked route is not permitted;
4. maintaining the remoteness of some parts of the planning area by ensuring some east-west river crossings are not upgraded;
5. developing and distributing information on appropriate behaviour and safety risks in the planning area for four-wheel drivers and those looking for 'challenging' driving experiences;
6. continuing to work with local, state and national four-wheel drive and off-road vehicle clubs and associations and other related visitor groups to actively promote responsible use in the planning area; and
7. providing appropriate information and interpretation on the scenic drives and tourist routes in the planning area, and disseminating this through appropriate outlets such as tourism associations, tourist centres, 'Streetsmart' maps and Royal Automobile Club guides.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Special Events

Requests for special events occasionally arise from a variety of organisations from school groups, clubs, community groups, recreational and sporting associations. Special events often involve large groups of people who require accommodation, suitable access, an established network of tracks and adequate facilities, such as parking and toilets. In general, many group activities and events are an acceptable use of conservation estate, provided that they are:

- sensitively located to maintain values;
- properly planned and managed;
- do not interfere with other forms of recreation; and
- are not resource-demanding on the Department.

Special events must be consistent with the Department's Policy No. 18 – *Recreation, Tourism and Visitor Services* and are subject to approval from the Department and, in some cases, the Conservation Commission. Other relevant authorities, such as the Department of Water and Department of Health, may also have an interest in an application, such as where the Statewide *Policy 13 – Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land* (Water and Rivers Commission 2003) may apply. Where requests are made to conduct special events for activities that are inconsistent with these policies, the event must be of national significance and approval is required from the Conservation Commission. Where possible, events should use existing roads and tracks.

It is possible that, during the life of this plan, 'one-off' special events may occur within the planning area. In the past, the area around Mt Lindesay has been used for rogaining events.

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

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

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

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

Competitive car rallies and other motor sports are not permitted within nature reserves and are generally undesirable within national parks. Whilst this activity is an exciting sport for competitors and spectators alike and has many social and economic benefits, consideration needs to be given to the level of environmental impact. Competitive rallies and similar events may be approved for State forest, and more suitable locations may be found within forest conservation areas in Wye block and around Walpole and Denmark.

30. Visitor Activities and Use – Special Events

Key Points

- Requests may be made to undertake 'one-off' special events within the planning area, which require accommodation, suitable access, an established network of tracks and adequate facilities, such as parking and toilets.

The objective is to provide for organised special events that offer the opportunity for participants to experience the planning area in suitable locations where its use can be sustained, does not impact on other visitor experiences, are carried out in a safe manner and are cost-negative to the Department.

This will be achieved by:

1. permitting special events only where the activity is consistent with Department policy;
2. assessing special events on a case-by-case basis, and requiring applications to include sufficient detail to enable thorough evaluation of environmental and social issues, including the event status (club, state or national), timing, and the number of competitors and observers expected;
3. ensuring that special events are held only within an appropriate management setting and pose no adverse impact on the environment; and
4. prohibiting competitive rallies and other motor sport events in national parks and nature reserves within the planning area.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Surfing, Swimming and Sand/sailboarding

Water-based sports are increasingly popular summer and holiday activities as they are a means of cooling down and provide enjoyment.

Surfing occurs from some beaches along the coast in the planning area, although south-easterly winds during the summer and large swells and on-shore conditions during the winter can limit where and when this occurs. While this activity is very popular, isolation and inaccessibility limits the popularity of this sport compared with other coastal areas. Those areas that are suitable for surfing are areas protected from the wind and which are close to Walpole and Denmark, including Conspicuous Beach, Rame Head, Shelley Beach, Circus Beach, Hush Hush Beach, Long Point and Bellanger Beach.

Many of the beaches in the region and the planning area are not appropriate for swimming due to the strong rips and deep channels close to the shore. Ocean conditions can also change quickly and unexpectedly and can be extremely hazardous for swimmers. However, swimming does occur in the more sheltered areas, particularly within the Walpole and Nornalup Inlets, Coalmine Beach, Peaceful Bay, Aldridge Cove and Blue Holes in the Walpole Nornalup National Park and at Greens Pool in the William Bay National Park, which makes the planning area regionally significant for this activity. Vacation swimming lessons during the school holidays are conducted at Coalmine Beach, William Bay National Park and at Peaceful Bay. Swimming also occurs in the freshwater lakes and rivers in the planning area, and safety issues in these areas can include underwater hazards, shallow water, the seasonality of water levels and flows, and the presence of *Amoebic meningitis*.

Sandboarding involves the use of a specialised board to 'surf' down steep sand dunes. Sandboarding has become increasingly popular in recent years. However, sandboarding is generally an unacceptable recreation activity on lands managed by the Department, particularly in coastal areas of high conservation value, as it can be dangerous and damaging in some of the more isolated, hazardous parts of the coastline of the planning area and hence, is not appropriate in the planning area.

Sailboarding and kite surfing on the Nornalup Inlet, access the water through the Walpole-Nornalup National Park. Coalmine and Sandy Beaches are used by beginners because of their shallow beaches and during the summer, south-easterly winds create flat-water conditions for

more experienced sailboard riders. Facilities required by sailboarders include parking areas, an open area for rigging and beaches to launch from. Both Sandy and Coalmine Beaches provide areas suitable for sailboards and will be permitted in these areas. In the previous *Walpole-Nornalup National Park Management Plan* (CALM 1992), sailboarding was permitted at both of these beaches, although the close proximity of Sandy Beach to sensitive vegetation meant that use of this area for sailboarding would require monitoring. Conflicts with swimmers and yachts, and the resulting safety issues, may also be another consideration at Coalmine Beach. Hence, monitoring of sail and kite boarding in these areas for impacts on the natural values of the area and conflicts with other visitors will still be appropriate. Designating launch sites for sailboarding and kite surfing could reduce conflicts.

30. Visitor Activities and Use – Surfing, Swimming and Sand/sailboarding

Key Points

- Popular surf beaches in the planning area include Conspicuous Beach, Rame Head, Shelley Beach, Circus Beach, Hush Hush Beach, Long Point and Bellanger Beach.
- Swimming along the coast of the planning area can sometimes be dangerous due to the strong rips and deep channels close to shore. Popular swimming areas include Walpole and Nornalup Inlets, Coalmine Beach, Peaceful Bay, Aldridge Cove and Blue Holes in the Walpole-Nornalup National Park and at Greens Pool in the William Bay National Park.
- Sandboarding is generally unacceptable on lands managed by the Department.
- Sailboarding occurs off Coalmine and Sandy Beaches. Sailboarders and kite-surfers may conflict with other visitors.

The objective is to allow for beach activities such as surfing, swimming and sailboarding in the planning area, except where there is a threat to the environment or a risk to public health or visitor safety and to protect the sand dune environment and minimise risk to public health and visitor safety.

This will be achieved by:

1. providing, clearly signposting and monitoring camping areas close to popular surfing beaches (see Section 31 *Visitor Accommodation*);
2. providing stable access tracks and vantage points at surfing areas where appropriate;
3. consulting with and, as appropriate, involving surfers in aspects of management of the planning area that affect surfing including camping, access and specific environmental impact problems;
4. prohibiting surfing competitions in the planning area, unless it can be shown that all the impacts can be acceptably managed (see Section 30 *Visitor Activities and Use – Special Events*);
5. providing appropriate information and interpretation to visitors on hazards associated with surfing and swimming in the planning area (e.g. rips at exposed beaches, and underwater hazards and the risk of *Amoebic meningitis* in freshwater areas);
6. prohibiting sandboarding in the planning area;
7. providing signage and/or information as to why sandboarding is prohibited in the planning area; and
8. designating launch areas for sailboarders and kite-surfers to minimise conflicts with other visitors.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

31. VISITOR ACCOMMODATION

Most types of visitor accommodation are readily available in areas adjacent to the planning area and about half of the visitors to the south-west region stay in commercial accommodation, such as hotels, resorts, motels and motor inns (Tourism WA 2005). While visitors should be encouraged to use these venues, some visitors stay overnight in attractive forest, river and coastal surroundings on lands managed by the Department. Overnight stays may be catered for by commercial concessions (see Section 33 *Commercial Operations*), or through the provision of built accommodation and camping facilities (some of which attract fees - see Section 32 *Visitor Fees*), or areas with no facilities.

The WW is part of the Government's 'Tourism' Policy and 'Ecotourism Strategy for WA', which committed to infrastructure and facilities for ecotourism in the planning area, such as low-impact camping and cabin accommodation. Opportunities that cannot be catered for elsewhere, such as camping in a forest, should be the focus within the planning area.

Built Accommodation

Generally, built accommodation is provided by way of a commercial concession (such as the caravan park at Coalmine Beach) or is catered for off lands managed by the Department by nearby private interests. However, there may be instances where remoteness, seasonality or other factors necessitate the Department itself providing built accommodation. The National Competition Policy also requires the Department to provide built accommodation on a fully commercial basis.

Within the planning area, there is a range of built accommodation from basic shelters and single huts through to cottages and fully serviced chalets. Built accommodation is provided for walkers on the Bibbulmun Track through a system of shelters. These basic three-sided shelters are located about every 15 km along this track. There are also small huts at Fernhook Falls, Mt Frankland and Centre Road. Coalmine Beach Caravan Park provides a range of opportunities from tent and caravan sites to cabins and fully serviced chalet accommodation. The caravan park operates under a lease agreement issued by the Department (see Section 33 *Commercial Operations*).

There is a broader range of accommodation in Manjimup, Northcliffe, Walpole, Denmark, Albany and Mount Barker and areas in between, including caravan parks, cottages and chalets, hotels, motels, bed and breakfast accommodation, farmstays, resorts, backpackers, camping areas, lodges and huts. Local government and private enterprise are important providers of low-key accommodation within close proximity of the planning area. Promotion of the planning area will further encourage the establishment of a greater number and range of accommodation types.

There are opportunities to further develop a range of less sophisticated built accommodation in the planning area. The Munda Biddi cycle trail proposes the construction of further huts along its length, similar to those on the Bibbulmun Track, although the Munda Biddi cycle trail may utilise towns more than the Bibbulmun Track. Fernhook Falls already supports significant development and may be ideal for further built accommodation. Built accommodation within the planning area will be complementary to, rather than competing with, those provided by private enterprises outside the planning area. Visitors using the more basic accommodation provided in the planning area are likely to be seeking a different experience than those staying in more developed accommodation outside of the planning area.

There is limited built accommodation in the northern and eastern parts of the planning area and on adjacent private property. Therefore, it may be necessary to develop built accommodation in these areas in association with the provision of trails or facilities for other activities such as four wheel driving, canoeing, cycling, horse riding and bushwalking.

Further built accommodation should consider:

- the trade-off between minimising environmental damage and preserving the experience by providing new sites;
- the appropriate visitor management setting;
- the maintenance of wilderness values of wilderness areas;
- the effect of water quality protection requirements on potential developments;
- ensuring access by visitors to the site, particularly in winter months when shelter is most needed. Huts for canoeists may not require vehicle access;
- providing unique opportunities for visitors, such as the construction of safari-tent accommodation that would be incorporated into the larger camping areas rather than a separate, dedicated site;
- ensuring site developments are discussed with traditional owners;
- management by commercial concession (see Section 33 *Commercial Operations*); and
- the climate of the planning area, particularly the wet winters, and that the provision of huts is often appreciated and encourages year round use while retaining the informality of the sites.

31. Visitor Accommodation – Built Accommodation

Key Points

- There is built accommodation within the planning area along the Bibbulmun Track, at Coalmine Beach, Mt Frankland, Centre Road and Fernhook Falls.
- There may be further need to develop built accommodation, including in the northern and eastern parts of the planning area, and in association with some activities such as canoeing, cycling (such as along the proposed Munda Biddi cycle trail), bushwalking and other proposed developed trails.
- Any accommodation provided by the Department is subject to the provisions of the National Competition Policy.
- Built accommodation will not be permitted within wilderness areas.

The objective is to provide opportunities for visitors to stay overnight in the planning area in appropriately located and designed built accommodation, where this cannot be adequately catered for on private property in the adjacent area.

This will be achieved by:

1. designing and developing built accommodation in accordance with Department Policy No. 18 – *Recreation, Tourism and Visitor Services*, site capability, environmental impact assessment, visitor management setting, and with approval of the Conservation Commission;
2. developing a booking system for any built accommodation as required; and
3. ensuring built accommodation is:
    - built to a safe structural standard;
    - environmentally sensitive;
    - compatible and in harmony with the surrounding landscape;
    - low maintenance; and
    - commercially viable.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Camping

Camping is a common and popular activity that provides a range of social benefits, including an awareness and understanding of the natural environment. The demand for camping within natural areas often varies from the individual seeking solitude, inspiration or self-reliant recreation to large semi-organised groups. Camping is often associated with nearby day-use recreational activities or scenic attractions.

Camping, under the Department's Policy No. 18 – *Recreation, Tourism and Visitor Services*, broadly falls into two classes:

- designated site camping – where areas are set aside for the purpose of camping, often with the provision of facilities and usually accessible by vehicle; and
- remote camping – where there is no specified area set aside for camping, where facilities are generally not supplied, and which may only be accessible by foot.

Within 'designated site camping', there may be a spectrum of camping opportunities available, such as vehicle-based camping or backpacking, based on the level of development of facilities such as toilets, access, water supply, picnic tables, rubbish removal, visitor information. Camping is only permitted within areas approved by the Department, and campsites need to be sited to minimise visitor impact and conserve natural and cultural values.

A variety of camping and facilities exist within the planning area. Fernhook Falls and Coalmine Beach Caravan Park (see Section 33 *Commercial Operations*) are designated camping sites and offer highly developed camping facilities including two-wheel drive access, parking areas, toilet facilities, water, rubbish removal and picnic furniture. These sites are well patronised by visitors. However, large organised groups with up to 30 vehicles, as well as various school and not-for-profit groups, are increasingly seeking places to camp within the planning area. To cater for this increasing use and to minimise the environmental impacts, existing and informal sites may need to be expanded, hardened, or closed and opportunities sought to cater for larger camping sites that may be suitable for campers/trailers, sustainable group camping, or a greater number of individual campers. At some of the larger campsites, there can be conflict between campers over campsites, the proximity of campers, the use of limited facilities or noise, and improvements may need to be made to campsites to improve visitor experiences. The *Walpole-Nornalup National Park Management Plan* (CALM 1992) recommended a camping area be developed in the Valley of the Giants.

There are many small remote camping sites in the planning area, particularly adjacent to rivers, creeks or pools. Some of these sites have existed for over 20 years and have become traditionally used by generations of local visitors for marroning, fishing and other water-based activities. Some sites that can be accessed by vehicle are rapidly expanding and subsequently being degraded. Sites along the Bibbulmun Track are remote with limited facilities and services and are accessed mainly by walking, and these sites diversify the visitor experience.

To maintain sustainable opportunities in the long-term, designated camping sites should be limited to recreation nodes within appropriate visitor management settings. At some remote camping sites with high natural, cultural or water protection values, particularly in some riparian areas adjacent to rivers, inlets or pools, it may be desirable to restrict access, limit visitor numbers through permits, rotate sites, operate as day-use only, or relocate the site in order to protect the environment or maintain a particular management setting.

Existing and potential camping sites for the planning area are shown in Table 14 and Maps 13 and 14. This listing of sites may not be exhaustive, and other sites may be provided that are consistent with visitor management settings and maintenance of other values within the planning area.

'Minor re-development' describes sites that are unlikely to change in their character, from sites that may not have any change to sites that may only have some minor modification (such as the installation of some additional or replacement facilities). 'Significant redevelopment' describes sites that are likely to change in their character through substantial site modification (such as new buildings, substantial re-organisation of the site layout, or an increase in camping capacity), or that may need to be closed for reasons such as environmental impacts, low usage or the need to relocate a site. The management setting describes the zone within which the site is located, and not the setting of the site.

Not all of the development of potential sites or re-development of existing sites may be achieved over the life of the plan. No priorities are assigned to these sites, and sites may only receive attention, subject to further detailed area Master Planning and specific site planning, according to the recreational development criteria of visitor risk, environmental impacts, social benefit, equity, public demand, and potential economic benefit. The amount of funding available will also determine priorities and affect what is achieved.

Table 14. Camping sites within the planning area

Campsite	Access	Management Setting[3]
Existing Sites that may Require Some Form of Minor Re-development		
Giants Campsite – Bibbulmun Track	Walking	Developed
William Bay Campsite – Bibbulmun Track	Walking	Developed
Fernhook Falls[2]	2WD	Developed
Coalmine Beach Caravan Park	2WD	Developed
Ordnance Crossing	2WD	Recreation
Bevan Road Camp	4WD	Recreation
Blue Lake	4WD	Recreation
Hay River west	4WD	Recreation
Hay River east	4WD	Recreation
Frankland River Campsite – Bibbulmun Track	Walking	Recreation
Mt Clare Campsite – Bibbulmun Track	Walking	Recreation
Myalgelup Pool	4WD	Recreation
Rame Head Campsite – Bibbulmun Track	Walking	Recreation
Centre Road Crossing[1, 2]	2WD	Recreation
Easter Crossing[1]	4WD	Natural-Recreation
Gladstone Falls[1]	2WD	Natural-Recreation
Lochart Pool[1]	4WD	Natural-Recreation
Salmon Camp	4WD	Natural
Nuyts area (Thompson Cove, Aldridge Cove, Crystal Lake and Forest of Arms)	Walking	Natural
Existing Sites that may Require Some Form of Significant Re-development or Change		
Caldyanup South	2WD	Recreation
Elsie Brook Crossing	2WD	Recreation
Millar's Basin[1]	2WD	Recreation
Styx River Falls[1]	2WD	Recreation
Long Point[1, 4]	4WD	Natural
Potential Camping Areas		
William Bay National Park Study Centre[2]	2WD	Developed
Denmark-Mount Barker/Nutcracker Roads[1, 2]	2WD	Developed
Vermeulen Road camp	Cycling	Developed
Clear Hills equestrian camp[1]	4WD, horses, cycles	Recreation
Base Road Campsite	Walking	Recreation
Bridge Road camps	4WD	Recreation
Copeland Road Campsite	4WD	Recreation
Hay River crossing – Sheepwash/Redmond[1]	4WD	Recreation
Roe Road/Rocky Road Camp	4WD	Recreation

Campsite	Access	Management Setting[3]
Camping area associated with trailhead for Cambellup-Moriarty stock route	2WD	Recreation
Denmark River South area in the vicinity of Mt Lindesay[1]	2WD	Recreation
Mt Frankland Camp[2]	2WD	Recreation
Northumberland Pool[1]	4WD	Recreation
Rocky Road/Long Road Camp	2WD	Recreation
Sheddick Stockman's camp on the Deep River[1]	2WD	Recreation
Ford Road Crossing	4WD	Natural-Recreation
Mitchell Road Crossing	Canoeing	Natural-Recreation
Wilderness Areas	Walking	Wilderness

1 = Site also may have/has a day-use function (see Section 30 *Visitor Activities and Use – Picnicking, Barbecuing and Day-use*).
2 = Site also may have/has a key interpretive/educational function (see Section 46 *Information, Interpretation and Education*).
3 = Refer to Appendix 9 for a description of the settings.
4 = Little long point is located on the border between Walpole-Nornalup and D'Entrecasteaux national parks.

Remote camping will also be permitted within the proposed wilderness areas (see Chapter C – *Managing Wilderness Values*). Both of the proposed wilderness areas will be designated for camping under regulations 6 and 66 of the *Conservation and Land Management Regulations 2002*. No facilities will be provided and there will be no specific areas within the two proposed wilderness areas set aside for camping. Access will only be gained on foot.

Camping is currently excluded from Conspicuous Beach, Soft Beach and Peaceful Bay Beach in Walpole-Nornalup National Park, and Mazzoletti Beach, Greens Pool and Lights Beach in William Bay National Park. However, this list is not exhaustive and other sites may be excluded where they are inconsistent with visitor management settings and the protection and maintenance of other values within the planning area.

The Department undertakes rubbish removal from some selected designated campsites within the planning area, although this can be a resource-dependent exercise. Visitors to the planning area are encouraged to adopt a 'crush and carry' policy and take their rubbish home with them or to designated rubbish disposal points (see Section 30 *Visitor Activities and Use – Picnicking, Barbequing and Day Use*).

The *Walpole-Nornalup National Park Management Plan* (CALM 1992) recommended that a peak season booking system be investigated to ensure the capacity of all camping areas is not exceeded. There is currently no camping booking system in place within the planning area as this has not been considered essential to date and monitoring is not showing any problems. However, the Department is soon to trial a Statewide booking system that may be applicable within the planning area. Camping fees are charged currently only at designated camping sites to assist in maintaining facilities, and this may also play a role in maintaining numbers within capacity.

The voluntary campground host scheme is in place for Fernhook Falls during peak periods and should be investigated for potential at other sites. Campground hosts welcome campers, provide information to campers and visitors, and assist them enjoy their stay.

As well as built accommodation, private property may also have a role to play in providing camping areas to supplement those facilities located on conservation estate. The *Walpole-Nornalup National Park Management Plan* (CALM 1992) recognised that the establishment of camping areas on private property should be encouraged. These facilities may benefit tourism and local economies within the region, and may provide different experiences to those that are provided by the Department. Liaison will continue with Tourism WA, local and adjacent Visitor Centres and other relevant local bodies regarding development of new camping opportunities in the planning area.

31. Visitor Accommodation – Camping

Key Points

- Several designated camping sites, such as Fernhook Falls and Coalmine Beach Caravan Park, offer high quality camping facilities in the planning area.
- There are many unplanned informal campsites within the planning area, with some of these being degraded by heavy or inappropriate use.
- Large organised groups require planned large campsites so that environmental and social impacts are minimised.

The objective is to provide a range of camping opportunities in the planning area whilst minimising environmental and social impacts and competition with private enterprise.

This will be achieved by:

1. developing a wide range of camping opportunities and settings with varying physical, social and managerial conditions (as per Table 14);
2. developing standard impact assessment criteria and techniques, including limits of acceptable change, to monitor and assess visitor impacts and sustainable use of campsites;
3. based on the development of standard impact assessment criteria and techniques, reviewing access to campsites where impacts are unsustainable;
4. using a booking system, rotation, seasonal use or other techniques for any campsites (i) with restricted access, (ii) that require limiting of numbers, or (iii) where management of visitation is required to ensure sustainability;
5. developing networks of campsites for walkers, cyclists and other activity-based visitors in conjunction with long distance trail opportunities that are, or will be, provided;
6. prohibiting the use, or restricting the operating hours, of portable generators or battery charging plants at some sites, when necessary;
7. charging fees for camping at some designated camping sites, other than within any future wilderness area, where practicable;
8. providing appropriate information and interpretation on designated camping sites (except for small sites), including facilities available and fees and charges to the public;
9. permitting beach camping (see Section 30 *Visitor Activities and Use – Marroning and Fishing*);
10. permitting overnight accommodation on boats within the planning area, subject to conditions appropriate to the waterways concerned;
11. encouraging the establishment of further camping areas on private property; and
12. liaising with Tourism WA, local and adjacent Visitor Centres and other relevant local bodies in the development of new camping opportunities in the planning area.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

Campfires

Campfires provide a focal point for social interaction and, to many visitors, are a traditional and valued part of their park experience. The weather along the south coast is often cold, wet and windy, and a campfire also provides warmth and comfort to campers. However, the collection of firewood and escapes from campfires (see Section 25 *Fire*) are of particular concern for managers.

