Swan Coastal Plain South

draft management plan

2014

Department of Parks and Wildlife

Conservation Commission WESTERN AUSTRALIA

20120385-0214-200

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February 2014

ISBN 978-1-921703-43-0 (print)

ISBN 978-1-921703-44-7 (online)

This draft management plan was prepared by the Conservation Commission of Western Australia through the agency of the Department of Parks and Wildlife.

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The recommended reference for this publication is:

Department of Parks and Wildlife, 2014, *Swan Coastal Plain South draft management plan 2014*, Department of Parks and Wildlife, Perth.

This document is available in alternative formats on request.

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Front cover photos

Main: Aerial view of Leschenault Peninsula Conservation Park. Photo – Owen Donovan (DPaW)
Top left: Carnaby's cockatoo (*Calyptorhynchus latirostris*). Photo – Leonie Valentine
Top right: *Banksia* tree on the Lake Pollard walk trail, Yalgorup National Park. Photo – Melissa Mazzella (DPaW)
Header photo: Vegetation of the Canning River Regional Park. Photo – Kym Pearce (DPaW)

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Acknowledgments

Planning team

This draft management plan was prepared by a Department of Parks and Wildlife planning team consisting of Kym Pearce, Kathryn McGuane, Craig Olejnik, Shawn Debono, Peter Hanly, Catherine Prideaux and Ewan McGregor. Previous planning team members included Brendan Dooley, Kathleen Lowry and Melissa Mazzella. Maps were produced by Aaron Rivers.

The planning team would like to thank the many other department staff who contributed to the preparation of the draft management plan. This includes staff from the department's Swan Coastal District, Swan and South West Regions, Regional Parks Unit, Fire Management Services, Environmental Management Branch, Sustainable Forest Management, and Species and Communities Branch.

Community involvement

Many individuals, community groups and organisations made valuable contributions to the development of this draft management plan. The planning team would especially like to thank Steve Atwell and Jenni Andrews from the City of Canning, a key stakeholder in the management of the Canning River Regional Park, Carmel Staniland from the Department of Mines and Petroleum, Caroline Haynes from Main Roads Western Australia, Dianne Russel–Taylor from the Peel Development Commission, and the Canning River Community Advisory Committee.

Many thanks to Julie Robert from the community advisory committee, who organised a follow-up workshop focusing on identifying values and threats for the Canning River Regional Park, and to those who attended.

Thanks also to representatives from the Department of Water, Department of Planning, Shires of Murray and Serpentine-Jarrahdale, Peel Harvey Conservation Council, and Gnaala Karla Booja people, who had input to the draft management plan through their attendance at a Peel region information session.

Invitation to comment

The public comment period for this draft management plan is an opportunity to provide information, express your opinion, suggest alternatives and have your say on how the parks and reserves of the southern part of the Swan Coastal Plain will be managed over the next 10 years.

Make your comments count

What to consider

In making your submission, it is important to understand that legislation and policy imposes certain obligations on the Department of Parks and Wildlife (the department, or DPaW) to manage lands and waters vested in the Conservation Commission of Western Australia (Conservation Commission) and that there may be little room to manage some issues in ways outside these constraints and responsibilities. Nevertheless, it is important to receive feedback from the public about the management of these issues.

The department and the Conservation Commission would particularly like to seek feedback during the public comment period on:

- management actions
- key performance indicators mentioned in various sections of the plan
- the degree to which you wish to be involved when the department plans for site-specific issues.

How to make effective comments

It is important to us to receive feedback on issues you agree with as well as those with which you disagree. Each submission is important, but those that explain the reasons for a concern, give support where appropriate, and/or offer information and constructive suggestions are most useful.

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

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

Where to send your comments

Submissions are welcome for three months after the release date of the draft management plan, and can be made online via the submission form at http://www.dpaw.wa.gov.au/parks/management-plans/draft-plans-open-for-public-comment, emailed to planning@dpaw.wa.gov.au, or by writing to:

Planning Coordinator
Swan Coastal Plain South draft management plan
Department of Parks and Wildlife
Locked Bag 104, Bentley Delivery Centre WA 6983

How your comments will be considered

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

1. The draft management plan *will* be amended if a submission:
   a) provides additional information of direct relevance to management
   b) indicates a change in (or clarifies) government legislation, management commitment or management policy
   c) proposes strategies that would better achieve management objectives
   d) indicates omission, inaccuracies or a lack of clarity.

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

All submissions are treated as public documents, unless the submitter clearly indicates to the contrary by marking all or part of the submission as ‘confidential’. It is important to note that confidence cannot be guaranteed under the *Freedom of Information Act 1992.*

Contents

Introduction

This draft management plan was prepared by the Conservation Commission of Western Australia (Conservation Commission), through the agency of the Department of Parks and Wildlife (the department, or DPaW). It provides broad direction for parks and reserves on the southern part of the Swan Coastal Plain that are managed by the department, and identifies the key values, threats and opportunities for the parks and reserves to ensure that management priorities to minimise the threats are determined at a strategic level. Detailed planning (referred to as subsidiary documents and/or operational management plans) may be required before significant works take place within individual reserves.

Key directions of this draft management plan include: protecting the Peel-Yalgorup and Vasse-Wonnerup Ramsar wetland systems; promoting and enhancing the long-term stability of tuart stands; gaining local knowledge about, and controlling, invasive species; understanding hydrology and maintaining or improving water balances in consultation with other government departments; managing species and ecological communities of conservation significance and impacts upon these to maintain long-term viability of populations; fostering and improving community understanding of, and involvement in, management of key values; and providing a range of compatible nature-based recreation opportunities and public education.

1. Overview of the Swan Coastal Plain

The Swan Coastal Plain comprises a mixture of fragmented and elongated reserves that protect highly valued habitats and remnant vegetation including tuart woodlands, heath, wetlands (including wetlands of international significance), estuaries, river systems and coastal plain with high levels of diversity and endemism of flora and fauna. Many of the parks and reserves are known for their high quality landscapes and cultural values, and provide facilities in a natural environment within an urban setting, for public use, education and enjoyment.

The Swan Coastal Plain has the highest population density in Western Australia. It is predicted that by 2026, 2.2 million people will live in the metropolitan region (WAPC 2012), representing 75 per cent of Western Australia's population, and that the Peel region will have more than doubled its size (WAPC 2005a and 2012).

The environmental stresses imposed on, and predicted for, natural areas that are fragmented and surrounded by rural and urban development mean that such areas need active management if they are to play a role in conservation of regional biodiversity. Hence, the principal management objective for much of the conservation reserves on the Swan Coastal Plain is to conserve flora and fauna, and landscape condition. The consolidation, expansion and ongoing management of the formal conservation reserve system are key strategies for biodiversity conservation on the Swan Coastal Plain.

Natural areas in urban and rural surroundings, such as those on the Swan Coastal Plain, can create a strong sense of community and bring improvements in the quality of life and local amenity by bringing the experience of natural places within people's reach (WAPC 2000). *The Peel 2020 Sustainability Strategy* (Peel Development Commission 2008) identifies values including the 'health of the waterways and environment' and 'the regional and rural identity' as being the most important to the community. Reserves on the Swan Coastal Plain provide different levels of nature-based recreation opportunities that are compatible with the protection of the conservation values of the reserves.

2. Management plan area

This draft management plan covers 81 existing conservation reserves on the southern Swan Coastal Plain, totalling about 21,000 hectares (Appendix 1). The reserves are primarily vested in the Conservation Commission and managed by DPaW. It also provides management direction for all parks and reserves in the Canning River Regional Park (Appendix 2) and proposes about 4,040 hectares of additions to the conservation estate (Appendix 3). These parks and reserves are referred to as the 'planning area' (Map 1).

The planning area boundary (Map 1) follows the Darling Range to the east and the coastline to the west, and extends from Dunsborough in the south to the Swan River in the north. The planning area lies within the local government areas of the cities of Perth, Subiaco, Armadale, Canning, Gosnells, Kwinana, Mandurah, Bunbury and Busselton, and the shires of Capel, Dardanup, Harvey, Kalamunda, Murray, Peppermint Grove, Serpentine-Jarrahdale and Waroona.

The planning area incorporates parks and reserves vested, or proposed to be vested, in the Conservation Commission that are covered by existing terrestrial management plans. Once finalised, this management plan will replace a number of these plans (see Table 1).

This draft management plan is consistent with all remaining management plans on the Swan Coastal Plain as appropriate (see http://www.dpaw.wa.gov.au/parks/management-plans), and also with adjacent management plans including the *Forest Management Plan 2014–2023* (Conservation Commission 2013).

Table 1 Management plans in force or in preparation within the planning area (as of February 2014)

Area management plans this plan *will* replace	Existing area management plans that this plan *will not* replace
Canning River Regional Park 1997–2007 (CALM 1997a)	Swan Estuary Marine Park and Adjacent Nature Reserves 1999–2009 (CALM 1999b)
Matilda Bay Reserve 1992–2002 (CALM 1992a)	Woodman Point Regional Park 2010 (DEC 2010c)
Yalgorup National Park 1995–2005 (CALM 1995)	Jandakot Regional Park 2010 (DEC 2010a)
Leschenault Peninsula Conservation Park 1998–2008 (CALM 1998a)	Thomsons Lake Nature Reserve 2005 (CALM 2005b)
Benger Swamp Nature Reserve 1987–1992 (CALM 1987)	Beeliar Regional Park 2006 (CALM 2006)
	Forrestdale Lake Nature Reserve 2005 (CALM 2005a)
	Lake McLarty Nature Reserve 2008 (DEC 2008a)
	Rockingham Lakes Regional Park 2010 (DEC 2010b)
	Draft management plans
	Tuart Forest National Park 2011 (DEC 2011)

3. Key values and threats

Key Values

The key values of the planning area are described below.

Natural values

- The planning area is renowned as one of 34 of the world's richest and most threatened reservoirs of plant and animal life, and is the only one in Australia recognised by the International Union for Conservation of Nature (IUCN), and lies within an internationally recognised 'biodiversity hotspot'.

- Internationally and nationally significant wetlands, including portions of the 'Peel–Yalgorup system' and 'Vasse–Wonnerup system' Ramsar sites, which provide habitat, migration stopovers, moulting grounds and breeding and drought refuge for thousands of waterbirds.
- Conservation category wetlands, which exist in about 80 per cent of reserves in the planning area.
- A rich mosaic of river, wetland and upland ecosystems which include plant species of conservation significance, critically threatened ecological communities (TECs), populations of threatened fauna, and species either endemic to the Swan Coastal Plain or poorly represented in the conservation reserve system.
- Remnant stands of tuart (*Eucalyptus gomphocephala*) woodland, highly valued for protecting ecosystem functions, and enhancing landscape, cultural and social values.

Peel-Yalgorup Ramsar site – Creery Wetland Nature Reserve. Photo – Kym Pearce (DPaW)

Vasse–Wonnerup Ramsar site. Photo – Kym Pearce (DPaW)

Cultural values

- Aboriginal sites and landscapes of mythological, ceremonial and spiritual significance, including ethnographic, anthropological and archaeological sites.
- Opportunities for joint management arrangements with local Aboriginal people.
- Links to early European exploration, settlement, establishment of agriculture and industry, and wartime activities.

Recreation and social values

- A collection of reserves that provide a variety of opportunities for education, recreation and interpretation relating to the natural and cultural values of the planning area.
- Opportunities for scientific research on aspects of the area's natural values including biodiversity and Ramsar wetlands.

Boating activities adjacent to Matilda Bay Reserve. Photo – Kym Pearce (DPaW)

Threats

- Altered hydrological regimes including inundation and changes to flow regimes of rivers, due to vegetation clearing, acid groundwater, surface water storage and groundwater extraction.
- Nutrient run-off into wetlands and waterways from surrounding land use.
- Invasive and problem plants and animals.
- The continuing spread of *Phytophthora* spp.
- Land clearing, development and intensification of land use, resulting in habitat loss, fragmentation and modification.
- Inappropriate fire regimes, particularly unplanned fire in small fragmented reserves, with a frequency and intensity that may result in local extinction of plant populations and/or which does not allow sufficient recovery of plant regeneration and specialised fauna habitat.
- Unlawful use by unauthorised vehicles, illegal cutting of vegetation, firewood collections and rubbish dumping.

Management context

4. Vision

In 2024, the landscape condition and biodiversity values of the reserves in the planning area will be enhanced. Key sites will provide a valuable hub for people to enjoy compatible recreation activities in a predominantly natural setting and the cultural, social and natural values of the landscape as a whole will be understood and respected.

This vision, which is derived from community input and reflects the key values of the planning area will be supported by the implementation of the strategic directions in the department's Corporate Plan.

5. Legislation and policy

Planning for conservation reserves occurs at a number of levels. Management plans are a part of a number of planning activities undertaken by the relevant managing agencies. Figure 1 illustrates the planning levels typically undertaken for conservation reserves. As shown, management plans are guided by legislation and policy, and in turn provide guidance for departmental subsidiary management documents such as fire response plans, weed and feral animal control plans, and recreation site development plans.

The department is responsible for the administration of the *Conservation and Land Management Act 1984* (CALM Act), which provides for the management of lands and waters vested in the Conservation Commission, and the *Wildlife Conservation Act 1950* (Wildlife Conservation Act), which provides for specific protection of native flora and fauna within Western Australia.

The federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), relates to the protection of nationally listed threatened species and ecological communities, heritage and key threatening processes. Actions that have, or are likely to have, a significant impact on a matter of national environmental significance, such as (i) wetlands of international importance (listed under the Ramsar Convention), (ii) threatened species and ecological communities, and (iii) migratory species protected under international agreements, require approval from the responsible federal government minister in addition to any approval that may be needed in Western Australia. In terms of (i) above, protected under the EPBC Act is the 'ecological character' of a Ramsar wetland as opposed to just features of the

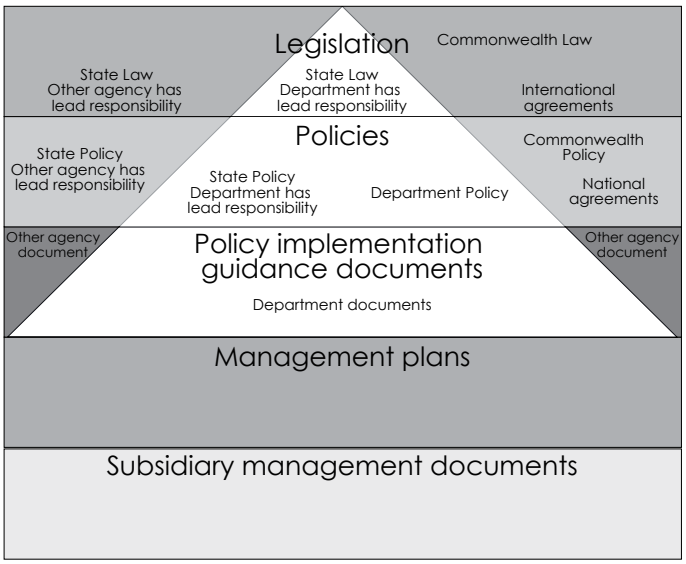


Figure 1: Management plan hierarchy

wetland located within the Ramsar site boundary.

There are other environmental legislation and DPaW policies which are relevant to this plan. These are referred to at the appropriate places in the document. Policies (see http://www.dpaw.wa.gov.au/about-us/36-policies-and-legislation) may be revised or superseded during the life of the plan.

This draft management plan provides a summary of operations proposed to be undertaken in the planning area as required under the CALM Act and addresses Commonwealth and international obligations. It also provides guidance for departmental business plans and the preparation of subsidiary management documents (operational management plans), which provide more detail for specific sites or management issues.

International conservation agreements

Australia is a signatory to the following international conservation agreements, which affect management of the planning area:

- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)
- China-Australia Migratory Bird Agreement (CAMBA)
- Japan-Australia Migratory Bird Agreement (JAMBA)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- Convention of Migratory Species of Wild Animals (known as the Bonn Convention).

Obligations under the Ramsar Convention

To be identified as a wetland of international importance and accepted on the Ramsar list, a wetland ecosystem must satisfy at least one of the Ramsar Convention's nine Criteria for Listing Internationally Important Wetlands (Ramsar Convention 2005).

The Peel–Yalgorup system (Ramsar site number 482) was listed in June 1990, and the site was significantly extended in 2001. It currently meets seven out of the nine qualifying criteria (Appendix 4).

The Vasse–Wonnerup system (Ramsar site number 484) was also listed in June 1990, and that site was extended in 2000. It meets two of the nine Ramsar criteria (Appendix 5).

In addition to promoting the conservation and wise use of wetlands, contracting parties to the Ramsar Convention accept a number of other responsibilities, including managing a Ramsar site to maintain its 'ecological character'. The ecological characters of the Peel–Yalgorup system and Vasse–Wonnerup system Ramsar sites within the planning area have been described in Hale and Butcher (2007) and WRM (2007) respectively. The ecological character description (ECD) includes a summary of the critical ecosystem components and processes, limits of acceptable change to the values of the wetlands and management recommendations, all of which provide guidance to this management plan. A summary of the critical ecosystem components and processes are shown in appendices 4 and 5.

This draft management plan covers the portions of the Ramsar wetland systems that are vested in the

Conservation Commission. About 62 per cent (16,553 hectares) of the Peel–Yalgorup Ramsar wetland system falls within lands managed by the department (Figure 2).

The department currently manages 35 per cent (about 390 hectares) of the Vasse–Wonnerup Ramsar

Figure 2: Reserves of the planning area in the Peel–Yalgorup Ramsar site.

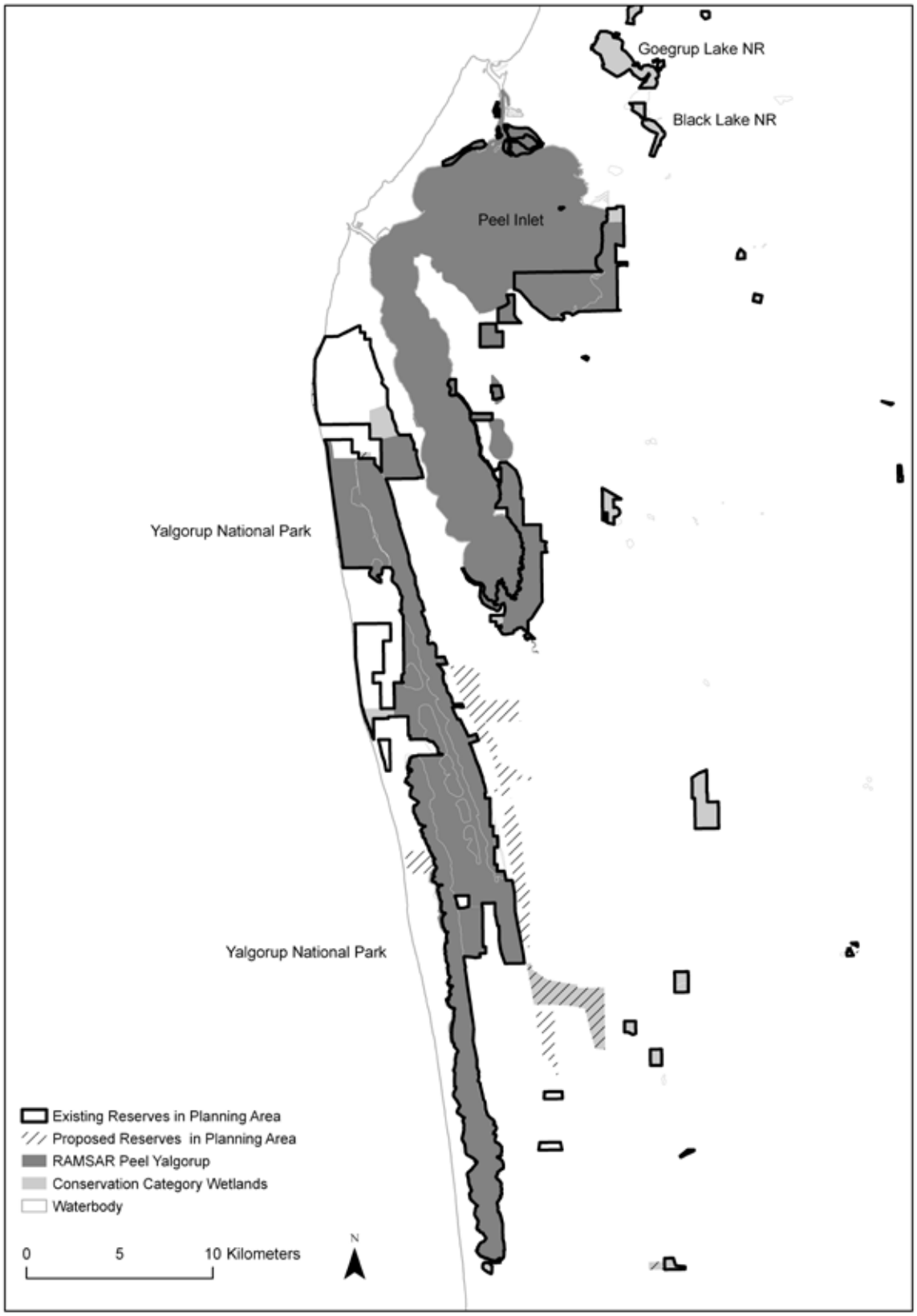
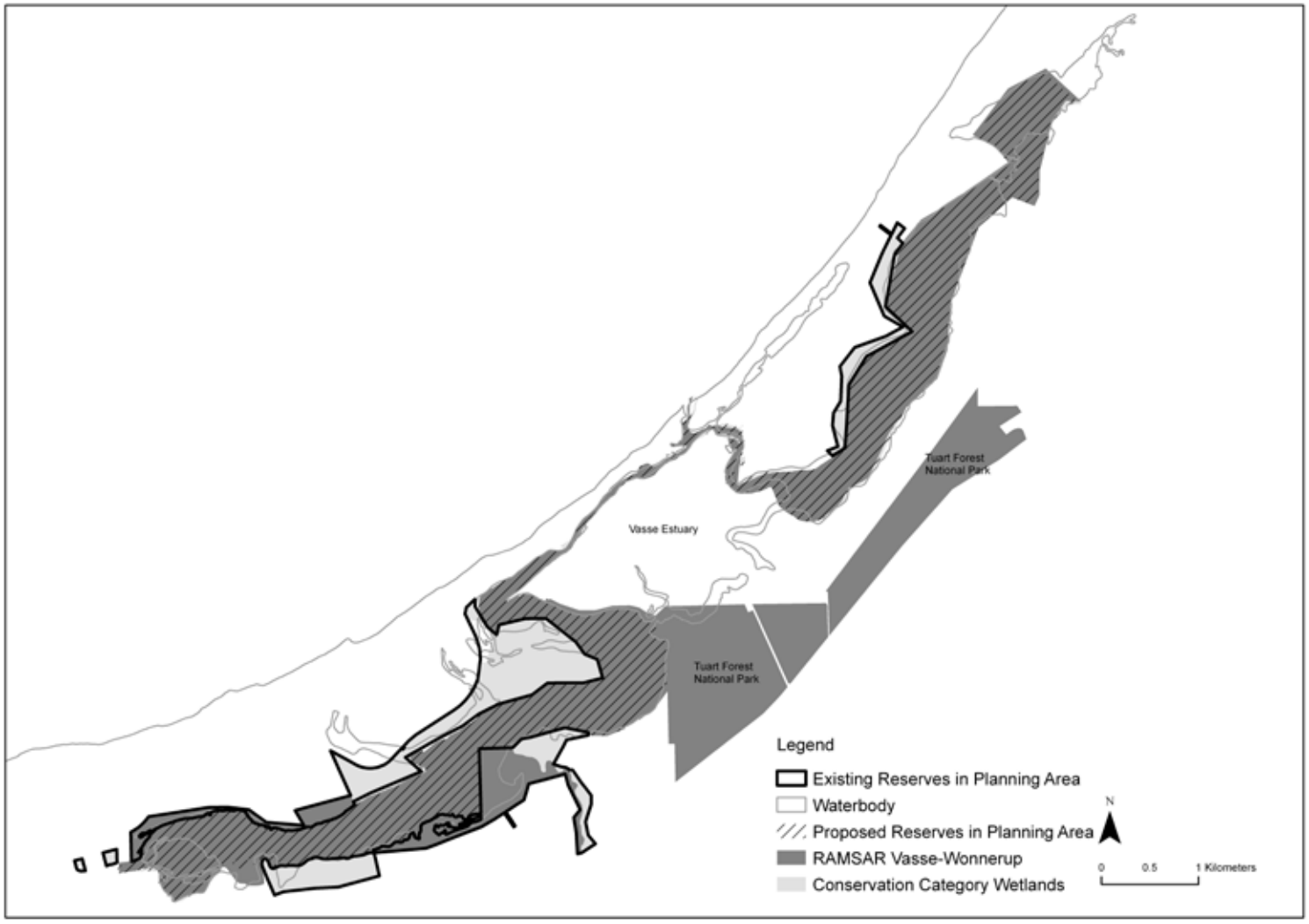


Figure 3: Reserves of the planning area in the Vasse–Wonnerup Ramsar site



site, which are located within and surrounding the Tuart Forest National Park (DEC 2011). Including the proposed additions to the Vasse–Wonnerup Ramsar site to be managed by DPaW, the total area managed by the department will be about 98 per cent (Figure 3).

