



Esperance and Recherche parks and reserves

draft management plan

2012









Department of Environment and Conservation 168 St Georges Terrace Perth WA 6000

Phone: (08) 6467 5000 Fax: (08) 6467 5562 www.dec.wa.gov.au

© Government of Western Australia 2012

October 2012

This work is copyright. You may download, display, print and reproduce this material in unaltered form (retaining this notice) for your personal, non-commercial use or use within your organisation. Apart from any use as permitted under the *Copyright Act 1968*, all other rights are reserved. Requests and enquiries concerning reproduction and rights should be addressed to the Department of Environment and Conservation.

This draft management plan was prepared by the Department of Environment and Conservation's Planning Unit on behalf of the Conservation Commission of Western Australia.

Questions regarding this plan should be directed to:

Planning Unit Department of Environment and Conservation 17 Dick Perry Avenue, Kensington WA 6151 Locked Bag 104 Bentley Delivery Centre WA 6983 Phone: (08) 9334 0333

Email: planning@dec.wa.gov.au

The recommended reference for this publication is:

Department of Environment and Conservation 2012, *Esperance and Recherche parks and reserves draft management plan 2012*, Department of Environment and Conservation, Perth.

This document is available in alternative formats on request.

Front cover photos

Main View of Lucky Bay and the rocky granite headlands of Cape Le Grand National Park. Photo – Klaus Tiedemann

Top left A honey possum (*Tarsipes rostratus*) feeding on the nectar of the one-sided bottlebrush (*Calothamnus quadrifidus*). Photo – DEC

Top right A New Zealand fur-seal (*Arctocephalus forsteri*), Recherche Archipelago Nature Reserve. Almost 90 per cent of the state's population of New Zealand fur-seals are from the Recherche Achipelago. Photo – Aberline Attwood

Header photo Thistle Cove, Cape Le Grand National Park. Photo – Aberline Attwood

Esperance and Recherche parks and reserves

draft management plan

2012

Department of Environment and Conservation Conservation Commission of Western Australia

Acknowledgments

Planning team

This draft management plan was prepared by a Department of Environment and Conservation planning team consisting of Aberline Attwood, Klaus Tiedemann, Ian Hughes, David Chadwick, Sue Eber, Alan Danks, Deon Utber, Laurent Marsol, Cameron Hennessy and Stephen Butler.

The planning team would like to thank the many other department staff, past and present, who contributed to the preparation of, and commented on, the management plan, particularly John Watson, Tegan Laslett, Allan Rose, Geoff Passmore, Peter Masters, Mike Fitzgerald, Geoff Young, Peter Fishwick, Adnaan Abrahams, Greg Broomhall, Julie Waters, John Lizamore, Emma Adams, Mick Rose, Aaron Rivers, Burke Stephens, Jude Allan and Paul McCluskey.

Community involvement

Many individuals and organisations made valuable contributions to the development of this document. The planning team would especially like to acknowledge the contributions of the former Esperance and Recherche Community Advisory Committee which had input into the *Esperance Coastal Reserves Issues Paper* (DEC 2007c), David Johnson, Ruth Kirchner, Bill Auburn, Michael Gibbs, Mike Spragg, David (Doc) Fetherstonhaugh, Marie Fowler, John Clemenger, Ron (Doc) Reynolds and Graham Tucker.

Aboriginal people

The contribution of Aboriginal people to the preparation of this plan is recognised. Any information presented that has been handed down should not be used outside the context of this management plan.

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

Invitation to comment

The Esperance and Recherche parks and reserves draft management plan is an opportunity to provide information, express your opinion, suggest alternatives and have your say on how the parks and reserves covered by this plan will be managed during 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 Environment and Conservation (the department) 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 outside of these constraints and responsibilities. Nevertheless, it is important to hear from the public about the management of these issues. There are also some issues which may have a number of management options over the life of the plan, or where the department has developed a proposal and wants to gauge public opinion about management.

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

- key performance indicators mentioned through various sections of the plan
- strategies identified for sections of interest to you
- the size, structure and overall readability of this plan
- the addition of proposed reserves to the conservation estate
- proposed visitor management settings and gazettal of wilderness
- development of day-use and camping sites
- development of walking trails
- development of public access
- development of birdwatching facilities within Mullet Lake Nature Reserve.

How to make effective comments

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

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

- make it clear and concise
- list your points according to the subject sections and page numbers in the plan
- describe briefly each subject or issue you wish to discuss
- say whether you agree or disagree with any or all of the aims or strategies within each subject or just those of specific interest to you—clearly state your reasons (particularly if you disagree) and provide supportive information where possible
- suggest alternatives to deal with issues 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 at www.dec.wa.gov.au/haveyoursay, emailed to planning@dec.wa.gov.au or by writing to:

Planning Coordinator
Esperance and Recherche parks and reserves draft management plan
Department of Environment and Conservation
Locked Bag 104, Bentley Delivery Centre
BENTLEY WA 6983

How your comments will be considered

All submissions will be summarised according to topics discussed. The management plan will then be reviewed in the light of submissions, according to established criteria (see below). A summary of the submissions will be prepared along with the final management plan.

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

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

Acknowledgments	ii
Invitation to comment	iii
Introduction	
1. Management plan area	
2. Key values and threats	4
Management directions and implementation	6
3. Vision	
4. Legislation and policy	
5. Management arrangements with Aboriginal people	7
6. Performance assessment and monitoring	8
7. Proposed tenure changes	9
8. Administration	11
9. Term of the plan	11
Managing the natural environment	12
10. Climate	12
11. Geology, landforms and soils	13
12. Hydrology	14
13. Wilderness	18
14. Biogeographic regions	19
15. Native plants and plant communities	20
16. Native animals and habitats	23
17. Ecological communities	36
18. Environmental weeds	38
19. Introduced and other problem animals	40
20. Diseases	42
21. Marine pollution	46
22. Fire	47
Managing cultural heritage	52
23. Aboriginal cultural heritage	52
24. Other Australian cultural heritage	55
Managing visitor use	57
25. Visitor planning	57
26. Visitor access	61
27. Visitor activities	65
20 Commercial tourism	75

Managing resource use	77
29. Mineral and petroleum exploration and development	77
30. Commercial fishing and aquaculture	78
31. Beekeeping	79
32. Water resource use	81
33. Utilities and services	82
34. Forest produce	83
Involving the community	84
35. Public participation in planning process	84
36. Ongoing community involvement and support	84
37. Off-reserve management and partnerships	86
Research and monitoring	88
38. Research requirements	88
References	90
Appendices	98
Figures	
Figure 1. Lake Gore Ramsar site, Lake Gore nationally important wetlands and Lake Mortijinup	
nationally important wetlands	28
Figure 2. Lake Warden System Ramsar site and Lake Warden nationally important wetlands	30
Tables	
Table 1. Proposed changes to existing reserves	9
Table 2. Walk trails within the planning area	67
Maps	
Map 1a. Planning area – east	123
Map 1b. Planning area – west	125
Map 2a. Visitor management settings – east	127
Map 2b. Visitor management settings – west	129
Map 3a. Visitor use and access – east	131

Introduction

1. Management plan area

This draft management plan, prepared by the Department of Environment and Conservation (the department; or DEC) on behalf of the Conservation Commission of Western Australia (the Conservation Commission), covers existing conservation reserves managed by the department within the Esperance District. Proposed additions to the conservation estate are also considered.