Within the planning area, fire rings and barbeque plates for campfires are available at some more developed campsites such as Fernhook Falls, as well as day-use sites such as Mt Burnett, Mt

Frankland and Centre Road Crossing. There are no campfires provided on the Bibbulmun Track within the planning area.

Campfires within the planning area can only be lit in authorised fire places (i.e. fire rings provided in designated camping sites). Furthermore, campfires will only be permitted after nightfall (6 pm – 9 am) during the wildfire season from the months of December to April, which minimises the risk of starting wildfires.

The current observed impact of campfires and projected increases in visitation to the planning area requires further consideration to reduce future impact that campfires may have on the environment. Gas or electric barbecues will be provided at the most popular recreation sites (such as Fernhook Falls), where this is cost effective and practical. Fuel stoves are an alternative and are more efficient, quicker and cleaner for cooking. Fuel stoves are permitted at all times and their use should be encouraged, particularly in natural and remote areas such as within wilderness areas and in bush and beach camping, where they are more suited.

The collection of firewood is prohibited within the planning area, except within gazetted public firewood areas on forest conservation areas (see Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*), and from the immediate vicinity of a camping area if:

- there is a sign erected authorising the collection of firewood; and
- the firewood is intended for use on a campfire or barbeque in the designated area.

While there are benefits in supplying firewood to recreation areas, there are significant management costs associated with firewood supply, which need to be balanced. Firewood is currently supplied to some camping sites such as Fernhook Falls. However, options for supplying a source of firewood for camping in the long-term may include:

- continued provision of firewood by the Department;
- provision of firewood by the Department in designated areas at suitable entry points to the planning area. Signposting will indicate designated areas where people can collect firewood;
- provision of firewood by contractors or others on a commercial basis, particularly at locations frequented by visitors, such as service stations and tourist bureaus;
- encouraging visitors to bring their own firewood; or
- a combination of the above.

31. Visitor Accommodation – Campfires

Key Points

- Campfires are a valued part of the camping experience for many people. However, the use of firewood can have significant impacts on natural values within the vicinity of campsites.
- Within wilderness areas, visitors should only use portable fuel stoves.

The objective is to preserve the experience of campfires by maintaining the use within designated areas, while minimising the impacts associated with firewood collection and the risk of wildfire escapes.

This will be achieved by:

1. only permitting campfires after nightfall (6 pm – 9 am) during the wildfire season from December to April, with campfires permissible during the day at other times of the year;
2. prohibiting campfires on days of 'Very High' or 'Extreme' fire danger;

3. investigating the most sustainable method to supply firewood for visitors to recreation sites, and applying this to the planning area;
4. providing fuel, such as gas or electric barbeques, to designated overnight sites and selected day-use sites for cooking purposes, where this is cost effective and practical;
5. encouraging the use of fuel stoves by campers, especially in natural and wilderness areas and for bush and beach camping, except where facilities are provided;
6. providing appropriate information and interpretation on the use of campfires, including the environmental impacts of firewood collection and appropriate use during fire danger periods; and
7. reducing the illegal collection of firewood within the planning area through public education.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

32. VISITOR FEES

The Department currently applies a 'user-pays' policy through a system of commercial concessions and the collection of visitor fees. Visitor fees can include day visitor entry fees and camping fees, fees for permits or fees for services (e.g. guided tours). Revenue raised from visitor fees is used to help maintain and develop visitor facilities or other conservation initiatives within the planning area.

Permitted access for some activities or to certain areas can be a means of limiting environmental damage in sensitive areas while providing a unique experience or opportunity for those willing to pay, or that are organised. However, the provision of services and facilities and the protection of values from visitor use is a considerable cost to the Department. Where necessary or appropriate, the 'user-pays' principle provides an equitable means of raising funds to offset some of these costs.

Entry Fees

Entry fees apply to some national parks in WA. Different types of entry passes available include:

- the day pass – entry cost to one or more parks on any one day per vehicle;
- an annual local park pass – cost per vehicle for annual pass to selected parks only;
- the holiday park pass – cost per vehicle for as many visits to as many parks for a 4 week period;
- an annual all parks pass – cost per vehicle for as many visits to any park for 12 months;
- Gold star pass – cost for an 'annual all parks pass' plus subscription to the Department's 'Landscope' magazine for 12 months; and
- special park passes (e.g. Tree Top Walk) – cost per person or family.

Fees are reviewed annually as a requirement of the *Financial Administration and Audit Act 1985*, although it is not practical to increase fees and charges annually. Fee increases are usually based on the Consumer Price Index.

Camping fees

Camping fees are often payable in addition to entry fees. Scheduled fees apply to sites on the basis of (a) sites with only basic facilities or no facilities, and (b) sites with facilities such as toilets and showers (includes caravans at unpowered sites).

In the planning area, entry fees are charged at the Tree Top Walk facility. Camping fees are payable at Fernhook Falls. Entry and camping fees may be introduced at other sites over the life of this plan.

Fees may also be collected from visitors when a service or opportunity is provided. There are currently no special permitted areas or activities within the planning area, although there is potential for this to apply to some special areas or activities on a limited basis. Current guided tours/walks are at cost.

32. Visitor Fees

Key Points

- The Department currently applies a 'user-pays' policy through a system of commercial concessions and the collection of visitor fees. Visitor fees can include both camping and day visitor entry fees or fees for service.
- Visitor fees can off-set management costs by raising funds to provide and maintain facilities and visitor services.
- Entry fees are charged at the Tree Top Walk.
- Camping fees are charged at Fernhook Falls.

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

This will be achieved by:

1. maintaining camping fees at Fernhook Falls, and considering the introduction of camping fees at other campsites where it is practical and cost-effective;
2. considering adopting visitor entry fees for parks in the planning area in consultation with the Conservation Commission, where they are practical and cost effective to the Department; and
3. providing appropriate information and interpretation on fees to visitors in cooperation with local and adjacent Visitor Centres.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

33. 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 from tourism help the Department meet the costs of managing the natural resource. A commercial concession is a 'right granted by way of a lease, licence or permit for occupation or use under appropriate conditions, of an area of land or water managed by the Department for the purposes of the provision of appropriate facilities and services for visitors' use and enjoyment'. Commercial concessions must be consistent with the purpose of the park, the protection of its values and with the objectives of this plan. The Department's Policy No. 18 – *Recreation, Tourism and Visitor Services* governs conditions for commercial concessions.

Leases

Leases are formal agreements that allow exclusive use of land. They are issued when the activity or land use involves significant infrastructure and/or retailing. A lease allows a lessee to occupy a particular area of land and hence provides security to protect significant investments.

There are two types of leases issued on lands and waters managed by the Department:

- forest leases granted under section 97 of the CALM Act; and
- leases for other lands and waters covered by the CALM Act, granted under section 100 of the CALM Act. This includes national parks and conservation parks.

Leases may be up to 21 years with an option of a further lease up to 21 years, with the length of commercial leases (for tourism and recreation purposes) usually being proportional to the level of investment and the expected return on the investment.

Apart from leases for tourism and recreation purposes, other lease uses have included utilities, and rubbish disposal (see Section 40 *Public Utilities and Services*). Leases are usually issued or renewed on a case-by-case basis. If, on application, the operation has a commercial benefit (such as a caravan park), then establishment of a formal 'Expression of Interest' process for the lease is initiated.

At the time of printing, there are four current leases issued within the planning area that have a recreation/tourism focus (Table 15).

Table 15. Leases within the planning area

Lease Number	Purpose	Location
1826/97	Clay target range	Hay block
1897/100	Public park with a 'pioneer' emphasis	Pioneer Park, Walpole townsite
1900/100	Caravan park	Coalmine Beach
2059/100	Yacht club	Coalmine Beach

Amendments to the CALM Act are proposed so that essential public infrastructure can be catered for. The Department will continue to issue and administer leases for facilities and uses in accordance with the provisions of the CALM Act.

Given the strong growth in nature-based tourism throughout the region, it is likely that demand for facilities in or near the planning area will increase. To cater for this, as well as preserving the area's natural setting, it is preferred that any new commercial operations not listed in Table 15 be located outside, but linked to, the planning area. These areas have scope for increased accommodation and have potential to cater for a variety of visitors seeking either a different class of facilities or type of accommodation, which is currently unavailable within the planning area.

There are other leases in the planning area with uses other than recreation and tourism (e.g. utilities), and these are discussed further in Section 40 *Public Utilities and Services*.

Licences

Licences allow tourist operators to enter and use lands and waters managed by the Department. Activities carried out under a licence are generally itinerant and do not require substantial infrastructure. All private tour operators conducting commercial tourist activities on conservation reserves and State forest are required to obtain a licence in accordance with section 101 of the CALM Act. Licensing enables the Department to monitor and regulate access and use of lands and waters under its control, and ensure that the natural values of these areas are maintained. By protecting these values, tour operators will be able to continue to visit areas maintained to the satisfaction of visitors. Collection of data can be made a condition of licensing.

Two types of licences are issued, depending on the nature of the activity, the security of the resource, and the risk to the participants. Restricted 'E Class' licences are issued where there are safety, environmental or management concerns, and hence the number of licences needs to be restricted. Generally 'E Class' licences are issued following a formal publicly advertised and competitive 'Expression of Interest' process. Unrestricted 'T Class' licences are issued where environmental and visitor management objectives can be achieved through the implementation of licence conditions, and most commonly applies to low-impact vehicle-based operations, such as Commercial Tour Operators (CTOs). 'T class' licences can be issued for one, three or five-year periods based on the level of registration with recognised accreditation tourism programs.

Conditions apply to all licences to minimise the impacts of activities, or to aid in management of the value being appreciated by the public. Managers consider a number of factors before issuing licences, including:

- infrastructure requirements of tour operations (e.g. adequate toilet facilities, access and parking for large vehicles);
- potential impacts to water quality;
- visitor safety;
- competence of group leaders;
- the potential damage to sensitive areas and wildlife; and
- the appropriateness of retail concessions in particular natural environments.

Guidance for the general conditions for tour operators in national parks and conservation parks is provided for in the Department's Tour Operator Handbook (CALM 1999b).

In the planning area, there are about 255 CTOs that are licensed to operate a wide range of nature-based activities. However, not all licensed operators actually use the planning area. Most of these operators run vehicle-based tours, stopping at developed recreation sites. A few commercial tour operators use less accessible areas of the planning area. Improvements in licensing, technology and the relationship with tour operators may provide more information about areas used, numbers of tourists visiting with tour operators, frequency/season of use and other vital information that can assist the Department and tourism organisations better cater and manage for tourism.

There are opportunities to continue to develop appropriate commercial tourism operations in the planning area. Concessions for activities and services such as vehicle-based tours, white water rafting, canoeing and boat hire, guided walks, accommodation and nature study tours could greatly increase visitor interest in, and attract more visitors to, the planning area. An assessment of these activities based on protecting the values of the planning area should be carried out prior to the issuing of any commercial concession.

The participation of Aboriginal traditional owners in promoting aspects of culture and lifestyle, including reference to medicinal and nutritional uses of native plants and bush tucker is of enormous interest to visitors and offers commercial enterprise opportunities. The interpretation of the planning area from the perspective of Aboriginal traditional owners must take place in a manner supported by the traditional owners.

33. Commercial Operations

Key Points

- The Department enters into commercial arrangements to help meet the rising demand for high quality recreation and tourism services, while at the same time ensuring that the financial contributions from tourism assist in meeting the costs of managing the natural environment.
- A commercial concession is a right granted by way of a lease, licence or permit for occupation or use (respectively), under appropriate conditions, of an area of land or water managed by the Department. A lease allows for occupation of an area and enables significant development to occur, whereas licences allow operators to enter and use lands and waters. Four leases, which have a recreation/tourism focus, occur within the planning area.
- Opportunities for tour operators include vehicle-based tours, horse riding, white water rafting, abseiling, canoeing and boat hire, guided walks, provision of and/or management of accommodation, camping and nature study tours.

The objective is to provide for a range of services and recreational experiences within the planning area through the involvement of private enterprise, whilst ensuring that commercial tourism activities are compatible with other management objectives.

This will be achieved by:

1. 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 within the planning area;
    - facilitate park management; and
    - provide a service or facility to visitors that the Department would not otherwise be able to provide;
2. reviewing leases, licences or permits on an appropriate basis;
3. encouraging tour operators that operate in the planning area to acquire quality assurance through industry accreditation and qualification programs. This will be facilitated, in part, by promoting the Tour Operator Handbook to operators;
4. evaluating proposals for licences and commercial tourism leases according to Department Policy No. 18 – *Recreation, Tourism and Visitor Services* and permit their establishment where appropriate;
5. identifying the sustainable level of operator use and monitoring the impact of these activities. This may involve the collection of data as part of the licence conditions of commercial operators in sufficient detail to enable thorough evaluation of environmental and social issues;
6. developing a policy in conjunction with Aboriginal traditional owners to promote their participation in commercial activities within the planning area;
7. ensuring any commercial recreation and tourism operations in the planning area are cost-neutral to the Department;
8. not providing concessions within the planning area if adequate facilities or services exist, or they can be developed, outside the parks that meet visitor needs; and
9. providing resources and training for the tourism industry in interpreting the Department's role and the planning area's natural and cultural values.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

34. VISITOR SAFETY

In addition to a genuine concern for visitor welfare, the Department has a moral and legal responsibility to consider the personal safety of visitors to the planning area. According to the *Occupiers Liability Act 1985*, the Department is defined as the "person occupying or having control of land or other premises" and needs to show anyone entering conservation lands a "duty of care". This is defined as "such care as in all the circumstance of the case is reasonable to see that the person will not suffer injury or damage by reason of any … danger". Many national parks and other natural areas that the Department manages are remote from emergency services, hard to access by emergency vehicles or have communication problems. The Department manages the risks presented to visitors by their activities and by the natural, cultural, and developed environments through a visitor risk management program under the Department's Policy No. 53 – *Visitor Risk Management*. The program involves the identification of hazards, assessment of the risks posed by these hazards, implementation of risk mitigation measures and ongoing monitoring. As part of the program, all designated recreation sites are routinely assessed to identify visitor risks.

The level of risk is part of the visitor experience and opportunities for risk taking are essential to many people's attraction to the outdoors. Visitor risk is often higher in the more 'natural' sites, although risk reduction is less at these sites and visitors should be advised accordingly. Some visitors to the planning area deliberately seek out activities because they involve risk, not despite them. These activities include rock climbing and abseiling, mountain biking, rock fishing, remote bushwalking and white water rafting. However, visitors are expected to take responsibility for their own safety, and the Department encourages visitors to use appropriate behaviour whilst undertaking recreational activities that involve risk. There are also risks to people associated with the use of vehicles, and the Department will inform the public about vehicle hazards and the safe use of vehicles on land managed by the Department.

Risks to visitors specifically within the planning area also include:

- rogue waves on rocks, cliff edges, rips and other risks associated with access to the coast;
- hypothermia from over-exposure under cold conditions;
- falling injuries associated with climbing (e.g. rock outcrops) and walking;
- overhead hazard of falling limbs;
- increased threat of visitors becoming lost in remote areas distant from access, contact and emergency assistance;
- attempting to cross flooded rivers;
- wild pigs; and
- canoeing and swimming, particularly in areas with snags, rocks or rapids. Fluctuating water levels can vary the water depth over obstacles such as sunken trees and stumps, and river floods can move obstacles to new locations.

However, many of these risks are overcome through attention to personal safety (including the registration of trip details with friends or family), appropriate maintenance of facilities by Department staff, and appropriate risk warning signage.

The Department works closely with the State Emergency Service, WA Police, St Johns Ambulance and volunteer fire brigades in managing visitor risk within the planning area. In the event of an incident, the coordination of search, rescue or recovery operations is the responsibility of the WA Police. However, where these occur on lands and waters managed by the Department, the initial response is often organised by the Department.

Emergency service 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 on land of high conservation value such as national parks and nature reserves (see Section 39 *Defence Training*). The Denmark and Walpole State Emergency Service groups sometimes use

the planning area for search and rescue training. 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;
- taking vehicles off roads and tracks;
- use of support or transport aircraft; and
- use of domestic animals (such as 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.

34. Visitor Safety

Key Points

- The Department has a moral and legal responsibility to minimise visitor risk, and has a "duty of care" for visitors to the planning area.
- The Department manages the risks presented to visitors by implementing Department Policy No. 53 – *Visitor Risk Management* and the visitor risk program.
- Designated recreation sites are routinely assessed to identify visitor risks.
- The most common risks to visitor safety relate to dehydration and heat exhaustion, slipping and tripping incidents associated with bushwalking on uneven ground, bites and stings and the threat of wildfire.
- Other risks to visitor safety include visitors becoming lost in remote areas, overhead hazard of falling tree limbs, hypothermia from over-exposure under cold conditions, unseen or unexpected conditions on the coast (e.g. rogue waves on rocks and cliff edges) or in inland waterways (e.g. water levels and snags).
- The coordination of search, rescue or recovery operations is the responsibility of the WA Police, although the Department often organises an initial response on the lands and waters it manages.
- Emergency service training may be an acceptable use of lands and waters managed by the Department if carried out in appropriate areas and in an ecologically sensitive manner. Approval for emergency service training activities within the planning area will be considered on a case-by-case basis.

The objective is to minimise risks to public safety associated with visiting areas managed by the Department while maintaining a range of visitor experiences wherever possible.

This will be achieved by:

1. continuing to undertake formal risk assessment of all recreation sites and facilities as part of the visitor risk management program and in addition to that which occurs on a day-to-day basis;
2. providing appropriate information and interpretation to enable visitors to consider and minimise risks and to highlight potentially hazardous areas and activities, particularly the inundation of seasonally wet areas and the safe use of vehicles;
3. liaising with organisations to adopt or develop new codes of conduct for popular activities (such as bushwalking, swimming, canoeing, horse riding, abseiling) and promoting and publicising them as appropriate;
4. investigating methods for improved emergency communication in the planning area;
5. applying industry standards and utilising appropriate expertise and quality of materials in the safe design and construction of facilities and structures; and
6. assessing impacts of specific proposals for undertaking emergency services training activities within the planning area, and providing conditional approval as appropriate.

Key Performance Indicators (see also Appendix 2):		
Performance Measure	**Target**	**Reporting Requirements**
34.1 The number and severity of incidents occurring within the planning area and reported to the Department	34.1 The number and severity of incidents occurring within the planning area and reported to the Department remains stable or decreases from 2008 levels	After 5 years

35. DOMESTIC ANIMALS

There are many opposing and strongly held views about the presence of domestic animals, such as dogs and cats, on public lands. On one hand, domestic animals[28] are important companions for many people who often have a personal attachment to their pet. Dogs provide particular enjoyment to their owners and are frequently taken on day trips and overnight stays, including trips by visitors commuting through or recreating within the planning area. Landholders adjacent to the planning area often also exercise their dogs in forest areas bordering their property.

However, there can often be conflicts when other visitors dislike the noise, risk of personal injury and fouling by domestic animals. There may be a risk of dogs taking baits in many conservation reserves that are poison-baited for the control of feral animals (see Section 23 *Introduced and Other Problem Animals*).

Department Policy No. 18 – *Recreation, Tourism and Visitor Services* and the *Dog Act 1976* provide guidance on the presence of domestic animals on lands managed by the Department. Dogs are not permitted on lands managed by the Department, except within designated dog areas, where guide dogs are required for visitors with visual or hearing impairment, or where specially trained dogs are required for management (i.e. feral animal control, see Section 23 *Introduced and Other Problem Animals*) or search and rescue operations. Dogs are required to be on a lead except in areas designated by the Department for dog exercise without the requirement for a lead or for guide or specially trained dogs (above), although they must be under the control of a competent person.

Only one designated area for dogs exists within the planning area on Foul Bay Beach at Peaceful Bay in the Walpole-Nornalup National Park. As there has been interest from the public for the provision of additional areas for dogs within the planning area, two additional areas in Mount Frankland South National Park within Keystone block (outside of the Public Drinking Water Source Area), and in Walpole-Nornalup National Park within the Horseyard Hill circuit and heritage trail will be designated for dogs. However, no further areas for dogs will be designated within the national parks and nature reserves within the planning area over the life of the plan, given the natural values of these areas.

There have been problems with inappropriate dog use on some beaches in Quarram Nature Reserve. To solve this issue, the extension of the boundaries of some reserves (see Section 11 *Proposed Tenure, Purpose, Vesting and Boundary Changes*) that adjoin the Southern Ocean will be investigated with a view to changing them to the low water mark. This will ensure consistency between reserves managed by the Department and enable the area between the high and low water mark to be managed for dogs under the *Conservation and Land Management Regulations 2002*.

[28] Domestic animals do not include horses, which are covered under Section 30 *Visitor Activities – Horse riding.*

In State forest within the planning area, two additional areas will also be designated for dogs in the forest conservation areas in the vicinity of Bee Road and the Arboretum on Bridge road in Swarbrick block (see Section 30 *Visitor Activities and Use – Bushwalking*). Any additional designated areas permitted during the life of this management plan will be restricted to the forest conservation areas.

35. Domestic Animals

Key Points

- Domestic animals are generally not permitted within the planning area, except within designated dog areas, for guide dogs and other specially trained dogs used for search and rescue and management purposes.
- Foul Bay Beach is an existing designated area for dogs, and other designated dog areas will be established in the planning area at Bee Road, the Arboretum on Bridge Road in Swarbrick block, Keystone block and Horseyard Hill.

The objective is to provide designated areas where domestic animals are allowed and visitors can enjoy the natural environment with their pets while protecting native fauna and visitors from the impacts of domestic animals.

This will be achieved by:

1. allowing domestic dogs only within designated areas:
    - at Foul Bay Beach at Peaceful Bay (Walpole-Nornalup National Park);
    - along Horseyard Hill circuit and heritage trail (Walpole-Nornalup National Park);
    - within Keystone block (Mount Frankland South National Park); and
    - within the forest conservation areas at Swarbrick block in the vicinity of Bee and Bridge roads;
2. allowing guide dogs and dogs required for emergency search and rescue and management purposes within the planning area, including dogs permitted to be used in the control of feral pigs;
3. providing appropriate information and interpretation on Department policy regarding domestic animals; and
4. encouraging visitors to take their domestic animals to areas outside the planning area.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

PART G. MANAGING RESOURCE USE

36. INDIGENOUS CUSTOMARY ACTIVITIES

The hunting and gathering of traditional foods by Aboriginal people is an important part of their culture, enabling them to maintain or re-establish their links with the land, share knowledge and partake in traditional practices (see Section 26 *Indigenous Heritage*). Aboriginal people in the region accessed lakes, rivers, estuaries, swamps and forest areas for a range of food that included fish, birds, reptiles, frogs, invertebrates, fungi, tubers, roots, berries and nuts from a variety of plant species (McDonald, Hales and Associates 1994). Aboriginal people also managed stands of *Taxandria juniperina* to provide spear shafts (T. Middleton *pers. comm.*).