The *Peel–Yalgorup system Ramsar site management plan* (Peel-Harvey Catchment Council 2009) was officially launched in 2011. *The Busselton Wetlands conservation strategy* (WAPC 2005b) provides a guide for sustainable land use and wise management of the Busselton wetlands, including the Vasse–Wonnerup Ramsar site. The department supports the strategies that are outlined in both of these documents where they relate to lands and waters vested in the Conservation Commission and will work with key stakeholders where possible to help in the implementation of the strategies.

Desired outcome

That this draft management plan is consistent with relevant legislation, including national and international obligations.

Management actions

1. Implement this draft management plan in accordance with relevant legislation and policy.
2. Consider strategies in the Peel–Yalgorup system Ramsar site management plan (Peel-Harvey Catchment Council 2009) and the Busselton Wetlands conservation strategy (WAPC 2005b).

6. Management arrangements with Aboriginal people

The Conservation Commission and the department support joint management arrangements with traditional custodians. On March 14 2012, the CALM Act was amended by the *Conservation Legislation Amendment Act 2011* to enable joint management of conservation estate and other types of lands with relevant Aboriginal people. The amendments to the CALM Act include the creation of the new section 56(2) objective for management plans to protect and conserve the value of the land to the culture and heritage of Aboriginal people.

There are four active native title claims over the planning area:

- Gnaala Karla Booja (WC98/58)
- Southwest Boojarah #2 (WC06/4-1)
- Whadjuk (WC11/9)
- Harris Family (WC96/41).

At the time of writing, no native title determination has been made. The South West Aboriginal Land and Sea Council is the native title representative body for the Gnaala Karla Booja, Southwest Boojarah #2 and Whadjuk claims. The Harris family claim is independently represented.

Furthermore, the state is in negotiation with the six native title claim groups represented by the council to resolve all native title matters in the South West in exchange for a package of benefits that includes joint management of parts of the south-west conservation estate. The state, DPaW and the council are currently developing a joint management proposal for parts of the south west conservation estate.

Regardless of the outcomes of the South West native title settlement negotiations, if, during the life of the plan, joint management is identified as a priority, and there are the resources and capacity to undertake it, a formal joint management arrangement may be entered into. A joint management agreement will need to include terms that do the following:

(a) establish a joint management body to manage the area

(b) specify the members of the body, which must include at least –

(i) the CEO or a person nominated by the CEO

(ii) a person to represent the interests of each other party to the agreement

(c) establish the body's procedures.

A joint management arrangement will also require the amendment of this management plan, to require that the CEO manage the plan jointly with one or more other persons specified in the plan and for the joint management agreement to be attached to the management plan.

A joint management arrangement may enable the joint management body to make management decisions about:

- the conduct of customary activities and access
- protecting and conserving the value of the land to the culture and heritage of Aboriginal people
- interpretive material
- opportunities for tourism and commercial activities, and employment.

Desired outcome

Involvement of Aboriginal people in the management of the planning area.

Management Actions

1. Where and when appropriate, enter into joint management arrangements under the South West native title settlement agreement.
2. Develop local area arrangements as appropriate with the relevant Aboriginal groups to manage and facilitate Customary Activities.
3. Encourage training, employment and economic development through cooperative management arrangements.

7. Performance assessment and monitoring

The Conservation Commission will assess the implementation of this management plan in accordance with section 19(1)(g)(iii) of the CALM Act. The key performance indicators in this management plan reflect desired outcomes, and management actions guide the department's contribution in achieving these. The EPBC Act, through the Environment Protection and Biodiversity Conservation Regulations 2000, regulates the reporting of sites in Australia that are listed under the Ramsar Convention.

Key performance indicators

A set of key performance indicators (KPIs) have been chosen to target key components of this plan. The key performance indicators are identified throughout the plan and presented with performance measures, objectives and reporting requirements. Any sustained change (that is, a continuous decrease or increase, for example, to populations) will trigger the need for further investigation to determine the cause of that change.

Portfolio of data and information

The department is required to establish and maintain a portfolio of evidence relating to the key performance indicators to enable measurement of implementation and management effectiveness of actions. The first step is establishing adequate baseline data.

8. Tenure and land arrangements

Existing reserves

All existing conservation estate within the planning area is vested in the Conservation Commission, with the exception of Boodalan Nature Reserve, which is jointly vested in the Conservation Commission and the Shire of Murray. Canning River Regional Park also includes reserves and freehold land vested in the City of Canning and forms part of the Swan Canning Riverpark managed by the Swan River Trust.

A summary of reserves for which this plan provides statutory management, is given below, and detailed lists of existing conservation estate, and proposed changes to these reserves, are provided in Appendix 1 and Appendix 3 respectively. For the purpose of this draft management plan, the planning area is divided into the following three areas:

Northern parks and reserves in the planning area (Map 2)

This area includes conservation estate within the boundary of the Metropolitan Region Scheme. The administration of these reserves is by the department's Swan Region and Regional Parks Unit. The total area of the existing conservation estate is about 765 hectares. The 18 parks and reserves, including 14 Bush Forever sites, are:

- 11 nature reserves, all <150 hectares, with the purpose of 'conservation of flora and fauna'
- Leda Nature Reserve, 438 hectares, with the purpose of 'conservation of flora and fauna'
- one nature reserve and three conservation parks in the Canning River Regional Park, a total area of 285 hectares which also includes other private and crown land (see below)
- Matilda Bay and Keanes Point, two section 5(1)g CALM Act Miscellaneous reserves nestled along the Swan River.

Canning River Regional Park in the northern parks and reserves section of the planning area. Photo – Grace Patorniti (DPaW)

Central parks and reserves in the planning area (Map 2)

This area includes conservation estate within the boundary of the Peel Region Scheme, as well as all of Yalgorup National Park. Management of these reserves is by the department's Swan Region (with the exception of the lower part of Yalgorup National Park which is managed by the South West Region). The total area of the existing conservation lands managed by DPaW is about 17,827 hectares. The 27 reserves are:

- 15 nature reserves of <150 hectares, including islands and wetlands, with the purpose of 'conservation of flora and fauna'
- five nature reserves >150 hectares, with the purpose of 'conservation of flora and fauna', including two reserves >1,000 hectare along the banks of the Peel–Harvey Estuary
- Yalgorup National Park, covering 13,141 hectares, extending in a north-south direction between 13 and 60 kilometres south of Mandurah, and comprising three reserves with the purpose of 'national park'
- two conservation parks, including Len Howard Conservation Park (67 hectares)
- two section 5(1)g CALM Act Miscellaneous reserves including one with the purpose of 'conservation and the protection of Aboriginal heritage and culture'.

Len Howard Conservation Park in the central parks and reserves section of the planning area. Photo – Melissa Mazzella (DPaW)

Southern parks and reserves in the planning area (Map 3 and 4)

This area includes all existing conservation estate within the boundary of the Greater Bunbury Region Scheme, and all remaining reserves. The administration of these reserves is by the department's South West Region. The total area of the existing conservation estate is about 2,405 hectares. The 36 reserves are:

- 30 nature reserves of <150 hectares, including adjoining reserves along waterways and wetlands, and reserves that protect remnant vegetation, TECs and conservation significant species
- two nature reserves >150 hectares: Benger Swamp Nature Reserve (536 hectares), and Locke Nature Reserve (200 hectares), both with the purpose of 'conservation of flora and fauna'
- Leschenault Peninsula Conservation Park, located north of Bunbury, and comprising two parcels of land totalling 580 hectares
- one unnamed section 5(1) g CALM Act Miscellaneous reserve
- two section 5(1) h CALM Act Miscellaneaous reserves, including one for the purpose of 'Tuart conservation and restoration'.

Broadwater Nature Reserve in the southern parks and reserves of planning area. Photo – Melissa Mazzella (DPaW)

Canning River Regional Park

Canning River Region Park is located south-east of Perth in the City of Canning. It extends for about six kilometres along both sides of the Canning River, from the Nicholson Road Bridge in Cannington, to the Shelley Bridge (Leach Highway) in Riverton. Responsibility for overall planning of the boundary through the Metropolitan Region Scheme, as well as the acquisition of private land within the park, is retained by

the Western Australian Planning Commission (WAPC). In consultation with DPaW, the WAPC will use this plan to help in the assessment of development proposals on lands within and adjoining the Canning River Regional Park.

Land within the park boundary is vested in several government agencies (including the Conservation Commission), and private landholders (Figure 4). In particular, the City of Canning will be consulted regarding management strategies that specifically relate to Canning River Regional Park. This draft management plan seeks to reserve land and have it vested in the Conservation Commission or the appropriate local government authority.

Conservation reserve system

Creation of a conservation reserve system that is comprehensive, adequate and representative helps meet obligations under the United Nations Convention on Biological Diversity (the Rio Convention), to which Australia is a signatory.

The existing and proposed conservation reserves will be managed to achieve biodiversity objectives that are consistent with the *National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia 1996). This strategy has since been reviewed to produce *Australia's Biodiversity Conservation Strategy 2010–2030* (Commonwealth of Australia 2010a), which, together with *Australia's Strategy for the National Reserve System 2009-2030* (Commonwealth of Australia 2010b) has been endorsed by the Natural Resource Management Ministerial Council. The 2010 strategy recognises that much of the 1996 strategy remains relevant.

The planning area lies within the Swan Coastal Plain Interim Biogeographic Regionalisation for Australia (IBRA) region. As at 2011, 10.5 per cent of the Swan Coastal Plain was protected in the conservation reserve system. All proposed additions will help in increasing the proportion of reserves in the formal conservation reserves system. Of the 30,312 hectares of tuart woodland remaining on the Swan Coastal Plain, 8,852 hectares, or 29 per cent will be contained within the planning area.

The EPA has previously estimated that some 80 per cent of the wetlands on the Swan Coastal Plain have been lost or irreversibly degraded (EPA 2004). More than 97 per cent of the heavier, more fertile soils on the eastern side of the Swan Coastal Plain have been cleared (CALM 1990, cited in Keighery and Trudgen 1992). Many of the parks and reserves are small and narrow and consolidation is required for effective management.

Proposed changes and additions

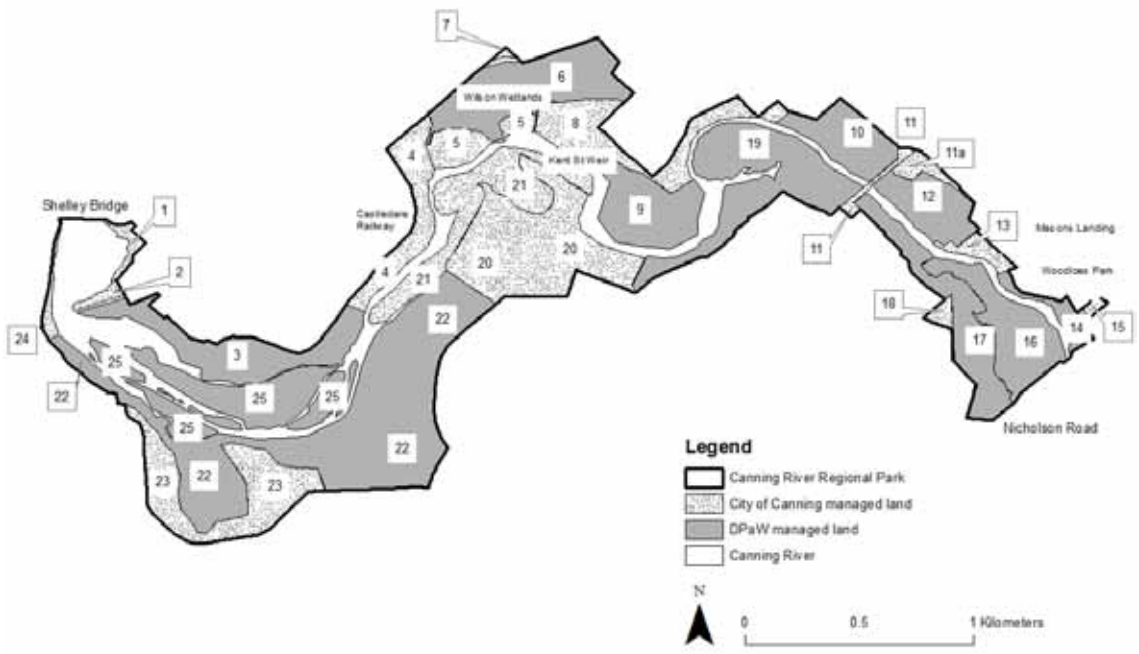
Proposed changes and additions to the existing reserves of the planning area are listed in Appendix 3 and shown on maps 2, 3 and 4. They are summarised below. Reserve changes proposed in this plan are consistent with the *Forest management plan 2014–2023* (Conservation Commission 2013). In addition, lands such as private property, unnecessary road reserves, unallocated crown land and other crown land should be included in the planning area if it benefits conservation or management objectives. As proposed additions become vested in the Conservation Commission they will be managed in accordance with this management plan.

Northern parks and reserves in the planning area (Map 2)

The expansion of small fragmented reserves through the consolidation of land would help in meeting conservation management objectives. Many areas of land have been identified as Bush Forever sites and acquired by WAPC (WAPC 2000). Through the acquisition and incorporation of unnecessary road reserves, crown land, unallocated crown land, or freehold land (where available) the conservation estate should be expanded if such additions will help in protecting internationally, nationally and regionally significant environmental values, or include poorly represented areas of the region.

The boundary of the Canning River Regional Park reflects the Metropolitan Region Scheme, and any changes will be consistent with future amendments to this scheme. Vesting of relevant portions of the park with the Conservation Commission has begun, with the proposed future tenure listed in Appendix 2 and Figure 4. Any additional park changes and proposed inclusions, such as WAPC Bush Forever sites, will be investigated and vested under the appropriate land manager (DPaW, City of Canning or City of Gosnells) if they are deemed suitable.

Figure 4. Canning River Regional Park revised planning areas



Central parks and reserves in the planning area (Map 2)

Proposals to incorporate portions of Myalup State Forest (No. 16) into Yalgorup National Park originated from previous planning documents (EPA and DCE 1983, CALM 1994, Conservation Commission 2004). Areas of native vegetation in Myalup State Forest (No. 16), outside those identified in the above documents, should also be considered as potential additions to Yalgorup National Park.

Yalgorup Lakes, and other areas with significant environmental values, should be protected by increasing and consolidating the area of Yalgorup National Park through the acquisition and incorporation of private land enclaves, (where available) unallocated crown land, unnecessary road reserves and other crown land (EPA 2010). This will help in meeting conservation management objectives and in rationalising park boundaries.

Boodalan Nature Reserve (R 33749), an island reserve in the Peel Inlet, is joint vested in the Conservation Commission and the Shire of Murray and has a purpose of 'Recreation and conservation of fauna'. The current state of the reserve is that it appears to be predominantly submerged at low tide and fully submerged at high tide. This draft management plan proposes that this be investigated, and if it is the case, that the purpose is amended accordingly, or the nature reserve be delisted/abolished, whichever is appropriate (Appendix 3).

Southern parks and reserves in the planning area (maps 3 and 4)

Many of the proposed reserves arise from long-standing recommendations from previous management plans or planning documents (CTRC 1974, EPA 1993, CALM 1998a, Conservation Commission 2004, DoP 2005). Proposed additions have also been identified, based on more recent assessments of known natural, cultural and social values, and the threats to these values.

The WAPC (2005a) support action to improve linkages and/or wildlife corridors between Tuart Forest National Park and Wonnerup Estuary. In addition, expanding the conservation estate around the wetlands would improve, and assist in the protection of, the environmental and landscape values. Freehold land (where available), road reserves, other crown land and unvested reserves in and next to the wetlands, and/or those that contain internationally, nationally and regionally significant environmental values should be acquired if it will assist in the protection of environmental and landscape values.

Desired outcome

The reserves of the planning area are protected by applying the most appropriate tenure, class and purpose.

Objective

Expansion of the conservation estate for a comprehensive, adequate and representative reserve system in the Swan Coastal Plain IBRA region.

Management actions

1. Manage the areas vested in the Conservation Commission and proposed for inclusion in national park (Appendix 3) in a manner consistent with their proposed land category and purpose, and with relevant department policies, until they are formally created.
2. Cooperate with relevant agencies to establish a comprehensive, adequate and representative reserve system, through Bush Forever and other relevant programs.
3. Continue to promote and encourage integrated management of parks and reserves with adjoining landowners and other key stakeholders.
4. Continue to promote and encourage integrated management of the Canning River Regional Park with relevant government agencies and private landowners, and develop subsidiary management documents, in accordance with this plan.
5. Subject to the public consultation phase and appropriate government processes, consider ratifying reserve names for provisionally named reserves, and give consideration to the naming process for other un-named reserves.
6. In consultation with the Shire of Murray, investigate whether Boodalan Nature Reserve is persistent above the low water mark, and if so, leave as is but remove ‘Recreation’ from the purpose and if not, delist/abolish the nature reserve.
7. Progress and implement longstanding recommendations for additions to the conservation reserve system as described in the text above.
8. Identify adjacent areas of regionally significant bushland that will also strengthen ecological linkages for acquisition and reservation under the CALM Act.

Key performance indicator

Performance measure	Target	Reporting requirements
The area of conservation estate in the planning area	Increase the area of conservation estate in the planning area	Every five years

9. Administration

The day-to-day implementation of the management plan is the responsibility of the department's district managers and the Regional Parks Unit (for Canning River Regional Park), who coordinate the operational management of parks and reserves in the planning area. The planning area lies within the Swan Coastal, Perth Hills, Wellington and Blackwood districts.

10. Term of the plan

Once finalised, this management plan is for a period of 10 years and comes into operation from the date that a notice is published in the Government Gazette. The plan will remain in force until it is revoked and a new plan is approved. The plan may be amended in accordance with section 61 of the CALM Act at any time.

Managing the natural environment

This chapter describes the natural values of the planning area, the threats to these values, and strategies proposed by the department to minimise the threats.

For many reserves on the Swan Coastal Plain, there is a need for a biodiversity inventory, as well as consolidation of information, and analysis and monitoring of conservation status and ecosystem condition. This is particularly important for obtaining quantitative benchmark information on introduced animals, hydrological regimes, and plant requirements, particularly in estuarine systems, and for understanding interactions between fire and invasive weeds, to determine appropriate post-fire weed control in small remnant reserves.

Information on flora and fauna can be found on the ***NatureMap*** database (http://naturemap.dec.wa.gov.au/default.aspx) produced by DPaW and the Western Australian Museum.

11. Physical environment

Climate change

Long-term climate variability is affecting the south-west of Western Australia, which is experiencing a trend of increasing temperatures and declining rainfall. The number of days hotter than 40°C has been increasing since the 1990s, and late autumn and winter rainfall has been decreasing (CSIRO 2012). The EPA (2007) stated that by 2030 there will be up to 2°C rise in temperature in all seasons and that there will be a 20 per cent reduction in winter rainfall from 1960 to 1990 levels.

Climate change may have significant effects on the key values of the planning area. The major effects of a warming and drying climate that are relevant to the planning area are:

- an increase in incidence and intensity of bushfires
- altered hydrological regimes, particularly decreasing watertables and streamflow, which in turn affects maintenance of critical habitat (such as wetlands) for many plant and animal species of conservation value
- the risk of inundation from sea level rises.

The coastline of Geographe Bay (Kay *et al.* 1992), and that within the local government authorities of Mandurah, Rockingham and Bunbury, is particularly vulnerable and susceptible to erosion (Climate Commission 2011).

Whilst there is limited knowledge about the resilience of natural systems to anticipated climate changes, protecting the natural environment can help to decrease its vulnerability to climate change. This draft management plan proposes the following strategies which, in helping to improve the resilience of species and ecosystems in general, will help them cope with the effects of climate change:

- additions to the conservation estate in the planning area
- controlling introduced and invasive plants and animals
- maintaining critical habitat (for example wetlands)
- fire management
- re-introduction programs.

Geomorphology

The planning area is within the physiographic unit of the Swan Coastal Plain. This unit, characterised by a generally subdued topography, is formed almost entirely of river (fluvial) and windblown (aeolian) depositional material. Within the planning area of the Swan Coastal Plain there are four distinct landforms that are roughly parallel to the coast. They are described in work by McArthur & Bettenay (1960), and summarised here.

The landforms, from east to west, are the Pinjarra Plain, formed by river transported unconsolidated clayey alluvium – and three generations of dunes. The oldest is the Bassendean Dune System, a gently undulating aeolian sand plain that has been leached of carbonate leaving mostly quartz sand. Next is the Spearwood Dune System which consist of slightly calcareous (contains carbonate) aeolian sand. The youngest is the Quindalup Dune System which consist of sand dunes or ridges formed by windblown unconsolidated calcareous and quartz beach sand.

The Pinjarra Plain is the most common landform in the Swan Coastal Plain, yet the least represented in the formal conservation reserves (EPA 2006; Webb *et al.* 2009). Any reserve additions to the existing conservation estate on the Pinjarra Plain will assist in management of small and fragmented parks and reserves, as well as protecting regionally significant environmental values.

Management and recreation activities in the planning area have the potential to adversely affect geology, landforms and soils. Threats from such activities include erosion, particularly of coastal strips, wetland soils and riparian areas, occurrence of acid sulphate soils, and leaching of nutrients into wetlands and river systems.

Such threats need to be reduced through the use of appropriate visitor and operations management procedures.

Hydrology

The planning area encompasses a number of catchments within the Swan Coastal Plain and contains a complex mosaic of estuaries, rivers, tributaries and wetlands. The rivers and wetlands have economic, recreational and environmental values.

The major rivers that cross the area originate east of the Darling Scarp and flow to the ocean. On the Swan Coastal Plain, surface run-off and groundwater discharge contribute to the flows within these rivers and their tributaries. The major rivers and some tributaries are perennial, having greater flows in winter than in summer. A major component of the summer flows is from groundwater discharge (Davidson 1995). The wetlands, such as lakes and swamps, have formed along the boundaries of the dune systems, though some wetlands occur within the dune systems (Davidson 1995; McArthur & Bettenay 1960). Many of these wetlands are dependent on groundwater.