The planning area occupies a total area of over 845,635 hectares and encompasses 71 existing parks and reserves (655,284 hectares) and more than 82 proposed additions (190,352 hectares), and extends from Lake Shaster Nature Reserve in the west, to the end of Wylie Scarp in Nuytsland Nature Reserve in the east, and inland to the limit of the cleared land north of Salmon Gums. It also incorporates the offshore islands, including those of the Recherche Archipelago (see maps 1a and 1b).



Cape Le Grand National Park. Photo – Lorna Charlton

Previously, two other statutory management plans¹ have been prepared for the Esperance area. The *South Coast Region Regional Management Plan 1992–2002* (CALM 1992) covers all of the planning area currently being dealt with in this plan. The *Esperance Lakes Nature Reserves Management Plan 1999–2009* (CALM 1999a) includes Lake Warden, Pink Lake (western portion), Woody Lake, Mullet Lake and Shark Lake. This management plan, once gazetted, will replace both plans as the statutory management plan for the planning area.

Existing reserves

The existing reserves are listed in Appendix 1 and summarised below.

National parks

There are three national parks that occupy an area of 320,908 hectares:

- Stokes National Park: 9,726 hectares, located approximately 80 kilometres west of Esperance
- Cape Le Grand National Park: 31,801 hectares, 40 kilometres east of Esperance
- Cape Arid National Park: 279,381 hectares, 120 kilometres east of Esperance.



Little Tagon Bay, Cape Arid National Park. Photo – Tegan Laslett

Approved management plans are available on the department's website www.dec.wa.gov.au/content/view/104/1887/.

Nature reserves

The planning area includes 64 nature reserves that occupy an area of 330,311 hectares and which are mostly set aside with the purpose of 'conservation of flora and fauna', including:

- Lake Shaster Nature Reserve, located 110 kilometres west of Esperance
- two large unnamed nature reserves surrounding Barker Inlet and Warrenup Lakes (reserves 27888 and 26885), Lake Gore Nature Reserve and Lake Mortijinup Nature Reserve located approximately 25 to 50 kilometres west of Esperance and to the east of Stokes National Park



Warrenup Beach, Nature Reserve 26885. Photo – Tegan Laslett

- a number of nature reserves comprising wetlands and/or adjacent vegetation in and around Esperance, including Shark Lake, Pink Lake (reserves 24953, 4182 and 24511), Lake Warden, Woody Lake and Mullet Lake nature reserves
- a number of inland nature reserves in the northern portion of the planning area, including the Burdett, Truslove, Kau Rock and Beaumont complexes; Cheadanup, Griffiths, Cascade, Bishops, Ridley, Muntz, Neredup and Clyde Hill nature reserves; and a number of other small or unnamed nature reserves
- Alexander Nature Reserve to the east of Cape Le Grand National Park, unnamed Nature Reserve
 41934 containing Mount Dean and Mount Esmond and part of Nuytsland Nature Reserve to the east of Cape Arid National Park (only the western portion of the reserve, to the end of Wylie Scarp)
- Woody Island Nature Reserve and Recherche Archipelago Nature Reserve which is made up of 105 islands and some 1,200 'obstacles to shipping' (comprising of reefs, islets and rocks) totalling more than 7,000 hectares and stretching 230 kilometres from east to west and up to 50 kilometres offshore
- Investigator Island Nature Reserve, situated approximately 25 kilometres south of Lake Shaster Nature Reserve.

Aerial view of Esperance Lakes, including Lake Warden, Woody Lake and Mullet Lake nature reserves. Photo – DEC

Other reserves

In addition, there are two miscellaneous reserves (Moir Homestead within Stokes National Park and Helms Forestry Reserve) and two section 5(1)(h)² reserves (Lake Quallilup and Cull Island lighthouse and weather station) that occupy a total area of 4,000.19 hectares.

² Section 5(1)(h) of the Conservation and Land Management Act 1985.

Proposed reserves

The planning area also includes proposed additions to the conservation reserve system (see maps 1a and 1b; and Appendix 2). Many of the proposed reserves arise from long-standing recommendations from previous management plans (CALM 1992, 1999). However, some further additions have been identified based on more recent assessments of natural, cultural and social values, and the threats to these values.

It is intended that the proposed reserve additions will be covered by the management plan once the change in land tenure and purpose occurs and the reserves are vested in the Conservation Commission. Any additions other than those identified in this management plan will be managed to be consistent with this management plan or, if necessary, the plan will be amended to apply to them.

Any reserve additions, or changes in the classification of existing reserves or the category of land, will be subject to normal consultation within government prior to the additions occurring.



Recherche Archipelago Nature Reserve, aerial view towards Renmark Island (with peak). Photo – Shire of Esperance

Plans relevant to adjacent areas

Adjacent plans include the *Biodiversity and Cultural Conservation Strategy for the Great Western Woodlands* (DEC 2010a) and, as part of the Government of Western Australia's Regional Marine Planning Initiative, a strategic plan is also currently being prepared for State waters of the south coast. The *South Coast Draft Regional Marine Strategic Plan* (DEC 2010b) was released in September 2010 for public comment.



View from Mount Ragged Summit Trail, Cape Arid National Park. Photo – Aberline Attwood

2. Key values and threats

Key values

The planning area has importance for the following specific key values.

Natural values

- Intact and varied natural landscapes with high scenic quality such as coastal cliffs, rocky headlands, granite peaks, quartzite hills, island chains, lakes, rivers and creeks, wetlands, inlets, sandy beaches with bays.
- Remote areas with high wilderness quality.
- A rich mosaic of vegetation complexes representing woodland, mallee and coastal heath, riparian and wetland ecosystems protecting restricted vegetation communities and flora populations of conservation significance.
- A major biogeographical transition zone between the South-West Botanical Province and the semiarid South-Western Interzone that is rich in rangeend³ flora and fauna species from both zones.