Section 23 of the *Wildlife Conservation Act 1950* 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 Department's Director General. 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. specially protected species);
- the activity does not impinge upon the safety of others;
- food taken is not sold; and
- the activity is consistent with other land management objectives.

Section 6 of the *Fish Resources Management Act 1994* also does not require an Aboriginal person to hold a recreational fishing licence to the extent that the person can take fish from any waters in accordance with continuing Aboriginal tradition if the fish are taken for themselves or their family and not for a commercial purpose, subject to closed season restrictions, methods of capture and size restrictions.

36. Indigenous Customary Activities

Key Points

- As part of their culture, Aboriginal people may seek to hunt or gather food within the planning area.
- Exemptions within the *Wildlife Conservation Act 1950* allow for these customary activities to occur.

The objective is to enable Aboriginal people to hunt and gather native foods consistent with sustainable use principles and relevant legislation and policy.

This will be achieved by:

1. allowing the traditional custodians of the area, or others approved by them, to take sufficient food for themselves and their family, provided this has been approved by the Director General and is in accordance with any associated conditions; and
2. managing food gathering activities consistent with legislation and policy.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

37. MINERAL AND PETROLEUM EXPLORATION AND DEVELOPMENT

Mineral and petroleum exploration and development on lands and waters managed by the Department are subject to the *Mining Act 1978*, the *Petroleum Act 1967*, the *Environmental Protection Act 1986*, the *Wildlife Conservation Act 1950* and various State Agreement acts. The Mining and Petroleum Acts take precedence over the CALM Act and may prevail over the contents of this management plan.

Sections 24, 24A and 25 of the *Mining Act 1978* define Ministerial responsibilities for approving mineral exploration and mining[29] on various land and waters of the State. The *Mining Act 1978* has the following implications for terrestrial lands to which the CALM Act applies (for the purposes of this part of the plan, CALM Act marine reserves are not dealt with) and which are managed by the Department.

1. Mining can be undertaken in the following terrestrial tenures subject to the concurrence of the Minister for the Environment and the consent of both Houses of Parliament. The Conservation Commission provides advice to the Minister for the Environment. The tenures that this applies to are:
    - any national parks;
    - class A nature reserves;
    - class A *Land Administration Act 1997* reserves (including conservation parks) in the South-West Land Division of the State (including the Esperance and Ravensthorpe Shires).

2. Mining can be undertaken in a State forest or timber reserve within the South West Mineral Field, subject to the concurrence of the Minister for the Environment.

3. Mining can be undertaken in the following terrestrial tenures subject to recommendations of the Minister for the Environment. The tenures that this applies to are as follows:
    - *Land Administration Act 1997* reserves which are not class A;
    - class A *Land Administration Act 1997* reserves (including conservation parks) outside the South -West Land Division of the State (including the Esperance and Ravensthorpe Shires);
    - State forest and timber reserves outside the South West Mineral Field.

Approval to mine under the *Mining Act 1978* cannot be given by the Minister administering that Act without meeting the requirements of the *Environmental Protection Act 1986*. Effectively, in matters which impact on the environment, the *Environmental Protection Act 1986* takes precedence over other Acts. DOIR, who administer mining and petroleum tenements throughout the State, refers projects that may potentially cause significant environmental impacts to the EPA under section 38 of the *Environmental Protection Act 1986* according to agreed guidelines. Under the Memorandum of Understanding between DOIR 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. 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. The Conservation Commission may provide advice to the Minister for the Environment on proposals to extract mineral or petroleum resources. In the case of this management plan, the Conservation Commission will seek to oppose any mineral or petroleum extraction activities that may affect the values of the planning area.

[29] Mining includes exploration, fossicking, prospecting and mining operations.

DOIR has produced an information booklet *Guidelines for Mineral Exploration and Mining within Conservation Reserves and other Environmentally Sensitive Areas* (Department of Industry and Resources 1998), which sets out the basic procedures and conditions to be applied to applications for mining tenements.

Mining and petroleum exploration and production is also subject to State Government policy and, at the time of publication, the State Government's policy is to prohibit mineral and petroleum exploration and extraction in national parks and nature reserves. More specifically, the Government's position is that applications for access to these areas will only be considered if they are lodged prior to 10 February 2001. If considered, there would be no presumption for approval and if approved, these applications would be expected to include contributions to reserve management in accordance with the principle of environmental offsets[30]. In addition, the Department's position is that the costs of follow up rehabilitation of mining and petroleum operations should be borne by the organisation/s responsible for the activity.

Mineral Resources and Prospectivity

The planning area has been, and continues to be, subject to mineral exploration. The mineral potential of the planning area was assessed in 1997 by the Joint Commonwealth and Western Australian Regional Forest Agreement Steering Committee (Bureau of Resource Sciences and Geological Survey of Western Australia, 1998). A polymetallic deposit was later discovered within the Albany-Fraser Orogen geological province (see Section 16 *Geology, Landforms and Soils*), with further modelling suggesting a high potential for mineralisation in sedimentary rocks and a degree of prospectivity for zinc, lead, silver, gold and tungsten. This signified a major change in the interpretation of the mineral prospectivity of the whole Albany-Fraser Orogen, which, prior to this, was thought not to have significant levels of mineralisation. Surveys were also carried out between 1999 and 2000 in the eastern part of the planning area, which found unusually high levels of gold, copper, silver and zinc. Further exploration results were disappointing and the tenements were surrendered following the end of the survey period. However, mineral discoveries are commonly the result of multiple stages of exploration by different companies using different techniques, concepts, target commodities and areas of focussed work, and the prospectivity of the Nornalup Complex in the planning area remains significant.

There are currently ten exploration licences within the planning area (Table 16), two of which are live and eight are pending.

Table 16. Current and expired mining tenements within the planning area

Tenement	Tenement Type	Lease holder	Lease Status
E70/2500	Exploration licence	Clara Resources Pty Ltd, Range Resources Ltd	Live
E70/2574	Exploration licence	Askens, Stewart	Pending
E70/2576	Exploration licence	Askens, Stewart	Pending
E70/2801	Exploration licence	Atriplex Ltd	Live
E70/3000	Exploration licence	Atriplex Ltd	Pending
E70/3001	Exploration licence	Atriplex Ltd	Pending
E70/3137	Exploration licence	Great Southern Gold Pty Ltd	Pending
E70/3138	Exploration licence	Great Southern Gold Pty Ltd	Pending
E70/3140	Exploration licence	Great Southern Gold Pty Ltd	Pending
E70/3141	Exploration licence	Great Southern Gold Pty Ltd	Pending

[30] Environmental offsets aim to ensure that significant and unavoidable environmental impacts are counterbalanced by a positive environmental gain, with a goal of achieving a 'net environmental benefit' (EPA 2006).

Basic Raw Materials

Basic raw materials (BRM), principally gravel but also limestone, marl sand and rock aggregate, have previously been extracted from the planning area by the Department and surrounding Shires for road construction, recreational site development and building uses. Most requests for BRM are from Shires or Main Roads WA for use on roads that are enclaves within the planning area. It is preferred that these materials are obtained from outside lands managed by the Department.

The removal of gravel and other industrial materials from lands managed by the Department is subject to the State Gravel Supply Strategy, the Department's Policy No. 2 – *Local Government Authority Access to Basic Raw Materials from State forest and Timber Reserves* and the Conservation Commission's Basic Raw Materials Policy. Gravel has previously been extracted from State forest and timber reserves by way of a CALM Act forest lease, however, a 2000 amendment to the CALM Act and legal advice now stipulate that the Department must respond to notices of intent by local government or Main Roads WA for gravel extraction under the *Local Government Act 1995*.

Gravel for the construction and maintenance of roads within the planning area will be sourced as far as possible outside the planning area. However, the Conservation Commission will consider extraction where the use of the material assists in the protection and management of the area, a more environmentally acceptable alternative is not available, where the material is used within the boundaries or enclaves of the planning area and where the environmental cost to the conservation estate on balance is neutral. To minimise disturbance to conservation areas, alternative sources of BRM, located outside the planning area, are preferred. Where extraction of BRM does occur, natural values of the planning area can be protected by:

- providing nodes for gravel extraction up to a maximum of 200 m from the carriageway along the South Western Highway between Quinninup and Walpole;
- siting pits only in vegetation communities that are adequately represented in conservation reserves and with the lowest natural values;
- siting pits in areas that are protectable from dieback disease introduction and spread (see Section 24 *Diseases*);
- siting pits in areas that are already infested with degraded vegetation and therefore unprotectable, with appropriate hygiene procedures to avoid spread (see Section 24 *Diseases*);
- applying best practice management in accordance with the Department's dieback disease hygiene manual (see Section 24 *Diseases*); and
- applying best practice rehabilitation following extraction (see Section 41 *Rehabilitation*).

There is a need for access to gravel within the planning area by the Shires of Denmark, Manjimup, Plantagenet and Main Roads WA for maintenance to the major roads of South West Highway, Denmark-Mount Barker Road and the North Walpole Road. As part of the State Gravel Supply Strategy, a coordinated study is being implemented by DOIR, local government authorities and Main Roads WA to plan for future strategic gravel supply and demand for the wider region. The State Gravel Supply Strategy investigations were completed in 2004 with 24 areas identified as having potential for strategic gravel sources (8 within the planning area, with 3 in proposed FCAs and 5 within national park). Following this study, it will be possible to determine gravel needs from within the planning area.

Decreasing availability of gravel suggests that the use of alternative materials such as crushed rock may be more appropriate. However, the use of alternative materials would inevitably result in considerably higher costs for all users and, while this may be inevitable in the long term, careful management of existing resources should ensure adequate supplies of gravel for all stakeholders for the foreseeable future.

37. Mineral and Petroleum Exploration and Development

Key Points

- Mining relates to exploration, fossicking, prospecting, and mining operations.
- Mining is regulated by the *Mining Act 1978*, the *Petroleum Act 1967*, relevant Government Agreement Acts, and the *Wildlife Conservation Act 1950* in relation to DRF. The *Environmental Protection Act 1986* takes precedence over these Acts in matters affecting the environment.
- Mining and mineral exploration is administered by DOIR. Projects which may cause significant environmental impact are referred to the EPA for assessment.
- Mining can have considerable impacts upon natural values. Mining in national parks, class 'A' nature reserves and *Land Administration Act 1997* class 'A' reserves within the South-West Land Division of the State (including the Shires of Esperance and Ravensthorpe) require the concurrence of the Minister for the Environment and the consent of both Houses of Parliament. Mining in a State forest or a timber reserve within the South West Mineral Field requires the concurrence of the Minister for the Environment. Mining on other terrestrial CALM Act land requires the Minister for the Environment's recommendations.
- Basic raw materials are required for road construction and maintenance and recreation site development.
- Gravel extraction in the planning area by local government and Main Roads WA is regulated by the *Local Government Act 1995* and the *Environmental Protection Act 1986*, and guided by Department and Conservation Commission policy and the State Gravel Supply Strategy.
- Where possible, gravel will be sourced outside the planning area.

The objective is to protect the planning area from the impacts of mining and extraction of basic raw materials, while being consistent with Government policy.

This will be achieved by:

1. in conjunction with DOIR, evaluating the likely impact of any proposed mineral resource development activities within the planning area (and external areas that may impact upon it) and make recommendations that minimise impacts within the context of Government policy;
2. monitoring, with DOIR, existing mineral exploration and mining activities that impact directly or indirectly on the planning area and requesting DOIR to take any necessary action where conditions are breached;
3. seeking direct and complimentary offsets to counterbalance any adverse environmental impact due to mineral and petroleum exploration and mining activities to achieve no net environmental loss or preferably a net environmental benefit outcome;
4. in accordance with Department and Conservation Commission policy, permitting access to basic raw materials from the planning area where the use of the material assists in the protection and management of the area, a more environmentally acceptable alternative is not available and where the material is used within the boundaries or enclaves of the planning area;
5. developing working arrangements with agencies extracting gravel and basic raw materials from lands managed by the Department;
6. ensuring all mining activities adhere to Department hygiene standards; and
7. ensuring that all sites in which any mining activity occurs are rehabilitated according to the Department rehabilitation standards and guidelines (see Section 41 *Rehabilitation*).

Key Performance Indicators:

There are no Key Performance Indicators for this section.

38. COMMERCIAL FISHING

The commercial fishing industry relies on selected beaches along the south coast (ocean-based fishery) and a number of major inlets (estuarine-based fishery), including Irwin Inlet. The ocean fishery is based on a salmon fishery (February to April), a rock lobster season (November to June), greenlip abalone *Haliotis laevigata* and brownlip abalone *H. conicopora*, estuarine species (cobbler *Cnidoglanis macrocephalus*, black bream, sea mullet *Mugil cephalus* and Australian herring predominantly) and shark and deep-sea fishing. The commercial fishing industry is managed by the Department of Fisheries. Commercial fishing operations on lands managed by the Department are in accordance with Department Policy No. 51 – *Access for Commerical Fishing Through CALM Lands*.

Most commercial fishing operations take place outside the planning area (off shore or in Irwin Inlet). However, a number of activities associated with commercial fishing take place within the planning area, including powerboat servicing, launching and catch transfer. Therefore, the use of vehicles, power generators and other equipment can affect planning area values and present a potential (though manageable) risk to other park visitors. Access to beaches for commercial fishing is managed by the Department under licence. Terrestrial commercial fishing, especially for salmon and herring occurs from a series of specified beaches along the south coast. In the planning area, camps are established at the mouth of the Nornalup Inlet during the fishing season and access is via the Blue Holes track and along Bellanger Beach. There have also been some applications for access to the coast through Quarram Nature Reserve for commercial fishing.

A separate indicative planning process has commenced to investigate the establishment of a marine conservation reserve in the Walpole and Nornalup Inlets. Issues relating to marine reserves, such as zoning for various purposes, are beyond the scope of this management plan, which is concerned with terrestrial reserves to the low water mark of the Walpole and Nornalup Inlets and the high water mark of the Southern Ocean. However, regardless of the outcomes of the marine planning process, this management plan supports the existing types and levels of access to the oceans and estuaries that are provided in the planning area.

38. Commercial Fishing

Key Points

- The commercial fishing industry relies on selected beaches along the south coast including Irwin Inlet.
- All fishing operations are controlled by the Department of Fisheries. Access through conservation estate is controlled by the Department, in accordance with Policy No. 51 – *Access for Commercial Fishing Through CALM Lands*.

The objective is to continue to allow access for commercial ocean and estuarine fishing subject to conditions to minimise impact on values of the planning area and park visitors.

This will be achieved by:

1. allowing existing fishing operations in the planning area to continue at the present scale in accordance with existing regulations as controlled by the Department of Fisheries;
2. ensuring any impacts of fishing operations within the planning area on natural values and conflict between visitors are minimised;
3. liaising with the Department of Fisheries to ensure that there are no inappropriate changes in fishing operations that might adversely affect values of the planning area and experience of visitors; and
4. continuing to provide access tracks within the planning area for commercial fishery use in accordance with Department Policy No. 51 – *Access for Commercial Fishing Through CALM Lands*.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

39. DEFENCE TRAINING

The Department sometimes receives requests regarding defence force training on lands and waters it manages. Activities previously undertaken within the planning area, in areas such as Redmond block, have included survival and navigation exercises, military training, driver training, leadership and search and rescue training. Some activities that may be proposed may be associated with an unacceptable level of ecological impact, and hence not be appropriate for the planning area. Conversely, in some instances activities may be able to be accommodated without unduly diminishing natural or cultural values of the planning area or disrupting other visitors. Where approval for defence force training in the planning area is granted, this will often be subject to specified conditions.

The types of defence force training activities proposed can vary considerably, hence requests to conduct such activities in the planning area are best assessed on a case-by-case basis so that the particular requirements and impacts of each exercise can be considered and conditional approval provided if/as appropriate. To facilitate this, the defence force unit or unit training coordinator must make written application to the Department at least three months before the proposed exercise to allow sufficient time for assessment. One of the key factors within the planning area is dieback protection, and it is important that the spread of *P. cinnamomi* is prevented. The Department's Policy No. 54 – *Defence Force training on CALM Managed Lands and Waters* also provides guidance on this issue.

In general, the following activities are not acceptable in the planning area:

- any operations that would involve soil movement and the spread of *P. cinnamomi* (see Section 24 *Diseases*);
- camping involving digging or soil disturbance, use of fire, rubbish disposal or construction of temporary toilets;
- group manoeuvres involving large numbers of personnel;
- damaging, cutting or destroying vegetation (for example for camouflage or concealment of personnel and equipment);
- carrying and use of firearms, ammunition or pyrotechnics;
- taking vehicles off roads and tracks (for example in deployment procedures);
- use of roads and tracks by heavy vehicles (except for logging roads where conditions are suitable);
- use of support or transport aircraft or power boats;
- survival training involving collecting and consuming native plants and animals regarded as bush tucker;
- use of domestic animals (see Section 35 *Domestic Animals*); and
- building fortifications, weapons pits or other structures.

39. Defence Training

Key Points

- Defence training is an acceptable use of lands and waters managed by the Department, but must be carried out in appropriate areas and in an environmentally sensitive manner.
- Activities will be assessed on an individual basis and a written application has to be made to the Department before any training exercise can be carried out within the planning area.

The objective is to allow for defence force training where the impacts on the planning area are minimised.

This will be achieved by:

1. prohibiting training exercises in areas likely to cause unacceptable damage to natural and cultural values or unacceptable risk and disturbance to visitors to the planning area;
2. assessing impacts of specific proposals for undertaking defence force training activities within the planning area, and providing conditional approvals if/as appropriate;
3. liaising with the defence forces likely to conduct training exercises in the planning area to (i) adopt minimal impact techniques during training exercises and (ii) encourage them to seek alternative suitable venues outside the planning area; and
4. maintaining a record of areas used for defence force exercises within the planning area so that advice can be given on the sustainability of areas and alternative areas can be identified.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

40. PUBLIC UTILITIES AND SERVICES

Public utilities and services within the planning area are significant to local and regional communities. Utility corridors often link various electricity, gas, telecommunication and water service networks to private property that may be surrounded by the planning area, or across Crown lands to shorten the route for these services to other nearby lands.

Leases over specific locations on lands managed by the Department for some utilities or services can be approved, provided that their impact on other values is minimised. The Department's Policy No. 18 – *Recreation, Tourism and Visitor Services* and Policy No. 49 – *Radio Communications Facilities Policy* guide the management of radio communication facilities and other leases (see Section 33 *Commercial Operations*). There are 7 current utility agreements within the planning area with another 3 agreements yet to be finalised (Table 17).

Table 17. Agreements or licences within the planning area

Number	Purpose	Location
Current Agreements		
2008/101	Telecommunications site (co-location) - WA Police	Mt Frankland
2018/101	Telecommunications site (co-location) - Telstra	Mt Frankland
2041/101	Telecommunications site (co-location) - Western Power	Mt Frankland
2079/35	Telecommunications site (co-location)	The Department's Walpole office
2088/101	Telecommunications site (co-location) - Department of Justice	Mt Frankland
2106/101	Temporary infiltration drain	Reserve 31362 near Walpole townsite
Agreements yet to be Finalised		
2034/35	Telecommunications site (co-location) – St John's Ambulance	Mt Frankland
2193/101	Wastewater pipeline	near Walpole townsite
2195/101	Pipeline to supply water from Butler's Creek Dam to wastewater treatment plant	Walpole
Memorandum of Understanding		
1921/97	Telecommunications site shared and owned by three agencies	Mt Burnside tower

Several companies and agencies have agreements for telecommunications facilities within the planning area, mainly located on Mt Frankland. Mt Frankland is also used as a fire tower by the Department (see Section 25 *Fire*), as well as a visitor destination because of the panoramic views it affords across the planning area (see Section 30 *Visitor Activities and Use – Picnicking, Barbequing and Day-Use*). A new application for telecommunication facilities at Mt Frankland is pending. The Memorandum of Understanding relating to telecommunications infrastructure at Mt Burnside involves the Department and two other agencies, as co-owners of the tower.

Ancillary equipment shelters or ground works associated with the co-location of existing structures on lands managed by the Department can be permitted under the co-location agreement provided no alternative sites are available, Department operations are not impeded, and any proposal is subject to environmental assessment.

Several utility corridors occur in the north, east and south of the planning area, often adjoining and connecting to private property. Most of these are transmission lines. Water pipelines link a water treatment plant, Butler's Creek Dam, the gravity fed tank and the Walpole townsite (see Section 45 *Water Resources*). Sewerage pipelines serve Walpole, and a line from the treatment plant to a woodlot south of Allen Road is proposed. The proposed Bunbury to Albany Gas Pipeline may impact upon some areas in the north of the planning area in Perillup block during the life of this plan. This should be subject to environmental assessment, should the proposal eventuate.

The distribution of electricity through transmission lines and water through pipelines has implications for landscape values of the planning area (see Section 18 *Landscape*). An assessment of the visual landscape values of the area by the Department in 2001 suggested that utility corridors have visual impacts on the landscape and the visitor's perception of the natural environment may be diminished, particularly where these features are visible from tourist routes or destinations, or where they are dominant features of the landscape. Potential new utility corridors should be subject to visual assessments as part of the approval process.

A number of Crown reserves vested with the purpose of 'trigonometric stations' are located on key prominent high points in the landscape (e.g. Mt Frankland, Mount Johnston, Mt Lindesay), and often structures and/or access tracks are present. Access to these may occasionally be required by the Department for Planning and Infrastructure. However, vehicle access to these could introduce *P. cinnamomi*, and there may be other environmental impacts on these prominent landscape features. If vehicle access is present and use is required, it should be restricted to the dry summer months under strict disease hygiene conditions.

Some services such as telephone, electricity and gas are also provided by privately run companies within the State. Competition between and within the private and public service providers may lead to duplication of services and may increase the pressure for 'public' utility corridors in or adjacent to the planning area.

The appropriate location of new corridors and infrastructure, and the ongoing management of existing ones, is necessary to minimise environmental impacts. Corridors can result in scars on the landscape, soil erosion, the introduction of weeds and *P. cinnamomi*, and create additional access requiring management. Impact mitigation can be achieved in most cases by the application of visual landscape management techniques, which are designed to minimise the loss of visual amenity often associated with these facilities, and rehabilitation and remediation techniques. Management of these issues can be complex and resource consuming. Consequently, it is preferred that new utilities and services to the planning area are minimised, existing sites and facilities are shared, and consideration is given to minimising impacts on the planning area. The location of structures should preferably be directed outside the planning area.