Wetlands with key values in the planning area are:

- Peel–Yalgorup and Vasse–Wonnerup Ramsar- listed wetland systems (see appendices 4 and 5 respectively); and
- seven wetlands listed in the *Directory of important wetlands in Australia* (Australian Nature Conservation Agency 1996):
  - the Swan Canning Estuary (CALM 1999b)
  - Brixton Street Swamps
  - Peel–Harvey Estuary
  - Lake McLarty system (DEC 2008a)
  - Yalgorup Lakes system
  - Benger Swamp
  - Vasse–Wonnerup wetlands.

About 80 per cent of existing conservation reserves in the planning area contain Conservation category wetlands listed in the *Geomorphic Wetlands Swan Coastal Plain dataset.* (http://www.water.wa.gov.au/idelve/gwa/metadata_statements/geomorph_wetlands.html).

An understanding of surface and groundwater flows is essential for conservation management of these wetlands, some of which also contain declared rare flora and fauna, and TECs. About two-thirds of listed TECs are associated with groundwater dependent ecosystems, such as wetlands (pers. comm. V. English 2012); see the link to the list of threatened ecological communities endorsed by the Minister for the Environment (May 2013) at http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities. Groundwater dependent ecosystems may be affected by both local and regional changes in groundwater flow (DoW 2009).

Benger Swamp is affected by irrigation drain flows and it is essential that any changes to irrigation, drainage systems and water allocations ensure that sufficient water is supplied to maintain the ecosystem that supports the threatened fauna and migratory birds that are subject to international treaties with Australia.

The Department of Water (DoW) is responsible for the management and protection of Western Australia's water resources. Close liaison with that department with regards to allocation and catchment protection planning is required to ensure that conservation values and their hydrological requirements are understood and met.

With regards to Canning River Regional Park, the Swan River Trust protects and manages the Swan Canning Riverpark, in partnership with the government and the community. For further information on the Swan River Trust, see http://www.swanrivertrust.wa.gov.au/.

Flood gates in the Vasse–Wonnerup Ramsar site. Photo – Kym Pearce (DPaW)

Desired outcome

Geomorphological and hydrological values are protected and conserved.

Management actions

1. Keep informed of current knowledge and contemporary management approaches in relation to climate change and its possible effects on native ecosystems.
2. Identify and protect geological features and soil types vulnerable to environmental damage (such as coastal dunes and/or riparian areas), and assess the potential effects on these from land uses, proposed developments and other activities.
3. Work with key stakeholders to maintain or improve the ecological character of Ramsar sites in lands managed by the department, and the condition and key values of Conservation category wetlands (and/or wetlands in the directory of important wetlands).
4. Work closely with the Department of Water, Swan River Trust and other government agencies to monitor hydrological regimes of surface and groundwater through the measurement of water

parameters taken at bores, gauging stations, weirs and other water sampling points; use this information to increase understanding of potential hydrological impacts and requirements to protect key conservation values.

5. Engage with relevant authorities in relation to water quality and quantity to promote good relations and to provide advice and direction for policy and development as necessary to protect conservation values. For example:
   a) Department of Water
   b) Swan River Trust
   c) Water Corporation
   d) Harvey Water
   e) NRM (natural resource management) groups, and neighbouring landholders
6. Develop and implement programs to monitor the condition of Conservation category wetlands.

12. Biological environment

Management actions are guided by the department's *Policy Statement No. 9: Conserving threatened species and ecological communities* (subject to final consultation) (CALM 1996). Species lists can be found on the ***NatureMap*** database http://naturemap.dec.wa.gov.au/default.aspx.

Native plants and plant communities

The planning area lies within the South-West Botanical province, which supports an estimated 5,700 taxa of vascular plants, representing two-thirds of the estimated plant taxa in Western Australia (Hopper *et al.* 1996; Beard *et al.* 2000). About 79 per cent of the plant taxa in the South-West province are endemic to the province (Beard *et al.* 2000).

The southern portion of the planning area (commonly referred to as the Busselton Plain) lies within the Busselton Augusta National Biodiversity Hotspot (SEWPaC 2009), and the entire planning area lies within the Southwest Australia Ecoregion, Australia's only international biodiversity hotspot, and one of only 34 in the world.

The entire planning area is species rich and has north–south and east–west ecotones in species distribution. There are high levels of diversity and endemism with all threatened species endemic or restricted to the Swan Coastal Plain, individual geomorphic units or the South West region. The Pinjarra Plain is floristically the most diverse landform (Keighery & Keighery 1991; Webb *et al.* 2009). Significant principal distributions are centred on claypans and vernal pools, relictual wetlands and deep sands. Although some plants are rare because of their requirement for a specific restricted habitat, the majority have become rare or threatened because of the activities of humans. Continued land clearing, plant diseases (particularly because of *Phytophthora* species), exotic weeds and pests, road works, utilities servicing and upgrades, urbanisation, grazing by domestic stock and changes to hydrological regimes continue to threaten the flora and ecological communities.

As part of some floristic studies on the Swan Coastal Plain over the last 20 years (for example Gibson et. al 1994), permanent plots have been set up to assess regional significance and distribution of plant communities, and distribution and conservation significance of species. Many of these studies have been used for a 'whole-of-government' approach to the protection of flora (for example Bush Forever and Swan Bioplan). The Conservation Commission's *Forest management plan 2014–2023* (Conservation Commission 2013) provides a detailed background on a number of studies that have led to recommendations for the protection of specific areas. Floristic reports from the Government of Western Australia (2000), Keighery *et al.* (2006) and Webb *et al.* (2009) help to consolidate flora

knowledge, identify information gaps, and summarise knowledge of naturally significant areas around the metropolitan area, Peel–Harvey Eastern Estuary and Busselton Plain.

Flora of conservation significance

The planning area contains the following conservation significant species (for detailed list see Appendix 6):

- 23 species listed under the EPBC Act – including one critically endangered species, 15 endangered species and seven vulnerable species
- 24 species of 'rare flora' declared and listed under the Wildlife Conservation Act – including 10 species that are critically endangered, seven that are endangered and seven that are vulnerable
- 76 priority species (note that the conservation status of many of these needs reviewing).

Calytrix breviseta ssp. breviseta (critically endangered under the Wildlife Conservation Act). Photo – DPaW

Current conservation efforts are primarily targeting threatened species, most of which have national and/or interim recovery plans or conservation advice which identifies threats and recommended actions to protect the species. Actions include field survey, mapping and monitoring of populations, translocations, determining vital attributes and life history so that appropriate fire management regimes can be defined, weed management, seeking to minimise the effects of development, and controlling access for recreation and utilities to minimise spread of disease and/or accidental disturbance to species.

Plant communities

Vegetation complex mapping of the Swan Coastal Plain was completed by Heddle *et al.* (1980) and takes into account soil, landform and floristics. More detailed studies of floristic communities present on the southern Swan Coastal Plain were completed by Gibson *et al.* (1994), and for Bush Forever and Swan Bioplan. Nine threatened ecological communities are listed for the Swan Coastal Plain, six of which are also listed under the EPBC Act.

Tuart conservation within the planning area is of particular significance. Although tuart and tuart woodlands in general are not formally listed, the species is restricted to the Swan Coastal Plain and only 35 per cent of the area of tuart woodlands and forests remain (CALM 2003). Big tracts of tuart dominated forest and woodlands exist in Yalgorup National Park and the surrounding reserves. The southern limit of the tall tuart forest on the Swan Coastal Plain is the Tuart Forest National Park (DEC 2011). Mature tuarts are highly valued for conserving biodiversity, especially in sustaining viable populations of fauna that rely on big tree hollows, as well as for protecting ecosystem function and providing connectivity between remnant vegetation.

Tuart Tree (Eucalyptus gomphocephala). Photo – DPaW

In recent years, tuarts in Yalgorup have suffered a significant decline in health including poor crown condition, death and reduced sapling regrowth. This may result from a combination of biotic and abiotic factors such as habitat loss and fragmentation, changes in land management (for example fire management and forestry practices), changes in hydrology, pests and pathogens and climate change (Barber and Hardy 2006).

Fringing vegetation, which acts as buffers around lakes, rivers and ephemeral wetlands, is considered to be of high conservation value. In the planning area, vegetation in buffers range from degraded to very good condition. Fringing vegetation is not only an important part of wetland ecosystem function, but is also a transition zone between wetland and upland communities and provides valuable ecological linkages. Some wetland plant communities are under threat because of grazing (current and previous regimes), changing hydrology, salinity, weeds and inappropriate recreation.

Ecological linkages (described in Molloy *et al.* 2009) can help restore ecological communities and rehabilitate landscapes. Their use will help in strengthening flora and fauna values and reducing the threats which arise from habitat fragmentation (EPA 2009).

Additional ecosystem monitoring is required to establish baseline data for many reserves in the planning area, particularly on small fragmented reserves. Some opportunities exist to monitor and/or identify possible locations of ecological communities through remote sensing, spatial modelling and predictive mapping.

The Swan Coastal Plain is altered to such an extent that much remnant vegetation is regionally significant and needs some level of protection (EPA 2006). Recommended additions of land to the conservation reserve system include areas that support vegetation types that are significant and not well represented in the existing planning area or in the conservation reserve system in general.

Desired outcome

Native plants and plant communities are identified, protected and conserved.

Objectives

1. Maintain or improve the population size of threatened flora species.
2. Establish baseline monitoring on departmental managed reserves, and continue monitoring on a regular basis.

Management Actions

1. Consolidate existing information and maintain a spatial inventory of plant species and communities that may require special protection (for example *NatureMap*).

2. Undertake a strategic threat analysis (i.e. weeds, disease, native and introduced species, grazing, inappropriate fire regimes, recreation) on threatened flora as a basis to prioritising and implementing urgent management actions to mitigate threatening processes.
3. Develop, review and/or implement actions from recovery plans (for example translocation) for species of conservation significance.
4. Monitor populations of threatened flora; identify viable populations and record natural variations in population numbers.
5. Review the conservation status of priority species.
6. Design native vegetation monitoring programs (or systematic flora surveys), including a network of monitoring sites, to evaluate native vegetation condition in the smaller, fragmented reserves, in conjunction with fauna monitoring.
7. Reduce the impacts of recreational use on key flora by controlling access and monitoring flora values.
8. Continue to provide advice to land use planning processes including statutory planning, environmental impact assessments and applications for clearing permits to ensure that biodiversity values are maintained, and monitor conditions following approval.
9. Encourage vegetation and landscape rehabilitation of:
   - disturbed areas, particularly those associated with wetland and riparian areas, and using local provenance material where possible;
   - degraded tuart stands;
   - banksia woodlands;
   - small remnants.
10. Periodically monitor and evaluate vegetation condition to assess rehabilitation efforts.
11. Protect mature tuart trees by limiting threats that reduce resilience of tuart ecosystems, and monitor tuart health and adapt management over the life of the plan in light of new research.

Key Performance Indicators

Performance measure	Target	Reporting requirements
The persistence and status of populations of threatened (i.e. rare) flora	Subject to natural variation and/or taxonomic changes, there is a recovery and/or maintenance of viable populations of threatened flora	Every five years, or as per recovery plan
Obtain baseline ecosystem information in reserves for which there is little or no information	Establish baseline ecosystem monitoring and reporting in one reserve per year	Every five years

Native animals and habitats

Research on the Swan Coastal Plain (such as How and Dell 1993) indicates that fauna have particular habitat and spatial requirements and respond poorly to the effects of fragmentation and its associated impacts, such as fire, weeds, competitors and predators. Therefore a primary aim for fauna management within the planning area is the expansion and protection of existing habitats and rehabilitation of degraded areas.

Birds are the most studied fauna group in the planning area. Baseline fauna data, with a focus on mammals in large reserves, and also reptiles, is required for a better understanding of the status of fauna populations in the planning area.

Fauna of conservation significance

The planning area contains many fauna species of conservation significance, including:

- 14 threatened and specially protected fauna taxa listed under the Wildlife Conservation Act (*Wildlife Conservation (Specially Protected Fauna) Notice 2012 (2)*):
  - Three mammals – chuditch (*Dasyurus geoffroii*), western ringtail possum (*Pseudocheirus occidentalis*), and Australian sea lion (*Neophoca cinerea*)
  - Six birds – the Australasian bittern (*Botaurus poiciloptilus*), Baudin's cockatoo (*Calyptorhynchus baudinii*), Carnaby's cockatoo (*Calyptorhynchus latirostris*), southern giant petrel (*Macronectes giganteus*), forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), and peregrine falcon (*Falco peregrinus*)
  - Two reptiles – loggerhead turtle (*Caretta caretta*) and carpet python (*Morelia spilota imbricata*)
  - Three insects – two bee species (*Leioproctus douglasiellus* and *Neopasiphae simplicior*) and graceful sun-moth (*Synemon gratiosa*)
- Nine threatened species listed under the EPBC Act:
  - Australasian bittern (*Botaurus poiciloptilus*) (endangered)
  - Baudin's cockatoo (*Calyptorhynchus baudinii*) (endangered)
  - Carnaby's cockatoo (*Calyptorhynchus latirostris*) (endangered)
  - southern giant petrel (*Macronectes giganteus*) (endangered)
  - graceful sun-moth (*Synemon gratiosa*) (endangered)
  - loggerhead turtle (*Caretta caretta*) (endangered)
  - chuditch (*Dasyurus geoffroii*) (vulnerable)
  - western ringtail possum (*Pseudocheirus occidentalis*) (vulnerable)
  - forest red-tailed black cockatoo (*Calyptorhynchus banksii* subsp. *naso*) (vulnerable)
- Nine DPaW priority species:
  - One Priority 1 – the cricket (*Pachysaga strobilas*)
  - One Priority 3 – a reptile, the Perth lined lerista (*Lerista lineate*)
  - Six Priority 4 – three mammals and three birds: western false pipistrelle (*Falsistrellis mackenziei*), water-rat (*Hydromys chrysogaster*), western brush wallaby (*Macropus irma*), hooded plover (*Charadrius rubricollis*), little bittern (*Ixobrychus minutus*) and eastern curlew (*Numenius madagascariensis*)
  - One Priority 5 – southern brown bandicoot (quenda) (*Isoodon obesulus* subsp. *fusciventer*)

Wetlands on the Swan Coastal Plain are important habitats for birds. The Peel–Harvey Estuary, Yalgorup Lakes, Benger Swamp and the Busselton Wetlands have been identified as 'important bird areas' (IBAs), which are sites of international importance for bird conservation for resident waterbirds and migratory shorebirds. IBAs are small enough to be practical targets for conservation management but large enough to meet the global IBA criteria (criteria are defined in Dutson *et al.* 2009; see <www.birdata.com.au/iba.vm> for further details of each IBA).

The Peel–Yalgorup system regularly supports in excess of 20,000 birds annually. Within this site, the Peel–Harvey Estuary support 86 species, with 29 migratory species listed under international agreements and an additional 32 species included on the national list of migratory species under the EPBC Act (Hale & Butcher 2007). The Vasse–Wonnerup system regularly supports between 25,000 and 35,000 waterbirds annually, including 40 species that have priority conservation status at a state, national or international level (WRM 2007). Benger Swamp is the only location on the Swan Coastal Plain known to support the critically endangered Australasian bittern. It is also one of seven known breeding sites in the south west for the freckled duck (*Stictonetta naevosa*). Bird monitoring has been occurring for many years at wetlands on the Swan Coastal Plain (see Jaensch 1986; Scopewest – Storey *et al.* 1993; Lane *et al.* 2007).

White-faced heron (Egretta novaehollandiae). Photo – B. Wells

The department currently has recovery plans for four of the species of conservation significance in the planning area – the chuditch, Carnaby's cockatoo, the forest red-tailed black cockatoo and Baudin's cockatoo. National recovery plans have been released for the southern giant petrel (SEWPaC 2011) and the loggerhead turtle (Commonwealth of Australia 2003) and there is an interim DPaW recovery plan for the western ringtail possum (see http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities for a link to DPaW recovery plans).

The Department of Sustainability, Environment, Water, Population and Communities (then Department of the Environment, Water, Heritage and the Arts) released an EPBC Act policy statement in 2009 about the western ringtail possum, to help in determining whether proposed actions are likely to have significant impacts on the species (Commonwealth of Australia 2009) (http://www.environment.gov.au/epbc/publications/pubs/western-ringtail-possum.pdf).

Western ringtail possum (Pseudocheirus occidentalis). Photo – Paul Tholen (DPaW)

The policy statement identifies the four main threats to the western ringtail possum: habitat loss and fragmentation, predation by foxes and cats, altered fire regimes and competition with the common brushtail possum (*Trichosurus vulpecular*). The southern part of the Swan Coastal Plain is considered to be important for the western ringtail possum because of a number of unique characteristics, including the highest known density populations, high quality peppermint habitat, and areas of habitat where the brushtail possum does not co-occur and therefore does not compete

for resources. The area also supports the biggest known population of western ringtail possums, which may form a critical resource for survival of the species (Commonwealth of Australia 2009). Leschenault Peninsula and Yalgorup National Park are translocation sites for the western ringtail possum, where individuals are being monitored and studied for research purposes.

Ecological linkages

Ecological linkages within the planning area provide a stepping stone of habitats to help in maintaining ecological processes, by providing migratory routes for fauna, green belts to limit effects of urbanisation on species and ecological communities, access to areas containing seasonally variable food and other resources and a refuge from major disturbances. The refuge function is especially relevant with regards to large bushfires and potential long-term effects of global warming.

The South West Regional Ecological Linkages Project recognises a series of regionally significant ecological linkages across the south west landscape (Molloy *et al.* 2009). Ecological linkages within the planning area function in a north–south and/or east–west direction. Rivers and associated riparian vegetation are often the most contiguous ecological linkages, and wetlands within the planning area can provide linkages in a regional and international context.

Vegetation of the Quindalup Dunes and, to a lesser extent, the Spearwood Dunes, retains some relatively contiguous ecological linkages, particularly through Yalgorup National Park and Canning River Regional Park. Elsewhere, however, the landscape is highly fragmented and therefore maintenance and expansion of conservation reserves and strategic restoration of existing bushland for ecological function is considered a priority.

Desired outcome

Native animals and habitats of the planning area are protected.

Objective

Maintain or improve the conservation status of threatened and priority listed fauna species.

Management actions

1. Consolidate existing information and maintain a spatial inventory of fauna species that may require special protection (for example *NatureMap*).
2. Reduce the impacts of recreational use on fauna by controlling access and by monitoring (for example, the effects of four-wheel driving on waterbird breeding habitats).
3. Develop, or revise where necessary, and implement, recovery plans for specially protected species.
4. Identify gaps in knowledge of fauna composition, abundance and distribution, and undertake, support or encourage systematic fauna surveys.
5. Expand and protect existing habitats and rehabilitate degraded areas to a standard suitable for fauna habitat, on a priority basis.
6. Undertake a strategic threat analysis (weeds, disease, native and introduced species, grazing, inappropriate fire regimes) of threatened fauna as a basis for prioritising management actions to mitigate threatening processes.

Key Performance Indicators

Performance measure	Target/s	Reporting requirements
The persistence and conservation status of populations of threatened (i.e. rare and priority 1 and 2) fauna species in the planning area	a) No local extinction of threatened fauna in the planning area b) Translocated fauna species are successfully established as viable breeding populations	Every five years, or as per recovery plans
Changes in species diversity of migratory wading birds	Subject to natural variation, no sustained decrease from known levels in the diversity of migratory wading birds	Every five years

Ecological communities

Threatened and priority ecological communities in the planning area include:

- 19 communities listed in Western Australia – comprising six critically endangered communities, six endangered communities and seven vulnerable communities
- eight communities listed under the EPBC Act – two critically endangered, and six endangered communities
- eight priority ecological communities.

For details on these listings see Appendix 7.

Southern wet shrublands, an endangered ecological community. Photo – DPaW

Thrombolites of the stromatolite like freshwater microbialite community of coastal brackish lakes, a critically endangered ecological community. Photo – Kym Pearce (DPaW)

Further data is required on priority (potentially threatened) ecological communities to determine their conservation status, and a risk assessment is required to determine where to focus efforts. Recovery plans have been prepared by DPaW for all ecological communities that are ranked critically endangered in Western Australia. Recovery plans have also been developed for most threatened ecological communities ranked as endangered and some that have been ranked as vulnerable, on an 'as needs' basis and as resources permit. For a link to DPaW recovery plans see http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities.

Desired outcome

Ecological communities of conservation significance are identified, protected and conserved.

Objective

Maintain the extent and improve or maintain the integrity (condition class, extent) and ranking of threatened ecological communities.

Management actions

1. Seek to identify and protect threatened and priority ecological communities.
2. Resolve the critical habitat parameters and requirements (e.g. groundwater and surface water) for threatened ecological communities, giving priority to those of highest rank. This process should include undertaking an assessment of the risks associated with hydrological change for water-dependent threatened ecological communities.
3. Implement all recovery plans for threatened ecological communities and develop plans for those communities for which plans do not currently exist, with priorities determined by threat rank.
4. Undertake a strategic threat analysis (hydrological change, weeds, disease, introduced species, grazing, inappropriate fire regimes, management operations and proposed developments) for threatened ecological communities as a basis for prioritising management actions to mitigate threatening processes.

Key Performance indicator

Performance measure	Target	Reporting requirements
Extent and condition class of threatened ecological communities	No decline in extent or overall condition class (Bush Forever scales) of threatened ecological communities	Every five years

13. Protecting the natural environment

Altered hydrological regimes

Threats to wetlands in the planning area include changes to groundwater and surface water flows and quality, urban and rural development, fire, removal of fringing vegetation that causes habitat loss and fragmentation, and weed invasion.

An essential component in protecting and maintaining the values of a wetland is to provide a buffer zone of terrestrial vegetation that is upslope of the outer edge of wetland dependent vegetation (Davies & Lane 1995). Buffer zones around wetlands can:

- improve water quality in both surface water and groundwater
- protect environmental assets such as avifauna nesting and roosting sites
- help prevent weed infestation
- minimise the effects of nuisance insects on residential areas.

Buffer zones along riverine systems can provide ecological linkages and corridors for flora and fauna.

There is an ongoing program of monitoring of water levels and water quality in bores and wetlands in the Canning River and Yalgorup Lakes, and within the Vasse–Wonnerup and Peel–Yalgorup systems, where monitoring is a requirement under the Ramsar Convention to maintain their ‘ecological character’.

Water supplementation is occurring in some wetlands surrounding the planning area, such as Lake McLarty in the Peel–Yalgorup system (DEC 2008a), to maintain water levels and ensure the protection of key values.

Water oxygenation equipment at Canning River Regional Park. Photo – Kym Pearce (DPaW)

Benger Swamp is affected by irrigation drain flows. Hence it is essential that any changes to irrigation, drainage systems and water allocations ensure that sufficient water is supplied to maintain the ecosystem that supports threatened fauna and migratory birds subject to international treaties with Australia.

Other sites that require supplementation need to be identified as part of a strategic overview for the Swan Coastal Plain, with a focus on threatened ecological communities and water dependent areas, threatened flora and Ramsar nominated sites.

Acid sulfate soils

Acid sulfate soils in Western Australia commonly occur in low lying wetlands, back-swamps, estuaries, salt marshes and tidal flats, though they are not confined to coastal regions. Within the planning area the majority of reserves that have wetland or riverine systems within or near them are at high to moderate risk of effects from acid sulfate soils. Where acid sulfate soils are identified, management measures including no soil movement, no dewatering and no development need be adopted to reduce disturbance to these areas. Information about assessing and managing risks due to the presence of acid sulfate soil can be found at http://www.der.wa.gov.au/your-environment/acid-sulfate-soils.

Desired outcome

The impacts of altered hydrological regimes on key values are minimised.

Management actions

1. Identify wetlands that may need water supplementation over the life of the plan to maintain conservation values, considering issues such as the impacts to water source, delivery of water to the appropriate zone, possible effects of salinity. Undertake supplementation as deemed necessary.