Kangaroo on the beach at Lucky Bay, Cape Le Grand National Park, Photo – Lorna Charlton

- Internationally (for example, Ramsar Convention) and nationally significant wetland systems
 that provide habitat, moulting and breeding refuges, migration stopovers and drought refuge for
 thousands of waterbirds.
- Refugial flora and fauna populations on mainland granite hills.
- Islands that provide refugial habitat for terrestrial fauna and relictual⁴ populations of fauna once widespread on the mainland.
- High level of vegetation connectivity east-west between coastal reserves as well as north-south along river corridors to the inland unallocated Crown land to the north of the planning area.

Cultural values

- Aboriginal sites and landscapes of mythological, ceremonial, cultural heritage and spiritual significance.
- Sites of early European exploration, activities (for example, sealing and whaling), historically significant events, development and settlement.



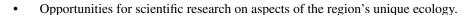
Egret in flight, Esperance Lakes. Photo – Tilo Massenbauer

Range-end species are species at or near the end of their known range. Due to the size and location of this planning area there are range-end species from all points of the compass, i.e. inland and arid species occurring at their southern and/or western range-end, coastal species at their northern range-end and south-west species at their eastern range-end.

⁴ Relictual refers to a surviving individual, population, community or species that is characteristic of an earlier period in evolutionary history.

Recreation and social values

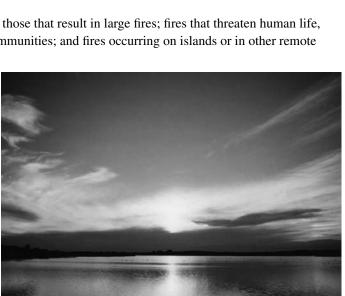
- An environment that provides opportunities for a wide range of nature-based recreational opportunities such as bushwalking, picnicking, camping, canoeing and wildlife interaction.
- Access to coastal and marine environments that provide opportunities for water-based recreational activities such as swimming, surfing, boating, fishing, snorkelling and diving.
- Nature-based tourism opportunities for commercial operators, and associated economic potential of tourism expenditure in the region.



- Opportunities for education and interpretation of the natural, cultural and recreational values of the region.
- Opportunities for community involvement in nature conservation activities in the planning area.



- Vegetation clearing and associated agriculture in the upper catchments, which has led to altered hydrological regimes and associated issues including salinisation, potential acid sulfate soils, increased inundation, and increased sediment and nutrient loads in wetlands and waterways.
- Biological threats including environmental weeds, introduced and other problem animals, and diseases such as Phytophthora.
- Inappropriate fire regimes, especially those that result in large fires; fires that threaten human life, assets, threatened flora, fauna and communities; and fires occurring on islands or in other remote areas.
- Unmanaged visitation and incompatible recreational use such as informal use of nature reserves, informal camping, campfires and overcrowding at recreation sites during peak periods.
- Marine pollution incidents such as the Sanko Harvest fuel and fertiliser spillage in 1991.
- Climate change.



Thistle Cove, Cape Le Grand National Park, Photo – Tegan Laslett

The wetlands within the planning area are internationally and nationally significant for waterbirds as well as being of high scenic quality and valued for nature-based recreational activities such as bushwalking, canoeing and birdwatching. Photo – Lorna Charlton

Management directions and implementation

3. Vision

The planning area will remain a place of high natural beauty and biodiversity where south-western and arid inter-zonal environments, island refugial habitats, internationally and nationally significant wetlands, and threatened and conservation significant flora, fauna and ecological communities will be conserved and enhanced. There will be an improved understanding of the values, threats and their impacts across the planning area. The planning area will remain a place of significant cultural value requiring protection, appreciation and respect.

The planning area will continue to be a place where people can enjoy, learn and gain an appreciation of the natural, cultural, wilderness and recreation values, and the need to protect and conserve these values for present and future generations through cooperative management and community involvement.



Lucky Bay, Cape Le Grand National Park. Photo – Emma Adams

4. Legislation and policy

The department primarily administers 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*, which provides specific protection for native flora and fauna within Western Australia. This management plan provides a summary of operations proposed to be undertaken in the planning area as required under the CALM Act. This plan also provides guidance for subsidiary management documents (operational management plans) that provide more management detail regarding fire response, weed and feral animal control and recreation site development.

International conservation agreements

Australia is a signatory to a number of important international conservation agreements (for example, the Ramsar Convention⁵, Bonn Convention, and JAMBA, CAMBA and ROKAMBA migratory bird agreements⁶), which affect management of the planning area.

Obligations under the Ramsar Convention

In order to be identified as a wetland of international importance and listed under the Ramsar Convention the site must meet at least one of the nine qualifying criteria (Ramsar Convention 2005). Two sites representing wetlands of international importance under the Ramsar Convention exist within the planning area (see Section 16 *Native animals and habitats – Wetlands*). Lake Warden System was listed in 1990, while Lake Gore was listed in 2001.

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 Ramsar Convention defines this ecological character as "... the combination of the ecosystem components, processes and benefits/service that characterise the wetlands at a given point in time". The ecological characters of the Lake Gore and Lake Warden System Ramsar sites have been described in DEC (2009b) and DEC (2009c) and a summary of the critical ecosystem components and processes are shown in appendices 3 and 4.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) through the Environment and Biodiversity Conservation Regulations (2000), state general principles for Ramsar wetlands in Australia, including requirements for management, management planning, and environmental impact assessment and approval⁷ (Schedule 6, regulation 10.02). This management plan is to be considered the Ramsar management plan for the Lake Gore and Lake Warden System Ramsar sites.

The specific limits of acceptable change identified by DEC (2009b) and DEC (2009c) will be used where possible as indicators of change in the key characteristics of the Ramsar-listed wetlands (see Section 6 *Performance assessment and monitoring*).

5. Management arrangements with Aboriginal people

The Conservation Commission and the department support joint management arrangements with traditional custodians. The department has a Memorandum of Understanding (MOU) with the Goldfields Land and Sea Council (signed in 2001), which is currently under review. The department has also worked closely with the Bay of Isles Aboriginal Community on a number of joint projects, including various training programs. In particular, the Bay of Isles Aboriginal Community has completed many successful Coastcare/Coastwest projects with the department. The department also has an MOU (2009–2014) with the National Trust of Australia (WA) and Gabbie Kylie Foundation (comprising Esperance Nyungar people).

The Goldfields Land and Sea Council is the representative body for native title claimants within the planning area. There are three active native title claims over the planning area: the Esperance Nyungars, Ngadju and Narnoobinya Family Group. Most of the planning area falls within the Esperance Nyungars' claim area, but the north east portion of Cape Arid National Park and the majority of Nuytsland Nature Reserve are under both the Ngadju and Narnoobinya claims. The far north of the planning area is also under the Ngadju claim area.