For maintenance of infrastructure (including during emergencies), utility companies require permission from the Department's District Manager for access and the conditions of entry and operation.

40. Public Utilities and Services

Key Points

- Utility corridors within the planning area allow power, water or telephone services to be provided to private property that is surrounded by conservation estate, or shorten the route for these services to other nearby lands, towns and other infrastructure.
- Impacts of construction and maintenance of these corridors include loss of visual amenity, soil erosion, weed introduction, disease spread and associated access problems.

The objective is to minimise the impacts of utilities and services within the planning area.

This will be achieved by:

1. liaising, where possible, with utility and service providers to locate utilities and services outside the planning area in areas where their impacts are minimised, and permitting new utilities and services within the planning area where there are no viable alternatives and where they are consistent with the protection of other values of the planning area and Government policy;
2. encouraging new utilities and services within the planning area to be developed using existing utility corridors;
3. permitting the co-location of structures on lands managed by the Department with ancillary equipment shelters or ground works, provided that Department operations are not impeded, no alternative sites are available, and any proposal is subject to full environmental assessment;
4. seeking direct and complimentary offsets to counterbalance any adverse environmental impact due to the installation and/or maintenance of public utilities to achieve no net environmental loss or preferably a net environmental benefit outcome;
5. minimising the impacts of any essential utility corridor that exists or is proposed in or nearby to the planning area by implementing landscape management techniques (see Section 18 *Landscape*);
6. encouraging the prime users of infrastructure and utility corridors to be responsible for management of environmental problems, such as weeds and the spread of disease;
7. encouraging the education of staff from utility companies of the importance of vehicle hygiene to prevent the spread of *P. cinnamomi* (see Section 24 *Diseases*); and
8. recognising the continued access to lands managed by the Department for the maintenance of existing assets.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

41. REHABILITATION

Rehabilitation is the process of returning disturbed land to a predetermined stable, self-regulating state in terms of surface, vegetation cover, land-use and/or productivity, consistent with the purpose for which the area is managed. The Department's Policy No. 10 – *Rehabilitation of Disturbed Land* provides guidance 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. Rehabilitation should be the last option in a series of management decisions designed to protect natural values;

- natural regeneration of native vegetation is the preferred method of rehabilitation, and where necessary, steps should be taken to encourage it. Where this is not possible, or needs supplementing, local species, grown from seed or cuttings obtained locally, should be planted, with restoration as far as possible of the original species diversity, composition and spacing; and
- where conditions have been changed to such an extent that local species cannot grow (e.g. on areas affected by salinity, dieback disease, or the removal of topsoil), or where a desired purpose, such as providing shade, cannot be met by local species, species suitable to the conditions and purpose should be planted. However, where more than one species are suitable, then that which occurs naturally closest to the rehabilitation-site should be used, with seeds and cuttings collected from the nearest possible source.

Rehabilitation within the planning area can be used following gravel pit working, mining, road works, previous silviculture activities, track closure, recreation site closure or redevelopment, or activities associated with fire suppression. To ensure that rehabilitation works have the greatest degree of success, as well as limiting the introduction of exotic (non-local) plants and enabling new vegetation to blend into the existing environment, local native species should be used. The initiation of rehabilitation, preferably as soon as practicable after disturbance, and restoration to a particular standard sometime thereafter may be more appropriate than complete restoration.

In cases where other agencies/organisations have been responsible for disturbance within the planning area, it is the Department's policy that the agency is responsible for rehabilitation of these areas to a suitable standard. In such cases, the cost of rehabilitation should also be borne by the agency.

Sources of brushing material (i.e. branches of trees and shrubs used to stabilise soil surfaces such as mobile dune systems) should also be free of disease and seed (unless it is from a local native species).

Non-native and introduced timber tree species trial plots exist across the planning area. These trials are no longer required and present an on-going weed threat to surrounding natural lands (see Section 22 *Environmental Weeds*). These non-native and introduced species trials should be removal (see Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*) and rehabilitated with native species.

41. Rehabilitation

Key Points

- Rehabilitation is the establishment of a stable, self-regulating ecosystem following disturbance.
- Rehabilitation can be used following gravel pit working, mining, road works, previous silviculture activities, track closure, recreation site closure or redevelopment, or activities associated with fire suppression.
- Use of local native species during rehabilitation ensures the greatest degree of success, and preserves the natural and landscape values of the area.

The objective is to restore degraded areas to a stable condition resembling as close as possible the natural ecosystem function.

This will be achieved by:

1. managing the planning area, as far as practicable, to avoid disturbance;
2. developing a working plan for rehabilitation within the planning area, including allocating priorities for works based on:
   - existing and potential impacts on natural and visual landscape values;

- type and extent of the disturbance;
- likelihood of natural regeneration;
- availability of resources;
- level of participation of stakeholders;
- the capacity for long-term monitoring; and
- potential future alternative uses, such as recreation;

3. rehabilitating, closing or relocating roads and tracks that have the potential to erode or impact on visual amenity;
4. in the event of planned activities which will cause disturbance, establishing conditions for the activities which minimise the area and degree of disturbance, and define the type of rehabilitation required;
5. ensuring that, whenever possible, the cost of rehabilitation is borne by those responsible for the disturbance;
6. actively involving private and public groups, individuals and traditional owners in rehabilitation programs;
7. using locally occurring native plant species in the rehabilitation of disturbed areas (e.g. gravel pits) wherever possible; and
8. monitoring, evaluating and recording progress of rehabilitation programs/projects.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
41.1 Disturbances related to fireline construction during wildfire suppression	41.1 Commencement of rehabilitation of all disturbances related to fireline construction during wildfire suppression prior to the break of the season, and restoration within 2 years	After 5 years
41.2 Disturbances related to recreation development	41.2 Commencement of rehabilitation and restoration of all disturbances related to recreation development within 12 months of project completion	
41.3 Exhausted gravel pits	41.3 Commencement of rehabilitation and restoration of all exhausted gravel pits within 6 years	
41.4 Disturbances related to mining	41.4 Commencement of rehabilitation and restoration of all disturbances related to mining according to permit conditions	

42. BEEKEEPING

The honeybee was introduced to Australia midway through the nineteenth century (see Section 23 Introduced and Other Problem Animals). Commercial beekeeping has since developed into a small but significant industry in WA, with an average annual total income for honey production of $9.3 million and a total worth (including pollination of agricultural and horticultural crops) of about $120 million per annum (Manning 1992). Commercial beekeepers have always relied heavily on large areas of native vegetation, and are increasingly dependent on lands managed by the Department.

Most commercial beekeepers operate in the forests between Nannup and Walpole, jarrah forest between Mundaring and Collie, the coastline north of Yanchep and the Goldfields, and hives are moved according to nectar flow cycles. In WA, beekeeping on all Crown land requires a permit for each apiary site obtained from the Department. In national parks, this permit is subject to conditions such as the use of existing tracks only and no interference to visitors or management. Managed-hive honeybees are kept within the planning area at about three kilometre intervals. This distance, chosen by the industry to minimise honeybee interaction between sites and the

potential transfer of honeybee diseases, determines how many and when the hives are placed at the site. Each apiarist will often have a system of sites over an extended range and move the hives according to flow cycles of between two and eight years. Apiarists must notify the Department when sites are in use and maintenance is required, and this must be according to Department standards. Within the planning area, there are about 57 registered sites, most of which are located in the western part of the planning area in new parks west and south of Thomson Road.

Honeybees are introduced fauna that can affect the ecological processes of native flora and animal communities, as well as posing a risk to visitor health (see Section 23 *Introduced and Other Problem Animals*). When allowing an introduced pollinator to persist within a conservation reserve, the dynamics between the native pollinators (which includes mammals, birds and insects) and the native flora and dependent fauna need to be considered. The abundance of the native bee species in the south-west (estimated in the 1000s) reflect the diversity and complexity of pollination mechanisms of the flora of the region, with almost half the plant species being primarily bee pollinated (Scheltema 1981). However, some flora through the exclusion of native pollinators, may have already become dependent on the honeybee for pollination. Further monitoring and research is required in the south-west to quantify the impacts of managed and feral honeybees within the natural environment.

While it is recognised that feral honeybees are more of a threat to the values of conservation reserves than managed honeybees, there is little knowledge about the range of conditions under which honeybees leave the hive and become feral. It is suggested that feral populations can be eliminated from areas after unfavourable conditions, such as drought or fire, as long as there is not a constant supply of managed hive bees swarming into the wild (Scheltema 1981).

The Department recognises the value of the beekeeping industry to the State's economy and seeks to continue its relationship with the apiarists within the planning area in a sustainable manner. Therefore, this management plan will take a precautionary and pragmatic approach that balances the needs of the apiarists within the planning area while ensuring that any adverse impacts of managed hives on the environment are minimised. Guidance for the management of apiculture on public land is provided by the Department's draft (revised) Policy No. 41 – *Beekeeping on Public Land*.

The Department considers whether access for beekeeping is either retained at the current level, increased, decreased or phased out based on a geographical assessment using appropriate environmental and management criteria (Appendix 10), and this process identifies suitable areas for beekeeping whilst minimising the potential impacts of honeybees (see Section 23 *Introduced and Other Problem Animals*). Predicted interaction between apiary sites and threatened flora and significant habitats and communities within the planning area and on Crown land within two kilometres of the planning area boundary is made by scientific experts within the Department and based on the best available knowledge.

The suitability for apiary sites and the predicted impact between honeybees and values is classified into 3 classes, which are:

- 'suitable' for apiary sites;
- 'suitable, but conditional'; or
- 'highly constrained'.

A substantial proportion of the planning area (35%) is classified as 'highly constrained'. A number of existing apiary sites fall into these areas and will be cancelled and relocated, where possible, in consultation with relevant stakeholders. Alternative sites will be found, where possible, outside of the planning area as a first priority, although new sites may be found within the planning area in 'suitable but conditional' areas. No new sites will be permitted within the 'highly constrained' areas.

Whole conservation reserves that have no historical apiary use have been classified in the assessment as 'highly constrained'. Hence, within the planning area, no new sites will be permitted in the following reserves: Mt Lindesay, Walpole-Nornalup, William Bay and Boyndaminup national parks; Quarram, Owingup, Mehniup, Kordabup, Mt Shadforth, C23068, C23120, A23325, A31468, A31561, A35621 nature reserves; and reserve A46405.

The majority of the planning area (65%) is classified as 'suitable, but conditional' for apiary sites. Apiary sites located in 'suitable, but conditional' areas will be renewed every five years. New sites may be permitted in 'suitable, but conditional' areas only within the 'karri belt' west of the Frankland River, exclusive of the reserves that have had no historical use and subject to existing access and other siteholders. Examples of additional conditions may include seasonal restrictions, hive limits, structural modifications to the hives to restrict the queen, increased disease hygiene control and/or regular monitoring of the apiary site.

There are no (negligible) parts of the planning area that are classified as 'suitable' for apiary sites without additional conditions.

While the approach outlined above will be maintained throughout the life of the plan, the methodology of categorising the planning area into classes of suitability should be reviewed midway through the life of this plan to ensure that criteria used are the best available, and categorisation remains in line with current knowledge of the planning area values. Any change in the categories of the planning area or criteria should ideally coincide with the time that the apiary permits are due for renewal.

Where appropriate, and in accordance with Policy 41, the location of apiary sites on private property will be encouraged. However, apiary sites adjoining the planning area may also impact on its natural values. Where a significant environmental impact to recognised values (e.g. threatened ecological communities) may occur, such proposals may be referred to the EPA for assessment.

42. Beekeeping

Key Points

- Beekeeping is a significant industry in the south-west and throughout WA.
- Commercial beekeepers have traditionally relied heavily on large areas of native vegetation, and are increasingly dependent on lands managed by the Department.
- There are currently 57 apiary sites in the planning area.
- A geographical assessment of the suitability for apiary sites and the predicted impact between honeybees and values shows that the majority of the planning area (65%) is classed as 'suitable, but conditional' for apiary sites, but 35% is classified as 'highly constrained' where a number of apiary sites will be cancelled and relocated.

The objective is to minimise the impacts of commercial honeybees on natural, recreation and other values of the planning area, while supporting the beekeeping industry within the State.

This will be achieved by:

1. managing apiary sites according to Department Policy No. 41 – *Beekeeping on Public Land* and the associated guidelines for implementation. In keeping with this, the Department will manage apiculture by designating access routes, supervising field activities (including applying dieback hygiene principles), sign posting sites and reviewing site management;
2. cancelling and relocating where possible, apiary sites that are within the 'highly constrained' areas;

3. not permitting any new sites within whole conservation reserves that have no historical use;
4. renewing, with additional conditions, the permits for sites within areas identified as being 'suitable but conditional' for apiary use, and reviewing every five years;
5. allowing new sites and transfer of sites within areas identified as being 'suitable but conditional' in the 'karri belt' west of the Frankland River outside of reserves with no historical use, subject to existing access, other siteholders and appropriate conditions;
6. controlling feral bees within the planning area where possible (see Section 23 *Introduced and Other Problem Animals*);
7. reviewing the criteria for determining the suitability of areas and the categories of suitability within the planning area midway through the life of the plan, or as new knowledge becomes available or circumstances change;
8. liaising with beekeepers (including through the Beekeepers Consultative Committee) and the Department of Agriculture and Food to ensure the most efficient use of sites;
9. collecting information on when apiary sites are in use within the planning area and the number of hives placed at each site;
10. supporting research into the effects of beekeeping on natural values and adapting management to incorporate new knowledge; and
11. encouraging the location of apiary sites on private property, where appropriate and in accordance with Policy 41.

Key Performance Indicators:
There are no Key Performance Indicators for this section.

43. FLORA HARVESTING

The Department is responsible for the conservation and management of all flora on lands managed by the Department under the CALM Act, and for administration of the *Wildlife Conservation Act 1950* throughout the State. The Department therefore has the authority to control the commercial harvesting of protected flora in WA on all lands. Three forms of licence are issued by the Department controlling picking under the *Wildlife Conservation Act 1950*, although only the Commercial Purposes Licence (CPL) applies to the sale of protected flora taken from Crown land. Declared rare flora are excluded from this licensed activity.

The harvesting of wildflowers is another small but significant industry in WA, and the planning area substantially contributes to the State's native wildflower industry. With an approximate annual income of $6.5 million per annum and a total worth of about $87 million per annum (2001/02), commercial wildflower pickers have always relied heavily on large areas of native vegetation, and are increasingly dependent on lands managed by the Department. The number of CPLs issued in 2002/03 for the taking of flora for commercial purposes from Crown land was 453, which is the number issued in 1980/81. In the planning area, the number of CPLs has declined since the 1990s due to a rationalisation of the industry and declining area available to pickers to the point where there are 29 current CPLs for wildflower pickers.

In the planning area, the main species harvested include snottygobble *Persoonia longifolia* and wild plum *Podocarpus drouynianus* for foliage backing for flower arrangements. Some other species, such as coastal jugflower *Adenanthos cuneatus*, gravel bottlebrush *Beaufortia decussata*, swamp bottlebrush *Beaufortia sparsa* and pineapple bush *Dasypogon bromeliifolius* are regularly used species available to the industry only from the Denmark area.

Harvesting of flora can have a number of environmental impacts. The collection of wildflowers or other plant parts can reduce the available seed stock and, by reducing the numbers of flowers available for cross-pollination, may reduce genetic diversity. Driving into areas to pick wildflowers may lead to the spread of *P. cinnamomi* by tyres and feet (see Section 24 *Diseases*), and trampling can also result. In order to protect representative plant communities (see Section

19 *Native Plants and Vegetation*), section 99A(6) of the CALM Act prevents flora harvesting from all lands managed by the Department other than State forest and timber reserves, except in specified circumstances. The specified circumstances under which flora harvesting could occur on national parks and other conservation lands would be essential works, removal of exotic plants, and therapeutic/scientific/horticultural purposes. The classification of State forest as a forest conservation area will not prevent licensed flora harvesting.

The exclusion of this activity from many parts of the planning area will significantly affect the wildflower industry, some local businesses and many local wildflower pickers. The quality of flowers grown commercially is higher than that of those picked from natural areas. Hence, it is possible that commercially grown flowers will eventually replace those picked from lands managed by the Department.

Wildflower picking will be catered for within the planning area in forest conservation areas. However, the extent or location of the access will need to be managed closely with industry in order to present an equitable and regulated opportunity for this activity within a reduced area, while minimising the impact on natural values. Means by which the industry may be accommodated within the planning area may involve further consideration of:

- allocation of blocks to pickers on the basis of species, rather than area;
- monitoring of the sustainability of different species to enable justification of quotas and determination of carrying capacities;
- the development of criteria for the re-allocation of pickers to remaining accessible areas;
- the development of techniques for managing pickers (e.g. quarterly returns);
- the integration of this activity with other management operations, such as prescribed burning;
- the identification of suitable areas outside of the planning area; and
- development of alternative means of maintaining the resource base (e.g. horticultural opportunities on private lands).

A Department-based 'Southern Flora Industry Management Team' meets regularly on issues related to managing the flora industry, and liaises with the WA Flora Industry Advisory Committee.

43. Flora Harvesting

Key Points

- The removal of flora is prohibited from most of the planning area, except from forest conservation areas.
- The collection of wildflowers or other plant parts can reduce the available seed stock, may reduce genetic diversity and may lead to the spread of *P. cinnamomi* or increased fire risk.

The objective is to facilitate wildflower picking in parts of the planning area, while minimising the impacts on natural values.

This will be achieved by:

1. prohibiting wildflower picking within national parks and nature reserves;
2. allowing the licensing of wildflower picking in forest conservation areas within the planning area;
3. identifying the remaining accessible commercial wildflower resource and ensuring harvesting remains sustainable, as far as practicable;
4. developing and implementing management controls to prevent adverse impacts; and
5. educating and informing the public about wildflower picking and the impacts on park values.

Key Performance Indicators (see also Appendix 2):		
Performance Measure	**Target**	**Reporting Requirements**
43.1 Vegetation community health as a direct result of flora harvesting activities	43.1 No decline in vegetation community health as a direct result of flora harvesting activities	After 5 years

44. REMOVAL OF TREES AND FIREWOOD AND CRAFTWOOD UTILISATION

Prior to legislative changes in 2000, the Department managed the removal of timber, wood products and wood by-products from State forest and timber reserves by way of contracts, licences and permits under Division 1 of Part VIII of the CALM Act. These items were defined as 'forest produce' under the then CALM Act and included trees, timber, chips and firewood.

The *CALM Amendment Act 2000* and the *Forest Products Act 2000* came into operation in November 2000. The latter Act created the FPC, which became responsible for harvesting and marketing timber products from State forests and timber reserves by way of production contracts. The term 'forest products' was defined as trees and parts of trees, timber, sawdust and chips; charcoal, gum, resin, kino or sap, and commercially harvested firewood. Firewood taken from public firewood areas or for campfires and barbecues was excluded. The FPC cannot remove forest products from national parks, conservation parks, nature reserves or CALM Act section 5(1)(g) or (h) reserves.

The *CALM Amendment Act 2000* removed the ability of the Department to manage the removal and sale of the tree/timber products from State forest and timber reserves. The CALM Act definition of 'forest produce' for the purpose of extraction/utilisation by way of permits, licences, and contracts (Division 1, Part VIII) has retained only honey, seed, beeswax, rocks, stone and soil (other than minerals within the meaning of the *Mining Act 1978*). Firewood can be taken from public firewood areas on State forest and timber reserves declared under Part 15 of the *Forest Management Regulations 1993* and for campfires and barbecues.

The CALM Act can issue licences under section 99A to take and remove exotic trees (e.g. pines); honey, beeswax or pollen (by apiary site permit); and forest produce (including trees and associated products) for 'essential works' on the Conservation Commission land other than State forest and timber reserves. The 'essential works' are defined in section 99A(2) of the CALM Act and allow the removal and sale of timber felled or removed when roads or firebreaks are constructed and roads are re-opened (for example, after a storm with fallen trees blocking access). The removal and sale of forest produce for 'essential works' must be advertised by the Department, and the removal and sale must benefit the land more than would be the case if the trees were not removed and sold.

Forest produce (including trees) can also be taken under licence from the Conservation Commission lands other than State forest and timber reserves for use for therapeutic, scientific or horticulture purposes [CALM Act Section 99A(1)(b)].

The Department can issue a commercial purposes licence under the *Wildlife Conservation Act 1950* for the removal of trees and parts of trees for craftwood uses, usually in consultation with the FPC (see 'Craftwood' below).

Much of the planning area adjoins private property and the state of these boundaries varies greatly. Many boundaries have a fire access track on the inside of the boundary. Some boundaries are, or have been, fenced and some do not have fences. While the State is not bound

by the *Dividing Fences Act 1961*, the Department is committed to being a good neighbour and often provides access to the timber salvaged from the fence establishment for new fencing.

The Department may utilise forest produce (including trees) that become available as a result of operations carried out on CALM Act land (including national parks) in accord with this management plan, such as wooden parking barriers/low fences. This utilisation reflects the powers under section 33(1)(cb) of the CALM Act. Forest produce (including trees) may also be taken and removed from forest conservation areas as salvage operations, predominantly likely to be connected with clearing required to provide access. Approval will be required in accordance with section 103 of the CALM Act.

The planning area contains many locations with introduced tree species (see Section 22 *Environmental Weeds*, and Section 48 *Research and Monitoring*) and these areas should be progressively harvested (by way of a CALM Act section 99(1)(c) licence for the removal of exotic trees if on a national park) and rehabilitated (see Section 41 *Rehabilitation*). Forest products that may be generated through this process, such as firewood and timber, could be used by the Department for the benefit of management of the planning area, such as for park signs and furniture.

Firewood

The provision of public firewood is a significant social issue in the planning area. Sourcing of firewood, particularly by local communities at Walpole, Peaceful Bay and Denmark, has traditionally been from nearby timber-producing areas, mainly State forests. However, firewood collection is not permitted within national parks, except for campfires and barbeques in the immediate vicinity of those recreation areas. The removal of firewood can have environmental impacts through the depletion of habitats for terrestrial animals, the spreading of disease and disturbance of vegetation by people accessing firewood-cutting areas.

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. Within the planning area, the Department will seek to make the forest conservation areas (Map 2) available for firewood collection, where this activity is sustainable. Other sources of firewood within the region include the larger areas of multiple-use State forest not subject to classification as a forest conservation area adjoining the planning area to the north and west, residue from management operations and product sourced from harvesting operations by licensed contractors. An example of this is the removal of trees as a result of 'essential works' or the removal of exotic trees.

Commercial firewood collection is administered by the FPC. The Department will encourage the FPC to provide areas for firewood collection by commercial suppliers in the local area.