2. Develop a priority list of wetlands requiring management actions or interim management guidelines, with priorities based on wetlands at highest risk (probability and consequence) from threatening processes including water quality, weeds, inappropriate fire regimes, bushfire and groundwater decline.

3. When planning and carrying out operations, consider the possibility of encountering acid sulfate soils (for example, during fire operations, or when considering on- and off-site development proposals) and avoid disturbing, compacting, dewatering or displacing saturated soils at risk.

4. Appropriately rehabilitate disturbed areas and fringing wetland vegetation, and monitor such rehabilitation so that restoration progresses to a stable condition resembling as close as possible the natural ecosystem function.

5. Prioritise sites where improved knowledge is needed to understand the hydrology of critical habitat and develop appropriate hydrological regimes for the benefit of key values, especially migratory birds.

Invasive plants and animals

Environmental weeds

Gibson *et al.* (1994) found that the most abundant weeds on the Swan Coastal Plain are from the *Poaceae* family, and the highest occurrence of weeds was in seasonal wetlands in the Quindalup and Spearwood dune systems. The 'Swan Weeds' database on the department's *FloraBase* website (see http://florabase.dpaw.wa.gov.au/) provides information on the biology and management of environmental weeds in Western Australia, with particular emphasis on those species occurring on the Swan Coastal Plain.

The department has developed an invasive plant prioritisation process which is an integrated approach to weed management in Western Australia and replaces the statewide environmental weed species rankings of the *Environmental weed strategy for Western Australia* (CALM 1999a). This process provides an updated ranking of the threat of each weed species on a DPaW regional basis against specific criteria, and aims to consider a 'species led' and an 'asset based' approach to controlling the threat of environmental weeds in Western Australia.

About 30 species have been identified in the planning area as top threatening weeds. This has resulted from a species-led prioritisation process for the Swan Coastal Plain, based on them having a high risk of causing ecological harm, their rapid invasiveness within their current distribution, potential for distribution, and feasibility of control. For further information and a link to a list of weed species for the planning area that are being managed under the invasive plant prioritisation process, see http://www.dpaw.wa.gov.au/plants-and-animals/plants.

Further requirements (statutory or otherwise) for land managers to manage weeds include declared plants requirements as set out in the *Agriculture and Related Resources Protection Act 1976*, or ministerial requirements under Part IV of the *Environmental Protection Act 1986*.

The threats posed to biodiversity from weeds differ depending on the characteristics of each reserve and its associated land uses. Consequently, management priorities will need to be adjusted accordingly.

A weed plan exists for the Canning River Regional Park, and each DPaW district has a weeds database from which they develop an annual works program. Weed mapping has been undertaken for reserves that have the most threatened ecological communities and rare flora values. Weed management in wetland areas focuses on the maintenance of open water for migratory birds, and on recreational assets. Post-fire weed control is a significant problem in small reserves and further information is required to understand weed invasiveness after fire and how to manage this effectively.

DPaW staff removing cotton bush from private property. Photo – Brian Inglis (DPaW)

Introduced and other problem animals

The small to medium sized ground mammals that now dominate fauna species on the Swan Coastal Plain include the cat, fox, house mouse and black rat (Keighery *et al.* 2006). Significant problem animals include rabbits and kangaroos in small fragmented reserves, and wild pigs in wetland areas.

Several reserves in the planning area are included in DPaW's long established 1080 baiting program ('Western Shield') for the control of foxes. These include parts of Yalgorup National Park, Leschenault Peninsula, Benger Swamp, Creery Wetlands and islands, and Locke Nature Reserve. These sites were chosen primarily because of the significant fauna that existed within the reserves, including the western ringtail possum, chuditch, bandicoots (quenda) and waterbirds. The response of predators and native fauna to baiting needs to be monitored, as do other introduced species that pose a direct threat to fauna and the native environment. The priority for monitoring should be based on threat priority.

Investigation into cat baiting is still occurring within other areas of Western Australia, and expansion of the cat baiting program into larger reserves such as Yalgorup National Park and Leschenault Peninsula on the Swan Coastal Plain may be considered within the life of the plan. Cats are a significant threat to the western ringtail possum and with the increasing urban development and interface, cat numbers are likely to increase.

Feral pigs can cause substantial damage to wetlands, where their diggings disturb populations of rare flora and affect water quality. Illegal release of feral pigs for hunting occurs in parts of the planning area. This sustains local populations and causes damage to assets and conservation values.

Research, using 'exclusion areas' where kangaroos are kept out, has found that grazing pressure from western grey kangaroos (*Macropus fuliginosus*) can impact significantly on conservation values, particularly in small fragmented areas. Kangaroos will frequently invade small reserves after fires to graze on shoots, and cause major damage to sensitive areas such as wetlands or threatened ecological communities. Management strategies to control kangaroos include fencing and shooting (licensed and regulated under the Wildlife Conservation Act), and research is currently being undertaken to look at biological population control by implants (Herbert 2004).

Mosquitoes and midges, while a natural component of wetland ecosystems, can swarm in spring and summer and affect residents living within a kilometre from wetlands. The Conservation Commission, in principle, opposes mosquito control in nature reserves, Ramsar wetlands and other wetlands of high conservation value (Conservation Commission 2011a). The establishment of adequate buffers between lakes and surrounding development will reduce the effect of these pest insects on residents (Bowen *et al.* 2002) and can also improve water quality. Some local government authorities operate mosquito control under their own environmental management plans and with relevant statutory approval if mosquito control occurs near Ramsar sites (for example the Shire of Capel's Mosquito Management Strategy, see http://www.capel.wa.gov.au/portals/0/doc/health/mms.pdf).

Desired outcome

The impacts of invasive plants and animals on key values are minimised.

Objective

Protect threatened or otherwise significant species and communities, and habitat of high conservation value, from adverse impacts due to:

1. new introductions of invasive plants and animals
2. expansion of current populations of invasive plants and animals.

Management actions

1. Maintain surveillance and recording systems for weeds that are known to have a significant impact on ecosystem health and vitality.
2. Limit the opportunity for weeds to be introduced and established by:
   a) applying appropriate hygiene practices to machinery
   b) minimising disturbance of soil during management activities
   c) only importing soil from sources with strict soil quarantine.

3. Finalise the invasive plant prioritisation process to combine a species led approach with an asset based approach to prioritise biodiversity benefit of weed control.
4. Liaise with neighbouring landholders, and implement measures to prevent weeds from adjacent areas either establishing within the planning area, or escaping from it.
5. Work collaboratively with other agencies, land managers and the community, as appropriate, to identify priority weeds and pests using risk-based procedures for determining their relative importance.
6. Where reasonable and practicable, implement control programs for priority weeds and pests, and encourage the coordinated involvement of government, industry, the community and other land managers in managing these weed and pest species.
7. Continue introduced predator control, and investigate, monitor and review its effectiveness through:
   a) adequate documentation and timely delivery of the fox control program
   b) cooperation and coordination between DPaW and other landholders and parties undertaking predator control in and around the planning area
   c) monitoring introduced predator activity and abundance in association with the control program
   d) monitoring native fauna species to verify that the conservation goals of fauna recovery plans are being successfully achieved and sustained.
8. Continue to manage small parks and reserves through the use of fencing and by minimising inappropriate access and impacts of invasive fauna species.

Key Performance indicator

Performance measure	Objective	Reporting
The extent of environmental weed species rated as 'very high – high', local priority or impacting high priority locations	Decrease in the extent of weed species rated as 'very high – high', local priority or impacting on high priority locations	After five years

Disease

Dieback disease caused by *Phytophthora cinnamomi* continues to spread and affect the distribution and abundance of many native south-west plant species and their associated fauna. This plant pathogen and a number of related *Phytophthora* species present a significant threat to the health and vitality of many ecosystems in and outside the planning area. Hence, their management remains a high priority to minimise the risk of new infections in areas that are not yet infected. *Phytophthora cinnamomi* can alter species composition and ecosystem functioning, by impacting susceptible species and vegetation types, some of which may be rare or threatened, and by increasing the vulnerability of impacted areas to invasion by weeds. It can adversely affect a range of other forest values, including productive capacity and the value of areas for recreation.

Soil movement activities, such as road construction or maintenance, and vehicles and bushwalkers, are known to spread pathogens, particularly in moist, relatively low-lying sites, unless carried out under strictly controlled hygiene conditions. Currently there are few means of controlling the pathogen's spread via autonomous root to root contact amongst plants, zoospores through soil and via surface water flows. Similarly, it is difficult to reduce the spread of the *Phytophthora* pathogen by fauna.

Management of *Phytophthora* is guided by *Policy Statement 3: Management of Phytophthora and disease caused by it* (CALM 1998b). The Conservation Commission's Position Statement No. 7 – *The threat of Phytophthora dieback to biodiversity values on lands vested in the Conservation Commission of Western Australia* (Conservation Commission 2012b) outlines the Conservation Commission's expectations in relation to the management of *Phytophthora* in Conservation Commission vested land. Subsidiary documents, which are periodically reviewed, detail the planning and approval process used by DPaW and

other proponents to minimise the risk of introduction and spread of *P. cinnamomi* (and other damaging agents, including weeds and pests). Useful tools in this approach include field demarcation of known infected areas and the preparation of hygiene management plans. Dieback mapping has been undertaken in parts of the planning area, to help with identifying protectable areas. The department will continue to monitor for signs of these diseases, support continued research and adapt management accordingly.

Phytophthora sp., particularly *P. multivora* has been implicated in 'tuart decline' in Yalgorup National Park (Scott *et al.* 2009). *P. multivora* is not inhibited by calcareous soils. Other biotic and abiotic processes, such as chronic insect infection, and changes in rainfall, salinity and/or soil nutrients, may also be implicated in the severe crown deterioration and plant mortality (Barber & Hardy 2006.) The Tuart Health Response Group, now coordinated by the State Centre of Excellence for Climate Change, Woodland and Forest Health, has adopted a collaborative and integrated approach to research into the possible causes of this decline and its impact on the biodiversity, the management of the decline, and the restoration of these ecosystems.

Various forms of stem canker and *Armillaria* sp. are known to impact on threatened flora in the planning area. At least 50 families, and more than 200 species, of native plants are susceptible to the endemic soil-borne fungus *Armillaria luteobubalina*, including tuart, peppermint, jarrah, *Acacia pulchella* and *Banksia grandis* (Robinson & Rayner 1998), all of which are found within the planning area. Other *Phytophthora* sp., gall rust (*Uromycladium tepperianum*) and the common, aerially dispersed, canker causing fungi may have a significant localised impact. Anecdotal reports are that many stands and individual marri on the Swan Coastal Plain are being harmed by canker, particularly in colder and drought affected areas (Centre of Excellence for Climate Change Woodland and Forest Health 2011).

Desired outcome

The effects of diseases on key values are minimised.

Management actions

1. Work collaboratively with other agencies and land managers, as appropriate, to identify priority forest diseases and syndromes using risk-based procedures for determining their relative importance.
2. Use planning procedures and operational controls to identify the relative importance of areas for protection, and to minimise the risk of spread and impacts from priority diseases already present.
3. Implement appropriate hygiene measures, including hygiene management plans, to minimise the spread of diseases during management operations and proposed development works.
4. Where reasonable and practicable, implement control programs for priority diseases, and encourage the coordinated involvement of government, industry, the community and other land managers in managing these.
5. Document and respond to outbreaks of diseases that become apparent during the life of the plan.

Fire

Organisational responsibility for fire management is shared between DPaW, the Department of Fire and Emergency Services (DFES) and local government. The arrangements are stipulated in the *Emergency Management Act 2005*, accompanying regulations and the *State emergency plan for bushfire (Westplan Bushfire)* (FESA 2011). These documents define four aspects of emergency management: prevention, preparedness, response and recovery. The department's fire management activities, including prescribed fire, bushfire prevention and fire suppression are regulated by legislation (for example the *Bush Fires Act 1954* (Bush Fires Act) and the CALM Act). Further guidance is provided by departmental policy (which is under review) and the Conservation Commission's Position statement No. 1 *Fire management* (Conservation Commission 2011b).

The Emergency Management Act prescribes DFES as the hazard management agency for response to the hazard of fire state-wide. DPaW and local government authorities are designated as 'combat agencies' responsible for the emergency management activity of fire suppression on lands that they manage, or on other lands at the request of DFES.

Further to this, DPaW is responsible for the prevention and preparedness aspects of fire management on lands managed under the CALM Act and on unallocated crown land and unmanaged reserves that are not within town sites.

The department has a well established process for planning, implementing and reviewing its prescribed burning program. This 'fire management plan' approach considers biogeography, land use, community protection, the available workforce, plant and equipment to establish management objectives, burn strategies, and success criteria. When fully implemented, it is intended to operate a hierarchy of five levels: 'regional fire management plans', the 'master burn planning process', 'three-year (six season) indicative burn plans', 'annual burn programs' and 'prescribed fire plans'. The Conservation Commission's *Forest management plan 2014–2023* (Conservation Commission 2013) provides a detailed description of the five levels of the 'fire management plan' approach.

Fire and biodiversity

Inappropriate fire regimes are a major threat to the diversity, viability and long-term conservation of communities, habitats and populations of many species within the planning area. While many flora taxa and ecosystems are resilient to a range of fire regimes, some have specific fire regime requirements. No single fire regime is optimal for all species (Burrows 2008, Burrows *et al.* 2008). Fire-sensitive species and ecosystems are most typically associated with the less flammable parts of the landscape that are not regularly exposed to fire, such as moister areas (for example wetlands and riparian vegetation) and areas with discontinuous vegetation (for example rock outcrops or other areas of sparse vegetation).

The richness and diversity of fauna taxa is generally maximised by avoiding widespread intense bushfires and by maintaining a diversity of post-fire vegetation successional stages to provide habitat diversity (Bamford & Roberts 2003). The fire responses of native fauna will also vary depending on the extent of, and interaction of fire with, habitat fragmentation and other ecological disturbances (for example the effects of weeds, disease and introduced animals). The response of reptiles to fire has been found to be dependent on vegetation type and fire ages (Valentine *et al.* 2012).

Inappropriate fire regimes are particularly damaging to threatened species and ecological communities that have specific fire regime requirements or that are found in geographically or temporally restricted habitats. For example, overly frequent fires may reduce the availability of nesting material or sites for the Australasian bittern, and riparian vegetation often requires near total exclusion of fire in order to persist.

Bushfire burning through Lake Clifton and surrounding wetlands on the Swan Coastal Plain.
Photo – Owen Donovan (DPaW)

Peat soils are common in the planning area and give rise to particular fire management considerations. Fires in peat soils are extremely difficult to extinguish and can burn for long periods of time. Considerable ecological damage can result from fire control activities as well as from the fire itself (Loomes *et al.* 2003). Increasing aridity from climate change may make peat soils more prone to fire.

Areas of remnant vegetation that are small in area and isolated from other remnants are also particularly sensitive to fire. A high intensity fire that affects the entirety of such a remnant may result in the loss of entire populations of rare and endemic flora. Such remnants also tend to experience significant impediments to post-fire recovery, such as kangaroo grazing and invasion of weeds.

Fire management in the planning area

Fire poses a significant risk to firefighters, visitors, adjoining landholders and local communities, as well as to conservation, cultural and community assets. It must be managed in a planned way to reduce the severity of bushfire and its associated impacts. Identifying fire vulnerable conservation and community assets and places of cultural significance within the planning area, and determining the likelihood and consequences of bushfires on them will help to determine and prioritise the risk mitigation strategies for bushfires.

The department implements a range of bushfire mitigation strategies including:

- prescribed burning. This is a strategy used by DPaW to:
  a) conserve biodiversity by providing a spatial and temporal diversity in vegetation structure and therefore habitat opportunities
  b) promote ecosystem resilience to disturbance from influences such as climate change and bushfire by providing a spatial and temporal diversity of vegetation structure, and therefore fauna habitat opportunities
  c) mitigate the risk of damage to life and property from bushfires by managing the quantity and spatial distribution of fuel loads across the land it manages
- maintaining a fire detection system (for example fire towers and spotter aircraft)
- maintaining a strategic protection system (for example strategic firebreaks) to minimise the extent of bushfire runs and to maintain access for fire management purposes
- maintaining access for fire management purposes and fire response capabilities as required
- community education and liaison
- liaison with other fire management authorities as required (for example DFES, local government authorities and local fire brigades).

In determining its approach to suppressing bushfires, DPaW takes into consideration environmentally sensitive areas and may modify its approach accordingly, where practicable. There are a number of fire operations guidelines to assist decision makers. The incident management structure may include a group that provides specialist environmental advice about the conduct of both suppression and post-fire rehabilitation operations. All fire management activities, particularly any new construction of roads or fire lines, should be planned and undertaken with strict hygiene measures in place to avoid harmful effects on threatened ecological communities and rare flora, and with consideration given to containing fires within existing roads to minimise the necessity for disturbance associated with new fire lines. In small fragmented reserves or fire exclusion areas, existing roads or alternative firebreaks (for example herbicide breaks) for fire control could be considered.

Trials by DPaW using fire have been applied within the planning area, such as in tuart ecosystems and for control of various weed species. Outcomes from such trials will be used to update fire management

procedures within the planning area. Monitoring of post-fire survival and recruitment success will be conducted to determine if communities are benefiting from prescribed burns.

Desired outcomes

Protection of life, property and community assets, and conservation of biodiversity.

Objective

Fire management that results in:

1. protection of human life, high value community assets and places of cultural significance.
2. protection of known populations of threatened species or threatened ecological communities and no loss attributable to the application of fire management strategies.

Management actions

1. Undertake an annual prescribed burning program that:
   a) seeks to address the risk of bushfire on the natural, cultural, recreation and economic values of lands managed by the department, and the risk presented by bushfire that emanates from DPaW-managed land
   b) protects and conserves fire-sensitive, geographically and temporally restricted and conservation significant species, habitats and communities and rehabilitation and translocation sites
   c) facilitates a diversity of habitats by maintaining or increasing the diversity of vegetation structure and composition
   d) creates and utilises new knowledge in an adaptive management framework
   e) is assessed against stated objectives for the program and stated objectives and success criteria for individual burns.
2. Undertake bushfire suppression and recovery operations in a manner that gives regard to fire operations guidelines that are periodically revised.
3. Further research the spatial and temporal arrangement of habitat required to facilitate the persistence of flora, fauna and communities, as resources permit.
4. Identify the highest conservation value reserves and establish and maintain post-fire monitoring sites to measure impact of bushfires and prescribed fires, and develop an understanding of fire ecology requirements, post-fire weed control and pest animal control.
5. Build and maintain management access for fire suppression where appropriate.
6. Appropriately rehabilitate disturbances resulting from fireline construction during bushfire suppression.
7. Identify fire regimes, if appropriate, in small, fragmented reserves.
8. Identify and protect community assets including recreation assets, neighbouring properties, utilities and valued resources through appropriate bushfire fuel management techniques.
9. Consult with stakeholders and interested community members about the planning and implementation of prescribed burning and other fire management programs to:
   a) develop community understanding of, support for and collaboration in, fire management
   b) enable constructive discussions and deliberations on fire management approaches.

Key performance indicators

Performance measure	Target	Reporting
The impact of fire on human life or community assets	No loss of human life and minimal loss of community assets attributable to the department's fire management	Annually
The persistence of threatened species and threatened ecological communities	No loss of known populations of threatened species or threatened ecological communities attributable to the application fire management strategies	Every five years

Managing cultural heritage

Management of Aboriginal and other cultural heritage in the planning area is guided by Western Australia's *Aboriginal Heritage Act 1972* (Aboriginal Heritage Act), *Heritage of Western Australia Act 1990*, the department's *Policy No. 18 – Recreation, tourism and visitor services* (DEC 2006), as well as any protocols or arrangements entered into by the department under the South West native title settlement agreement (SWNTS).

14. Aboriginal cultural heritage

The Swan Coastal Plain was traditionally abundant in water supplies, and a variety of environmental zones provided rich resources to the Whadjuk, Binjareb and Wardandi Noongar people. Land use patterns of the Noongar people were based on seasonal and environmental factors (O'Connor *et al.* 1989). The rivers and the associated creek systems, the flow of lakes, wetlands and surrounding landscape were not only an important economic resource but were also intricately linked to the Dreaming stories of ancestral beings (O'Connor *et al.* 1995).

Within the planning area, there are about 90 Aboriginal heritage sites[1] ethnographic and/or archaeological sites that are registered on the Department of Aboriginal Affairs' *Register of Aboriginal Sites* (DAA 2012). This includes artefacts/scatter, water sources, camps, fish traps, hunting, skeletal material/burial, mythological, dreaming areas, men's and women's sites, ceremonial, engravings, historical, repository/cache, man-made structures and modified trees. Registered sites probably only represent a small proportion of the actual sites within the planning area. All sites are protected under the Aboriginal Heritage Act, whether they are registered or not.

Leschenault Peninsula – an Aboriginal heritage site. Photo - Kym Pearce (DPaW)

The unnamed section 5(1)(g) reserve 45057, near Pinjarra, is a place of particular importance. This is reflected in the purpose of the reserve, which is 'conservation and the protection of Aboriginal heritage and culture'. This site is registered in the *Register of Aboriginal Sites* as a 'meeting place, camp and massacre place'.

Under section 56 (2) of the CALM Act, DPaW is responsible for protecting and conserving the value of the land to the culture and heritage of Aboriginal people. The department will follow any protocol or agreement entered into under the SWNTS agreement to protect and conserve Aboriginal heritage sites and to ascertain

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[1]*Aboriginal heritage sites can be categorised as archaeological and/or ethnographic sites. Ethnographic sites include: places for current ritual or ceremony, caches of ceremonial objects, sites with mythological associations, or sources of stone, ochre, plants or animals which are known or used. Archaeological sites are often enthographic sites as well, and include the physical remains of Aboriginal culture, both before and after European settlement. Archaeological sites include shelters, fish traps or weirs, stone or ochre quarries, stone artefact production areas, shell middens, seed grinding patches, engravings, paintings, marked trees and burial sites.*

the value of the land to Aboriginal people. It is recognised that not all sites are listed in the *Register of Aboriginal Sites* and hence assessment before any operations may be necessary. This may include examinations of the ethnographic and archaeological heritage values. The Department of Aboriginal Affairs and the Department of the Premier and Cabinet have released *Aboriginal Heritage Due Diligence Guidelines* (DIA & DPC 2013). Good working relationships with Noongar people will assist in ensuring that these guidelines are effectively applied and that relevant Acts are complied with (see www.daa.wa.gov.au/Documents/HeritageCulture/Heritage%20management/AHA_Due_Diligence_Guidelines.pdf).

Opportunities to collaborate with the registered native title claimant groups and, where appropriate, other Aboriginal people to jointly manage the land could also include working together to develop Aboriginal interpretive trails, education programs and conservation management arrangements. Some good models for this have already been developed, which may provide a useful guide (for example Noongar consultation protocol guidelines Swan and Canning Rivers iconic trails project, see www.noongar.org.au/images/pdf/misc/FinalReportwebLR.pdf).

Activities for Aboriginal customary purpose

Amendments to the CALM Act (and associated regulations), together with the Wildlife Conservation Act, allow Aboriginal people to access CALM Act land to conduct traditional activities, subject to regulations. Such traditional customary purposes may be for medicinal, artistic, ceremonial or other cultural purposes. The department will work with registered native title claimant groups, joint management parties and local Aboriginal communities to develop arrangements to manage customary activities on the conservation estate. The development of relationships at a local level is seen as vital to the ongoing management of customary activities in these areas.