⁵ The Convention on Wetlands of International Importance especially as Waterfowl Habitat was signed in Ramsar, Iran in 1971 and is commonly referred to as the 'Ramsar Convention'. It is an intergovernmental treaty dedicated to the conservation and wise use of wetlands. The convention encourages contracting parties to designate sites containing biological diversity to the List of Wetlands of International Importance (known as 'Ramsar sites'). These sites need to be managed to ensure their special ecological values are maintain or improved.

⁶ The Bonn Convention is the Convention on the Conservation of Migratory Species of Wild Animals, CAMBA is the China-Australia Migratory Bird Agreement, JAMBA is the Japan-Australia Migratory Bird Agreement, and ROKAMBA is the Republic of Korea-Australia Migratory Bird Agreement.

Any action that is likely to have a significant impact on the ecological character of a Ramsar wetland (whether the action is to occur inside the wetland or not) is required to be assessed under a statutory environmental impact assessment and approval process. This is also the case for other matters of national environment significance under the EPBC Act (i.e. threatened species and ecological communities, and migratory species protected under international agreements).

On 14 March 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. If, over the life of this plan, native title is determined⁸ or if joint management is identified as a priority and there are the resources and capacity to undertake it, a joint management agreement may be considered. A joint management agreement may cover details such as:

- · access for customary purpose and activities
- restrictions to public access
- · protocols for heritage assessment
- levels and types of involvement in joint management activities
- · employment opportunities
- type of native title determined, if any
- administration matters, such as membership of the joint management body, if any, and decision-making processes.

This plan may need to be amended to accommodate these developments.

One of the ways in which the connection of Aboriginal people to country can be more widely recognised is through the naming of reserves or individual recreation sites. For example, the new campground at Stokes National Park, has been named 'Benwenerup' Campground after the Aboriginal name for Stokes Inlet.



Dolphin Cove, Cape Arid National Park, named after the headland shaped like a dolphin. Photo – Klaus Tiedemann

6. Performance assessment and monitoring

The Conservation Commission and the department will measure the success of this plan in accordance with section 19(1)(g) of the CALM Act by using selected key performance indicators and other mechanisms as appropriate.

Key performance indicators

A set of key performance indicators has been chosen to target key components of the plan. The application of a key performance indicator is identified throughout the plan and presented with performance measures, objectives and reporting requirements.

Some of the key performance indicators selected in this management plan measure changes in populations. Any sustained change (i.e. a continuous decrease or increase) will trigger the need for further investigation to determine the cause of that change.

Limits of acceptable change (and/or interim limits where baseline information is yet to be collected) have been set for the key performance indicators for hydrology, fauna and riparian vegetation as they relate to the Ramsar sites in the planning area (see Section 4 *Legislation and policy – International conservation*

At the time of preparation of this management plan, no native title determinations have been made in relation to the planning area. Native title is extinguished over the majority of the national parks and nature reserves in the planning area as well as over Stokes Inlet as it has been national park previously.

agreements). The limits of acceptable change depict the variation that is considered acceptable in a particular measure or feature of the ecological character of the wetland (see Section 16 Native animals and habitats – Wetlands). Where a lack of knowledge exists, the precautionary principle9 has been applied in setting the limits of acceptable change. In the management and monitoring of the site, limits of acceptable change are ideally combined with management trigger values. Management trigger values are a precautionary alert purposely set below limits of acceptable change so that an adaptive management response can occur prior to the limits of acceptable change being reached. This ultimately aids in preventing a change in ecological character.



There are several changes to existing reserves proposed in this management plan, including adding Lake Quallilup section 5(1)(h) reserve to Stokes National Park. Photo – Tegan Laslett

Portfolio of evidence

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

7. Proposed tenure changes

Existing reserves

Several changes to the tenure of existing reserves are proposed (Table 1; and maps 1a and 1b). These changes either derive from long-standing proposals from the *South Coast Region Regional Management Plan* (CALM 1992) or were identified during this management planning process to address protection of values, management issues and/or anomalies with the purpose and objectives of the reserves.

Table 1. Proposed changes to existing reserves

Name	No.	Proposed changes
Lake Shaster Nature Reserve	C32339	Change western portion of nature reserve to 'A' class reserve. Add eastern portion (east of Munglinup Inlet) to Stokes National Park following CALM (1992) recommendation E1a and to facilitate management of recreational use.
Unnamed nature reserve	C27888	Add to Stokes National Park following CALM (1992) recommendation E12 and to facilitate management of recreational use.
Unnamed nature reserve	C26885	Add to Stokes National Park following CALM (1992) recommendation E13 and to facilitate management of recreational use.
Lake Quallilup 5(1)(h) reserve	C50792	Add to Stokes National Park following CALM (1992) recommendation E14 to further protect Lake Quallilup, which is proposed to be added to the Lake Gore Ramsar site (Environment Australia 2001a).

⁹ Contracting Parties to the Ramsar Convention are, when implementing their wetland management planning process, invited to take into consideration the precautionary approach, as established in Principle 15 of the 1992 Rio Declaration on Environment and Development adopted by the United Nations Conference on Environment and Development, which affirms that "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".

Name	No.	Proposed changes
Helms Forestry Reserve (Misc Reserve)	C23527	Change majority to an 'A' class nature reserve in recognition of the significant nature conservation values, including a priority ecological community and retain two small miscellaneous reserves, providing for the arboretum and forestry.
Lake Warden Nature Reserve	A32257	Remove recreation from purpose statement as per CALM (1999) Table 1 recommendation, as current purpose is inconsistent with status as a nature reserve.
Woody Lake Nature Reserve	A15231	Change to conservation park to allow long-established recreational activities to continue.
Cape Arid National Park	A14234, A24047	Incorporate reserve A14234 into A24047 for ease of administration with the purpose of 'national park'. Excise the trigonometrical station from A14234 and create a section 5(1)(h) reserve with a management order issued to the Conservation Commission for the purpose of 'conservation and trigonometrical station'. Add Neridup Location 9 to reserve A24047.
Nuytsland Nature Reserve (western portion)	A27632	Add western section (west of where Wylie Scarp terminates at the coast) to Cape Arid National Park to facilitate management of recreation following CALM (1992) recommendation E32.
Woody Island Nature Reserve	A39435	Change to conservation park to facilitate management of recreation and address inconsistencies with purpose of the reserve.
All 'C' class and unclassified reserves	Various	Change to 'A' class reserves (see Appendix 1) to enable adequate protection of their conservation values.

Dalyup Nature Reserve (Reserve 19628) was proposed to be cancelled (CALM 1992), however it is now recommended to be retained, as further investigations of the reserve have found heathland vegetation communities not adequately

represented in the conservation reserve system.