Despite the concern in the community about firewood collection issues, there is little information on the demand or use of firewood in the region. Nevertheless, the Department will seek to arrange for public firewood collection areas within the forest conservation areas of the planning area, and these will be clearly signposted and included in park literature. The allocation of these areas for public firewood collection to ensure the sustainable use of these areas will require further consideration of:

- monitoring of the sustainability of the resource to enable justification of quotas and determination of carrying capacities, or the cessation of access to the resource in a particular area;
- the development of criteria for assessment of areas for continued firewood collection;
- the integration of this activity with other management operations, such as prescribed burning and road maintenance;
- the identification of suitable areas outside of the planning area; and

- development of alternative means of maintaining the resource (e.g. integration with harvest operations in nearby State forest areas and encouraging the establishment of plantations on cleared private property).

Craftwood

The use of the craftwood resource on Crown lands managed by the Department, similar to firewood and flora harvesting, is dictated by legislation and the current and future tenure of lands. Craftwood is defined as "a piece of wood on the forest floor, generally small in size, often with distinctive grain, colour or shape". Burls are not craftwood (CALM 1993). The extraction and sale of craftwood from conservation reserves, such as national parks, is not permitted. Within the planning area forest conservation areas, where timber production (logging) on a sustained yield basis is not a management objective, will allow low impact craftwood collection. Larger areas of multiple-use (not classified) State forest adjoin the planning area to the north and west, which are another source of craftwood within the region.

The Department and the FPC have a management arrangement in place for the sale of craftwood from State forest, which involves the Department approving of environmental management requirements before FPC issue a minor contract that allows the sale of forest products from State forest. The FPC have also introduced craftwood auctions, which allow bidding for craftwood to be manufactured into craft items. The Department can also use a Commercial Purposes (Forest Produce) Licence under the *Wildlife Conservation Act 1950* to allow the extraction and sale of craftwood from Crown land, and the licence can also be used to extract and sell craftwood from State forest.

Craftwood is generally available from harvest areas on State forest to the north and west of the planning area. In these areas, craftwood can be obtained in the period (usually between one to two years) between the completion of harvesting and the regeneration burn, once the sawlog material has been removed by FPC harvest contractors.

Craftwood, like firewood, is often made available in residue from various operations such as gravel extraction, road and firebreak construction or maintenance (i.e. 'essential works'), and removal of exotic trees. The use of these residues will be encouraged.

Traditionally there has been little demand for craftwood within the planning area, and it has been restricted largely to *Banksia* nuts, *Xanthorrhoea* bases, sheoak, tingle and jarrah timber offcuts. The allocation of areas for craftwood collection is similar to that of wildflower pickers, and a reduction in available areas may involve further consideration of:

- allocation of blocks to craftwood collectors on the basis of species or product, rather than area;
- monitoring of the sustainability of different species or products to enable justification of quotas and determination of carrying capacities;
- the development of criteria for the re-allocation of collectors to remaining accessible areas;
- the development of techniques for managing collectors (e.g. quarterly returns and inspections);
- the integration of this activity with other management operations, such as prescribed burning;
- the identification of suitable areas outside of the planning area; and
- development of alternative means of maintaining the resource (e.g. integration with harvest operations in nearby State forest areas and encouraging the establishment of plantations on cleared private property).

44. Removal of Trees and Firewood and Craftwood Utilisation

Key Points

- Timber production from much of the planning area ceased in 2001.
- The Director General can grant a licence to take and sell forest products, including trees from national park, provided the produce is used for therapeutic, scientific or horticultural purposes or is as a result of 'essential works'. 'Essential works' include:
  - works that are required to establish access to land;
  - works that are required to re-establish access to land;
  - works to provide a firebreak; and
  - a licence may also be issued to take and remove exotic trees such as pines.
- These products can be used for the management of the planning area.
- Except with the removal of exotic trees as a result of 'essential works', firewood and craftwood can not be removed from national parks and nature reserves within the planning area. Instead, the Department will seek to arrange for public firewood collection areas within forest conservation areas in the planning area. Craftwood can be removed under a *Wildlife Conservation Act 1950* commercial purposes (forest produce) licence from forest conservation areas within the planning area.

The objective is to prevent removal of native forest produce, unless authorised for safety, salvage, public firewood or management purposes.

This will be achieved by:

1. permitting forest produce, including trees, to be taken from the national parks within the planning area where a licence is granted by the Director General. The forest produce must be used for therapeutic, scientific or horticultural purposes or be as a result of essential works or the removal of exotic trees;
2. arranging for public firewood collection areas on forest conservation areas within the planning area as appropriate, subject to the assessment and protection of natural values;
3. managing public firewood collection by clearly signposting the areas and including the arrangements in park information; and
4. removing salvage of vegetative material from management operations and using this material as much as possible within the planning area, or making it available for use by the public.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

45. WATER RESOURCES

The responsibility for the regulation, protection and management of water resources in the planning area rests with the Department of Water.

Water Regulation

Water licences are a regulatory tool under the *Rights In Water and Irrigation Act 1914* (RIWI Act) to regulate the taking of water from catchments. However, this is only from surface water or groundwater catchments proclaimed under this Act. There are no catchments proclaimed under the RIWI Act in the planning area. Water removal permits can be issued under CALM Act section 97A(2) and (6) for State forest and timber reserves, and section 101 (1a) and (1e) for other CALM Act land (e.g. national parks). The Conservation Commission needs to be consulted and the Minister for the Environment needs to give approval for such a permit. The permit cannot limit the operation of the RIWI Act and needs to be in accord with a CALM Act management plan.

Water Protection

Existing and future drinking water sources are protected by declaring water reserves and catchment areas. These areas, established under the *Country Areas Water Supply Act 1947*, are referred to as Public Drinking Water Source Areas (PDWSAs). There are several PDWSAs within the planning area declared under the *Country Areas Water Supply Act 1947* (Map 6):

- Denmark River Catchment Area;
- Kent River Water Reserve;
- Walpole Weir Catchment Area (and Butler's Creek Dam Catchment Area);
- Deep River Water Reserve;
- Scotsdale Brook Water Reserve (only a small part overlaps forest conservation areas in Styx and Harewood blocks); and
- Quickup River Dam Catchment Area.

Under section 33(1)(dc) of the CALM Act, a function of the Department is to promote the conservation of water, both in terms of quality and quantity, on the land it manages. A management objective of indigenous State forest and timber reserves under section 55 (1a)(d) of the CALM Act is water catchment protection.

Drinking Water Source Protection Plans (DWSPP) establish the level of protection required within PDWSAs. The plans identify development pressures, the vulnerability of a water source to contamination, establish priority classification areas and set out programs to protect the resource. There are three levels of water quality protection priority that avoid risk (priority 1 areas), minimise risk (priority 2 areas) and limit the risk (priority 3 areas). Guidance on the type of land uses appropriate within these priority areas is provided by the Water Quality Protection Note '*Land use compatibility in Public Drinking Water Source Areas*' (Department of Environment 2004) and Statewide *Policy 13 – Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land* (Water and Rivers Commission 2003).

Within the planning area only the Walpole Weir Catchment Area (and Butler's Creek Dam Catchment Area) has a DWSPP (currently in draft) for the Walpole town water supply. The Walpole Treatment Plant treats water to remove colour and turbidity and to balance pH prior to use by the Walpole township (Water and Rivers Commission 2000). Since linking the Butler's Creek Dam to the existing water treatment plant, the Butler's Creek Dam has been used as the primary water source for Walpole due to its better quality than the Walpole River, which only assists during summer peak demand periods. The draft DWSPP proposes that all Crown land in the Walpole Weir catchment area will become a Priority 1 PDWSA (excluding the Shire owned waste transfer station). Consideration is being given to assessing alternate water supplies in this catchment that are mainly confined to national park (such as Samuel's Brook) to overcome some of the land use restrictions placed on private property. The Department of Water will require access to conduct investigations into these alternate water supplies. Liaison will continue with the Department of Water and the Shire of Manjimup.

DWSPPs will also be developed for other PDWSAs in the planning area where water is or may be extracted (i.e. Denmark River, Quickup River and Mitchell River). PDWSAs on lands managed by the Department normally have the most stringent priority classification for drinking water sources (ie priority 1 areas). Any proposed developments in the planning area that are within PDWSAs should refer to the guidelines outlined above and consider the compatibility of land uses against the priority 1 classification. Some proposed recreation sites and activities within proposed priority 1 and 2 PDWSAs may be conditional upon the development and implementation of an environmental management plan, subject to liaison with the Department of Water.

Drinking water is supplied at several recreation sites from structures that collect and store rainwater. This type of facility will apply to other high-use campsites developed in the planning area.

Currently the Rest Point Holiday Village (located on a Crown Lease managed by the Department for Planning and Infrastructure) sources its water supply from a soak within the adjacent Walpole-Nornalup National Park. This has occurred since 1964. This issue was not specifically addressed in the *Walpole-Nornalup National Park Management Plan* (CALM 1992), although it was not considered inconsistent with the general provisions of the plan. This water extraction will be allowed from the national park for this purpose for a further five years, during which time the Rest Point Holiday Village will switch to an alternative supply. This water extraction will be subject to conditions set by the Department.

There are also a large number of watering points for fire control purposes spread across the planning area (see Section 25 *Fire*). These sites, particularly along strategic access, need to be kept and maintained.

Potential Water Supply

Under section 33(1)(dd) of the CALM Act, a function of the Department is to develop policies that provide for water to be taken from land to which the Act applies. By way of an amendment to the *CALM Regulations 2002* a management objective for Indigenous State forest and timber reserves now includes the removal and storage of water. No such similar amendment to regulations was required to allow the extraction of water from national parks or nature reserves.

Parts of the Styx, Kent, Bow and Denmark Rivers were identified during the Regional Forest Agreement process and as part of the public consultation process for the preparation of this management plan as high priority for the provision of water resources in the next 10 to 15 years. Drinking water is an important community resource and will be available for future water supply from the planning area if and when required, subject to proper assessment and approval. Potential potable drinking water supply from the Denmark River in particular, may supplement the supply for Denmark, the City of Albany and the Lower Great Southern Towns Water Supply Scheme. Potential water supply may also be required in the future from the Mitchell River to augment the Denmark Water Supply Scheme.

During the consultation process in the preparation of this management plan, the zones of inundation of these rivers were requested to be excluded from the WW for the provision of future water supplies. On 8 December 2004 the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004* established the CALM Act section 5(1)(h) reserve 46405 over the anticipated area of inundation of a potential future reservoir on the Denmark River for the purpose of *conservation, recreation, future reservoir and water infrastructure* (see Section 3 *Planning Area*). Inundation areas of the Bow River for a proposed reservoir have been excluded from Mount Roe National Park and remain as forest conservation area. Similarly, the inundation area of the proposed Styx reservoir remains as forest conservation area.

In general, proponents seeking to extract water from the planning area require a licence from the Department of Water. In order to be licensed, the proponent would need approval from the Department to access the land for the purpose of extracting water. The Department may, after consultation with the Conservation Commission and with approval from the Minister for the Environment, issue a water removal permit under the CALM Act for this to occur. 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. In addition, it will be important that sufficient environmental flows are maintained for rivers in the planning area to minimise adverse environmental impacts on aquatic environments (see Section 17 *Hydrology and Catchment Protection*).

The Department of Water has nine stream gauging stations either in, adjacent to or accessed via the planning area including one on the Deep River, two on the Weld River, two on the Kent River, two on the Denmark River, one on the Mitchell River and one on the Hay River. The Department of Water requires regular access to these sites for data collection activities and to maintain fixed assets.

45. Water Resources

Key Points

- There are no areas proclaimed or prescribed under the RIWI Act within the planning area.
- The planning area contains several declared PDWS areas under the *Country Areas Water Supply Act 1947*, including the Denmark River Catchment Area, Kent River Water Reserve, Deep River Water Reserve, Quickup River Dam Catchment Area and the Walpole Weir Catchment Area. The Walpole town water supply comes from the Walpole Weir Catchment Area, while the Quickup River Dam Catchment Area supplies water to Denmark.
- When a catchment has been declared under the RIWI Act, no water extraction can occur in the planning area without a licence issued by the Water and Rivers Commission. A water removal permit under the CALM Act will also need to be issued by the Department in consultation with the Conservation Commission and approved by the Minister for the Environment. An assessment by the Department of Water on behalf of the Water and Rivers Commission, the Department, the Conservation Commission and the EPA may be required for proposals to extract water.
- Parts of the Styx, Kent, Bow and Denmark Rivers within the planning area have been identified as high priority for the provision of water resources. Potential potable drinking water supply from the Denmark River may supplement the supply for Denmark, the City of Albany and the Lower Great Southern Towns Water Supply Scheme. CALM Act section 5(1)(h) reserve 46405 was established on 8 December 2004 under the *Reserves (National Parks, Conservation Parks and Other Reserves) Act 2004* for the purpose of *conservation, recreation, future reservoir and water infrastructure*. Inundation areas of the proposed reservoirs on the Bow and Styx Rivers remain as forest conservation area.

The objective is to minimise the impact of water resource use on the values of the planning area while ensuring consistency with Government policy and options for public water supplies in the future are maintained.

This will be achieved by:

1. requesting that the Department of Water liaises with the Department when investigating water resources in the planning area to ensure that environmental impacts are minimised;
2. ensuring that land use activities within the planning area are consistent with the priority one PDWSA rating outlined within Water Quality Protection Note '*Land use compatibility in Public Drinking Water Source Areas*' and Statewide *Policy 13 – Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land*;
3. subjecting all new infrastructure supporting water extraction on adjoining lands to the strategies of Section 40 *Public Utilities and Services*;
4. referring any proposals for significant use of water resources of the planning area, particularly where this may adversely affect the values of the planning area, to the EPA for formal assessment;
5. liaising with the Department of Water to ensure sufficient environmental flows are maintained for rivers in the planning area, particularly where damming occurs, and that

this is supported by an appropriate level of monitoring to determine environmental thresholds where extraction is permitted;

6. issuing a CALM Act water removal permit, after consultation with the Conservation Commission and approval of the Minister for the Environment, approval by the Department of Water and an appropriate level of assessment under the *Environmental Protection Act 1986*, for the extraction (taking) of water from the planning area. Where a CALM Act water removal permit is not issued or the Water and Rivers Commission does not grant a licence, water may not be extracted from the planning area; and
7. permitting the extraction of water from a soak in the Walpole-Nornalup National Park by the Rest Point Holiday Village for a further five years, subject to the conditions stated above. During this time, an alternative supply needs to be located and utilised.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

PART H. INVOLVING THE COMMUNITY

The planning area provides a valuable opportunity for the community to experience and learn about forested and coastal environments and their landforms, river systems, biota and cultural heritage. 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 this 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 visitors have safe, enjoyable experiences in the planning area.

Various Department policies provide management direction for involving the community, including:

- No. 15 – *Community Involvement (Public Participation and Volunteers)*;
- No. 18 – *Recreation, Tourism and Visitor Services* (subject to final consultation); and
- No. 25 – *Community Education and Interpretation*.

The Department's Visitor Interpretation Manual (CALM 1996) also provides guidance.

A range of communication strategies that target different audiences is used, including:

- information (embracing publicity, promotions and marketing);
- interpretation of visitor experiences;
- education (for schools and special interest groups);
- liaison, consultation and advisory services to stakeholder groups; and
- community involvement (public participation, volunteers, friends and advisory groups).

The Department is developing a communication plan for the planning area (CALM 2005), which will promote the conservation and enjoyment of the area through a range of these communication strategies.

46. INFORMATION, INTERPRETATION AND EDUCATION

Information

Information, in the form of details of facilities, activities, features and regulations, is provided by the Department about the planning area, and is available through park signage, print media, the Department's *NatureBase* website (see Nomenclature) and park rangers. Signage may be for orientation, interpretation or management. Information is also widely available from many external sources, including tour operators and the tourism industry. The delivery of consistent and accurate information by both internal and external providers is important in achieving effective communication. To that end, the Department will provide advice, resources and training to operators and other information providers to assist them in reinforcing the Department's messages to visitors.

Interpretation

Interpretation is the craft of enriching visitor experience and is an interactive process involving the visitor, the interpretive medium and the setting. Interpretation is a process and an opportunity for translating stories of places, the biota and people in terms that motivate and inspire visitors to greater understanding and care. The interpretation of values to visitors is integrated with recreation and tourism planning and site developments (see Chapter F *Managing Visitor Use*).

The *Walpole-Nornalup National Park Management Plan* (CALM 1992) had an information and interpretation strategy aimed at providing and disseminating information to an increasing number of people visiting that park. One of the actions was to "*Continue to explore different methods, media and themes for use in interpretive information and activities*". Interpretation for the planning area is now being coordinated on a regional basis through the Warren Region Visitor Services Plan (CALM 2004), with the overall encompassing theme of:

"*experience the dynamic nature of the Warren Region in the deep south from river catchments and tall forest to the coast*".

Three primary interpretive themes further develop the stories embraced by this encompassing regional theme:

- *places – discover a diversity of places and the dynamic processes that shape this region*;
- *biota – explore the inter-relationships within a variety of forest and other wildlife communities*; and
- *people – contemplate the connection of the many faces of people caring for this country*.

The interpretation of natural and cultural values is through themes and stories and allocating sites to interpret through facilities, exhibits, signs, print and electronic media products, visitor contact and guided experiences. A regional story analysis helps identify key sites for interpretation of themes and sub-themes. The site analysis also considers:

- proximity to major travel routes and interpretive drive trails;
- suitability for major site development; and
- existing or potential attraction for visitor activity groups.

Together these criteria distinguish key sites for development and interpretation.

Interpretive and educational opportunities have been developed at a range of sites in the planning area. Overall, education and interpretation programs for the planning area will concentrate on raising awareness of the planning area's natural values and their vulnerability to human impact, the indigenous heritage and cultural values of the planning area, the land classification system, and the positive actions visitors can take to support the management of the planning area. This will be through the three primary themes (A, B, C above). Areas of greatest visitor activity at key interpretive sites (such as the Tree Top Walk, Mt Frankland, Swarbrick forest and Fernhook Falls) will be targeted for interpretation and other aspects of the communication strategy. This may sometimes mean areas are identified outside the planning area for targeted interpretation.

Walpole Wilderness Discovery Centre

The Walpole Wilderness Discovery Centre, a commitment within the Government's 'Tourism' Policy and 'Ecotourism Strategy for WA', will be an inspirational focal point for visitors and communities that advocates the values, appreciation and sustainable management of the WW (Tourism Co-ordinates 2003). The Discovery Centre will act as the lynchpin for the whole interpretive story within the planning area and will focus on developing the three primary themes described above. In addition, there will be five interpretive sub-themes for the Discovery Centre that focus on:

- the concept and values of wilderness;
- the forest and its relationship to the land and the waterways (regional ecology);
- biodiversity 'hot spot' status;
- the human story of the WW's creation; and
- Indigenous connection to the area.

The centre will serve as a 'hub' that will encourage people to discover the WW, its values and its management needs, with a number of 'satellite' interpretation and interaction points across the planning area. Three Walpole Wilderness Discovery Centre sites have been selected (Map 1). All three sites will interpret the sub-theme of 'wilderness', although each will have their own design theme:

- Valley of the Giants: exploring perspectives of the forest and wilderness;
- Mt Frankland: places for expansive reflection on wilderness; and
- Swarbrick forest: spaces for introspective contemplation of the forest.

Subject to planning, site design and finances, the three Discovery Centre sites may be expanded in the future from their initial construction to cater for further education or interpretation programs or further facilities, based on the three existing primary themes and sub-themes. The hub concept will also operate through interaction with local tourist bureaus, operators and guides, and interpretation at other key sites across the planning area.

The primary attractions and facilities of the planning area are detailed in the Department's pre-visit information brochure - *Guide to the Southern Forests*. The internet is also a valuable source of pre-visit information and sites, such as the Department's *NatureBase* website (see Nomenclature) and other associated websites such as the Bibbulmun Track Foundation (*http://www.bibbulmuntrack.org.au*), provide a range of information about the planning area. There is a need to provide further information about park orientation as well as the values and regulations within the planning area, including the development of an internet web site specifically to promote the WW.

The planning area is particularly suited to interpretive walks and drives, especially where these involve scenic drive routes (such as the Great Forest Trees Drive and Beardmore/North Walpole Road) or where walk trails link to accommodation facilities or recreation sites (such as around Walpole).

Aboriginal people have a long and established involvement with the area, and interpretation should reflect their culture and values (see Section 8 *Management Arrangements with Aboriginal People* and Section 26 *Indigenous Heritage*).

Education

Community education is a series of linked learning programs with defined outcomes in mind. Educational resources and learning activities are designed specifically for various educational groups. The planning area is a good base for a range of opportunities for education programs for many schools in the region, and the Department is often involved with local schools.

The Department liaises with an established 'Bush Ranger' program based out of Albany, and once or twice a year the program is run in Walpole. This voluntary program for young Western Australians is part of a broader program known as 'Cadets WA', which aims to give all secondary school-aged youth the opportunity to participate in personal development training that provides practical life skills, develops leadership, teamwork and initiative skills, and fosters qualities of community responsibility and service.

There may be sufficient community interest and management capacity within the life of this plan to establish more formal programs, such as Bush Rangers, particularly if the Discovery Centre sites are expanded to cater for further education programs.

46. Information, Interpretation and Education

Key Points

- An excellent opportunity exists to further promote awareness of the key values and ecosystem processes in the planning area and their conservation and management. The Walpole Wilderness Discovery Centre is a major component of this.
- The planning area is a good base for a range of opportunities for education programs for schools in the region.

The objective is to promote community awareness, understanding and appreciation of the natural and cultural values of the planning area and engender support for effective management of the planning area.

This will be achieved by:

1. developing and implementing a communication plan for the planning area;
2. continuing to provide interpretive facilities, products and services as required and in accordance with the regional themes;
3. liaising closely with other agencies, educational institutions, organisations, tourism agencies, operators and guides, and individuals who have similar interests in the interpretation of land, waters and wildlife managed by the Department;
4. supporting the Bush Ranger Program and other educational programs, and considering the establishment of a full-time Bush Ranger program/unit during the life of the plan where there is community interest and management capacity; and
5. seeking funds, including sponsorship, for the continued development of environmental themes at locations in and close to the planning area, including the Walpole Wilderness Discovery Centre.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
46.1 Participation in education programs offered within the District and the Walpole Wilderness Discovery Centre	46.1 Maintenance or an increase in participation, including recurrent participation, in education programs offered within the District and Walpole Wilderness Discovery Centre from 2008 levels	After 5 years
The Key Performance Indicator KPI 28.1 also applies to this section		

47. COMMUNITY INVOLVEMENT AND LIAISON

Community involvement is action-oriented opportunities for people to participate in Department programs developed to maintain ongoing community support and participation. Community involvement is an integral part of the Department's operations and the implementation of this management plan. The community, as groups or individuals, are encouraged to be involved in both the planning and management of many of the Department's activities, including volunteer programs. The community can provide knowledge and advice and can contribute greatly to Department projects. At the same time, community collaboration helps the Department to convey information about conservation and land management issues and its responsibilities.