The hunting and gathering of food by Aboriginal people is an important part of their culture, enabling them to maintain traditional relationships with the land and water, share knowledge and partake in traditional practices. Aboriginal people in the region continue to use the lands and waters of the planning area to undertake cultural activities and gather a variety of traditional foods including various plants, mammals, fish, birds, reptiles, frogs and invertebrates. The department will work with the registered native title claimant groups, joint management parties and local Aboriginal communities to develop local area arrangements to support and manage customary activities including the taking of traditional food by Aboriginal people.

Desired outcome

Aboriginal culture and heritage values are protected and conserved.

Management actions

1. Consult with the registered native title claimant groups and other Aboriginal people as appropriate to ascertain the value of the planning area to Aboriginal people, and ensure that such values inform and guide management actions.
2. Enter into arrangements and protocols agreed to in the South West native title settlement agreement or where appropriate to both (i) protect Aboriginal heritage sites; and (ii) to ascertain the value of the land to the culture and heritage of Aboriginal people.
3. Work with registered native title claimant groups and traditional owners who speak for country, to protect heritage sites within the planning area.
4. Ensure management and visitor activities, and threatening processes, such as inappropriate fire regimes, introduced plants and animals and altered hydrological regimes, do not adversely affect Aboriginal cultural heritage.
5. Liaise with the registered native title claimant groups, the Department of Aboriginal Affairs, local government, other appropriate Aboriginal people, the South West Aboriginal Land and Sea Council, other relevant organisations and the local community about the appropriate protection and management of cultural heritage.

15. Other cultural heritage

The planning area has a rich historic heritage associated with early exploration and settlement, the agricultural and forestry industries and wartime activities. Evidence of early European history is still seen today in the names of locations, buildings and old ruins.

Lime kiln – Yalgorup National Park.
Photo - Melissa Mazzella (DPaW)

The Heritage Council of Western Australia maintains a state register to recognise and protect places of cultural heritage significance. It includes buildings, structures, gardens and conservation sites, cemeteries, landscapes and archaeological sites. In the northern parks and reserves of the planning area listed sites include the Royal Freshwater Bay Yacht Club located on Keanes Point Reserve, parklands such as Matilda Bay Reserve, and historic sites such as Woodloes Homestead in Canning River Regional Park.

Listed sites in the central parks and reserves of the planning area include geological features such as the thrombolites, historic sites such as the lime works and Lake Clifton tunnels, and sites valued for conservation, landscape or open space including Yalgorup National Park, Creery wetlands, Goegrup lake system and the Peel–Harvey estuarine system. In the southern reserves, listed sites include the Vasse Estuary, Wonnerup Jetty (now just a site name) and part of the Broadwater wetlands.

Some places of heritage significance are listed in local government municipal inventories. Other places of heritage significance include evidence of European exploration and settlement, such as the drover's camp at Martins Tank, Belvidere (former Princep estate and alternative lifestyle commune), Lake Clifton townsite, Whittakers Mill, and horse yard remnants at Duck Pond, which was used as a training and patrol ground for the 10th Light Horse Brigade during World War II.

It is important that information continues to be collected and collated about historic sites within reserves, and that this information is made available for interpretation and protection of the site where appropriate. The government heritage property disposal process for disposal or demolition of heritage places that meet the relevant criteria needs to be observed, where appropriate.

Desired outcome

Cultural heritage is protected and conserved.

Management actions

1. Protect and conserve cultural heritage to ensure threatening processes do not have an adverse impact.
2. Continue to collect and collate information on historic sites and provide interpretive material if appropriate.
3. Liaise with the Heritage Council of Western Australia, local government, other relevant organisations and the local community about the identification and appropriate protection and management of cultural heritage.

Key Performance indicator

Performance measure	Objective	Reporting
Protection of known Aboriginal or other cultural heritage sites	No adverse impacts on known Aboriginal or other cultural heritage sites as a result of management activities	Every five years

Managing visitor use

The provision of visitor services, facilities and experiences in the planning area is guided by the department's *Policy Statement No. 18 – Recreation, tourism, and visitor services* (DEC 2006).

16. Visitor opportunities and planning

Regional recreational context

Visitor numbers have greatly increased over the last 10 years in popular recreation areas such as Yalgorup National Park and Leschenault Peninsula Conservation Park. Visitation is also quite high at Matilda Bay Reserve, estimated to have received the highest number of visits in the planning area of approximately 900,000 in 2012-2013. It is further estimated that 265,000 visits[2] were made to Canning River Regional Park. Monitoring at Yalgorup National Park recorded 359,060 visits in 2012-2013, while Leschenault Peninsula Conservation Park, just north of Bunbury, received 110,012 visits[3] during the same period.

The department's statewide visitor survey program has indicated a trend towards an increase in the proportion of day trip visits and a reduction in the number of overnight ones. Domestic tourism also dominates over the international market. Visitation levels and patterns may be influenced by external infrastructure such as the opening of the Forrest Highway which adjoins Yalgorup National Park, existing and proposed subdivisions surrounding some reserves, and externally organised statewide events. With a trend of increasing visitor use there is expected to be increasing pressure and adverse effects on the planning area reserves, particularly in areas with undesirable visitor behaviour and ageing infrastructure.

Matilda Bay, Canning River Regional Park, Len Howard Conservation Park, Yalgorup National Park and Leschenault Peninsula Conservation Park provide for a variety of compatible day use activities. Yalgorup National Park and Leschenault Peninsula are the only parks in the planning area with designated camping facilities. However, there is increased community concern about declining camping opportunities on private and crown land, as well as increasing demand from Perth residents and tourists to experience camping in a non-urban setting. The department is responding to this by identifying appropriate sites for more camping and caravan experiences on conservation estate (see Section 18 Visitor activities; Overnight stays).

Bird hide in Yalgorup National Park.
Photo – Melissa Mazzella (DPaW)

All but one of the nature reserves in the planning area are gazetted for the purpose of 'conservation of flora and fauna'. Hence, only compatible, 'low impact' recreation is permitted, and then only when it does not adversely affect the natural values and ecosystems of the reserve. Several nature reserves, including Brixton St Wetland, Creery Wetland and Samphire Cove have walking trails, boardwalks, interpretation signs and bird hides for the bird and nature enthusiasts.

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[2]The above figures were extrapolated from the results of a study conducted in 2005 by consultants: Colmar Brunton.

[3]These figures are determined or extrapolated from vehicle classifiers, traffic counters or pedestrian counters. The figures are the best estimate that were available at the close of the year's reporting.

Visitor planning

It is necessary to plan for visitor use in order to manage issues relating to visitor risk, environmental impacts, social benefit, equity, public demand and potential economic benefit. On a larger scale, it is important that visitor planning takes into account activities provided for elsewhere in and surrounding the planning area, rather than endeavouring to provide a wide range of visitor opportunities that could reduce the quality of experience or compromise natural and cultural values. On a smaller scale, it is important to provide cost-efficient, effective and safe services and utilities in the reserves that are compatible with site specific natural and cultural values and compatible with resources to maintain these facilities.

Features such as footbridges, buildings and open grassed areas play an important role in the landscape of some reserves such as Matilda Bay and Canning River Regional Park. Retaining visual quality should be a high priority in the planning area. The department's *Policy Statement No. 34 – Visual resource management* (CALM 1989) and guidelines should be adhered to in all aspects of land management, particularly the planning and implementation of new facilities, buildings, recreation sites and signs.

Visitor safety

The department routinely conducts risk audits of all designated recreation areas and trails, with mitigation works undertaken on a priority basis according to the degree of risk posed to visitors. To help minimise the incidence of injury to visitors, whether it be slipping and tripping on uneven ground, stolen hazard and direction signs, damage to structures, falling tree limbs, bushfires and emergency response, the department has developed *Policy Statement No. 53 – Visitor risk management* (CALM 1997b) which outlines a visitor risk management program for the planning area.

Visitor behaviour

Some parts of the planning area are easily accessible. Areas such as Canning River Regional Park, Yalgorup National Park and the proposed additions, Leschenault Peninsula Conservation Park and some small fragmented nature reserves, are close to urban development but are still relatively secluded, which makes them a prime target for anti-social behaviour and illegal activity. Problems such as rubbish dumping, illegal access, including by trail bikes and off-road vehicles, theft and vandalism of infrastructure such as fences and signs, and illegal removal of vegetation are some of the issues that need to be managed.

Desired outcome

Community enjoyment of the facilities and services, and the natural environment of the planning area.

Objective

Maintain or increase visitor satisfaction in reserves that have dedicated facilities and services.

Management actions

1. Provide and maintain a range of safe nature-based visitor facilities and services consistent with the department's *Policy No. 18 – Recreation, tourism and visitor services* (DEC 2006) in appropriate reserves to:
   a) provide adequate protection and maintenance of the key values of the planning area
   b) ensure site capability and safety standards are maintained
   c) maintain the rights and enjoyment of other visitors.
2. Undertake visitor surveys and use the data to determine requirements for better meeting visitor needs while minimising adverse effects on key values of the planning area.

3. Undertake visitor risk assessments of all recreation sites and facilities as part of a visitor risk management program, in addition to those which occur on a day-to-day basis, and implement appropriate action as necessary.
4. Encourage sympathetic and integrated management of departmental strategies with neighbouring land managers and owners for consistent and strategic visitor planning for the greater area.
5. Ensure that any site planning, including master plans and site development plans, takes into account all key values of the reserve.

Key Performance indicator

Performance measure	Target	Reporting requirement
Visitor satisfaction with nature-based facilities and services in the planning area	Maintain or increase visitor satisfaction with nature-based facilities and services	Every five years

17. Visitor access

Vehicular access

All formal recreation sites in the planning area are accessible by two-wheel-drive vehicles. Most road and track access on DPaW-managed lands is managed by the department, except for dedicated public roads, which remain a separate road reserve managed by either Main Roads Western Australia or relevant local government authorities. A small number of unutilised road reserves are scattered across the planning area. Any unnecessary road reserves within the planning area should be considered for inclusion into the appropriate conservation estate.

Off-road driving on roads and tracks closed to the public, or where there are no tracks, is not permitted unless signposted. Off-road vehicles can cause damage to sensitive areas such as coastal dune vegetation by causing loss of vegetation and soil erosion, and have the potential to spread diseases and weeds, while posing risks to other users and reducing aesthetic values. All vehicles within the planning area must be registered under the *Road Traffic Act 1974* and drivers must possess a current driver's licence. Vehicles registered under the *Control of Vehicles (Off-road Areas) Act 1978* and unregistered off-road vehicles (for example ATVs, off-road motorbikes and dune buggies) are not permitted.

Four-wheel-drive vehicles can access sections of beach through Yalgorup National Park, (in 2010–11 records estimate 72,000 visits on Tims Thicket road, the northern access to the beach) and through Leschenault Peninsula Conservation Park (2010–11 records estimate 67,855 visits to Buffalo Beach car park, the main access point to the beach). Four-wheel-drive access through Yalgorup National Park and along the beach at Leschenault Peninsula can be maintained provided that the activity does not damage the fragile dune system, or harm other areas with conservation values, and that there is minimal conflict with other users of the beach. Currently the coastline between Yalgorup National Park and the low water mark is unallocated crown land (UCL) and four-wheel-drive activity is actively managed by the Shires of Waroona and Harvey, and the City of Mandurah. Leschenault Peninsula Conservation Park extends to the low water mark and there is a 'Code of the Coast' program in place, under which vehicles are allowed on the beach between the high and low water marks.

The completion of the Forrest Highway south of Perth has resulted in an increase in uncontrolled four-wheel-drive access to nature reserves on the eastern bank of the Harvey Estuary (pers. comm. C. Olejnik 2011). This will place increased pressure on the estuary and has the potential to introduce or increase the spread of dieback. Controlled access to the estuary will need to be considered to minimise impacts on key values. Much of the Vasse–Wonnerup Inlet does not provide for vehicle access, and this will remain the case to protect the conservation values.

Leschenault Peninsula Conservation Park beach access. Photo – Kym Pearce (DPaW)

Provision for management access will be sought where adjacent subdivision offers an opportunity and where there is an advantage for reserve management purposes.

Access to parks and reserves often needs to be temporarily, permanently or seasonally closed to the public for management operations, such as:

- feral animal baiting
- fire management and emergency response
- flora and fauna monitoring
- weed control
- maintenance works.

Other access

Other forms of appropriate access within the planning area include pedestrian access, horseriding, mountain biking and water access (for boating, canoeing or swimming) (see Section 18 – Visitor activities). Access needs to be carefully managed to balance the demand for visitor use with the protection of key values, including the natural qualities that are highly valued by visitors and the local community. Walking on informal (natural surface) trails is generally deemed to be a suitable activity within the planning area.

Horseriding is deemed acceptable on some conservation estate if it has only a minimal effect on the reserve, if it is a pre-existing use of the area, and if trails are gazetted. The effects of horses on conservation estate are well documented (Newsome *et al.* 2008; Wells and Lauenroth 2007). Horseriding activities should be assessed for appropriateness based on environmental impacts (for example, spread of weeds and dieback), condition of the trails and possible conflict with other recreation users.

Desired outcome

Access that minimises the impact on key values is provided and maintained.

Management Actions

1. Only allow non-management and emergency response vehicles to drive on dedicated roads and DPaW-managed roads and tracks, or outside designated areas, with approval from the District Manager.
2. Temporarily, permanently or seasonally close management roads or tracks to the public, subject to approval by the District Manager, and signpost ‘management access only’ accordingly.
3. Ensure that road reserves are located to best protect the natural and landscape values and meet public access needs, and negotiate with appropriate authorities to cancel unnecessary or unutilised road reserves, adding them to the planning area.
4. Undertake design, construction and maintenance operations for unsealed roads and progressively rehabilitate redundant roads.

5. Where appropriate, improve access to services, information and facilities for people with disabilities and emergency services.
6. Assess horseriding, boating and four-wheel-drive activities, taking into account the presence of sensitive sites, other trail users and surrounding access, and discuss proposals with local users. Use this information to either close, relocate, rehabilitate or upgrade trails and/or designate them to departmental requirements.

18. Visitor activities

Day use

A range of day use sites are available in the planning area, and include picnic and barbecue areas, lookouts, interpretive stops, links to recreation trails and nature viewing sites. Future management of such facilities will depend on the types of users, the purpose of the reserve and the sensitivity of the conservation and landscape values.

Surrounding visitor facilities also need to be considered. These include:

- roadhouses, caravan parks and other camp sites
- walking, cycling and horseriding trails
- boat launching facilities
- lookout points
- four-wheel-drive roads and access
- bird hides
- day use areas managed by local government.

Trails

There are a variety of recreational trails in the planning area, including dual use trails in Matilda Bay and Canning River Regional Park that provide valuable access around the river system (Riverpark), low-key trails that lead to bird viewing areas, and bridle trails.

Over time, several trails have developed in areas where they either inadvertently cause harm to the natural environment, or are just not appropriate for the purpose of the reserve. Some trails that traverse through conservation estate are also inappropriately located (for example the 10th Light Horse Bridle Trail is now partly inaccessible because of the opening of the Forrest Highway), poorly signed or in poor condition. Information is available about existing and proposed trails in the planning area and surrounding lands (such as Cutherbert *et al.* 2007; Transplan Pty Ltd *et al.* 2007; Tredwell Management 2008) and that provides a coordinated approach to developing trails for users (such as the WA State Trail Bike Strategy (Trail Bike Management Australia & Motorcycling WA 2008)).

Existing and proposed trail opportunities will be assessed on an as needs basis over the life of the plan (subject to availability of funds) guided by established assessment processes. Future development of any proposed trails will need to be compatible with the key values of the planning area. If new trails are required during the life of the plan, then site specific planning and public consultation will need to be undertaken.

Overnight stays

Yalgorup National Park and Leschenault Peninsula Conservation Park are the only reserves in the planning area with designated camping areas. Martins Tank in Yalgorup National Park is located on the banks of Martin Tank Lake among the tuart and peppermint woodland and provides for small and large group camping. In 2010–11 it was estimated there were 20,990 visits to Martins Tank campground, primarily in summer, during school holidays and over long weekends. Belvidere campground and The Cut in Leschenault Peninsula are located on the estuary. Belvidere is the bigger camp site of the two and provides for small and big groups, as well as pedestrian and cycle access and caravans. It is estimated that in 2010–11 there were 20,170 visits to Belvidere campground. The Cut can be reached by boat, or by walking or cycling on the management access track from Belvidere. Camping fees apply to all sites.

Yalgorup National Park. Photo – Kym Pearce (DPaW)

Informal camping (i.e. no designated sites or facilities) whilst not permitted, does occur in several reserves.

DPaW's Swan Region has prepared a caravanning and camping strategy for the Swan Region (DEC 2012). This identified that Martins Tank campsite in Yalgorup National Park had the potential to be expanded to cater for an increased number of visitors and to provide additional low cost camping and caravanning facilities. This has subsequently been done. The Swan Region are now reviewing this strategy, looking for further opportunities to increase availability and access for low cost camping (pers. comm. E. MacGregor 2013).

Belvidere campground in Leschenault Peninsula Conservation Park has the potential for expansion if required (CALM 1998a). The provision of additional camping grounds, with the potential to offer visitors alternative and varied styles of nature-based camping options, may be considered, as necessary, over the life of this plan.

This draft management plan proposes some improvements to existing recreation facilities and sites, including day use, camping, trails and car parks, as outlined in Table 2.

Table 2 Objectives and proposals for recreation reserves of the planning area

Reserve name; objective/s for visitor activities and use	Proposals
All reserves	Progressively upgrade, replace or remove facilities as determined by visitor risk assessment and/or funding availability. Provide or modify facilities and services as necessary to facilitate comprehensive and integrated interpretation of natural, cultural and historic features. Provide universal visitor access to recreation facilities where possible.
Northern parks and reserves in planning area	
Matilda Bay	
Objective: To continue to ensure a high quality parkland setting that provides for a variety of compatible recreation activities and reflects the mix of Aboriginal and other cultural values, as well as conservation and landscape values that it has known for over 100 years.	Improve car park arrangements for the reserve with a priority on visitor safety. Maintain and upgrade paths and feature points, and provide clear access and signage. Ensure that ongoing maintenance and development at Matilda Bay is consistent with *Architectural design guidelines for developments at Matilda Bay Reserve, Crawley, Western Australia* (DEC & Lawrence Associates Architects 2006). Continue to provide picnic facilities and designated function areas in a well maintained parkland setting. Continue to allow non-commercial events such as weddings with appropriate licences and permits.
Canning River Regional Park	
Objective: To encourage visitor day use while ensuring that the level and type of use is sustainable and that conflict with key values and other park users is minimised.	Implement existing *Recreation master plan* (CALM 1997a) to enable access around the park. Maintain recreation sites at Mason's Landing, Riverton Bridge area, Kent Street Weir-Wilson Park and several smaller sites with provision for parking and passive recreation activities including high quality walking and cycle paths, canoe launches and lookouts. Continue to work with the City of Canning for a cooperative approach to maintenance and development of facilities, sites and information. Continue the use of a sign system with a brand image that is effective in communicating park features, hazards, visitor orientation and information.

Reserve name; objective/s for visitor activities and use	Proposals
Central parks and reserves in the planning area	
Len Howard Conservation Park	
Objective: Encourage appropriate day use that is consistent with the conservation values of the reserve and develop interpretation at key sites.	Upgrade trails that will retain a natural recreation experience particularly near the wetland areas. Upgrade and develop new interpretation facilities. Upgrade and continue to maintain several access points with interpretation, signage and facilities at key sites in the park. Have a high ranger presence.
Yalgorup National Park	
Objective: To provide recreational opportunities in an equitable manner that do not adversely affect the park's values and that promote the understanding, appreciation and awareness of those values.	Maintain and upgrade the major recreation site at Martins Tank, and maintain low- key recreation sites at Tims Thicket, White Hill, Lake Clifton thrombolites, Preston Beach information bay and Lake Hayward. Investigate future development at sites including Whittakers Mill, Lime Kiln and Pink Lake. Investigate and upgrade a network of short and long recreation trails (including bridle trails) and observation points that do not compromise conservation values and that take into consideration recreational use in surrounding reserves. Have a high ranger presence, and use campground hosts and other volunteers to provide interpretation and/or education activities at busy sites during peak season. Monitor the impacts of recreation activities, and identify threats to conservation values, including sensitive dunes, tuarts, plants of conservation significance, wetlands, fringing vegetation and fauna relocation sites and work with the local community and stakeholder groups to mitigate adverse effects or remove the threat.
Southern parks and reserves in the planning area	
Leschenault Peninsula Conservation Park	
Objective: To provide a wide range of nature-based recreational opportunities that will be consistent with protecting the parks natural and cultural values.	Have a high ranger presence with possible provision of interpretation and/or education activities at busy sites during peak season. Monitor the effects of recreation activities and identify threats to conservation values including wetlands areas and fringing vegetation, fauna relocation sites, plants of conservation significance, dunal systems and work with the local community and stakeholder groups to mitigate adverse effects or remove the threat. Continue maintenance of major recreation sites including Belvidere camp site, JB O'Reilly, Buffalo Beach, Tuart Grove and low-key sites at The Cut, and investigate future camping requirements and opportunities.

Campfires

Campfires and firewood collection have detrimental effects on the natural environment, including loss of vegetation cover, soil compaction and the accumulation of ash. Hot ash and coals from beach campfires can be a visitor risk, and campfire escapes are a cause of bushfires. Within the planning area, campfires are only permitted in fire rings located at day use and camp sites in Yalgorup National Park and Leschenault Peninsula, except when fire bans apply.

Water-based activities

Recreational fishing (freshwater and coastal) is generally managed by the Department of Fisheries under the *Fish Resources Act 1994* and is permitted in nature reserves, national parks and conservation parks unless specified. Inappropriate access to fishing sites through reserves managed by the department has occurred. This causes environmental degradation to riverbanks, foreshores and dune systems. Inappropriate access roads will be closed for site rehabilitation with appropriate signage and in consultation with local user groups, local government authorities, subdivision developers and interest groups.

Several canoe trails exist, which pass by the reserves in the planning area in the Canning River, Peel Inlet, and Leschenault Estuary, and users are known to kayak on Goegrup Lake and surrounding lakes. Several canoe launch sites exist within Canning River Regional Park.

Changes in water levels and quality that may be because of climate change (Technical Advisory Panel 2007), reduction in rainfall and/or increased groundwater abstraction (Commander 1988; Barr 2003; Knott *et al.* 2003) must be taken into account when considering the suitability of water-based activities. Any such activities, including swimming, will need to be monitored for impacts to birds and other fauna, and to the riverbanks.

The Department of Transport is responsible for safety and navigation in and on waters in and surrounding the planning area. Currently there is a boat ramp at Matilda Bay for public use, one in Koolijerrunp Nature Reserve (managed by the Shire of Murray) and several boat ramps next to existing reserves such as Goegrup Lake Nature Reserve. Any motorised water-based activities, particularly motorised boats such as water-ski and jet skis, will be allowed in designated areas only.

Domestic animals

Domestic animals are not permitted in nature reserves and are not usually permitted in national parks or conservation parks although, under the CALM Regulations, dogs or horses can be permitted in 'designated areas' where signposted. The exception is guide and hearing dogs for visually and hearing impaired visitors and specially trained dogs for search and rescue operations, which may be allowed in all areas. Within the planning area, some areas consider dog access manageable and/or there has been pre-existing use in those areas.

Domestic dogs are currently permitted on a lead only following walk trails in Matilda Bay, Len Howard Conservation Park and Canning River Regional Park (except in nature reserves or wetland bodies). Dogs are permitted at Buffalo Beach and on the beach below the high water mark in Leschenault Peninsula. Several sites in the planning area such as Tims Thicket in Yalgorup National Park are next to Shire managed reserves where dogs are permitted.