Proposed additions

In addition to the existing national parks and nature reserves, the planning area includes proposed additions to the conservation reserve system (see maps 1a and 1b; and Appendix 2). Many of the proposed additions arise from long-standing recommendations in previous management plans, however some further additions to the planning area have been identified during this planning process (Appendix 2). These



A walking tour on Woody Island conducted by a commercial tour operator. It is proposed to change Woody Island to a conservation park to provide for the current level of recreation.

Photo – Aberline Attwood

proposed additions have been identified based on:

- developing a comprehensive, adequate and representative conservation reserve system
- protecting significant remnant vegetation communities and riparian vegetation
- protecting important fauna habitats
- protecting wetland areas and threatened and priority ecological communities
- enhancing the South Coast Macro Corridor network (Watson and Wilkins 1999, Wilkins *et al.* 2006)—in particular the coastal corridor and river foreshore corridors which connect the coastal corridor with the unallocated Crown land to the north.

8. Administration

The planning area lies within the Esperance District of the South Coast Region of the department. The day-to-day implementation of the final management plan will be the responsibility of the department's District Manager, who coordinates within allocated budgets and other resources the operational management of parks and reserves in the planning area.

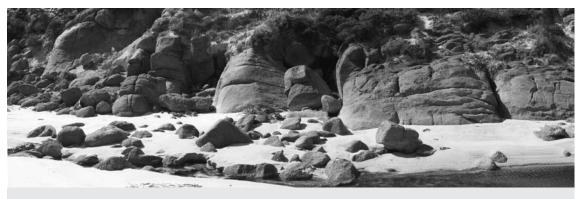


Southern heath monitors (*Varanus rosenbergi*) fighting. Photo – Sarah Comer/DEC

There are ranger operational centres at Stokes, Cape Le Grand and Cape Arid national parks, which facilitate the day-to-day management of these and the surrounding parks and reserves. A permanent seasonal ranger and research staff residence has been built at Lucky Bay in Cape Le Grand National Park. A new ranger residence may also be constructed in Cape Arid National Park and the old residence used as an office. Future upgrades to facilities will be confined to the current areas rather than located elsewhere on the parks. However, as the proposed changes in tenure and additions to the conservation estate occur, it may be necessary to provide further operational centres.

9. Term of the plan

This management plan will guide operational management of the planning area for a period of 10 years from the date that a notice is published in the Government Gazette. During this time, amendments to the final management plan are allowed under section 61 of the CALM Act. If an amendment is necessary, the proposed changes will be released for public comment. At the end of the 10-year period, the management plan may be reviewed and a new management plan prepared. In the event that the plan is not reviewed and replaced by the end of the 10-year period, it will remain as the primary guiding document for the area.



Little Hellfire Bay, Cape Le Grand National Park. Photo – Aberline Attwood

Managing the natural environment

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

10. Climate

The planning area has a Mediterranean climate of warm, dry summers and cool, wet winters and moderately reliable rainfall (average annual rainfall of 620 millimetres). The planning area is in the temperate zone but towards the eastern and northern end (northern sections of Cape Arid National Park and Nuytsland Nature Reserve) conditions are more arid (CALM 2003). As a consequence of straddling both temperate and arid climatic zones, the planning area supports high biodiversity (see sections 15 *Native plants and plant communities* and 16 *Native animals and habitats*).

Potential impacts to biodiversity within the planning area may arise either directly or indirectly from climate change and may be more acute on the islands. Integrating the results of climate change impact studies within current conservation strategies at the regional, community and species level could help improve the survival of species and ecosystems, and decrease their vulnerability to climate change (Watson 2005). Vulnerability of threatened species in the planning area to climate change has been assessed through the South Coast Threatened Species and Ecological Communities Strategic Management Plan (Gilfillan et al. 2009). At the regional level, conservation strategies include preserving vegetation corridors (Watson and Wilkins 1999, Wilkins et al. 2006) (see Section 16 Native animals and habitats – Vegetation corridors), increasing the area of conservation reserve system (see Section 7 Proposed tenure changes - Proposed additions), and implementing species recovery programs (see sections 15 Native plants and plant communities - Flora of conservation significance and 16 Native animals and habitats - Fauna of conservation significance). At the area level, strategies include improving resilience by increasing and refining existing management actions against other threats, such as integrated predator and weed control programs, improving disease control, and fire management (see sections 18 Environmental weeds, 19 Introduced and other problem animals, 20 Diseases and 22 Fire). At the species level, collecting seed and captive fauna breeding programs provide a fall-back mechanism for long-term species survival and potential reintroduction projects.

Desired outcome

The survival of species and ecosystems are improved while their vulnerability to climate change is decreased.

Management actions

- Incorporate the potential for climate change impacts upon threatened species and communities and develop effective response strategies (for example, Gilfillan et al. 2009).
- 2. Incorporate the results of climate change impact studies, as they become available, into current conservation strategies at the regional, community and species level.



Salisbury Island, Recherche Archipelago Nature Reserve. Photo – Emma Adams

11. Geology, landforms and soils



The view from the summit of Frenchman Peak, Cape Le Grand National Park, towards the granite headlands of the coast. Photo – Tegan Laslett

The majority of the planning area occurs within the Archaean Yilgarn Craton, consisting of graniticmigmatite terrains and greenstone belts; and the Proterozoic Albany-Fraser Orogen, a belt of migmatite, gneiss and granites (GSWA 1974). Part of Nuytsland Nature Reserve extends into the Phanerozoic Eucla Basin (a thin, flat sheet of Cretaceous and Tertiary sedimentary rocks) and some of the islands of Recherche Archipelago Nature Reserve form part of the Bremer Basin (GSWA 1974).

The gneiss and granite base of the planning area is overlain by Eocene and Tertiary coastal limestones from the Eucla basin in the east, and Quaternary coastal sandplains and dunes along the coast (Myers 1995). Quaternary marine erosion has created a number of smooth, flat or gently sloping terraces that descend towards the coast (Morgan and Peers 1973). Calcareous clays and loams form duplex soils that often contain sheet and modular kankar, outcrops of metamorphosed sandstone, and white and yellow sandplains and loamy plains with numerous saltpans. These soils are highly susceptible to wind and water erosion, have low water holding capacity and low fertility. Inappropriate management activities and/or recreational development and activities in these areas can add to erosion issues (see sections 26 *Visitor access* and 27 *Visitor activities*). Subsurface acidity is not considered an issue in the planning area, although hazard mapping of the wetlands from Lake Warden to Mullet Lake shows a high probability of occurrence of acid sulfate soils in low-lying areas, swamps and lakes (Galloway and Clarendon 2009).

The coastline is strongly indented with numerous rugged rocky headlands interspersed with asymmetrical bays that reflect prevailing current from the west.