The CALM Act (sections 14, 33A and 57-59) provides for public participation in the preparation of management plans. The community have been involved in various ways in the preparation of this management plan (see Section 5 *Public Participation*). In particular, members of the Walpole Wilderness Area Community Advisory Committee have been advising the Department throughout the plan's preparation. On completion of the management plan, new arrangements for community involvement in advising the Department on the implementation of the plan will be established.

Ongoing community support is essential for the successful implementation of this management plan. It is particularly important to involve the community, local Aboriginal people, local authorities, other agencies and neighbours, which will enhance integrated land management, particularly where management issues such as fire, weeds and visual land management go beyond the boundaries of the reserves. Principles for effective neighbour relations, outlined in the Department's *Good Neighbour Policy,* are important for developing partnerships with the community.

Community groups are encouraged to take part in volunteer activities throughout the planning area, such as clean up days, help with maintenance such as erosion control and track maintenance, the rehabilitation of injured or orphaned fauna ('Wildlife Carers') and assisting with flora and fauna surveys or research. Not only does the Department benefit from these activities, but the volunteers also gain meaningful and enjoyable experiences in an area of interest. The community benefits from volunteer programs through the added level of environmental management, and an improved level of services in the form of information and education. Local bushfire brigades, campground hosts and the Friends of the Bibbulmun Track are examples of independent volunteers, working cooperatively in a well-established relationship with the Department, to the mutual benefit of both parties and the community. During 2003/4, volunteers contributed 2940 hours in the Frankland District.

The CALM Act provides for the appointment of honorary Departmental officers. Selected volunteers may be appointed and, after appropriate training, invested with powers to enable them to carry out certain functions for the Department. Volunteers may work in areas of land management, heritage, as facilitators of volunteer groups or assist in emergency situations.

Working together with Aboriginal people to 'care for country' will assist heritage preservation and conservation of the environment, as well as enrich cross-cultural awareness. The future involvement of Aboriginal people in management of the planning area will be considered in light of the Government determining a policy position (see Section 8 *Management Arrangements with Aboriginal People*).

47. Community Involvement and Liaison

Key Points

- The community has been involved in preparing this plan, and ongoing community support is essential for the successful implementation of this management plan.
- The Department supports voluntary activities, which contribute to the protection of all values of the planning area, achieving management objectives, and building community awareness, understanding and commitments to these objectives.

The objective is to facilitate effective community involvement in management of the planning area.

This will be achieved by:

1. continuing to involve interested local individuals and organisations in conservation and land management programs within the planning area;
2. continuing to liaise with local Aboriginal people, neighbours, land managers, local authorities, relevant agencies and other stakeholders to enhance management of the planning area;
3. establishing new advisory arrangements for the community to provide advice to the Department in implementing the strategies of this plan; and
4. continuing to support volunteer involvement in Department programs and the maintenance of the Department's volunteer database.

Key Performance Indicators (see also Appendix 2):

Performance Measure	Target	Reporting Requirements
47.1 The number of registered volunteers and the level of volunteer hours	47.1 An increase in the number of registered volunteers and the level of volunteer hours	After 5 years

PART I. MONITORING AND IMPLEMENTING THE PLAN

48. RESEARCH AND MONITORING

In managing the many natural, cultural and other values of the planning area, there is an acknowledgment that, although there is a good understanding of many of these values, there is still a considerable amount still to be discovered and a level of uncertainty about what policy and practices are best. Research and monitoring are essential components of management, and are required to successfully implement this management plan. Research and monitoring can increase knowledge and lead to a better understanding of the values of protected areas, aid performance assessment and provide a scientific basis for improving and adapting future management to achieve best practices. 'Adaptive management' is a process of responding positively to change, where the management of complex natural systems builds on common sense and learning from experience, experimenting, monitoring, and continually improves and adjusts practices based on what was learnt. This plan utilises best available knowledge to develop practices aimed at meeting specific management objectives. Monitoring, regular review and analysis of management outcomes and ongoing research are critical if land management in the region is to continuously improve.

The Department undertakes research and monitoring within the planning area, often as part of larger State-wide projects. The Department also actively seeks opportunities to collaborate with universities, CSIRO and other research, management, industry and voluntary bodies. FORESTCHECK is an integrated monitoring system that has been developed to provide information about any changes and trends in key forest organisms, communities and processes associated with a variety of forest management activities (CALM 2001). Nature-based tourism or social research and monitoring is conducted or facilitated principally through the Visitor Satisfaction Survey, the Visitor Statistics ('VISTAT') Program, the Nature-based Tourism Research Reference Group, and the Sustainable Tourism Cooperative Research Centre (STCRC). In partnership with the STCRC and other protected area management agencies in Australia, the Department is currently involved in a project to develop indicators for the sustainable management of visitor use of protected areas, which will significantly contribute towards the development of a visitor impact assessment process for natural areas across the State, including the planning area. Several current research projects also employ co-operative arrangements between voluntary organisations and the Department. Current projects are providing valuable guidelines for management of natural and other values in the planning area.

Research Requirements

It is appropriate that research and monitoring involve a wide range of organisations and groups. The involvement of volunteers, educational institutions and individual researchers can increase the efficiency of research and monitoring, and provide quality information for the benefit of the broader community. Allocating priority for research and monitoring may result in conducting programs that have relatively little direct management application to the planning area, but significant direct application to the conservation estate and species or communities elsewhere.

Department research gives priority to:

- describing and documenting WA's biological diversity;
- providing knowledge on how best to conserve the State's biodiversity;
- evaluating and minimising impacts of threatening processes on natural values; and
- increasing knowledge of visitor use patterns and profiles (e.g. demographics, level of use of recreation sites, visitor expectations and perceptions).

Research itself has the potential to adversely impact upon the values of the planning area, and proposals for research should be assessed as to their likely impacts and be subject to appropriate conditions if necessary.

Research in the Planning Area

In the case of this management plan, specific research and monitoring should also assist in meeting the requirements of KPIs (Appendix 2), including gaining a better understanding of those values identified as being most at risk (sensitive to disturbance). Consideration of research projects that examine the impacts of changes to conditions should also be given priority. The risk assessment process for this management plan has identified priority areas for consideration in future research programs, and some of these are also recognised as gaps in the knowledge about biodiversity in the Warren and Jarrah Forest bioregions (May and McKenzie 2003). Priorities for research, including surveys, in the planning area over the life of this management plan include:

- the distribution and impacts of *P. cinnamomi* within the planning area (see Section 24 *Diseases*);
- systematic fauna surveys to determine whether threatened and specially protected fauna species are present in sustainable numbers (see Section 20 *Native Animals*);
- community-based vegetation and regional ecosystem mapping (May and McKenzie 2003);
- biological or reproductive attributes of each fire sensitive species to assist in the devising of appropriate fire regimes for Landscape Conservation Units;
- the distribution and abundance of introduced animals and environmental weeds to manage their impact on natural values (see Section 22 *Environmental Weeds*, and Section 23 *Introduced and Other Problem Animals*);
- the distribution of peat communities and the hydrological impact of fire on these organic-rich soils (peatlands) (see Section 25 *Fire*);
- understanding patterns and processes of hydrology, water quality, soil quality and erosion (see Section 16 *Geology, Landforms and Soils*, and Section 17 *Hydrology and Catchment Protection*), particularly the effect of salinity and inundation on species and communities;
- social research to increase current knowledge of visitor profiles, patterns of use of recreation sites and visitor perceptions to guide future management;
- social research and monitoring to determine the extent to which recreation, environmental education and interpretation activities are meeting visitor needs, and the need for additional recreation facilities taking into consideration population changes in nearby areas, visitor management settings and access; and
- the impact of recreation activities and facilities on the environment of the planning area.

Several tree species trial plots exist across the planning area. Historically, these trial plots were established to investigate the response/resistance of various tree species to *P. cinnamomi*. This research is now complete and the removal of these exotic species (see Section 22 *Environmental Weeds*, and Section 44 *Removal of Trees and Firewood and Craftwood Utilisation*) and rehabilitation (see Section 41 *Rehabilitation*) is required.

Research is permitted in wilderness areas, provided it contributes to the achievement of management objectives in wilderness areas and is compatible with maintaining wilderness quality. Mechanised access for research activities would be subject to the approval of the Conservation Commission. The 'Fire Regimes for Biodiversity Project' is located within the proposed Willmott-Quindinillup wilderness area (see Section 25 *Fire*).

48. Research and Monitoring

Key Points

- Protected areas are a valuable resource for a wide range of research projects undertaken in the State.
- In order to implement this management plan and achieve the objectives contained within, research and monitoring is required to improve the understanding of the values of the planning area and aid in performance assessment.

The objective is to increase knowledge and understanding of natural and social values to provide for better management of the planning area, and to monitor the impacts associated with implementing the management plan.

This will be achieved by:

1. conducting research and monitoring, as resources permit and according to priority, that focuses on issues and values required to report on this management plan, and the establishment of baseline information;
2. encouraging and supporting, wherever possible, external agencies, organisations, volunteers and individuals to carry out research and monitoring projects where this contributes to biodiversity conservation and reflects visitor's use of the area;
3. applying a permit system for research proposals from outside the Department which will specify conditions under which work may be carried out and results disseminated;
4. continuing to issue permits for research on wildlife within the planning area as appropriate;
5. storing, updating (when required) and using information gained through research, monitoring and experience, if necessary, to modify management practices;
6. ensuring that research and monitoring activities do not adversely impact on the values of the planning area;
7. developing and maintaining a database of historical, current and required research on the planning area;
8. incorporating research and monitoring findings into interpretive and educational material where appropriate;
9. proposing nature-based tourism research projects through the Nature-based Tourism Research Group; and
10. pursuing external funding sources to assist in achieving research and monitoring objectives.

Key Performance Indicators:

There are no Key Performance Indicators for this section.

49. TERM OF THE PLAN

This management plan for the Walpole Wilderness and Adjacent 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 Minister for the Environment. If the plan is not reviewed and replaced by the end of the 10-year period, section 55(2) of the CALM Act allows the plan to remain in force in its original form, unless it is either revoked by the Minister or until a new plan is approved.

GLOSSARY

Aquifer	A layer of rock which holds and allows water to move through it, and from which water can be extracted
Autonomous	Existing or capable of existing independently
Biodiversity	Biodiversity in the context of this management plan can be defined as "the variety of all life forms: the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form; often considered at three levels: genetic diversity, species diversity and ecosystem diversity"
Biogeography	The study of both geography and biology including the relationships between plants, animals, soils, water, climate and humans
Bioregion	A land and water territory whose limits are defined not by political boundaries, but by geographical limits of human communities and ecological systems
Biosphere reserve	Representative terrestrial or coastal environments that have been internationally recognised within the framework of UNESCO's MAB program for their values in conservation and in providing the scientific knowledge, skills and human values to support sustainable development (Biosphere reserve nomination form 1994)
Biotic	Of, or relating to living things; caused or produced by living organisms
Block	A named administrative subdivision of the forest, varying in size from about 3000 to 8000 ha
Ecosystem	A community or an assemblage of communities of organisms, interacting with one another and the environment in which they live
Eco-tourism	Tourism focused on appreciation of natural values, such as to see particular biota or to visit national parks and other reserves
Endemic	Flora or fauna that is confined in its natural occurrence to a particular region
Estuarine	Relating to a water passage where the tide meets a river current; especially an arm of the sea at the lower end of a river
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 a oxygen deficit, which can have a major detrimental effect on the fish other aquatic organisms
Extant	Still existing
Fauna	The animals inhabiting an area; including mammals, birds, reptiles, amphibians and invertebrates. Usually restricted to animals occurring naturally and excluding feral or introduced animals
Fire regime-specific species	Species that has a specific fire regime, or sequence of fire, for its persistence, which could be a unique combination of fire interval, season and intensity. For example, *Melaleuca viminea* requires infrequent, moderate to high intensity summer fires for thicket regeneration.
Fire sensitive	Species, or individual or community that is readily killed by low intensity fire and relies on seed for regeneration. This usually refers to understorey plants with thin bark or with canopies relatively close to the ground and which are obligate seeders and which have relatively long juvenile periods, such as green honeysuckle *Lambertia rariflora* and river banksia *Banksia seminuda*.
Flora	The plants growing in an area; including flowering and non-flowering plants, ferns, mosses, lichens, algae and fungi. Usually restricted to species occurring naturally and excluding weeds
Genetic	To do with the hereditary units that are composed of sequences of DNA
Geodiversity	The diversity of minerals, rocks, fossils, soils, landforms and geological processes that constitute the topography, landscape and underlying structure of the Earth
Geomorphology	The study of the earth surface features and their formation
Geoprocesses	Natural and other processes that affect geodiversity features
Habitat	A component of an ecosystem providing food and shelter to a particular organism
Host	The organism from which a parasite obtains its nutrition or shelter

Hydrology	The scientific study of the characteristics of water, especially of its movement in relation to the land
Indigenous	Native or belonging naturally (to a place)
Invertebrate	Animals without backbones, for example, insects, worms, spiders and crustaceans
Key fire response species	Also known as 'focal' or 'umbrella' species, these species have vital attributes that can be used to determine appropriate fire regimes. They are usually 'fire regime-specific species' or 'fire sensitive species', both of which can be, and often are, 'key fire response species'. Fauna with specific habitat requirements such as the noisy scrub bird and mainland quokka can also be key fire response species.
Key performance indicators	The minimum set, which if properly monitored, provides rigorous data describing the major trends in, and impacts on, Australian biodiversity (Kanowski *et al.* 2001)
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
Mesic	Of, or adapted to, a temperate, moderately moist habitat
Nature-based tourism	Tourism that is dependent upon the resources of the natural environment and incorporates a range of tourism experiences including adventure tourism, eco-tourism and aspects of cultural and rural tourism
Obligate	Restricted to a single mode of behaviour or environmental condition, such as an obligate aerobe that is dependent on the presence of molecular oxygen to breathe
Old growth forest	Ecologically mature forest where the effects of unnatural disturbance are now negligible. The definition focuses on forest in which the upper stratum or overstorey is in a late mature to senescent growth stage.
Pathogen	A specific causative agent (as a bacterium or virus) of disease
Phytogeography	Study of the biogeography of plants
Relictual	Pertaining to an archaic form in an otherwise extinct taxon
Riparian	Pertaining to the banks of streams, rivers or lakes
Sclerophyll	Pertaining to vegetation with leaves stiffened by mechanical tissue with heavily thickened cell walls, which prevents the leaves from wilting in dry conditions
Seral stage	The developmental stages of an ecological succession.
Spores	Primitive, usually unicellular, reproductive body produced by plants and some micro-organisms and capable of development into a new individual either directly or after fusion with another spore
Statutory	Enacted or required by law
Taxa (taxon)	A defined unit (for example, species or genus) in the classification of plants and animals
Turbidity	Discolouration of water due to suspended silt or organic matter.
Vascular plants	Plants that have a specialised circulatory or conducting system that includes xylem and phloem
Vector	Any agency responsible for the introduction or dispersal of an organism
Vegetation complex	A combination of distinct site vegetation types, usually associated with a particular geomorphic, climatic, floristic and vegetation structural association
Vertebrate	Animals that have a spinal column, which includes fish, amphibians, reptiles, birds and mammals

ACRONYMS

AS	Australian Standard
BRM	Basic Raw Materials
CALM	Department of Conservation and Land Management
CAMBA	China Australia Migratory Bird Agreement
CAR	Comprehensive, adequate and representative protected area reserve system. Comprehensive enough that the full range of ecosystems recognised at an appropriate scale are reserved; adequate enough to maintain the ecological viability and integrity of populations, species and communities; and representative enough that the reserves reflect the biotic diversity of the ecosystems.
CPL	Commercial Purposes Licence
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTO	Commercial Tour Operator
DEC	Department of Environment and Conservation
DOIR	Department of Industry and Resources
DRA	Disease Risk Area
DRF	Declared Rare Flora
DWSPP	Drinking Water Supply Protection Plan
EPA	Environment Protection Authority
FESA	Fire and Emergency Services Authority
FNA	Fly Neighbourly Advice
FPC	Forest Products Commission
IBRA	Interim Biogeographic Regionalisation for Australia
IMCRA	Interim Marine and Coastal Regionalisation for Australia
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
JAMBA	Japan Australia Migratory Bird Agreement
KPI	Key Performance Indicator
LBU	Logical Burn Unit
LCU	Landscape Conservation Unit
MAB	Man and the Biosphere program (UNESCO)
NRM	Natural Resource Management
NWI	National Wilderness Inventory
PDWSA	Public Drinking Water Supply Area
RATIS	Recreation and Tourism Information System
RFA	Regional Forest Agreement
RIWI	Rights In Water Irrigation Act 1914
TEC	Threatened Ecological Community
UCL	Unallocated Crown land
UMR	Un-managed Reserve
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WW	Walpole Wilderness

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Mal Graeme – ex CALM, Katanning District, Regional Services Division.
Dr Joanna Young – Joanna Young and Associates, Walpole.

Insert:

Map 1. Management Planning Area

Insert:

Map 2. Tenure

Insert:

Map 3. Wilderness Quality and Proposed Wilderness Areas

Insert:

Map 4. Forest Ecosystems

Insert:

Map 5. Elevation

Insert:

Map 6. Hydrology and Water Resources

Insert:

Map 7. Visual Landscape Management Zones

Insert:

Map 8. Flora Species Richness

Insert

Map 9. Old Growth Forest and Threatened Ecological Communities

Insert:

Map 10. Fire Landscape Conservation Units

Insert:

Map 11. Visitor Management Settings

Insert:

Map 12. Public Access

Insert:

Map 13a. Existing Recreation Sites

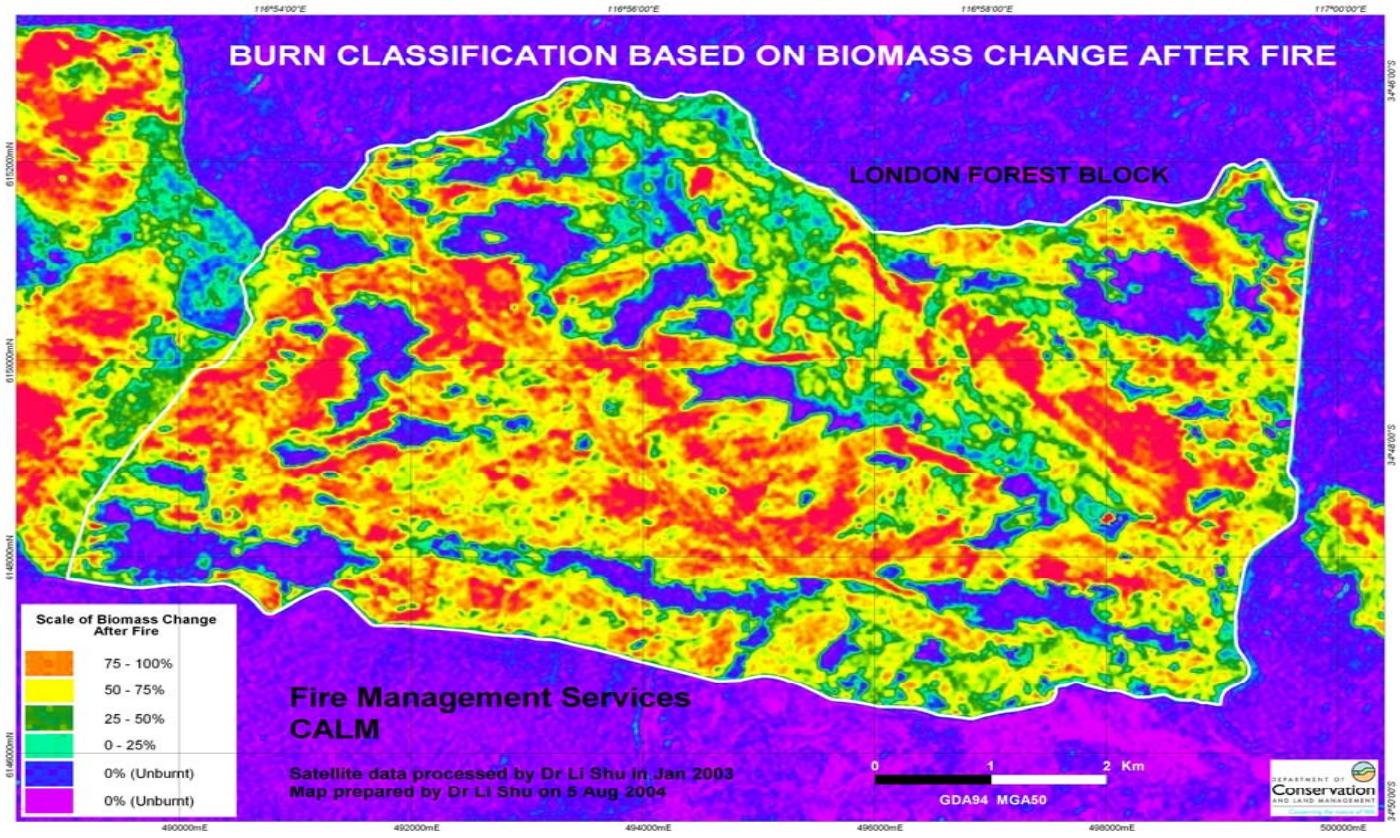
Insert:

Map 13b. Proposed Recreation Sites

APPENDICES

Appendix 1. Satellite image after prescribed fire within London block

Satellite image shows the scale of biomass change after prescribed fire within London block in the planning area.