Some reserves in the planning area are fox baited with 1080 several times a year. Where this occurs signage will be installed to notify and warn visitors of the risks to domestic animals. The City of Canning manages a local cat law with cat prohibited areas within Canning River Regional Park.

Desired outcome

A variety of high quality sites, facilities and trails that meet visitor needs and are compatible with key values.

Management Actions

1. Upgrade, maintain or develop recreational facilities including day use, camping, trails and car parks in accordance with this management plan (Table 2) and departmental policy. Rehabilitation and any necessary erosion control works should be considered an integral part of any such developments.
2. Monitor the impacts of, and demand for, recreational activities, and control such activities in consultation with users where the impacts become significant or unacceptable, by using appropriate visitor management techniques.
3. Investigate the current use, safety and conservation implications of the gazetted water ski area in Lake Preston, and, through the Department of Transport, consider revoking the gazettal.
4. Develop and/or implement existing recreation master plans for Yalgorup National Park, Leschenault Peninsula Conservation Park and Canning River Regional Park, in consultation with local users and other key stakeholders, highlighting sensitive areas and appropriate recreation use and considering the surrounding area. Review or develop other site plans before any on-ground implementation to manage specific visitor use issues.
5. Work with key stakeholders to provide other compatible recreation opportunities on areas adjoining or near to the reserves.

19. Visitor interpretation and education

The provision of consistent and accurate information to park and reserve visitors allows managers to communicate the value of these areas and explain how to protect them. The department provides a variety of information about the planning area through a range of media, including signs, information bays, bird hides, printed materials, the department's website, electronic media, social networking and DPaW staff. Information is also available from external sources, especially the tourism industry, conservation groups, volunteers, local governments and tour operators.

The main interpretation sites in the planning area are within:

- Matilda Bay Reserve
- Canning River Regional Park
- Len Howard Conservation Park
- Yalgorup National Park
- Leschenault Peninsula Conservation Park.

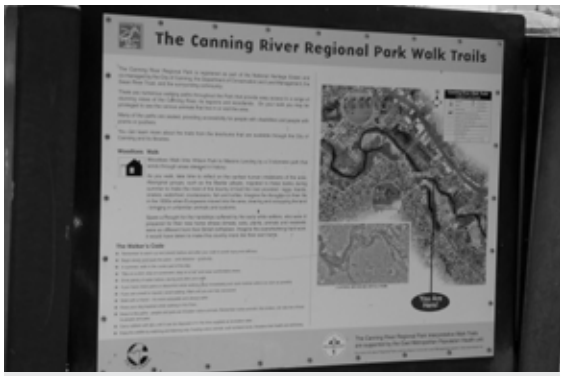
Interpretive themes in some nature reserves include the conservation values for the area and how to protect these values. It is important that with increased pressure on reserves from rising visitation and urban development, the department works with local government, developers and the local community to develop information and interpretation conveying the appropriate use of reserves, code of conduct in conservation estate and the conservation values to be protected.

Primary interpretive themes expressed within the planning area are:

- landscapes and wetlands
- ecology (relating to wetlands and waterways, flora and fauna of an area)
- biodiversity (bioregions and threatened or restricted habitats)
- people (Aboriginal heritage, early explorers and settlers and the Swan Coastal Plain today)
- altered landscapes (catchment management, remnant bushland, introduced species and impacts)
- recreation (activities and sites available, code of conduct appropriate for activities and reserves).

Education programs, including presentations and organised field activities, are targeted at specific user groups to foster greater awareness, appreciation and understanding of the area's key values. The planning area provides a base for a range of opportunities for education programs for schools, and the department often liaises with local schools.

There are education centres in several locations surrounding the reserves in the planning area. The Canning River Eco Education Centre was opened in June 2008. Its aim is to increase awareness and understanding of the Canning River and surroundings by running environmental education programs in schools. It also provides resources for classes, workshops and community development for local community groups and corporate organisations.



Signs at Canning River Regional Park. Photo – DPaW

Interpretation explaining conservation values at Brixton St Wetland Nature Reserve. Photo – DPaW

Desired outcome

Increase visitor appreciation and awareness of natural and cultural values.

Objective

Provide a range of interpretive sites and mediums with up to date information on natural and cultural values.

Management actions

1. Provide, through partnerships and sponsorships where appropriate, quality information, interpretation and educational opportunities for visitors to increase their understanding and appreciation of:
   a) the key values of the area
   b) management issues, such as appropriate visitor activities, behaviour, access and visitor safety
   c) tuart woodlands
   d) internationally important wetland ecosystems
   e) Noongar cultural values
   f) other heritage of the planning area.
2. Involve Noongar people in the development of visitor information and education opportunities.
3. Develop interpretation and communication plans for key sites.
4. Continue to maintain and upgrade interpretation facilities and directional signage, ensuring an accurate reflection of information and in conjunction with key stakeholders.

Key performance indicator

Performance measure	Target	Reporting requirement
Provision of up to date interpretive information	A range of interpretive sites and mediums are provided	Every five years

20. Tourism and commercial operations

Commercial concessions, such as leases and licences for commercial tourism operations, allow private businesses to offer high quality tourism and recreation opportunities, and facilities and services to the public. This can assist the department in providing quality visitor experiences within the planning area. Commercial concessions are granted in consultation with the Conservation Commission, and must be consistent with the varying purposes of reserves in the planning area, the protection of key values and with the objectives of this draft management plan.

Licences allow tourist operators to enter and use DPaW-managed lands and waters. Three reserves in the planning area have licenced tour operations. Currently, there are three 'T class" commercial tour operators (CTOs) that possess licences to conduct activities at Matilda Bay, such as catering and wedding functions. In Yalgorup National Park, 57 'T class' CTO licences are current for operators to conduct activities such as guided walks, wildlife watching and vehicle-based tours. While current use of Yalgorup National Park by CTOs is low (pers. comm. A. Wright 2011), opportunities may increase during the life of this plan. In Leschenault Peninsula 54 'T class' CTO licences are current, although activity here is also thought to be low (pers. comm. L. Price 2011).

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. There are two reserves in the planning area that have formal lease agreements. Keanes Point Reserve is leased to the Royal Freshwater Bay Yacht Club and Matilda Bay Reserve has nine leases which include a restaurant, kiosk, water sports complex, clubhouses and a power cabling easement. It is likely that the majority of these leases will continue throughout the life of the plan, with any further proposals having a strong relevance to the historical or cultural aspects of the reserve.

Old and disused facilities owned by the Bunbury Waterski Club exist on reserve 34745 under an expired lease. This reserve is vested in the Shire of Harvey. However, it is proposed that it become incorporated into Yalgorup National Park and vested in the Conservation Commission. The site is likely to be contaminated with materials such as asbestos. The department will encourage the removal of these facilities before incorporation into the conservation estate.

Desired outcome

Commercial tourism activities are compatible with management objectives and the range of services and experiences available are extended by the involvement of private enterprise.

Management actions

1. Evaluate proposals for licences and commercial tourism leases according to departmental policy (DEC 2006).
2. Ensure that all commercial operations operate under a lease, licence or permit agreement with appropriate conditions, including the provision of information, to enable an assessment to be made of the activity, and monitor compliance with general conditions.
3. Investigate opportunities for partnerships with commercial operators to provide built accommodation and camping within the planning area, as deemed necessary and appropriate.

Managing resource use

21. Resource exploration and development

Exploration, extraction and rehabilitation activities are approved and largely governed by other government agencies under legislation such as the *Environmental Protection Act 1986* (Environmental Protection Act), *Mining Act 1978* (Mining Act) and state agreements. Petroleum (which includes oil, gas and geothermal energy) exploration and production within state land and onshore waters is authorised under the *Petroleum and Geothermal Energy Resources Act 1967* (Petroleum Act). This Act may soon be amended to also cover the geological storage of greenhouse gases. The Department of Mines and Petroleum (DMP) is the state's lead agency for related assessment and approvals under the Mining and Petroleum Acts and is a decision making authority for non-state agreement Act projects.

A broad range of mineral commodities occur in the southern part of the Swan Coastal Plain, and the whole of the underlying Perth Basin is a potential source of petroleum resources and geothermal energy. The area is also prospective for geological storage of greenhouse gases.

Tenement applications to explore or mine reserves vested in the Conservation Commission will be referred to the Minister for Environment, and proposals referred to the EPA, as required under environmental, mining and petroleum legislation.

22. Basic raw materials

This section discusses activities associated with extraction of basic raw materials that are not covered and approved under the Mining Act. Basic raw materials such as gravel, shale, clay, sand, limestone and rock continue to be in demand by local governments and Main Roads Western Australia for maintenance of roads. DPaW also uses basic raw materials for its own purposes in recreation and management activities.

The determination of raw material needs from within the planning area should be assessed within the framework of Western Australia's *State Gravel Supply Strategy* (Main Roads WA 1998), developed to prevent a shortage of gravel and other road building materials needed for construction and maintenance of the state's roads. The extraction of raw materials can result in the loss of vegetation and the introduction and spread of dieback and weeds, as well as having visual impacts.

Lime sand is extracted adjacent to Yalgorup National Park from a 'level 1' inert waste landfill and lime extraction area north of the park.

Access to basic raw materials from land vested in the Conservation Commission by local government authorities will only be supported:

- where the road or facility to be constructed is adjacent to, and/or within, the boundaries of such land
- where the use of that basic raw material supports the protection and management of that land
- provided that a more environmentally acceptable alternative is not available.

Even if these conditions are met, this use still requires authorisation under relevant legislation such as the *Land Administration Act 1997*.

Access to basic raw material for commercial purposes under the Mining Act will generally not be supported.

23. Public utilities and services

Infrastructure such as electricity, water, gas and telecommunication lines are placed on road reserves, easements or underground in the planning area.

Rubbish bins are located on some reserves. The collection of waste is the responsibility of either the department or local government authority. The visual impact of any infrastructure or facilities should be carefully considered, along with issues such as erosion.

Utility providers need permission from the relevant District Manager for access to DPaW-managed land. This permission will include conditions of entry and operation for the maintenance of infrastructure, including during emergencies.

The siting of utilities and the conduct of maintenance must consider sensitive sites such as threatened ecological communities and rare flora. Access, particularly in low lying wetlands, can lead to the spread of weeds and disease. Appropriate hygiene practices must be employed.

Storm outlets and drains are present in Canning River Regional Park. These need to be managed both for their aesthetics and their potential impacts on water quality. The City of Canning and the Water Corporation have upgraded outfalls in the park in accordance with water sensitive urban design principals and best practice.

24. Forest produce

Forest produce may be generated in accordance with licences issued under section 99A(1) of the CALM Act for (i) use for therapeutic, scientific or horticultural purposes, (ii) essential works, and (iii) the taking or removal of exotic trees (for example *Pinus*), honey, beeswax or pollen (by apiary site permit).

Firewood collection, and the extraction and sale of craftwood from national parks and nature reserves, is not permitted.

Under section 33(1)(cb) of the CALM Act, forest produce obtained as a by-product of necessary operations (on nature reserves) or compatible operations (on national parks or conservation parks) can be used for making improvements to the land, where it is consistent with the reserve purpose. Forest produce obtained in this manner may be used by the department for management purposes.

25. Water resources

The main state legislation that governs water resource management is the *Rights in Water and Irrigation Act 1914* (RIWI Act) which is administered by DoW. A licence issued by DoW is the main regulatory instrument governing the extraction of both surface and groundwater. Each licence defines an annual right to take water (an individual annual entitlement or allocation) and sets conditions that apply to the allocation. The RIWI Act also requires that water be set aside to sustain the environment.

DoW prepares water allocation plans which state how much water can be taken for consumptive use, while leaving sufficient in the environment to meet in situ ecological and recreational or cultural needs. These plans, along with source protection plans, prepared by DoW and the Water Corporation, include objectives and policies that DPaW takes into account when planning at strategic and operational levels. Permits (related to the disturbance of beds and banks) and licences (for the taking and use of water) are required within proclaimed areas. The protection of water resources in the planning area is covered under the *Country Areas Water Supply Act 1947* and the *Metropolitan Water Supply Sewerage and Drainage Act 1909*. For further information on water allocation plans see www.water.wa.gov.au/Managing+water/Allocation+planning/default.aspx.

The primary role of DPaW in this aspect of water resource management is to provide input and advice into the licensing process regarding potential environmental risks associated with the taking of water from land vested in the Conservation Commission. This occurs through the environmental impact assessment process via advice to the Conservation Commission and the EPA. On lands vested in the Conservation Commission, the Department-issued CALM Act section 101 permit is considered a precursor to a RIWI Act process, and DPaW is required to consult the Conservation Commission.

Under the *Waterways Conservation Act 1976*, which focuses principally on estuarine waterways, the ability to construct infrastructure, such as jetties, can be controlled by the issue of permits. Under this Act, the responsible minister can also use a licensing system to control the disposal of material into waterways.

The Preston Beach Water Reserve, located in part of the proposed Yalgorup National Park, is the only public drinking water supply in the planning area (DoW 2006). DoW requires access to these water source areas to conduct investigations into alternative water supplies, and to surface, ground and meteorological monitoring sites in the planning area for data collection and asset maintenance.

There are several bores and stream gauging stations maintained by DPaW and DoW either in, or next to, the planning area, which are used for research and monitoring purposes. Also, DPaW uses water points located throughout the planning area for fire fighting, and these will continue to be maintained.

Ground and surface water levels may be lowered by the use of licensed and unlicensed bores in urban areas, which in turn influences the volume of water in wetlands in the area. Water abstraction and/or extraction may need to be restricted in areas near the planning area to maintain the integrity of the lakes and wetlands (for example, Lake Clifton), and to maintain the 'filter strips' of fringing vegetation around the lakes.

26. Beekeeping

There are 17 formalised current or available apiary sites on existing or proposed reserves in the planning area (within conservation reserves or within a two kilometre radius). No new apiary site permits will be issued within the planning area. Existing sites will be reviewed during the life of this plan in accordance with the department's *Policy statement No. 41: Beekeeping on public land* (CALM 1992b).

Desired outcome

Impacts of resource use on key values are minimised.

Management actions

1. Make submissions in relation to development proposals (including proposals for infrastructure development, extraction of minerals and petroleum resources, development of geothermal energy and the geological storage of greenhouse gases) that have been forwarded to DPaW for comment or advice, with a view to:
   a) minimising the permanent loss of native vegetation and/or damage to its integrity as a result of development
   b) seeking the replacement of native ecosystems permanently lost to development, in line with the *WA Environmental offsets policy* (Government of WA 2011)
   c) promoting the construction of infrastructure such as roads, pipelines and other utilities at common locations, such as infrastructure corridors, while minimising construction in sensitive areas.
2. Liaise with the Department of Mines and Petroleum and the Department of State Development to assess the effects of proposed resource use on important areas such as habitats for threatened species and key recreation sites, referring proposals to the EPA where necessary or appropriate.
3. Monitor compliance with conditions and management plans to ensure that any impacts from resource

use are within predicted and approved limits, and seek appropriate offsets to fully address any loss of biodiversity values.

4. The Department of Parks and Wildlife will seek to ensure that all basic raw material removals from lands vested in the Conservation Commission:
   a) comply with relevant legislation, policies and guidelines, which will be reviewed
   b) contribute to the ongoing implementation of the *State gravel supply strategy* (Main Roads WA 1998).
5. Encourage resource users to be responsible for managing environmental problems, particularly the introduction and spread of weeds and disease.
6. Recognise the continued need for access by agencies and utility managers to DPaW-managed lands for the maintenance of existing assets, whilst encouraging future placement of utilities to be off department land.
7. Permit the removal of forest produce only where it is consistent with the CALM Act and where a licence is granted by the Director General (i) for therapeutic, scientific or horticultural purposes, (ii) because of essential works, or (iii) because of the removal of exotic trees.
8. Ensure that procedures for necessary and compatible operations on DPaW-managed lands reflect best practice.
9. Liaise with the Department of Water and adjacent land managers about the management of water resources to ensure that sufficient environmental flows are maintained for rivers and wetlands in the planning area, and to ensure that adverse environmental effects are minimised.
10. Control feral bees within the planning area where practicable.

Involving the community

Community involvement and partnerships are an integral part of the department's operations, including the development and implementation of this draft management plan. A key objective for the department is to develop community awareness and appreciation of the state's natural environment and biodiversity, and to promote community involvement in, and support for, its protection and conservation.

27. Community involvement and support

The community has been involved in the preparation of this draft management plan and many community groups and members have provided advice on issues throughout the planning process.

DPaW recognises the ongoing connection of Aboriginal people to the land in the planning area and encourages Aboriginal people to continue to use the land for cultural and recreational purposes. Recent changes to the CALM Act now recognise the right of Aboriginal people to use the land to conduct customary activities (subject to regulation) such as ceremonies and collecting bush tucker. These changes also make possible joint management of parts of the planning area. DPaW looks forward to working with registered native title claimants and other Aboriginal people to care for the country in the planning area and to protect and promote Aboriginal culture and heritage.

Ongoing community support is essential for the successful implementation of this draft management plan. Reserves within the Swan Coastal Plain provide many opportunities for community members to take part in volunteer activities such as:

- track maintenance, including 'adopt-a-track' programs
- input into visitor planning
- campground hosting
- vegetation rehabilitation and weed removal
- fauna surveys.

Members of Birds Australia mist netting for migratory birds. Photo – Paul Tholen (DPaW)

Volunteer activities increase the department's work capabilities and skills base and are a valuable asset to the management of reserves. They also foster communication links, community ownership, sense of place and understanding with the community.

28. Off-reserve management and partnerships

Principles for effective neighbour relations are described in the department's *Good neighbour policy* (DEC 2007b). It is important for fostering partnerships with the community that these principles be followed when managing the planning area. Management objectives for this plan cannot be achieved in isolation, as lands of varying tenure adjoin the planning area. In particular, the following activities need to be approached from the broader integrated land management perspective to achieve the management objectives for the planning area:

- catchment protection and water quality
- invasive species control
- threatened species protection
- visitor and fire management.

The department works with other land management agencies, neighbouring landholders and the local community to achieve effective and coordinated management of cross-boundary issues. DPaW also liaises with the federal Department of Sustainability, Environment, Water, Population and Communities, which is responsible for the management of Ramsar wetlands, migratory bird species and threatened plants and animals listed under the EPBC Act.

Several state government agencies have responsibilities for, or provide advice on, land use practices within the vicinity of the planning area, including:

- declared pest animals and plants (Department of Agriculture and Food)
- drainage and water resource use (Department of Water)
- management of the Swan Canning River system (Swan River Trust).

Liaison with the local government authorities is especially important, given that local government:

- broadly represents the views of the communities within their jurisdiction
- is able to encourage planning and land management practices that complement management of the planning area
- along with local bushfire brigades and volunteers, works with the department to provide cooperative and coordinated fire fighting on or near DPaW-managed land
- shares responsibilities in the provision and maintenance of the public road network.

The planning area lies within the management regions of both the Swan and South West natural resource management groups which, in partnership with governments, Aboriginal groups, land managers and community groups, help deliver federal government conservation funding programs. Effective partnerships and financial grants from this initiative, such as GeoCatch (covering the Geographe Bay Catchment (<www.geocatch.asn.au>), contribute significantly towards the management of the planning area.

Many threatened fauna species such as Carnaby's cockatoo and the forest red-tailed black cockatoo are highly mobile and often travel across tenures in search of food, shelter or social interaction, and

Rehabilitation in the Peel area. Photo – Melissa Mazzella (DPaW)

often occur outside DPaW-managed lands. Liaison with landholders will be important in implementing recovery actions for these species, particularly in increasing awareness about threatened species and providing information on actions that landholders can undertake to help in the recovery effort.

A range of covenant and voluntary management schemes (for example the department's Nature Conservation Covenant and Land for Wildlife schemes) have properties that are adjacent to the planning area. These, along with the National Trust conservation covenant schemes, offer protection and linkage benefits for natural values as well as provide support and advice for landholders.

Desired outcome

Community involvement and support benefits planning and management of the planning area.

Management actions

1. Create opportunities for Aboriginal people to be involved in the management of the planning area.
2. Liaise with neighbours, local authorities, relevant agencies and other stakeholders to facilitate off-reserve conservation and the effective, coordinated management of cross-boundary issues.
3. Continue to provide and promote opportunities for volunteer and community involvement in management of the planning area, including community members who have a particular interest in Ramsar wetlands and/or may be affected by the management of the wetlands.
4. Continue to administer the Canning River Regional Park Community Advisory Committee.
5. Continue to contribute towards DPaW's volunteer database.
6. Consider seeking corporate sponsorship and other innovate funding arrangements for the planning area.

Research and monitoring

Research and monitoring will assist in achieving the key performance indicators listed in this plan. This includes gaining a better understanding of those values identified as being most at risk and the threats most likely to have adverse impacts on key values. The plan allows for the adaptation of management in light of new knowledge arising from research and monitoring by regularly reviewing management activities.

Research and monitoring projects should evaluate the effectiveness of management practices in protecting key values and should give priority to areas where:

- the quality of base data is the poorest
- understanding of the effect of management actions is poorest
- there have been unanticipated changes in factors affecting the planning area, such as access or adjacent land uses
- the rates of resource or social change are the highest.

Broad direction for research and monitoring in the planning area is provided by the department's Science Division in *A strategic plan for biodiversity conservation research 2008–2017* (DEC 2008b) as well as species recovery plans, floristic reports and research priorities set by the Centre of Excellence for Climate Change Woodland and Forest Health, based at Murdoch University (which now coordinates the Tuart Health Response Group). The *Ecological character description for the Peel–Yalgorup Ramsar site* (Hale & Butcher 2007) and the *Ecological character description for the Vasse–Wonnerup Ramsar site* (WRM 2007) provide direction for reducing knowledge gaps and highlight the monitoring priorities for the respective wetlands.

Research also includes social research, which contributes to an understanding of people's attitudes and behaviours towards the environment and how they interact with it. It can also help in better understanding issues related to DPaW programs, improve decision making and the effective and timely delivery of services. It is important that surveys are periodically conducted throughout the planning area, targeting high use areas and areas of interest.

Desired outcome

Knowledge and understanding of the values and threats to the planning area is increased in order to inform management and allow assessment of the key performance indicators in this draft management plan.

Management actions

1. Develop and implement an integrated program of survey, research and monitoring aimed at:
   a) collecting evidence to allow reporting on key performance indicators
   b) establishing baseline information
   c) other department research priorities.
2. Incorporate research and monitoring findings into interpretive and educational material where appropriate.
3. Encourage and support volunteers, educational institutions and other organisations where their research contributes directly to relevant strategies or the implementation and assessment of this draft management plan.
4. Adapt management according to research outcomes, including the assessment of ecosystem rehabilitation and experimental trials.