The landforms of Cape Le Grand and Cape Arid national parks are dominated by granite peaks, which also make up the islands of Recherche Archipelago Nature Reserve. The archipelago includes 105 islands and more than 1,500 islets; they are characterised by conical or dome-shaped hills rising from the continental shelf. These granite outcrops and islands are significant within the planning area as they provide refugial habitats for many threatened and restricted flora and fauna (see Section 16 *Native animals and habitats*).

Other significant geological features include the Russell Range including Mount Ragged, other inland hills such as Mount Burdett,



Whistling Rock, near Thistle Cove, Cape Le Grand National Park. Photo – Tegan Laslett



Bilbunya Dunes, Nuytsland Nature Reserve. Photo – Laurent Marsol

Wylie Scarp and karst¹⁰ areas of Nuytsland Nature Reserve. Further investigation is required to confirm the presence of stromatolite-like organisms in the salt lakes near Point Malcolm in Nuytsland Nature Reserve.

While the geology and landforms of the planning area contribute to the high scenic value of the region, there are no formal geoheritage¹¹ sites within the planning area.

Desired outcome

The geology, landforms and soils are protected and conserved.

Management actions

- Identify and protect geological features, landforms and soil types vulnerable to environmental damage (such as coastal dunes and/or karst areas), and assess the potential for impact on these from land uses, proposed developments and activities, including management operations such as providing access roads/tracks, constructing firebreaks and recreational site development.
- 2. Identify and then consider the potential for creating acid sulfate soils during management operations and planning (for example, fire management), and avoid disturbing, compacting or displacing saturated soils at risk.
- 3. Support the survey of the salt lakes in Nuytsland Nature Reserve for stromatolite-like organisms.

12. Hydrology

Surface water hydrology

In the planning area, rivers extend up to 80 kilometres inland and discharge into inlets or estuaries. Most of the major rivers are west of Esperance, including the Oldfield, Munglinup, Young and Lort rivers. The eastern part of the planning area contains smaller watercourses, including Thomas River and near pristine rivers (with catchments less than 20 per cent cleared) Jenamullup, Jorndee, Poison and Fern creeks. Conversely, Dalyup River, which feeds into Lake Gore, has 80 per cent or more of its catchment cleared and, along with the Munglinup, Young and Lort rivers, has been identified as eutrophic (Gunby *et al.* 2004).

Stokes, Torradup and Barker inlets are the major estuaries in the planning area. Torradup and Barker inlets are within Stokes National Park and Nature Reserve 26885¹² respectively. The tidal component of Stokes Inlet is surrounded by Stokes National Park and is a 'normally closed' lagoonal estuary (Bancroft *et al.* 1997).

There are many significant lakes and wetlands in the planning area (see Appendix 3), including the internationally significant Lake Gore and Lake Warden System (Ramsar sites) and the nationally significant Lake Gidong, Lake Kubitch, Carbul Lake, Quallilup Lake, Lake Nambarup, Lake Mortijinup, Mainberup Swamp and Pink Lake (Environment Australia 2001a). These wetlands support a diverse array of waterbirds (see Section 16 *Native animals and habitats*).

¹⁰ Karst means landscapes and landforms, with associated subterranean features such as caves, which are shaped by the dissolution of bedrock such as limestone or other carbonate rocks.

Statewide and nationally significant features of geology that offer important information or insight into the formation or development of the continent, have high landscape value or that can be used for research, teaching or for a reference site.

Although Barker Inlet is within Nature Reserve 26885, Nature Reserve 27888 adjoins Barker Inlet and is sometimes referred to as 'Barker Inlet Nature Reserve'. Both nature reserves are not formally named and are proposed additions to Stokes National Park.

Wetlands of regional significance include Lake Shaster, Native Dog Swamp, Paper Bark Swamp, Benje Benjenup Lake, Stevens Lake, Doombup Lake, Bannitup Lake, Ocean View, Ewarts Swamp, Boolenup Lake, inland salt lake wetland systems, including Roberts Swamp and Jeffery, Swan and Truslove lagoons and Lake Hillier (the pink lake on Middle Island in Recherche Archipelago Nature Reserve).

Water depth, salinity and pH have been recorded since 1977 in selected wetlands for the planning area as part of the *South West Wetland Monitoring Program* (now



Jorndee Creek, Cape Arid National Park. Photo – Aberline Attwood

administered through the *Salinity Strategy*) (DEC 2009b, DEC 2009c). Despite this, there are still numerous knowledge gaps for wetlands across the planning area. Further studies are required to properly characterise the bathymetry, surface/groundwater interactions, seasonal influences, water and soil physico-chemical properties, and sedimentation rates.

Groundwater hydrology

Groundwater is scarce and generally brackish to saline throughout the region. However, a perched freshwater aquifer exists in the sand dunes west of Esperance within Butty Harbour Reserve (Reserve 24486, part of which is a proposed addition to Lake Mortijinup Nature Reserve), and forms the main water supply for Esperance townsite.

While interactions between groundwater and surface water hydrological systems are well known for the Lake Warden catchment, they are generally not well understood for the wider planning area. In some areas, groundwater contributes significantly to surface water hydrology, while in others groundwater interactions are minimal. For example, groundwater input is responsible for sustaining lake levels over summer within the Lake Warden System and groundwater base flows can contribute up to 70 per cent of summer creek flows in Coramup and Bandy creeks (DEC 2009c).

Altered hydrological regimes

Extensive clearing in the upper catchments and associated agricultural activities (such as cropping, fertilising, grazing and trampling) has led to changes to the hydrological system, exacerbated by increases in unseasonable, episodic rainfall events (DEC 2009b, DEC 2009c). This has directly or indirectly contributed to a number of threats to the planning area, such as:

- increased surface run-off and rising groundwater tables
- increased lake levels and prolonged inundation of wetland areas
- reduced shoreline and wading habitats and loss of riparian vegetation
- erosion, sedimentation and siltation
- secondary salinity (although much of the planning area is naturally brackish or saline)
- elevated nutrient levels leading to eutrophication (although lakes such as Wheatfield, Warden and Station are considered to be naturally eutrophic), algal blooms and weeds
- potential acid sulfate soils
- altered fire regimes.

Due to the impacts of altered hydrology, the Lake Warden catchment is designated as a natural diversity recovery catchment (Government of Western Australia 1996, Government of Western Australia 2000). Targeted revegetation within the Lake Warden catchment and dewatering of the Ramsar site have been undertaken, in particular draining of water from Lake Wheatfield using a gravityfed pipe system into Bandy Creek. The water depth levels in Lake Warden are being monitored and volume limits for Lake Warden and other affected lakes in the wetland system have been set in order to



Aerial view of Lake Gore (bottom left) and connected lakes to Lake Quallilup (top right). Photo – Tilo Massenbauer

provide maximum recovery of riparian vegetation and waterbird populations (see Section 15 *Native animals and habitats – Wetlands*). Ongoing dewatering will be necessary to maintain lake depth within these limits. The option of pumping water from Lake Warden and disposing via pipeline into Esperance Bay also will be considered if required. Potential threats from the dewatering project (including excessive dewatering and potential acid sulfate soils) will need to be monitored throughout the project. To aid in the revegetation and protection of the Lake Warden catchment, numerous additions to Lake Warden Nature Reserve, Woody Lake Nature Reserve, and Mullet Lake Nature Reserve are proposed (see Appendix 2). The catchment recovery plan for Lake Warden, being prepared by the department, is due for completion in 2012.