Appendix 2. Performance assessment

Key performance indicators for the planning area

KEY VALUES	OBJECTIVE	KEY PERFORMANCE INDICATORS*		
		Performance Measure	Target	Reporting Requirements
PART B: MANAGEMENT DIRECTIONS AND PURPOSE				
Section 8. Management Arrangements with Aboriginal People				
Potential for 'joint-management' between the Department and Aboriginal people	Provide a mechanism for management to be conducted cooperatively by the Department and Aboriginal people	8.1 The establishment of a Park Council or similar joint management arrangement	8.1 The successful establishment of a Park Council or similar joint management arrangement within 5 years of commencement of the plan	After 5 years
Section 11. Proposed Tenure, Purpose, Vesting and Boundary Changes				
The conservation of biodiversity and ecological integrity in all native forest ecosystems through the establishment and management of a system of reserves that is comprehensive, adequate and representative	Incorporate appropriate lands and waters into the conservation estate to assist in the protection of the values of the planning area, to provide maximum security of tenure, and to contribute towards the establishment of a comprehensive, adequate and representative reserve system	11.1 Tenure actions for which the Department and Conservation Commission are responsible	11.1 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 WILDERNESS VALUES				
Section 12. Identification and Dedication of Wilderness Areas				
Qualities of remoteness and naturalness not readily available in the south-west	Provide statutory protection to wilderness areas	12.1 Gazettal of 2 wilderness areas under section 62 of the CALM Act	12.1 Gazettal of 2 wilderness areas within 2 years	After 2 years
Section 13. Management of Wilderness Areas				
Qualities of remoteness and naturalness not readily available in the south-west	Maintain or enhance wilderness qualities in the planning area	13.1 The extent and level of wilderness quality within wilderness areas	13.1 The extent and level of wilderness quality in wilderness areas does not diminish from 2008 levels	After 5 years
PART D: MANAGING THE NATURAL ENVIRONMENT				
Section 16. Geology, Landforms and Soils				

A complex mosaic of geology, landforms and soils that provide the physical, chemical and biological foundation necessary to support plant life and sustain ecological processes. Geoheritage sites important for research and for understanding the formation of landscape and environment	Maintain the geodiversity and geoprocesses of the planning area and protect sites of known geoheritage	16.1 Area of erosion within the planning area	16.1a No new areas of erosion as a result of human activities 16.1b Identification of existing erosion within 3 years 16.1c Repair of 90% of existing erosion within the life of the plan	After 5 years
Section 17. Hydrology and Catchment Protection				
Extensive, varied, unique and nationally significant wetland systems that provide habitat for a range of endemic flora and fauna. Protection of a major river (Deep River) in a relatively natural state	Protect and conserve the quality and quantity of water resources within the planning area, particularly the wetland systems, rivers and the coastline	17.1 Condition of the Mt Soho Swamps and Owingup Swamp system wetlands of national significance	17.1 No further decline in, and where degraded restoration of, the condition of the Mt Soho Swamps and Owingup Swamp system wetlands of national significance	After 5 years
Section 19. Native Plants and Vegetation				
A rich mosaic of vegetation representing wetland, woodland and forest ecosystems protecting rare and priority flora populations	Identify, protect and conserve the diversity and distribution of specially-protected and other native plants and plant communities within the planning area	19.1 Population size[1] and/or number of populations of critically endangered flora species located within the planning area	19.1 Increase in population size[1] and/or number of populations of critically endangered flora species located within the planning area	After 5 years, or as per recovery plans if applicable
		19.2 Populations of endangered or vulnerable flora species within the planning area	19.2 No loss of a single population of endangered or vulnerable flora species within the planning area	After 5 years, or as per recovery plans if applicable
Section 20. Native Animals				
Extensive areas of intact fauna habitat and populations of rare and priority fauna species	Identify, protect and conserve specially-protected and other native fauna and their habitats within the planning area	20.1 The conservation status of threatened fauna species located within the planning area	20.1a No decline in the conservation status of threatened fauna species in the planning area 20.1b Translocated fauna species are successfully established as viable breeding populations	After 5 years, or as per recovery plans if applicable

		20.2 Range and number of populations of locally endemic fauna species: Walpole burrowing crayfish, tingle trapdoor spider, Nornalup frog and sunset frog	20.2 The range and number of populations of locally endemic fauna species: Walpole burrowing crayfish, tingle trapdoor spider, Nornalup frog and sunset frog will be maintained or increased	After 5 years, or as per recovery plans if applicable
Section 21. Ecological Communities				
A rich mosaic of vegetation representing wetland, woodland, and forest ecosystems protecting restricted vegetation communities and rare and priority flora populations. Extensive areas of intact fauna habitat and populations of rare and priority fauna species. Extensive, varied, unique and nationally significant wetland systems that provide habitat for a range of endemic flora and fauna	Identify, protect and conserve threatened and other ecological communities of conservation significance within the planning area	21.1 The flora species that comprise the Mt Lindesay - Little Lindesay Granite threatened ecological community	21.1 No loss of flora species that comprise the Mt Lindesay - Little Lindesay Granite threatened ecological community	After 5 years, or as per recovery plan if applicable
		21.2 The location and species composition of the poorly known 'relictual peat' threatened ecological communities within the planning area	21.2 The location and flora and invertebrate species composition of the 'relictual peat' threatened ecological communities will be identified	After 5 years, or as per recovery plans if applicable
Section 22. Environmental Weeds				
A rich mosaic of vegetation representing wetland, woodland and forest ecosystems protecting restricted vegetation communities and rare and priority flora populations	Minimise the impact of environmental weeds on values of the planning area	22.1 The extent of weed species at priority sites, including former research trials of introduced tree species, and with a 'High' rating in the *Environmental Weed Strategy*, or deemed as a local priority.	22.1 Decrease in the extent of weed species at priority sites, including former research trials of introduced tree species, and with a 'High' rating in the *Environmental Weed Strategy*, or deemed as a local priority.	After 5 years
Section 23. Introduced and Other Problem Animals				
A rich mosaic of vegetation representing wetland, woodland, and forest ecosystems protecting restricted vegetation communities and rare and priority flora populations	Minimise and, where possible, negate the impacts of introduced and problem animals on values of the planning area	23.1 Populations of feral pigs in the planning area	23.1 No increase in the number of populations of feral pigs in the planning area	After 5 years

Extensive areas of intact fauna habitat and populations of rare and priority fauna species. Extensive, varied, unique and nationally significant wetland systems that provide habitat for a range of endemic flora and fauna				
Section 24. Diseases				
A rich mosaic of vegetation representing wetland, woodland, and forest ecosystems protecting restricted vegetation communities and rare and priority flora populations. Extensive areas of intact fauna habitat	Determine the extent and influence of *P. cinnamomi* within the planning area, and to ameliorate the impact and minimise the further spread, of *P. cinnamomi*, and other diseases, within the planning area	24.1 The identification and establishment of protectable areas that are a priority for protection	24.1 Protectable areas that are a priority for protection have been identified and established	After 5 years
		24.2 Development of further dieback KPIs	24.2 Further dieback KPIs have been developed	After 2 years
		24.3 Knowledge of plant species and ecological communities at risk from *P. cinnamomi* in the planning area	24.3 Identification of plant species and ecological communities threatened by *P. cinnamomi* and at high risk from short term vectoring	After 5 years, or as per recovery plans if applicable
Section 25. Fire				
A rich mosaic of vegetation representing wetland, woodland, and forest ecosystems protecting restricted vegetation communities and rare and priority flora populations. Extensive areas of intact fauna habitat and populations of rare and priority fauna species	Protect and promote the biodiversity of ecosystems and to protect life and community assets	25.1 The extent of fire diversity measured by the diversity and scale of post-fire fuel ages within a Landscape Conservation Unit	25.1 The distribution of post-fire fuel ages (time since fire) for each Landscape Conservation Unit approximates the fuel age distribution in Figure 9	Annually
		25.2 The impact on human life or significant community assets	25.2 No loss of human life or significant community assets, or serious injury attributable to the Department's fire management	
		25.3 The extent to which fire management guidelines for significant habitats requiring specific fire regimes are addressed in burn objectives	25.3 Burn objectives are met for significant habitats requiring specific fire regimes	
		25.4 The extent to which fire management guidelines have been prepared for significant habitats requiring specific fire regimes	25.4 Development of published fire management guidelines for significant habitats requiring specific fire regimes	After 2 years
PART E: MANAGING OUR CULTURAL HERITAGE				
Section 26. Indigenous Heritage				

Aboriginal sites and landscapes of mythological, ceremonial, cultural and spiritual significance	Identify, protect and conserve the Aboriginal cultural heritage and cultural resources of the planning area	26.1 Protection of known or identifiable heritage sites and values	26.1 No disturbance without formal approval	After 5 years
Section 27. Non -indigenous Heritage				
A rich non-indigenous cultural heritage associated with exploration, early settlement, and the agricultural/forestry industries	Identify, protect and conserve the non-indigenous cultural heritage of the planning area	27.1 Protection of known or identifiable heritage sites and values.	27.1 No disturbance without formal approval.	After 5 years
PART F: MANAGING VISITOR USE				
Section 28. Visitor Opportunities				
A terrestrial environment that provides opportunities for a wide range of nature-based recreation activities including recreational driving, bushwalking, picnicking, camping, fishing and wildlife interaction Coastal and hinterland recreational opportunities for many local communities within the Manjimup, Denmark, Plantagenet and Albany local government areas	Provide visitors with a range of sustainable nature-based experiences to facilitate their enjoyment and understanding of the natural and cultural values of the area	28.1 Visitor satisfaction levels of nature-based experiences within the planning area	28.1 Visitor satisfaction levels of nature-based experiences within the planning area are maintained or increased from 2008 levels	After 5 years
		28.2 The range and number of visitor opportunities	28.2 The range and number of visitor opportunities is consistent with visitor management settings	After 5 years
		28.3 Social, economic and environmental visitor impact indicators	28.3 Social, economic and environmental visitor impact indicators will be developed during the life of the plan	After 5 years
Section 34. Visitor Safety				
A terrestrial environment that provides opportunities for a wide range of nature-based recreation activities with minimal risk to visitors	Minimise risks to public safety associated with visiting areas managed by the Department while maintaining a range of visitor experiences wherever possible	34.1 The number and severity of incidents occurring within the planning area and reported to the Department	34.1 The number and severity of incidents occurring within the planning area and reported to the Department remains stable or decreases from 2008 levels	After 5 years
PART G: MANAGING RESOURCE USE				
Section 41. Rehabilitation				
A complex mosaic of geology, landforms and soils that provide the physical, chemical and biological foundation necessary to support plant life and sustain ecological	Restore degraded areas to a stable condition resembling as close as possible the natural ecosystem function	41.1 Disturbances related to fireline construction during wildfire suppression	41.1 Commencement of rehabilitation of all disturbances related to fireline construction during wildfire suppression prior to the break of the season, and restoration within 2 years	After 5 years

		41.2 Disturbances related to recreation development	41.2 Commencement of rehabilitation and restoration of all disturbances related to recreation development within 12 months of project completion	After 5 years
		41.3 Exhausted gravel pits	41.3 Commencement of rehabilitation and restoration of all exhausted gravel pits within 6 years	After 5 years
		41.4 Disturbances related to mining	41.4 Commencement of rehabilitation and restoration of all disturbances related to mining according to permit conditions	After 5 years
Section 43. Flora Harvesting				
Limited resource supply opportunities for firewood, craftwood, apiary and flora harvesting activities	Facilitate wildflower picking in parts of the planning area, while minimising the impacts on natural values	43.1 Vegetation community health as a direct result of flora harvesting activities	43.1 No decline in vegetation community health as a direct result of flora harvesting activities	After 5 years
PART H: INVOLVING THE COMMUNITY				
Section 46. Information, Interpretation and Education				
Regionally significant quality interpretive and experiential recreation opportunities such as the Tree Top Walk and the Walpole Wilderness Discovery Centre	Promote community awareness, understanding and appreciation of the natural and cultural values of the planning area and engender support for effective management of the planning area	46.1 Participation in education programs offered within the District and the Walpole Wilderness Discovery Centre	46.1 Maintenance or increase in participation in education programs offered within the District and Walpole Wilderness Discovery Centre from 2008 levels	After 5 years
Section 47. Community Involvement and Liaison				
An extensive range of opportunities for community involvement in the implementation of the management plan	Facilitate effective community involvement in management of the planning area	47.1 The number of registered volunteers and the level of volunteer hours	47.1 An increase in the number of registered volunteers and the level of volunteer hours	After 5 years

1 = Population size is defined as the number of mature/reproducing plants.

* The response to target shortfall for any of the key performance indicators is for the Department to investigate the cause and report to the Conservation Commission for action.

Appendix 3. Reserves and areas requiring further investigation

No.	Reserve	Location	Comments
Additions Proposed in the Walpole-Nornalup National Park Management Plan 1992-2002			
1	C26583		Not completed. To be added to reserve 31362
2		UCL along the banks of the Deep River	
3		UCL along Landors Gully	
4		UCL along the banks of the Deep River	
5		UCL along the banks of the Frankland River, along Hay Location 602	
6		UCL along the banks of the Frankland River, near the Nornalup Bridge	
7		UCL near the Walpole River, portion of closed road	
8		UCL along the Bow River	
9		Excision of a small portion of reserve 31362 north of the South West Highway	
10	C14325		"Water", unvested
11	A31468		"Conservation of flora and fauna"
12		Road reserve through Nuyts block	
13		Road reserve from Peaceful Bay towards Rame Head	
14		Road reserve adjacent to Conspicuous Beach Road and Ficifolia Road	
15		Shoreline of Irwin Inlet	
16		UCL along the west bank of the Walpole River, north of the South West Highway	This area has not been identified in recent investigations
17		Closed road between the South West Highway and Rest Point Road	
Further Proposed Additions to Walpole-Nornalup National Park			
18		Portion of State Forest 47	Swarbrick block
19		UCL immediately east of Walpole	Within Walpole Townsite
20		Nelson Location 5619	Freehold land donated to the State for addition to the Walpole-Nornalup National Park
Proposed Additions to Walpole-Nornalup National Park in the *Forest Management Plan 2004-2013*			
21	A29777		Nature reserve inside Walpole Townsite already vested in the Conservation Commission
22	C26584		"Yacht Club site", an enclave that is already vested with the Conservation Commission
23		Unmade road reserve adjacent to 5 above and along the western boundary of Hay Location 601	
24		Portion of unnecessarily wide road reserve adjacent to the Nornalup Bridge	Reduce to normal road width and add balance to reserve 31362
25		Unmade road reserve east of Bow Bridge, between South West Highway and Irwin Inlet	This is dependant on the requirements for access to Irwin Inlet, and the proposed Munda Biddi Trail and Rail Trail.
26	46895		"Conservation and Recreation" created in 2002, abuts Nature Reserve A31468 and already vested in the Conservation Commission

No.	Reserve	Location	Comments
27		Nelson Location 13577	Add to Reserve 31362
28		Hay Location 2390	Section of closed road to add to Reserve 31362
29		Hay Location 2379	Formerly Lot 11 Diagram 84879, add to Reserve 31362
Other Areas Requiring Further Investigation			
30	27398	Watson Road	
31	29660	Scotsdale/Fernley roads	
32	UCL	2283	Between Mehniup and Quarram nature reserves, proposed to be a nature reserve
33	UCL		Vicinity of Boat Harbour Road
34	18272	Near Mehniup Nature Reserve	A number of reserves that link Mehniup and part of Thames block on the north side of the South Coast Highway
35	2006	Denmark River	Adjacent to Harewood block, depending on the long-term water supply requirements
36	2054		Adjacent to Harewood block, depending on the long-term water supply requirements
37	UCL	Stanley Island	Adjacent to Quarram Nature Reserve
38	1916	Muirs Bridge, Frankland River	Water reserve used for picnicking and camping on the Frankland River
39	UCL	Lot 650 foreshore	Adjacent to Walpole Inlet and Walpole River between the Golf Club and Townsite.

The status of other Crown reserves continues to change over time due to subsequent investigations and changes in vesting. A number of these Crown reserves are currently being included in adjoining conservation reserves.

Appendix 4. Characteristics of the rivers of the planning area

River System	Receiving Coastal Water-body or Wetland	Catchment Area (km^2)	Main Channel Length (km)	Clearing (%)	Mean Annual Flow (ML)	Salinity[1]	Tributaries (that occur within the planning area)
Walpole	Walpole Inlet	60	15	13	19 000	Fresh	Felix Brook, Samuel's Brook
Deep	Nornalup Inlet	1000	120	3	140 000	Fresh	Weld River, Mattabandup Creek, Spring Creek, Croea Brook, Middle Creek, Our Brook, Bell Brook, Landors Gully, Crystal Brook
Frankland	Nornalup Inlet	4650	400	56	200 000	Marginal/brackish	Poorginup Gully, Spearwood Brook, Elsie Brook, Wedding Brook, Boxhall Creek
Bow	Irwin Inlet	250	20	15	41 000	Fresh	
Kent	Irwin Inlet	2040	100	42	123 000	Marginal	Styx River, Little River, Nile Creek
Kordabup	Parry Inlet	120	12	50	28 000	Fresh	
Denmark	Wilson Inlet	690	60	15	45 000	Fresh/marginal	Quickup River, Horkinup Creek, Cleerillup Creek, Kompup Creek, Makoyup Creek, Drake Creek
Hay	Wilson Inlet	1280	80	60	78 000	Marginal/brackish	Mitchell River, Sheepwash Creek
Sleeman	Wilson Inlet	90	22	80	15 000	Fresh	

1 = Fresh (0-500 mg/L), marginal (500-1500 mg/L), brackish (1500-5000 mg/L) and saline (>5000 mg/L).
Source: Pen (1999).

Appendix 5. Ecological communities

Threatened ecological communities

Below is a list of ecological communities within the planning area from May and McKenzie (2003). Two of the communities ('Mt Lindesay - Little Lindesay Granite Community' and '*Reedia* swamps of the Warren Bioregion') are detailed further below.

Ecological Community	Status[1]
Mt Lindesay-Little Lindesay Granite Community (see below for a full description)	EN
Reedia spathacea - *Empodisma gracillimum* - *Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region (see below for a full description)	P1
Relictual peat community (eg Lake Surprise) (South Coast Region *pers. comm.*)	P1
Aquatic invertebrate communities of peat swamps (Storey 1998, A Storey *pers. comm.*)	P2
Sphagnum communities of the tingle forest (only 3 known occurrences in the Walpole area) (G. Wardell-Johnston data; R. Hearn *pers. comm.*)	P2
Saprolite association/Palusmont wetlands (Walpole Inlet) (R. Hearn *pers. comm.*, V. and C. Semeniuk data)	P2
Southwest Coastal Grassland (R. Hearn and T. Macfarlane *pers. comm.*)	P2
Southern granite community (eg Muirillup Rock, Northcliffe; subset of wheatbelt granites; insufficient information to distinguish discrete community type/s at this point) (N. Marchant *pers. comm.*, I. Bayly data)	P2
Karri community at edge of geographic range (Plantagenet District) (K. Tinley *pers. comm.*)	P2
Flat wetlands Rocky Gully to Denmark (M. Graeme *pers. comm.*)	P2
Epiphytic cryptogams of the karri forest Cryptogams associated with *Trymalium floribundum* and *Chorilaena quercifolia* in the karri forests of south-western WA (R. Hearn and T. Macfarlane *pers. comm.*)	P3
Naturally brackish/saline coastal lakes in the south-west region (S. Halse *pers. comm.*)	NE
Aquatic invertebrates associated with permanent freshwater/brackish pools (S. Halse *pers. comm.*)	NE
Plant assemblages of primary saline wetlands (J. Buegge *pers. comm.*)	NE

1 = **Conservation Status Codes as at January 2008:**

PD = Presumed Totally Destroyed
An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

CR = Critically Endangered
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

EN = Endangered
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

VU = Vulnerable
An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

NE = Not Evaluated by the Threatened Ecological Community Scientific Committee.

P1 = Priority One: Poorly-known ecological communities
Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

P2 = Priority Two: Poorly-known ecological communities
Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land and water reserves) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

P3 = Priority Three: Poorly known ecological communities
Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
(ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
(iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

P4 = Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
(b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
(c) Ecological communities that have been removed from the list of threatened communities during the past five years.

P5 = Priority Five: Conservation Dependent ecological communities. Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Mt Lindesay-Little Lindesay Granite Community

The Mt Lindesay-Little Lindesay Granite community is categorised as 'Endangered'. The community is yet to be listed under the EPBC Act, which will provide statutory protection for the community.

The Mt Lindesay-Little Lindesay Granite community consists of jarrah shrub-mallee and heath on the upper slopes and summit area with mixed jarrah – marri – bullich low woodland in gullies. Typical shrub species include bull banksia *Banksia grandis*, variable-leaved hakea *Hakea varia* and gravel bottlebrush. Typical sedges are *Mesomelaena graciliceps* and hair sedge *Tetraria capillaris*. Priority taxa include: *Sphenotoma parviflorum*, *Gastrolobium brownii* and *Billardiera drummondii*. *Andersonia setifolia* is locally endemic to the mountain. *Andersonia hammersleyana*, another local endemic, occurs on the lower slopes.

Threats to the community (Barrett 1996) are:

- dieback caused by *P. cinnamomi*: dieback is widespread and has had a severe impact on large sections of the upper slopes. However, pockets still persist which are dieback free or are only in the early stages of infestation;
- frequent fire: only small pockets of the community escaped the 1991 fire and much of the area has been burnt four times in the past 25 years;
- feral animals; and
- recreation.

A recovery plan is currently being developed for this community. However, phosphite treatment at a species level has been undertaken for several years in an attempt to reduce the impact of *Phytopthora* dieback disease on the susceptible threatened species in the community (May and McKenzie 2003). Recreational access to the western section of Mt Lindesay is being formalised to reduce disturbance to the community as a result of erosion, vegetation trampling and disease vectoring.

Reedia spathacea - Empodisma gracillimum - Schoenus multiglumis dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region

The Reedia swamps are peat paluslopes[31] and sandy mud floodplains dominated by *Reedia spathacea* (DRF - Endangered), *Empodisma gracillimum* (endemic) and *Schoenus multiglumis* (endemic). The perennially high water tables of these freshwater wetlands are primarily maintained by the humid climate, collection of rainwater from large natural catchment areas by sub-surface flow into confined aquifers, and the water storage capacity of peat.

A number of priority species are concentrated in these wetlands including: *Amperea protensa* (Priority 3), *Drosera binata* (Priority 2), *Gonocarpus simplex* (Priority 3), although they are not restricted to this community.

The Reedia swamp communities are categorised at the State level as a priority 1 ecological community and are vulnerable to one or more known threatening processes including feral pig grazing, trampling and wallowing (see Section 23 *Introduced and Other Problem Animals*), inappropriate fire regimes (see Section 25 *Fire*), disruption of hydrological maintenance of wetlands (see Section 17 *Hydrology and Catchment Protection*), nutrient enrichment, and weed invasion (see Section 22 *Environmental Weed*s).

[31] Paluslopes are hill slope wetlands created by hill side seepages.

Significant vegetation associations

Significant Vegetation Associations in the planning area that meet or exceed the criteria for significance used by Hopkins *et al*. (2002).