DPaW staff monitoring for birds in Kooljerrenup National Reserve. Photo - Melissa Mazzella (DPaW)

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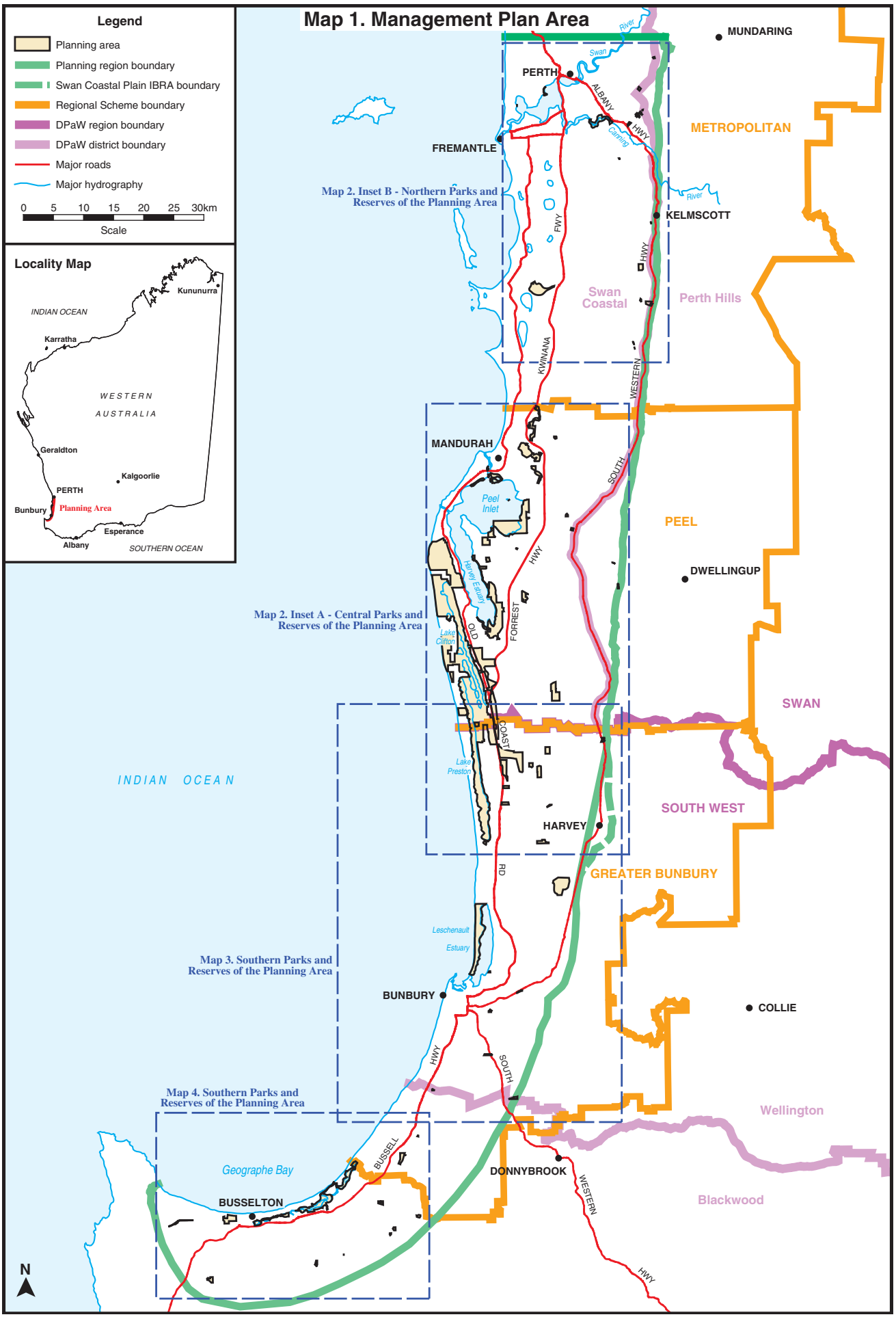
C. Olejnik (2011) – District Nature Conservation Coordinator, Swan Coastal District, Department of Parks and Wildlife ;

L. Price (2011) – District Parks and Visitor Services Coordinator, Wellington District, Department of Parks and Wildlife;

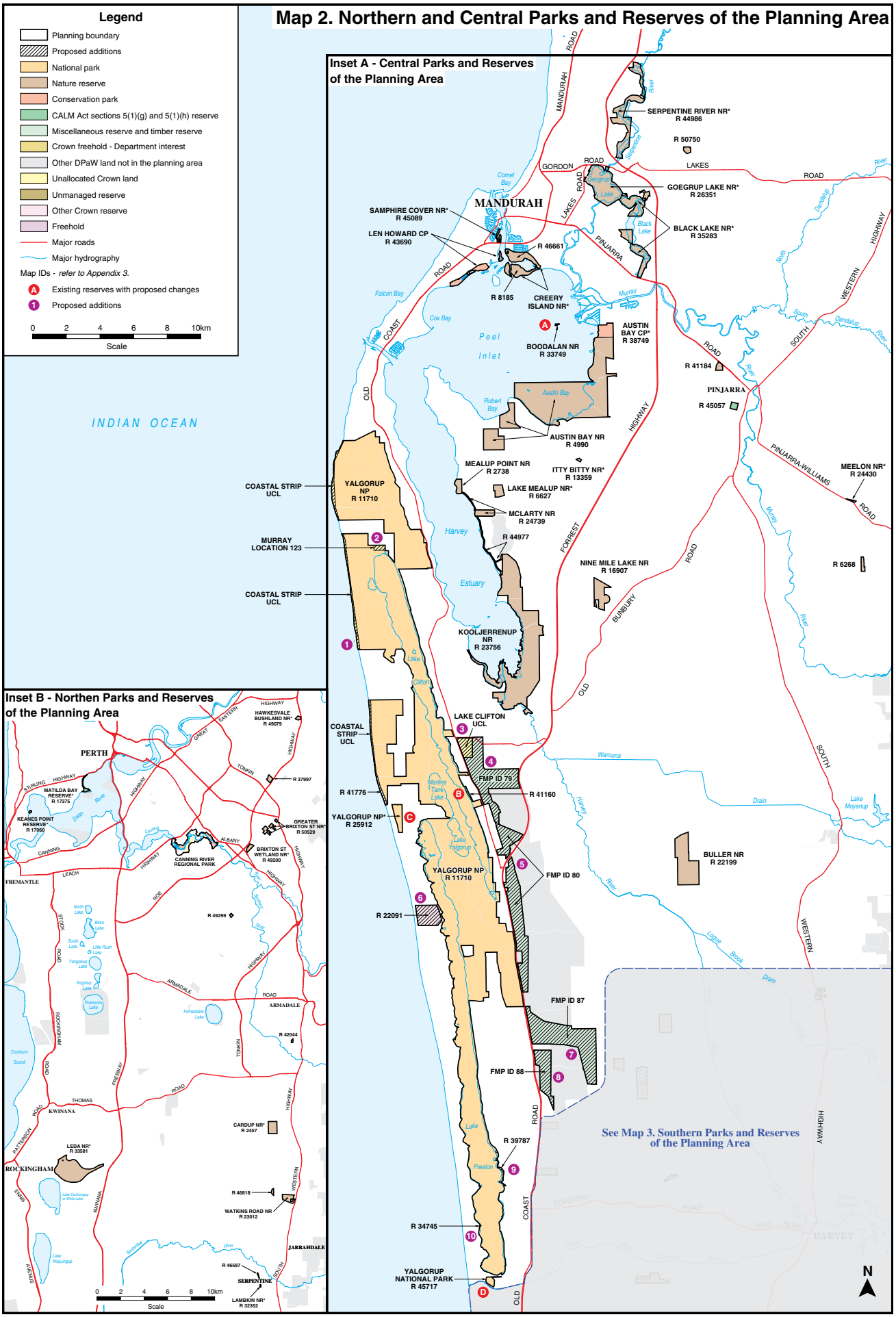
V. English (2012) – Principal Ecologist, Department of Parks and Wildlife;

E. MacGregor (2013) – Regional Leader Parks and Visitor Services, Swan Region, Department of Parks and Wildlife.

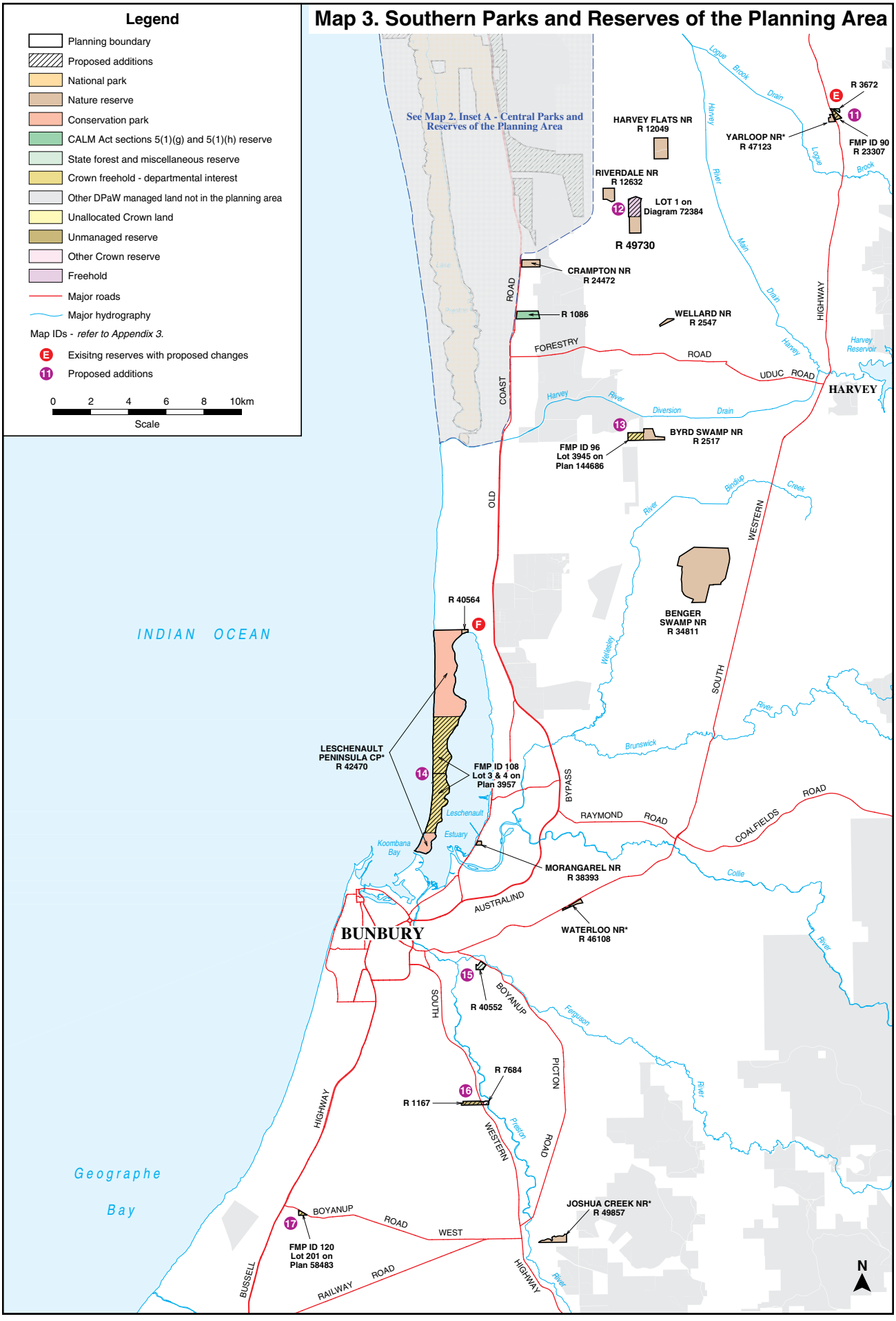
Map 1: Management Plan Area



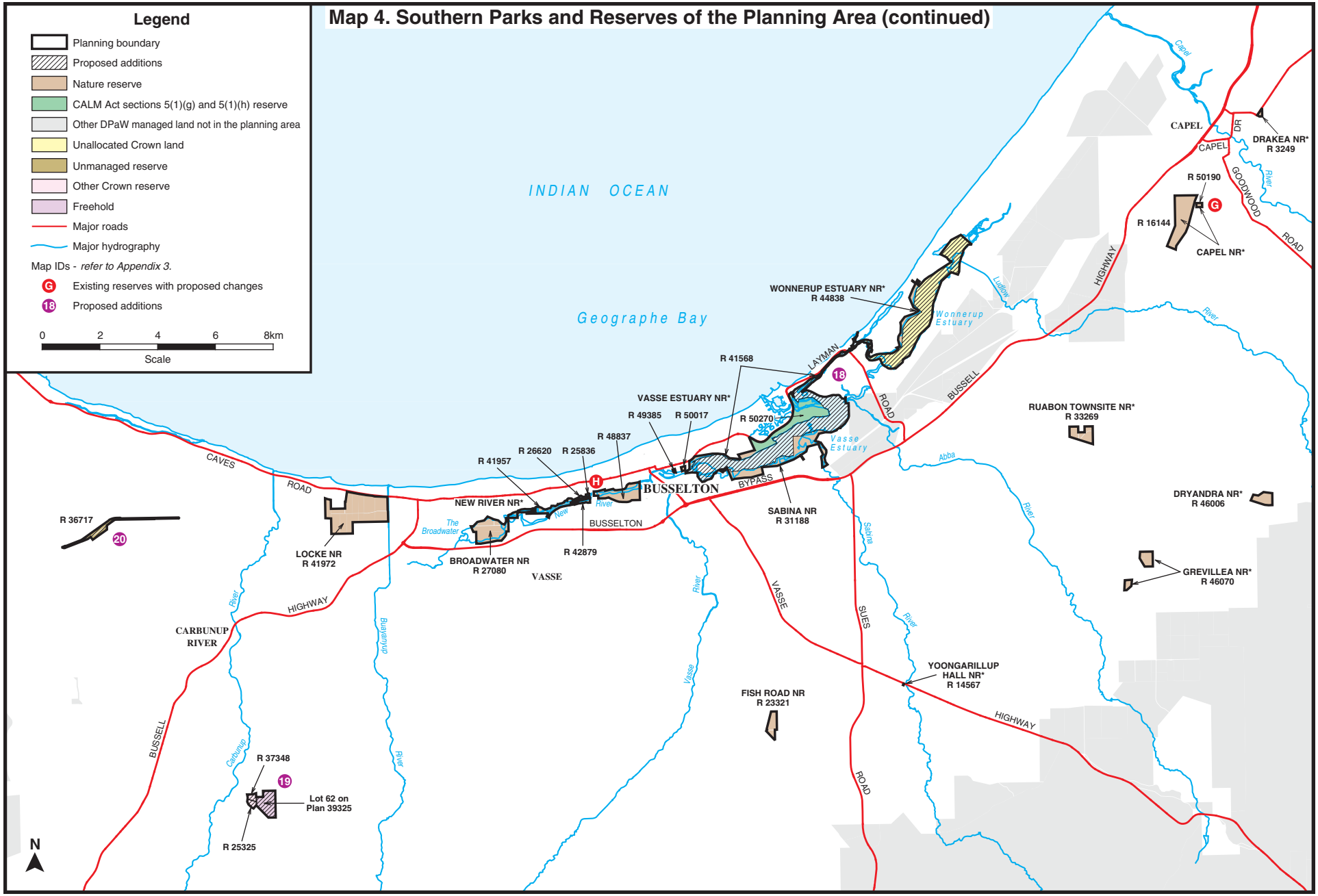
Map 2: Northern and Central parks and reserves of the planning area



Map 3: Southern parks and reserves of the planning area



Map 4: Southern parks and reserves of the planning area (cont)



Appendices

Appendix 1: Existing conservation estate within the planning area

Reserve name / tenure	Reserve number	Purpose	Class	Area (ha)#	Comments
Northern parks and reserves in planning area					
Brixton St Wetland Nature Reserve*	R 49200	Conservation of flora and fauna	A	20	Also known as Kenwick Wetlands
Canning River Regional Park	R 28740	Conservation park	C	2	For detail see Appendix 2
Canning River Regional Park	R 47244	Conservation park	C	1	
Canning River Regional Park (nature reserve)	R 49362	Conservation of flora and fauna	C	15	
Canning River Regional Park	R 49363	Conservation park	C	50	
Cardup Nature Reserve*	R 2457	Conservation of flora and fauna	A	75	
Hawkevale Bushland Nature Reserve*	R 49079	Conservation of flora and fauna	A	10	
Greater Brixton St Nature Reserve*	R 50529	Conservation of flora and fauna	A	40	Also known as Kenwick Wetlands
Keanes Point Reserve (5(1)(g) reserve)*	R 17060	Recreation and purposes incidental thereto	A	2	
Lambkin Nature Reserve*	R 32352	Conservation of flora and fauna	C	2	
Leda Nature Reserve*	R 33581	Conservation of flora and fauna	A	440	
Matilda Bay Reserve (5(1)(g) reserve)*	R 17375	Recreation	A	20	
Un-named nature reserve	R 37997	Conservation of flora and fauna	A	20	
Un-named nature reserve	R 42044	Conservation of flora and fauna	C	4	
Un-named nature reserve	R 46818	Conservation of flora and fauna	A	8	
Un-named nature reserve	R 46587	Conservation of flora and fauna	C	2	
Un-named nature reserve	R 49299	Conservation of flora and fauna	A	5	
Watkins Road Nature Reserve*	R 23012	Conservation of flora and fauna	C	55	
Central parks and reserves in planning area					
Austin Bay Nature Reserve	R 4990	Conservation of flora and fauna	A	1660	Change name to Austin Bay/ Carrabungup Nature Reserve
Austin Bay Conservation Park*	R 38749	Conservation park	C	70	
Black Lake Nature Reserve*	R 35283	Conservation of flora and fauna	C	270	

Reserve name / tenure	Reserve number	Purpose	Class	Area (ha)#	Comments
Boodalan Nature Reserve	R 33749	Recreation and conservation of fauna	C	1	See Appendix 3 for proposed changes
Buller Nature Reserve	R 22199	Conservation of flora and fauna	A	300	
Creery Island Nature Reserve*	R 8185	Conservation of flora and fauna	A	75	
Creery Wetland Nature Reserve*	R 46661	Conservation of flora and fauna	A	95	
Goegrup Lake Nature Reserve*	R 26351	Conservation of flora and fauna	C	320	
Itty Bitty Nature Reserve*	R 13359	Conservation of flora and fauna	A	3	
Kooljerrenup Nature Reserve	R 23756	Conservation of flora and fauna	A	1240	
Lake Mealup Nature Reserve*	R 6627	Conservation of flora and fauna	A	35	
Len Howard Conservation Park	R 43690	Conservation park	A	65	
McLarty Nature Reserve	R 24739	Conservation of flora and fauna	A	50	
Mealup Point Nature Reserve	R 2738	Conservation of flora and fauna	A	30	
Meelon Nature Reserve*	R 24430	Conservation of flora and fauna	A	3	
Nine Mile Lake Nature Reserve	R 16907	Conservation of flora and fauna	A	115	
Serpentine River Nature Reserve*	R 44986	Conservation of flora and fauna	A	260	
Samphire Cover Nature Reserve*	R 45089	Conservation of flora and fauna	A	10	
Un-named 5(1)(g) reserve	R 41160	Foreshore management	C	7	See Appendix 3 for proposed changes
Un-named 5(1)(g) reserve	R 45057	Conservation and the protection of Aboriginal heritage and culture	C	15	
Un-named nature reserve	R 6268	Conservation of flora and fauna	C	15	
Un-named nature reserve	R 41184	Conservation of flora and fauna	A	15	
Un-named nature reserve	R 44977	Conservation of flora and fauna	A	25	
Un-named nature reserve	R 50750	Conservation of flora and fauna	C	15	
Yalgorup National Park	R 11710	National park	A	13,050	
Yalgorup National Park*	R 25912	National park and propagation and harvesting of marram grass	C	65	See Appendix 3 for proposed changes
Yalgorup National Park*	R 45717	National park	A	20	See Appendix 3 for proposed changes
Southern parks and reserves in planning area					
Benger Swamp Nature Reserve	R 34811	Conservation of flora and fauna	C	580	
Broadwater Nature Reserve	R 27080	Conservation of flora and fauna	C	80	
Byrd Swamp Nature Reserve*	R 2517	Conservation of flora and fauna	A	40	
Capel Nature Reserve	R 16144	Conservation of flora and fauna	A	95	
Capel Nature Reserve*	R 50190	Conservation of flora and fauna	C	3	See Appendix 3 for proposed changes
Crampton Nature Reserve	R 24472	Conservation of flora and fauna	A	35	
Drakea Nature Reserve*	R 3249	Conservation of flora and fauna	A	3	

Reserve name / tenure	Reserve number	Purpose	Class	Area (ha)#	Comments
Dryandra Nature Reserve*	R 46006	Conservation of flora and fauna	A	25	
Fish Road Nature Reserve	R 23321	Conservation of flora and fauna	C	25	
Oats Road Nature Reserve*	R 46070	Conservation of flora and fauna	A	30	
Harvey Flats Nature Reserve	R 12049	Conservation of flora and fauna and water	A	80	
Joshua Brook Nature Reserve*	R 49857	Conservation of flora and fauna	C	35	
Leschenault Peninsula Conservation Park*	R 42470	Conservation park	A	580	
Locke Nature Reserve	R 41972	Conservation of flora and fauna	C	200	
Morangarel Nature Reserve	R 38393	Conservation of flora and fauna	A	5	
New River Nature Reserve*	R 25836	Conservation of flora and fauna	C	1	See Appendix 3 for proposed changes
New River Nature Reserve*	R 26620	Conservation of flora and fauna	C	5	See Appendix 3 for proposed changes
New River Nature Reserve*	R 41597	Conservation of flora and fauna	C	30	
New River Nature Reserve*	R 42879	Conservation of flora and fauna	C	5	See Appendix 3 for proposed changes
New River Nature Reserve*	R 48837	Conservation of flora and fauna	C	65	See Appendix 3 for proposed changes
Riverdale Nature Reserve	R 12632	Conservation of flora and fauna and water	A	40	
Ruabon Townsite Nature Reserve*	R 33269	Conservation of flora and fauna	C	35	
Sabina Nature Reserve	R 31188	Conservation of flora and fauna	A	103	
Un-named 5(1)(h) reserve	R 1086	Tuart conservation and restoration	C	50	
Un-named 5 (1) (h) reserve	R 50270	Conservation	C	120	
Un-named 5(1)(g) reserve	R 3672	Timber	C	3	See Appendix 3 for proposed changes
Un-named nature reserve	R 49730	Conservation of flora and fauna	A	50	
Un-named nature reserve	R 40564	Conservation of flora and fauna	C	5	See Appendix 3 for proposed changes
Wonnerup Nature Reserve*	R 41568	Conservation of flora and fauna	C	25	
Wellard Nature Reserve*	R 2547	Conservation of flora and fauna	A	10	
Wonnerup Estuary Nature Reserve*	R 44838	Conservation of flora and fauna	C	30	
Vasse Estuary Nature Reserve*	R 49385	Conservation of flora and fauna	C	1	
Vasse Estuary Nature Reserve*	R 50017	Conservation of flora and fauna	A	1	
Waterloo Nature Reserve*	R 46108	Conservation of flora and fauna	C	10	
Yarloop Nature Reserve*	R 47123	Conservation of flora and fauna	A	9	
Yoongarillup Hall Nature Reserve*	R 14567	Conservation of flora and fauna	C	1	Also known as Spanish Settlers

*Provisional name #Approximate area

Appendix 2: Canning River Regional Park revised planning areas

Planning area	Proposed reserve purpose	Proposed vested authority
Area 1	Recreation and natural environment uses	City of Canning
Area 2	Recreation and natural environment uses	City of Canning
Area 3	Conservation park	DPaW
Area 4	Recreation and natural environment uses	City of Canning
Area 5	Recreation and natural environment uses	City of Canning
Area 6	Conservation park	DPaW
Area 7	Public recreation	City of Canning
Area 8	Recreation and natural environment uses	City of Canning
Area 9	Conservation park	DPaW
Area 10	Conservation park	DPaW
Area 11	Recreation	City of Canning
Area 11a	Conservation park	City of Canning
Area 12	Conservation park	DPaW
Area 13	Recreation and natural environment uses	City of Canning
Area 14	Conservation park	DPaW
Area 15	Heritage uses	City of Canning
Area 16	Conservation park	DPaW
Area 17	Conservation park	DPaW
Area 18	Recreation	City of Canning
Area 19	Conservation park	DPaW
Area 20	Recreation and natural environment uses	City of Canning
Area 21	Conservation park	City of Canning
Area 22	Conservation park	DPaW
Area 23	Recreation and natural environment uses	City of Canning
Area 24	Recreation and natural environment uses	City of Canning
Area 25	Conservation of flora and fauna	DPaW