Sediment cores taken from Lake Gore indicate that deposition/siltation of the lake has increased 50 times since European settlement. Lake Gore Wetland System has been classified as a Tier 1 state biodiversity asset at risk of salinity and identified as a potential natural diversity recovery catchment.

Desired outcome

The natural surface and groundwater hydrological regimes, particularly the wetland and river systems, are protected and conserved and the impacts of altered hydrological regimes on key values are minimised.

Management actions

- 1. Protect watercourses, inlets, lakes and wetlands from damage or disturbance during management activities that may affect water quality or quantity.
- 2. Assess development proposals for their potential adverse impacts on hydrology, and refer proposals that may impact on key values to the Environment Protection Authority (state and/or federal equivalent).
- 3. Establish baseline information and maintain a database on surface and groundwater hydrological regimes, particularly for the inlets, lakes and wetlands.
- 4. Improve departmental knowledge of interactions between groundwater and surface water systems.
- 5. Establish survey and monitoring programs as necessary, for the effective research and monitoring of hydrological regimes, as outlined in the Ramsar ecological character descriptions for Lake Gore and the Lake Warden System (DEC 2009b, DEC 2009c).
- Continue regular monitoring of Lake Gore and Lake Warden System Ramsar sites to look at
 groundwater and lake levels, wetted perimeter, river flows, water and soil physico-chemical properties
 as recommended by the ecological character descriptions (DEC 2009b, DEC 2009c).

- Revegetate targeted areas of the Lake Warden Natural Diversity Recovery Catchment to improve wetland ecosystem function.
- 8. Continue the dewatering project for Lake Wheatfield.
- Continue to monitor water levels in Lake Warden and if high water levels persist over an extended period consider mechanical intervention to prevent long-term inundation and restore shoreline waterbird habitat.
- 10. Add proposed additions to Lake Warden, Woody Lake and Mullet Lake nature reserves (see Appendix 2).
- 11. Add land to the conservation estate that includes major rivers and estuaries as well as lakes and wetlands with international, national and/or regional significance (for example, the western river corridors, Stokes Inlet and various lakes, wetlands and surrounding riparian vegetation, see Appendix 2).
- 12. Investigate Lake Gore as a potential recovery catchment to assist in restoring wetland habitat.
- 13. Monitor and assess the sediment transport system for Lake Gore and investigate the feasibility of mechanical intervention to Lake Gore's water levels and reduce sediment inflow into the system.
- 14. Investigate and monitor key hydrological parameters in Pink Lake such as water level, quality and chemical composition, and seek to maintain these within pre-determined limits.
- 15. Maintain Stokes Inlet in its natural state as a 'normally closed' lagoonal estuary by not artificially opening the sandbar.

Key performance indicator

Performance measure	Objective	Reporting
Hydrological limits of acceptable	Limits of acceptable change (or interim	Every 5 years
change for Ramsar wetlands	limits) are not exceeded	



A satellite lake of Woody Lake, Woody Lake Nature Reserve, showing part of Kepwari Wetland Trail. The skeletons of dead melaleuca trees are the result of rising watertables. As native vegetation in a catchment is cleared, less rainfall is intercepted and there is increased run-off into wetlands and rivers. While fringing sedges and rushes can spread rapidly and 'migrate' to higher ground, prolonged flooding gradually suffocates long-lived wetland trees. Photo – Lorna Charlton



View from the summit of Mount Ragged in Cape Arid National Park towards the proposed wilderness area. Photo – Ryan Butler

13. Wilderness

Wilderness areas are created under section 62(1)(a) of the CALM Act. To support the legislation, the department has developed *Policy Statement No. 62 Identification and Management of Wilderness and Surrounding Areas* (CALM 2004b) that incorporates the National Wilderness Inventory (NWI) criteria¹³ and specifies a NWI wilderness quality index of at least 12 and a minimum size of 8,000 hectares in temperate areas or 20,000 hectares in arid, semi-arid and tropical areas. The NWI data for the reserves indicate that large areas within Cape Arid National Park and Nuytsland Nature Reserve meet the criteria for wilderness. There has not been an assessment of the reserves west of Esperance, but areas of 8,000 hectares would be limited.

One candidate wilderness area, the 'Mount Ragged Wilderness Area' ¹⁴ (196,141 hectares), has been identified that meets the NWI criteria and is suitable to maintain as wilderness (see Map 2b). ¹⁵ This area is located in Cape Arid National Park and Nuytsland Nature Reserve to the east of Mount Ragged and Gora Track. It contains no internal public access tracks, trails or recreation sites, and visitation to the area is very low. Public access and camping is restricted to the Mount Ragged area.

Desired outcome

Wilderness areas and/or wilderness qualities within potential wilderness areas are maintained or enhanced.

Management actions

- 1. Gazette the Mount Ragged Wilderness Area under section 62(1)(a) of the CALM Act.
- 2. Manage gazetted wilderness areas according to departmental policy (for example, CALM [2004]).

¹³ The Australian Heritage Council has compiled and maintains the NWI, which is designed to identify wilderness quality across Australia. The NWI uses a quality index rating of zero to 20, with 20 being the highest quality. The following four criteria are used to estimate the quality of wilderness:

[•] remoteness from settlement – how remote a site is from permanent human occupation

[•] remoteness from access – how remote a site is from established access routes

[•] apparent naturalness – the degree to which a site is free from permanent structures associated with modern technological society

[•] biophysical naturalness – the degree to which a site is free from biophysical disturbances caused by the influence of modern technological society.

Interim name only. Other potential names for the wilderness area include Russell Range Wilderness Area or Purrganu Wilderness Area. Purrganu, according to CG von Brandstein's Ngadjumaja, An Aboriginal Language of South-East Western Australia is Ngadju language for 'Mount Ragged'.

¹⁵ Other areas may also meet the minimum size requirements within the Cape Arid and Nuytsland area but have not been chosen to progress as candidate wilderness at this stage.