Vegetation Association No.*	Beard Code	Description	Reason For Significance
3	E2,3Mc	Medium forest; jarrah-marri	Poorly reserved >0 but < 15% in reserves
14	e2Lc	Low forest; jarrah	Poorly reserved or limited in extent
37	mSc	Shrublands; teatree thicket	Poorly reserved >0 but < 15% in reserves
49	XZc	Shrublands; mixed heath	≤ 30% of original extent, poorly reserved or limited in extent.
125	Sl	Bare areas; salt lakes	Poorly reserved or limited in extent
126	Fl	Bare areas; freshwater lakes	≤ 30% of original extent.
129	Ds	Bare areas; drift sand	≤ 30% of original extent.
965	e2,3Mi	Medium woodland; jarrah and marri	Vegetation association of limited current extent (i.e. < 2000 ha) in SW Agricultural Region
999	e3Mi	Medium woodland; marri	Poorly reserved >0 but < 15% in reserves and ≤ 30% of original extent
1112	e1Tc/e2,3Tc	Mosaic: Tall forest; karri / Tall forest; jarrah and marri	Poorly reserved or limited in extent
1130	E1,68Tc	Tall forest; karri and red tingle	Vegetation association of limited current extent (i.e. < 2000ha) in SW Agricultural Region
1151	E2,68Mc	Medium forest; jarrah and red tingle	Vegetation association of limited current extent (i.e. < 2000ha) in SW Agricultural Region
1157	E2,3,Tc	Tall forest; jarrah and marri	Poorly reserved >0 but < 15% in reserves, vegetation association of limited current extent (i.e. < 2000ha) in SW Agricultural Region, poorly reserved or limited in extent

* Beard 1980

Appendix 6. Environmental weeds

Environmental weeds in the planning area that are current priorities for control

Common Name	Scientific Name	Declared Weed Rating[1]	Rating[2]	Distribution	Impact	Invasiveness	MWAG[3] priority
Sydney golden wattle	*Acacia longifolia subsp. longifolia*		Not listed				
Blackwood	*Acacia melanoxylon*		Low				
Bridal creeper[4]	*Asparagus asparagoides*		High	Y	Y	Y	Y
Pampas grass	*Cortaderia selloana*		High	Y	Y	Y	Y
Golden dodder	*Cuscuta campestris*	P1, P4	Not listed	Y		Y	
Dolichus pea	*Dipogon lignosus*		Low				Y
St John's wort	*Hypericum perforatum*	P1, P2	Low				
Victorian tea tree	*Leptospermum laevigatum*		High	Y	Y	Y	Y
Myrtle-leaf milkwort	*Polygala myrtifolia*		Not listed				
Blackberry[4]	*Rubus fruiticosis*	P1, P4	Low				Y
Pink senecio	*Senecio elegans*		Not rated				
Onion weed	*Trachyandra divaricata*		Mild	Y			
Bullrush	*Typha orientalis*		High	Y	Y	Y	Y
Watsonia	*Watsonia spp.*		Moderate		Y	Y	Y
Arum lily	*Zantedeschia aethiopica*	P1, P4	High	Y	Y	Y	Y

1 = Declared plants are gazetted under five categories, which define the action required: P1 (prevention), P2 (eradication), P3 (control), P4 (containment) and P5 (special action on public land) (Peirce and Pratt 2002).
2 = Rating refers to the categories under the *Environmental Weed Strategy for Western Australia* (CALM 1999a).
3 = Manjimup Weed Action Group.
4 = Weed of National Significance.

Appendix 7. Fire management

Areas in which fire may be applied conditionally

The protection from wildfire and the exclusion of fire from small patches will also enhance overall biodiversity and provide protection for a number of specific values. These areas vary in their requirements and may include:

- *Fire Exclusion – Reference Area* (FERA): an area from which fire has been deliberately excluded to provide a reference site for scientific studies of the effects of fire on the environment. The fire management objective is to protect from wildfire or exclude fire in perpetuity. These areas are generally in the order of less than 500 ha that have value to scientific study because they are long unburnt. Criteria have been established for selecting FERA and are available on the Department's *NatureBase* website (see Nomenclature);
- *Scientific Study Area*: an area where scientific study is being undertaken and for the period of that study is not to be burnt, or is burnt as per the study requirements. The fire management objective for these areas is to protect them from wildfire or exclude fire for the life of the study;
- *No Planned Burn (Management Plan)*: an area specifically identified in a management plan that is not to be burnt by prescribed fire. The fire management objective for these areas is to protect them from wildfire or exclude fire for the life of the management plan;
- *Fire Exclusion – Habitat*: an area identified as having special value as fauna or flora habitat due to its vegetation structure, species composition, seral stages, niche values or location. The fire management objective for these areas is to protect them from wildfire or exclude fire;
- *Fire Exclusion – Silviculture*: an area that contains regrowth that may be sensitive to fire (see Section 25 *Fire*). The fire management objective for these areas is to identify them in the rolling three-year indicative and annual burn programs and individual burn prescriptions, so that appropriate protection can be determined and justified;
- *Fire Exclusion – Cultural*: an area identified as having indigenous or non-indigenous cultural values that are sensitive to fire. The fire management objective for these areas is to protect them from wildfire or exclude fire; and
- *Specified Management Regimes*: an area identified in a management plan that has been assigned a specific fire regime for a specified purpose, such as the 'Fire Mosaic Project' (see Section 25 *Fire*). The fire management objective for these areas is to protect them from wildfire or exclude fire.

Appendix 8. Cultural heritage sites

Heritage classification of cultural heritage sites within the planning area

Site	WA Register of Heritage Places Municipal Inventories	Australian Heritage Council Register of National Estate	DEC Moveable Heritage and Cultural Heritage Sites Database - RATIS	Site	WA Register of Heritage Places Municipal Inventories	Australian Heritage Council Register of National Estate	DEC Moveable Heritage and Cultural Heritage Sites Database - RATIS
Aldridge Cove			X	Nornalup Inlet			X
Ancient Empire Board Walk			X	Nornalup Inlet Precinct			X
Bald Head			X	Nut Road Lookout			X
Bellanger Beach			X	Nuyts Wilderness Trail			X
Blue Holes Fishing Spot			X	Peaceful Bay			X
Boggy Lake			X	Peaceful Bay Settlement	X		
Cairn at Crystal Springs			X	Pioneer Park			X
Centre Road Crossing			X	Pleated Lady - Tingle Tree on Rate Road			X
Circular Pool			X	Possum Trappers Cave			X
Circus Beach and Trail			X	Railway Bridge - Beach Road			X
Coalmine Beach			X	Railway Bridge - Bow River			X
Conspicuous Beach			X	Railway Bridge - Mehniup			X
Crystal Lake			X	Rare Tingles			X
Crystal Springs hut and cattle yard	X			Rest Point			X
Deep River Bridge, Bevan Road			X	Rest Point Sawpits	X		X
Deep River Precinct/Area		Interim[1]	X	Sandy Beach	X		X
Denmark River			X	Sapper Bridge and track connecting to Circular Pool			X
Dog trappers hut site			X	Sapper's Bridge			X
Fernhook Falls			X	Scenic Drive – Walpole-Nornalup National Park			X
Foul Bay			X	Shanghai Gully			X
Frankland River			X	Shelley Beach			X
Gladstone Falls			X	Soho Hills			X
Granite Peak			X	The Depot			X

Site	WA Register of Heritage Places Municipal Inventories	Australian Heritage Council Register of National Estate	DEC Moveable Heritage and Cultural Heritage Sites Database - RATIS	Site	WA Register of Heritage Places Municipal Inventories	Australian Heritage Council Register of National Estate	DEC Moveable Heritage and Cultural Heritage Sites Database - RATIS
Harewood Forest	X			Thompson's Cove			X
Hill Top Walk			X	Tingle Forest - Deep River			X
Hilltop and boardwalk			X	Tingle Hills			X
Horseyard Hill			X	Tingle Trees - Walpole-Nornalup National Park			X
House ruins - Deep River	X		X	Tinglewood Road			X
Hush Hush Beach			X	Tree Top Walk - Valley of the Giants	X		X
John (Jack) Rate Lookout			X	Valley of the Giants			X
Lost Beach			X	Valley of the Giants Precinct			X
Millers Basin			X	Walpole Country Club			X
Monastery Landing	X		X	Walpole Inlet			X
Mount Clare			X	Walpole Inlet			X
Mt Frankland Fire Lookout			X	Walpole Nornalup National Park Precinct			X
Mt Frankland hut			X	Walpole River			X
Mount Frankland National Park Precinct			X	Point Hillier Cairn	X		
Mt Hopkins			X	Remains of Denmark- Walpole Railway	X		
Mt Lindesay			X	Muir's hut and yards	X		
Mt Roe			X	Owingup Wetland System		Indicative[2]	
Murrum Trail			X	Proposed South Coast National Park		Registered	
My River and stockman's huts			X	Gully Area - Nornalup Road		Indicative	
Newdegate Island			X	Mehniup Nature Reserve		Indicative	
Nornalup			X	Quarram Nature Reserve		Indicative	
Banksia goodii site A		Interim		William Bay National Park		Indicative	
Banksia goodii site C		Interim		Denmark Area		Interim	
Banksia goodii site D		Interim		Frankland Area		Interim	
Bow River Area		Interim		Redmond Road Area		Interim	
Caladenia harringtoniae site F -		Interim		Roe Area		Interim	

Site	WA Register of Heritage Places Municipal Inventories	Australian Heritage Council Register of National Estate	DEC Moveable Heritage and Cultural Heritage Sites Database - RATIS	Site	WA Register of Heritage Places Municipal Inventories	Australian Heritage Council Register of National Estate	DEC Moveable Heritage and Cultural Heritage Sites Database - RATIS
Bevan Road							
Caladenia harringtoniae site H - Sheddick Road		Interim		Walpole-Nornalup Area		Interim	
Chitelup Area		Interim		Walpole-Nornalup National Park		Interim	X
Denbarker Area		Interim		Willmott Area - Bevan Road		Interim	
Bow River Area – Kangaroo Road		Interim		Mt Shadforth Area		Interim	
Challar Area – Mindanup Road		Interim		Collis Block		Interim	

1 = Interim sites are those that have been publicly proposed for entry into the *Register of the National Estate*, but will undergo the application of new procedures in the *Australian Heritage Council Act 2003* to determine if they are to be entered in the Register.

2 = Indicative sites are those where data has been entered into the *Register of the National Estate* and is at some stage in the assessment process, although a decision on whether the place should be entered in the Register has not been made.

Appendix 9. Visitor management settings criteria

	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 purposes	Maintaining and restoring the integrity of ecological processes and natural landscapes, maintaining and restoring biodiversity, and maintaining opportunities for solitude by maintaining or restoring the highest degree of apparent and 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 will be 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, remote areas (8000 ha in temperate areas, 20 000 in arid, semi-arid and tropical areas of the State), 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 will assist in maintaining wilderness values in adjacent areas.	Remote areas with conservation significance. Some evidence of previous development in process of rehabilitation, or existing human activity related to management tracks/trails, designated 4WD tracks and walking tracks.	Modified environment but dominated by natural vegetation and landscapes 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 environments with a moderate to high level of nature-based developments 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.
Access (access standards and type of transport used by visitors, resource users and protected area managers)	Vehicles: use of any form of mechanised transport is not permitted within wilderness, except for emergency or essential management operations, or reasons of cultural importance. Walk: constructed walking tracks, signs, track markers and toilets will not be permitted in wilderness, and walking access is via natural routes. AS Walking Track standard 6 only. Existing vehicle tracks and built walking tracks within wilderness, 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.	Vehicles: use of mechanised transport within areas surrounding wilderness will be 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: 4WD only. Walk: AS Walking Track class 4 to 6; tracks generally formed (class 6 tracks not formed). Boats: non-motorised boats only. Cycle: types 4 cycle trail. Horses: no horses permitted.	Vehicles: 4WD, sometimes 2WD seasonal. Walk: AS Walking Track class 3 to 5; tracks formed. Boats: boats, motorised and non-motorised, on designated routes/areas Cycle: types 4 cycle trail. Horses: designated bridle trails possible.	Vehicles: 2WD unsealed. Walk: AS Walking Track class 2 to 4; tracks generally formed. Boats: boats, motorised and non-motorised, on designated routes/areas Cycle: types 2 & 3 cycle trails. Horses: designated bridle trails possible.	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 trails. Horses: designated bridle trails possible.	

	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**
	Flying under 2000 feet for fixed wing aircraft and 1500 feet for helicopters above wilderness is discouraged, except for emergency or essential research purposes.		Airstrip: no airstrips permitted.	Airstrip: natural earth.	Airstrip: unsealed.	Airstrip: sealed.	
Site modification (Extent, type and design of infrastructure, facilities, amenities 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: campsites not defined but includes 'Wild' or 'Remote' camping. Day Use: day use sites not defined. Walk: 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: campsites not defined. Day Use: day use sites not defined.	Minimal modification at sites. 'No Facilities' level of development. Overnight Stays: campsites not defined. Day Use: Car parking not defined. Facilities: No facilities provided.	Minor modifications at specific sites. 'Medium' and 'Low' level of development. Overnight Stays: campsites 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: campsites 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: 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 and a moderate level of facilities and services (safari camp, ecolodge). Day Use: Defined car parking areas and bays. Facilities: High level of facilities including shade shelters, gas BBQs, tables, toilets, rubbish collection, visitor information in 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.
Social interaction (Density of users and degree of social interaction and opportunities for solitude)	Interaction between users is minimal, with usually less than two other groups encountered during a day, and no other groups within sight or sound at campsites. Maximum group size of about six to eight people.		Little interaction between users, with small numbers of brief encounters with individuals or small groups only except at campsites.	High likelihood of contact with individuals and small groups along access routes and at campsites.	High level of contact with others at campsites and along access routes. Campsite 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 are not provided (except where necessary to protect wilderness values). Commercial tourism and recreation		Visitors must be totally self-reliant. Support services infrequent or unreliable.	Visitors must still 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	Minimal self-reliance. High level of support facilities usually 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**
	operators not permitted in wilderness.				away from roads and tracks.		
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. Wherever possible, ground disturbing activities required for fire management will be conducted outside of wilderness. This includes construction and maintenance of access roads, firebreaks, fuel-reduced buffers and water points. Prescribed burning within wilderness 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 be 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.	
Commercial uses	Commercial recreation and tourism operations are not permitted within wilderness (*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	CTO licences permitted, but may consider regulating numbers to maintain visitor experiences consistent with setting (E class). Focus on nature-	CTO licences permitted with focus on nature-based/cultural activities.	CTO licences permitted, nature-based/cultural and adventure activities.	CTO licences permitted, nature-based/ cultural and adventure activities.	

	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**
		maintain adjacent wilderness qualities (E class).	based/cultural activities. Leases generally not permitted, or if allowed then setting revised.	Leases permitted in appropriate tenure and subject to strict sustainable conditions.	Leases permitted	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 the maintenance of the qualities of the area and operate according to the 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.	

Appendix 10. Commercial apiary site assessment

Criteria and approach for assessing commercial apiary sites within the planning area

	Suitable	**Suitable, but Conditional**	**Highly Constrained**
Approach	Maintain or increase numbers of apiary sites in these areas. Standard permit conditions would apply	Maintain of increase numbers of apiary sites in these areas. Additional permit conditions would apply, such as increased hygiene and seasonal, site location and access restrictions. Research and monitoring at these sites may be required	Close, and re-locate where possible, any current apiary sites in these areas. Prevent any new apiary sites in these areas
Environmental Criteria			
1. Threatened and other conservation significant flora within a 2 km radius	No rare, priority 1 or 2 flora present that are visited by honeybees	Rare, priority 1 or 2 flora present that are visited by honeybees and impacts are seasonal or undetermined[1]	Rare, priority 1 or 2 flora present that are visited by honeybees and impact is predicted to be year round[1]
	No priority 3 or 4, endemic, disjunct or relictual flora present that are visited by honeybees	Rare or priority 1 or 2 flora present that are visited by honeybees but no predicted impact[2] Priority 3 or 4, endemic, disjunct or relictual flora that are visited by honeybees present[3]	
2. Significant ecological communities within a 2 km radius	No Threatened Ecological Communities (TECs)	TEC present and impacts are seasonal[1] TEC present, but no predicted impact[2]	TEC present and impact is predicted to be year round[1]
3. Threatened fauna and other significant habitats (ie habitats for fauna adversely impacted by honeybees) within a 2 km 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[4]	
	No fauna watering points at fauna breeding centres and translocation sites present		Fauna watering point at fauna breeding centres and translocation sites present[5]
	No other significant habitats or communities present	Other significant habitats or communities are present that are seasonally impacted[6]	Other significant habitats or communities are present that are impacted year round
Management Criteria			
1. Previous use	A conservation reserve that has authorised historic use of commercial beekeeping		A conservation reserve that has no authorised historic use of commercial beekeeping

	Suitable	Suitable, but Conditional	Highly Constrained
2. Access	Public or suitable management vehicle only access is available		There is no public or suitable management vehicle only access or current access is being closed
	No gazetted wilderness present	'Candidate' wilderness only	Gazetted wilderness present
3. Recreation sites or dwellings within a 500 m radius	No built accommodation/camping/day use site present		Built accommodation/camping/day use site present
4. Tracks and trails within a 200 m radius	No walk trail present (Class 1 or 2)	Walk trail present, but only used infrequently or proposed walk trail (Class 1 or 2)	Walk trail present and used frequently (Class 1 or 2)
5. Disease control	Low risk of *Phytophthora cinnamomi* spread	*P. cinnamomi* present or area identified as protectable from *P. cinnamomi* spread, but there is an existing site[7]	Area identified as protectable from *P. cinnamomi* spread and there are no existing sites[7]
6. Apiary sites within a 3 km radius	No other apiary sites present		Apiary site present
7. Feral honeybee management within 2 km		Feral honeybee control program in place[8]	
8. Weed management within a 2 km radius	No 'High' or 'Moderate' rated environmental weeds present that are considered to have an increased seedset due to honeybees	'High' or 'Moderate' rated environmental weeds that are considered to have an increased seedset due to honeybees, but flower seasonally[9]	'High' or 'Moderate' rated environmental weeds that are considered to have an increased seedset due to honeybees and flower year round[9]
9. Other management concerns	No impact on Department operations or the requirements of other authorities controlling Crown land or Government reserves	An impact on Department operations or the requirements of other authorities controlling Crown land or Government reserves that can be managed	An impact on Department operations or the requirements of other authorities controlling Crown land or Government reserves that can not be managed

Notes:

[1] = Impacts are seasonal or undetermined (see Guidance for Additional Conditions – A). Where impacts are predicted to be year-round, the area will be considered to be highly constrained.

[2] = Visited by honeybees, but no predicted impact. These flora and TECs are still of high conservation significance and a precautionary approach is warranted (see Guidance for Additional Conditions – B).

[3] = As with note 2 above, priority 3 or 4, endemic, disjunct and relictual flora are of conservation significance and a precautionary approach is warranted. In addition, although populations of these species may be widespread and impacts on these populations may not threaten the existence of the species, there still may be some populations that should be afforded higher protection (e.g. the population may be (1) at the species' range end, (2) the largest viable population, or (3) genetically significant) (see Guidance for Additional Conditions – C).

[4] = If there is a current apiary site and there are feral honeybees present, then use can continue year-round. However, old growth forest and other significant habitats for hollow-nesting fauna will be targeted for feral honeybee control (see Guidance for Additional Conditions – D). For new sites within old growth forest see Guidance for Additional Conditions – E.

[5] = Native fauna breeding centres and fauna translocation sites often have watering points. Commercial beekeeping in the vicinity may disturb the animals from drinking.

[6] = To be determined through the planning process. (If no specific habitats are identified through the planning process then the following should be inserted for this note "no other significant habitat or community likely to be impacted by honeybees has been identified during the planning process, however they may be identified during the life of this management plan").

Other significant habitats may be identified due to:

- new research/information;
- changes in threat status of fauna; and/or
- changes in resource availability – for example, directly after a fire when competition between species such as honey possums and honeybees would be at its highest.

[7] = Standard disease control conditions will apply. The soil dryness index may be used to restrict vehicle access to the sites. There should be no new sites established in areas that are protectable from *P. cinnamomi* (or designated Disease Risk Areas).

[8] = There may need to be seasonal restrictions (see Guidance for Additional Conditions – D) when a feral honeybee control program is in place.

[9] = High or moderate rated 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 one month. Placement and number of hives also may be restricted.

B Placement (at least 100 m from populations) and number of hives may be restricted. Monitoring or representative samples for health of adult populations and seedling recruitment or TEC to ensure there is no decline due to apiary management, taking into account 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 honeybee control program is in place, then use of the site will be restricted during periods when the queen 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 honeybees present, a condition may be that if during the period of the permit, feral honeybee hives are located within two kilometres of the site, the site will be temporarily restricted until the feral honeybees are controlled.

F Seasonal restriction is based on the flowering period of environmental weeds but only until the environmental weed has been successfully eradicated.

Assessment of Current Apiary Sites within the Planning Area

Apiary sites within the planning area were assessed against the environmental and management criteria and categorised as suitable, suitable but conditional or highly constrained. The table below shows the result of the assessment and indicates what criteria require additional conditions. Some of these additional conditions have been included as guidance but should be seen as a minimum set.

	Environmental Criteria Assessment								**Management Criteria Assessment**							Conditions
Apiary Site No.	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 Walk Trail	Disease Risk	Weed Management		
	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 (0)																
Suitable but Conditional (52)																
96				X				X								C, D
141		X		X				X								A, C, D
143				X				X								C, D
158								X	X				X			C, D
159		X		X				X	X							C, D
276		X						X								A, D
295		X		X				X								A, C, D
643				X				X								C, D
832 (P)		X						X								D
871		X		X				X			X		X			A, C, D
915 (P)								X								D
946								X								D
948		X						X								A, D
949				X				X					X			C, D
1824 (P)								X					X			D
2135								X					X	X		D, F
2237 (P)		X						X					X			A, D
2249		X						X								A, D
2310								X					X			D
2922				X				X					X			C, D
3087		X						X					X			A, D
3201		X	X	X				X								A, B, C, D
3202								X								D
3204		X		X				X								A, C, D
3211		X	X	X				X					X			A, B, C, D, F
3239				X				X					X			C, D, F
3369				X				X					X			C, D
3398 (P)								X								D
3728								X								D

3731								X					X			D
3732								X					X			D
3946			X	X				X					X			B, C, D, F
4415				X				X								C, D
4568				X				X					X			C, D
4676				X				X								C, D
5060 (P)		X		X				X								A, D
5301				X				X								C, D, F
5302		X		X				X								A, C, D
5303				X				X								C, D
5317 (P)								X								D
5765				X				X					X			C, D
5766				X				X								C, D
5767				X				X								C, D
5914				X				X								D, F
5915								X								D, F
5918		X		X				X								A, C, D
5919								X					X			D
5921			X	X		X		X								A, B, C, D
5925		X	X	X				X								A, B, C, D
5951								X								D
5952				X				X								C, D
6096								X								D, F
Highly Constrained (11)																
95		X		X				X			X		X			NA
3203				X				X			X					NA
3726				X	X			X					X			NA
3727		X		X	X			X								NA
3729		X		X	X			X	X		X		X			NA
4574		X	X	X				X			X	X			X	NA
5920				X	X			X								NA
5922		X	X					X						X	X	NA
5923		X	X	X	X	X		X			X			X	X	NA
5924		X	X	X	X			X								NA
5950		X	X	X	X			X						X	X	NA
Sites within 2 km of Planning Area (5)																
2134								X						X		D, F
3077 (B)				X				X			X		X			C, D
4031								X					X			D
4418		X						X								A, D
5565 (B)								X								D