Appendix 3: Proposed changes to the planning area

Map ID	Reserve number	Current vesting	Current purpose	Area (ha)*	Proposed purpose	Class	Proposed changes and reasons for inclusion
EXISTING RESERVES							
A	R 33749 Boodalan Nature Reserve	Conservation Commission and Shire of Murray	Recreation and conservation of fauna	1	Conservation of flora and fauna	C	Delist/abolish this nature reserve if the proposed investigation finds that it no longer serves its current purpose
B	R 41160 Un-named 5(1)(g) reserve	Conservation Commission	Foreshore management	8	National park	A	Incorporate into R 11710 Yalgorup National Park and change purpose to national park
C	R 25912	Conservation Commission	National park and propagation and harvesting of marram grass	65	National park	C	Investigate inclusion into R11710 and change purpose to national park
D	R 45717	Conservation Commission	National park	20	National park	A	Incorporate into Yalgorup National Park R11710
E	R 3672 Un-named 5(1)(g) reserve	Conservation Commission	Timber	3	Conservation of flora and fauna	C	Incorporate into Yarloop Nature Reserve R47123
F	R 40564	Conservation Commission	Conservation of flora and fauna	6	Conservation park	A	Incorporate into Leschenault Peninsula Conservation Park R42470
G	R 50190	Conservation Commission	Conservation of flora and fauna	3	Conservation of flora and fauna	A	Incorporate into Capel Nature Reserve R16144
H	R 25836 R 26620 R42879 R 48837	Conservation Commission	Conservation of flora and fauna	1 3 6 65	Conservation of flora and fauna	C	Incorporate into R41597

Map ID	Reserve number	Current vesting	Current purpose	Area (ha)*	Proposed purpose	Class	Proposed changes and reasons for inclusion
PROPOSED ADDITIONS							
1	Coastal strip to low water mark	Unallocated crown land	N/A	180	National park	A	Addition to Yalgorup National Park (R11710) as recommended in the Yalgorup National Park Management Plan 1995–2005 (CALM 1995) to rationalise boundaries
	Parts of R41776	Shire of Waroona	Recreation and the protection of the environment	20			
2	Murray location 123	Unallocated crown land	N/A	20	National park		Addition to Yalgorup National Park (R11710) as part of a land exchanged in 1992
3	Lake Clifton townsite	Unallocated crown land	N/A	80	National park	A	Addition to Yalgorup National Park (R11710) as recommended in the Yalgorup National Park Management Plan 1995–2005 (CALM 1995)
4	FMP ID 79 (part of Myalup State Forest No. 16)	Conservation Commission	State forest	560	National park	A	Addition as recommended by the FMP#, Appendix 1 Incorporate into Yalgorup National Park (R11710)
5	FMP ID 80 (part of Myalup State Forest No. 16)	Conservation Commission	State forest	660	National park	A	Addition as recommended by the FMP#, Appendix 1 Incorporate into Yalgorup National Park (R11710).
6	Reserve 22091	Shire of Waroona	Recreation and camping	160	National park	A	Addition to Yalgorup National Park (R11710) for the protection of high conservation value.
7	FMP ID 80 (part of Myalup State Forest No. 16)	Conservation Commission	State forest	690	National park	A	Addition as recommended by the FMP#, Appendix 1. Incorporate into Yalgorup National Park (R11710)
8	FMP ID 88 (part of Myalup State Forest No. 16)	Conservation Commission	State forest	220	National park	A	Addition as recommended by the FMP#, Appendix 1. Incorporate into Yalgorup National Park (R11710)

Map ID	Reserve number	Current vesting	Current purpose	Area (ha)*	Proposed purpose	Class	Proposed changes and reasons for inclusion
9	Reserve 39787	Shire of Harvey	Public recreation	15	National park	A	Addition to Yalgorup National Park (R11710) as recommended in the Yalgorup National Park Management Plan 1995-2005 (CALM 1995) to protect fringing vegetation of Lake Preston
10	Reserve 34745	Shire of Harvey	Recreation	1	National park	A	Addition to Yalgorup National Park (R11710) as recommended in the Yalgorup National Park Management Plan 1995-2005 (CALM 1995) to protect fringing vegetation of Lake Preston
11	FMP ID 90 (R23307)	Unvested	National park	10	Conservation of flora and fauna	A	Addition as recommended by the FMP#, Appendix 1. Incorporate into Yarloop Nature Reserve (R47123)
12	Lot 1 on Diagram 72384	Freehold	N/A	60	Conservation of flora and fauna	A	Proposed addition to un-named nature reserve 49730
13	FMP ID 96– Lot 3945 on Plan 144686	Freehold	N/A	35	Conservation of flora and fauna	A	Addition as recommended by the FMP#, Appendix 1. Proposed addition to Byrd Swamp Nature Reserve (R2517)
14	FMP ID 108 – Lot 3 and 4 on Plan 3957	Freehold	N/A	500	Conservation park	A	Addition as recommended in the Leschenault Peninsula management plan 1998-2008 (CALM 1998a) and FMP#, Appendix 1. Incorporate into Leschenault Peninsula Conservation Park (R42470).
15	R 40552	Executive Director Department of CALM	Timber Depot	15	Conservation of flora and fauna	A	For the protection of Priority Ecological Community and recommended in the EPA review of Greater Bunbury Regional Scheme
16	R1167	Unvested	Parkland	20	Conservation of flora and fauna	A	Addition as recommended by the FMP#, Appendix 1.
	R7684	Shire of Capel	Recreation and landscape protection	5			Incorporate R1167 and R7684 as ‘Franklandia Nature Reserve’

Map ID	Reserve number	Current vesting	Current purpose	Area (ha)*	Proposed purpose	Class	Proposed changes and reasons for inclusion
17	FMP ID 120 – Lot 201 on Plan 58483	Freehold	N/A	8	Conservation of flora and fauna	A	Addition as recommended by the FMP#, Appendix 1. Protection of Threatened Ecological Community
18	Vasse–Wonnerup Estuaries	Unallocated crown land	N/A	700	Conservation of flora and fauna	A	Protection of Ramsar values
19	Part of R25325	Shire of Busselton	Gravel and recreation, motorcycle racing	6	Conservation of flora and fauna	A	Protection of high conservation values
	Part of R37348	Shire of Busselton	Rubbish disposal	6			
	Lot 62 on plan 39325	Freehold		45			
20	Part of R36717 (Vasse Yallingup Siding)	Unvested	Parkland	25	Conservation of flora and fauna	A	Protection of high conservation values

* Approximate area – subject to negotiations with relevant land management authorities # FMP – *Forest Management Plan 2014–2023* (Conservation Commission 2013)

Appendix 4: Peel–Yalgorup Ramsar site

The Peel–Yalgorup Ramsar site is located about 80 kilometres south of Perth. It lies within the City of Mandurah and the shires of Murray, Waroona and Harvey. It comprises the Peel Inlet and Harvey Estuary, the freshwater wetlands of lakes Mealup and McLarty (see also DEC 2008a), the Yalgorup National Park environment (including the saline lakes system) and sections of fringing upland. There are current proposals to include Geogrup and Black lakes on the Serpentine River (Peel–Harvey Catchment Council 2009).

The site is a 26,530 hectare wetland system of shallow estuary and saline, brackish and freshwater lakes that are considered to be representative examples of wetlands on the Swan Coastal Plain. The wetlands form a chain of diverse habitat types, which in turn support an array of ecologically important species and communities.

The full description of the Peel–Yalgorup Ramsar site can be found in the Ramsar Information Sheet at http://www.environment.gov.au/water/topics/wetlands/database/pubs/36-ris.pdf

Ramsar criteria for listing

The Peel–Yalgorup wetlands currently meet seven out of the nine qualifying Ramsar criteria.

Criterion 1

A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near natural wetland type found within the appropriate biogeographic region.

The site includes the biggest and most diverse estuarine complex in south-western Australia and also particularly good examples of coastal saline lakes and freshwater marshes.

Criterion 2

A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

The fairy tern (*Sterna nereis*) is recognised on the IUCN Red List as vulnerable. The Lake Clifton thrombolite community (*Thrombolite microbialite)* community of a coastal brackish lake (Lake Clifton) is listed in the critically endangered category of threatened ecological communities under the EPBC Act.

Criterion 3

A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Lake Clifton, part of the Yalgorup National Park and Peel–Yalgorup system, supports the Lake Clifton thrombolite community.

Criterion 4

A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

The critical life stage of migration: annual use by big numbers of many species of migratory animals.

The critical life stage of breeding: regionally significant breeding cormorants fishes crabs and prawns. The critical life stage of moulting: possible moulting phase in shelducks and musk ducks.

The critical life stage of drought refuge: seasonal influx of big numbers of waterbirds from dried out wetlands in surrounding areas, and periodic massive influx from wider regions during drought.

Criterion 5

A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

The site comprises the most important area for waterbirds in south-western Australia, supporting in excess of 20,000 waterbirds annually, with greater than 150,000 individuals recorded at one time.

Numbers exceeding 20,000 birds have been recorded in all comprehensive surveys conducted in the 1990s in the Peel–Harvey Estuary.

Criterion 6

A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of waterbird.

14 species have been identified as meeting this criterion:

- Red-necked avocet (*Recurvirostra novaehollandiae*)
- Red-necked stint (*Calidris ruficollis*)
- Red-capped plover (*Charadrius ruficapillus*)
- Hooded plover (*Thinornis rubricollis*)
- Black-winged stilt (*Himantopus himantopus*)
- Banded stilt (*Cladorhynchus leucocephalus*)
- Curlew sandpiper (*Calidris ferruginea*)
- Sharp-tailed sandpiper (*Calidris acuminate*)
- Fairy tern (*Sterna nereis*)
- Musk duck (*Biziura lobata*)
- Grey teal (*Anas gracilis*)
- Australasian shoveler (*Anas rhynchotis*)
- Australian shelduck (*Tadorna tadornoides*)
- Eurasian coot (*Fulica atra*).

Criterion 8

A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

The Peel–Yalgorup Ramsar site is important as a nursery and/or breeding and/or feeding ground for at least 50 species of fish as well as the commercially significant blue swimmer crab (*Portunus pelagicus*) and western king prawn (*Penaeus latisulcatus*).

The Peel–Harvey Estuary is a migratory route for the pouched lamprey (*Geotria australis*).

Ecological character description

An ecological character description (ECD) for the Peel–Yalgorup Ramsar site was first produced at the time of listing in 1990. Since then there have been several changes in the surrounding catchment and to the wetlands, including the construction of the Dawesville Channel, as well as a substantial increase in the Mandurah population. In 2007, a new ECD was developed to take into account fundamental and permanent changes in the ecological components of the estuary. The summary table below is the benchmark against which future changes should be measured (after Hale and Butcher 2007).

Component	Description
Peel–Harvey Estuary	
Geomorphology	• Shallow 'bar-built' estuary • Narrow connections to the Indian Ocean (Mandurah Channel and Dawesville Channel) • Organic sediments (black ooze)
Hydrology	• Tidal exchange with Indian Ocean (now considered a 'marine embayment') • Highly seasonal freshwater inflows from direct precipitation and rivers • Limited groundwater inflow
Water quality	• High concentrations of nutrients from catchment • Seasonal variation in salinity (although salinity is now more marine) • Water column stratification
Acid sulfate soils	• Monosulfidic black ooze exposed via dredging
Phytoplankton	• Decreased phytoplankton biomass
Benthic plants	• Decreased macroalgae biomass • Increased extent of seagrass
Littoral vegetation	• Samphire community extent believed to have decreased • Paperbark condition declining (Harvey Estuary)
Invertebrates	• Commercially significant taxa include blue manna crabs and western king prawns. • Diverse communities in the estuary and intertidal zones
Fauna	• Estuarine and marine fish species, estuarine species possibly decreasing, marine species increasing • Migratory route for some fish species • High diversity and abundance of waterbirds • Regularly supports > 20 000 waterbirds (150 000 recorded in 1977) • Breeding recorded for 12 species • Regularly supports > 1 per cent of population of 11 species (including IUCN Red List species fairy tern, *Sterna nereis*) • No evidence of change in waterbird abundance

Component	Description
Yalgorup Lakes	
Geomorphology	• Shallow depressional wetlands • No defined surface water inflows or outflow channels
Hydrology	• Highly seasonal freshwater (predominantly groundwater) inflows • No surface water outflows • Suspected decrease in groundwater inflows • Changes to lake levels – data deficient
Water quality	• Brackish to hypersaline with seasonal salinity cycles, salinity suspected to be increasing • Low nutrient concentrations, suspected to be increasing • Some lakes exhibit stratification • Highly alkaline (calcium and bicarbonate)
Benthic microbial community	• Lake Clifton thrombolite (microbialite) population, suspected declining condition • Cyanobacterial algal mats across the sediment surface in some lakes
Flora	• Small buffer zones, particularly to east of Lake Clifton • Some areas of paperbark communities
Fauna	• Significant site for waterbirds, no evidence of change in abundance • Large numbers of shelduck and black swans (annually) • One per cent of the population of five species • Eight breeding species • Fish kills at Lake Clifton

Component	Description
Lakes McLarty and Mealup	
Geomorphology	• Shallow depressional wetlands • No defined surface water inflows or outflow channels
Hydrology	• Highly seasonal freshwater (predominantly groundwater) inflows • No natural surface water outflows, both Lakes connected to artificial drainage network. • Suspected decrease in groundwater inflows • Changes to lake levels at Lake Mealup, increasing duration of dry period
Water quality	• Naturally fresh to brackish conditions • Severe acidification at Lake Mealup (pH 2.7) and nutrient enrichment • Salinity and nutrients increasing at Lake McLarty
Flora	• *Typha* in localised sections of Lake McLarty, extensive at Lake Mealup • Sedges on lake margins • Paperbark community at higher elevations and at Little Lake Mealup.
Fauna	• Important habitat for freshwater invertebrates • Provides habitat for large diversity and number of waterbirds • Suspected increasing shorebirds at Lake McLarty and significant declines at Lake Mealup • Twelve species recorded breeding
Goegrup and Black lakes	
Geomorphology	• Riverine wetlands on the Serpentine River (Goegrup 'in-stream') • Black Lake connects to Goegrup Lake via narrow channel
Hydrology	• Highly seasonal freshwater (predominantly surface water) inflows • Tidal influence from Peel Inlet
Water quality	• Seasonal salinity cycle • High nutrient concentrations (catchment nutrient loads) • Low dissolved oxygen concentration
Flora	• High phytoplankton biomass • Samphire at low elevations in the littoral zone • Paperbark communities at higher elevations
Fauna	• Supports waterbirds, data deficient

Appendix 5: Vasse–Wonnerup Ramsar site

The 1,115 hectare Vasse –Wonnerup Ramsar site is located in the Shire of Busselton. It comprises the Vasse and Wonnerup estuaries (lagoons) and Wonnerup Inlet, as well as seasonally inundated floodplains, marshes in the lower reaches of tributary rivers, much of the northern shore of the Vasse Estuary, the lower reaches of the Sabina River (Reserve 31188) and part of the Tuart Forest National Park (Reserve 40250), including the lower reaches of the Abba River. The Ramsar site is less than half of the overall Busselton wetlands system, which covers some 2,500 hectares.

The site is of extensive, shallow, nutrient-enriched permanent wetlands with widely varying salinities. The site regularly supports peak numbers of 25 000 to 30 000 waterbirds, as well as the biggest regular breeding colony of black swan (*Cygnus atratus*) in Western Australia. The only estuary to support bigger numbers of waterbirds in the state is the Peel–Harvey estuary, which is 13 times the size of Vasse–Wonnerup.

A natural sand bar across the mouth of Wonnerup Inlet closes the system to the sea for much of the year and there are floodgates on the exit channels that connect the Vasse and Wonnerup estuaries to the narrow Wonnerup Inlet. The floodgates were installed in the early 1900s to mitigate flooding of adjoining agricultural land (Lane *et al.* 1997) during high river flows in winter and to prevent seawater inundation caused by storm surges. The gates effectively transformed the estuaries into shallow, winter-fresh/summer-saline lagoons, unique in Western Australia. Floodgates on the exit channels of the Vasse and Wonnerup estuaries are managed by the Department of Water. However, DPaW has been delegated responsibility for their operation during summer and autumn to maintain minimum water levels and water quality (WAPC 2005b; WRM 2007).

The full description of the Vasse–Wonnerup Ramsar site can be found in the Ramsar information sheet at <www.environment.gov.au/water/topics/wetlands/database/pubs/38-ris.pdf>.

Ramsar criteria for listing

The Vasse–Wonnerup wetlands meet two out of the nine Ramsar criteria.

Criterion 5

A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

More than 33,000 waterbirds were counted in January 1986 and waterbird data indicate that more than 20,000 waterbirds use the wetlands each year.

In the 1998 to 2000 survey over 37,000 waterbirds from 68 species were found to use the wetlands (Lane 2009).

Criterion 6

A wetland should be considered internationally important if it regularly supports one per cent of the individuals in a population of one species or subspecies of waterbird.

At least one per cent of the Australian population of black-winged stilt (*Himantopus himantopus*) and at least one per cent of the world population of red-necked avocet (*Recurvirostra novaehollandiae*) use Vasse–Wonnerup system in most years

The 1998 to 2000 surveys also found that the shelduck (*Tadorna tadornoides*) and Australasian shoveler (*Anas rhynchotis*) were also in numbers greater than one per cent of the population (Lane 2009).

Ecological character description

The summary table has been taken out of WRM 2007.

Component	Description
Geomorphology/Estuary morphology	Broad, shallow basin, large seasonal variation in area of inundation
Seasonally closed estuary	
Soil type	Sandy, poor nutrient retention, acid sulfate soils
Sedimentation and erosion	
Hydrology and hydrogeology	Seasonal freshwater inflows
Nutrients	Eutrophication
Salinity	Seasonal salinity regime
Dissolved oxygen	Summer anoxia/hypoxia
Phytoplankton and aquatic macrophytes	Microalgae, macroalgae, seagrasses
Fringing vegetation	Samphires, sedges and reeds, remnant eucalypts, paperbarks
Habitat connectivity	Tuart National Park and Geographe Bay
Aquatic invertebrates	Zooplankton, benthic macroinvertebrates
Fish community	Freshwater, estuarine and marine fishes
Waterbirds	International migratory species
Australian resident species	

Appendix 6: Rare flora in the planning area

Data taken from Western Australia Herbarium and DPaW Threatened Flora database (DEFL) 2012.

Plant name	Common name	WC status	EPBC status	Recovery plans+
Andersonia gracilis	Slender andersonia	Vulnerable	Endangered	National and interim recovery plan No. 228
Banksia nivea subsp *uliginosa*	Honey-pot dryandra	Endangered	Endangered	Interim recovery plan No. 225
Banksia squarrosa subsp *argillacea*	Pingle	Vulnerable	Vulnerable	National and interim recovery plan No. 177
Caladenia huegelii	Grand spider orchid	Critically endangered	Endangered	National and interim recovery plan No. 272
Calytrix breviseta subsp *breviseta*	Swamp starflower	Critically endangered	Endangered	National and interim recovery plan No. 180
Chamelaucium sp. C Coast Plain (R.D. Royce 4872)	Royce's wax flower	Vulnerable	Vulnerable	
Conospermum undulatum	Wavy leaf smokebush	Vulnerable	Vulnerable	National and interim recovery plan No. 251
Darwinia whicherensis	Abba bell	Critically endangered	Endangered	Interim recovery plan No. 139
Diuris micrantha	Dwarf bee-orchid	Vulnerable	Vulnerable	Conservation advice
Diuris purdiei	Purdie's donkey orchid	Endangered	Endangered	Conservation advice
Drackea elastica	Glossy-leaved hammer orchid	Critically endangered	Endangered	National and interim recovery plan No. 256
Eleocharis keigheryi	Keighery's eleocharis	Vulnerable	Vulnerable	
Eremophila glabra subsp *chlorella*		Critically endangered		Interim in draft
Grevillea maccutcheonii	McCutcheon's grevillea	Critically endangered	Endangered	National and interim recovery plan No. 144
Grevillea elongata	Ironstone grevillea	Endangered	Vulnerable	National and interim recovery plan No. 131
Lambertia echinata subsp. *occidentalis*	Western prickly honeysuckle	Critically endangered	Endangered	National and interim recovery plan No. 133
Lepidosperma rostratum	Beaked lepidosperma	Endangered	Endangered	Conservation advice
Macarthuria keigheryi		Endangered	Endangered	National and interim recovery plan No. 260
Petrophile latericola	Ironstone petrophile	Critically endangered	Endangered	Interim recovery plan No. 93
Synaphea sp Fairbridge Farm	Selena synaphea	Critically endangered	Critically endangered	National and interim recovery plan No. 236 and Conservation advice

Plant name	Common name	WC status	EPBC status	Recovery plans+
Synaphea stenoloba	Dwellingup synaphea	Critically endangered	Endangered	National and Interim recovery plan No. 62 and Conservation advice
Tetraria australiensis	Southern tertraria	Vulnerable	Vulnerable	Conservation advice
Verticordia densiflora var. *pedunculata*	Long stalked featherflower	Endangered	Endangered	Conservation advice
Verticordia plumose var. *vassensis*	Vasse featherflower	Endangered	Endangered	Conservation advice

#Component of the Claypans of the Swan Coastal Plain listed as one ecological community under the EPBC Act

A link to TEC interim recovery plans can be found at http://www.dpaw.wa.gov.au/about-us/science-and-research/publications-resources/105-plans-and-reports.

Appendix 7: Threatened ecological communities in the planning area

Community name	Western Australia status	EPBC status	Recovery plan
Eucalyptus calophylla – Kingia australis woodlands on heavy soils, Swan Coastal Plain	Critically endangered	Endangered	Interim recovery plan No. 315
Eucalyptus calophylla – Xanthorrhoea preissii woodlands and shrublands, Swan Coastal Plain	Critically endangered	Endangered	Interim recovery plan No. 60
*Sedgelands in Holocene d*une swales of the southern Swan Coastal Plain	Critically endangered	Endangered	Interim recovery plan number 314
Shrublands and woodlands of the eastern side of the Swan Coastal Plain	Critically endangered	Endangered	Interim recovery plan No. 230
Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)	Critically endangered	Endangered	Interim recovery plan No. 215
Stromatolite like freshwater microbialite community of coastal brackish lakes (Lake Clifton)	Critically endangered	Critically endangered	Interim recovery plan No. 153
Shrublands and woodlands on Muchea Limestone	Endangered	Endangered	Interim recovery plan No. 57
Banksia attenuata and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain	Endangered		
Banksia attenuata woodland over species rich dense shrublands	Endangered		
Melaleuca huegelii – Melaleuca acerosa shrublands on limestone ridges (Gibson *et al.* 1994 type 26a)	Endangered		Interim recovery plan No. 193
Shrublands on dry clay flats	Endangered	Critically endangered#	Conservation advice
Southern wet shrublands, Swan Coastal Plain	Endangered		
Callitris preissii (or *Melaleuca lanceolata)* forests and woodlands, Swan Coastal Plain	Vulnerable		

Community name	Western Australia status	EPBC status	Recovery plan
Dense shrublands on clay flats	Vulnerable	Critically endangered#	Conservation advice
Eucalyptus calophylla – Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain	Vulnerable		
Eucalyptus calophylla woodlands on heavy soils of the southern Swan Coastal Plain	Vulnerable		
Herb rich saline shrublands in clay pans	Vulnerable	Critically endangered#	Conservation advice
Herb rich shrublands in clay pans	Vulnerable	Critically endangered#	Conservation advice
Shrublands on calcareous silts of the Swan Coastal Plain	Vulnerable		