- Maintain wilderness qualities within wilderness areas (candidate and/or gazetted) by restricting public
 access to walk-in only, by prohibiting any development of the area and taking wilderness quality into
 account when undertaking management operations.
- 4. Monitor the wilderness quality of the Cape Arid and Nuytsland areas of the planning area, in particular the Mount Ragged Wilderness Area.
- 5. Consider progressing other candidate wilderness areas for gazettal as appropriate.
- 6. Enhance visitors' knowledge and appreciation of wilderness through interpretation (not appropriate within wilderness areas) and awareness programs.

Key performance indicators

Performance measure	Objective	Reporting
Gazettal of the Mount Ragged Wilderness Area under section 62(1)(a) of the CALM Act	Gazettal of the Mount Ragged Wilderness Area	Every 5 years
The extent and rating of wilderness quality within wilderness areas	The extent and rating of wilderness quality in wilderness areas does not diminish from 2012 levels	Every 5 years

14. Biogeographic regions

The Interim Biogeographic Regionalisation for Australia (IBRA) provides a planning framework for selecting a comprehensive, adequate and representative (CAR) reserve system of protected areas to conserve Australia's biodiversity (Thackway and Cresswell 1995, National Reserve System Task Group 2009). The IBRA divides Western Australia into 26 biogeographic regions and smaller subregions, based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation (CALM 2003).

The planning area lies predominantly within the Esperance Plains region (both Recherche and Fitzgerald subregions) and the Mallee region (Eastern and Western Mallee subregions) with the northern part of Cape Arid National Park around Pine Hill within the Coolgardie region (Mardabilla subregion).

The Esperance Plains region includes all the coastal reserves of the planning area. The region is characterised by proteaceous scrub and mallee heaths on sandplains rich in endemic flora. The Mallee region includes the northern reaches of the river corridors, the inland nature reserves, and the Mount Ragged area of Cape Arid National Park. The region is substantially cleared in the west and south and dominated by mallee woodlands and shrublands, heath, eucalypt open woodlands and remnants of eucalypt woodlands. The Coolgardie region (the portion within the planning area) contains eucalypt woodlands over broombrush/greybush, bluebush and saltbush on red-brown loams and aeolian sands.

At a subregional level, Recherche and Fitzgerald subregions have 29.2 and 27.7 per cent of their area protected in conservation reserves respectively; Eastern Mallee and Western Mallee have 27.3 and 9.9 per cent respectively; and Mardabilla has 12.79 per cent. As only a very small portion of the planning area is within the Western Mallee and Mardabilla subregions, there is limited scope to improve reservation levels with the proposed additions in this management plan.¹⁷

Despite the comparatively high reservation figures for Recherche, Fitzgerald and Eastern Mallee subregions, there is a biased representation of certain vegetation types due to the presence of large

¹⁶ Comprehensiveness – inclusion of the full range of ecosystems recognised at an appropriate scale within and across each bioregion. Adequacy – the maintenance of the ecological viability and integrity of populations, species and ecosystems. Representativeness – the principle that those areas that are selected for inclusion in reserves reasonably reflect the biotic diversity of the ecosystems from which they derive.

The two additions to Cheadanup Nature Reserve represent a small 0.01 per cent increase in reservation within the Western Mallee subregion. Future management planning for other parks and reserves within the Western Mallee and Mardabilla subregions may consider pursuing additions to the conservation estate to improve the level of reservation of these subregions.

conservation reserves and the extensive clearing of the agricultural areas (CALM 2003). Therefore, many of the proposed additions within this management plan aim to address this biased representation (see Section 15 *Native plants and communities – Vegetation associations*).

The planning area is adjacent to two Interim Marine and Coastal Regionalisation for Australia regions; the WA South Coast and Eucla (Thackway and Cresswell 1998). There are no existing marine reserves near the planning area, although the marine waters within the Recherche Archipelago and also adjacent to Stokes National Park are proposed for reservation (CALM 1994).

15. Native plants and plant communities

The planning area covers part of the Southwest Australian Ecoregion, Australia's only international biodiversity hotspot¹⁸ (Gole 2006). There are more than 1,942 native vascular taxa recorded within the planning area from 98 families (NatureMap naturemap.dec.wa.gov.au Sept 2010 data); the main families being Myrtaceae (eucalypts and paperbarks - 298 species), Fabaceae (legumes, peas and wattles – 211 species), Orchidaceae (orchids – 163 species), Proteaceae (banksias and grevilleas – 145 species), Ericaceae (heaths – 91 species), Asteraceae (daisies - 90 species), Cyperaceae (sedges - 87 species) and Poaceae (grasses – 54 species). Survey data for most reserves is limited, and often confined to specific threatened species, access routes or to the large reserves such as Cape Le Grand and Cape Arid national parks (CALM 2003). Further surveying within the planning area is therefore required.



Nematolepis phebalioides, Barker Inlet. Photo – Laurent Marsol

Cape Arid National Park is particularly rich in flora species with 1,039 taxa recorded, more than half of the taxa within the planning area (NatureMap September 2010 data). The northern part of Cape Arid National Park straddles a large part of a major biogeographical transition zone between the South-West Botanical Province and the semi-arid South-Western Interzone (Beard 1975, 1980), and consequently supports range-end flora and fauna as well as species from both zones. Recent information indicates that Cape Arid National Park may be on a par with the Fitzgerald River and Stirling Range national parks for flora richness (Keighery unpubl.). The southern end of Russell Range in particular, within Cape Arid National Park, has been identified as a centre of flora endemism and high species diversity (CALM 2003).

Flora of conservation significance

The planning area contains many plant species of conservation significance, such as:

- 10 taxa declared as rare flora under the Wildlife Conservation Act 1950: small two-coloured kangaroo paw (Anigozanthos bicolor subsp. minor), sedge conostylis (Conostylis lepidospermoides), Eremophila denticulata subsp. denticulata, cumquat eremophila (Eremophila denticulata subsp. trisulcata), Twin Peak Island mallee (Eucalyptus insularis), goblet mallee (Eucalyptus merrickiae), the prickly honeysuckle (Lambertia echinata subsp. echinata), salt myoporum (Myoporum turbinatum), Myoporum velutinum and underground orchid (Rhizanthella gardneri)
- 142 priority ¹⁹ flora 19 priority 1, 52 priority 2, 44 priority 3 and 27 priority 4

¹⁸ For more information on international biodiversity hotspots www.environment.gov.au/biodiversity/hotspots/international-hotspots.html

¹⁹ Priority 1 and 2 flora in particular are still considered to be under threat even though they are not declared as 'rare' under the Wildlife Conservation Act.

• of the 152 rare and priority flora, 45 taxa are either locally endemic (with a range of less than 150 kilometres) or endemic to the bioregion (Esperance, Mallee or Coolgardie bioregions as applicable).

Interim recovery plans²⁰ have been prepared for the small two-coloured kangaroo paw (CALM 2006), prickly honeysuckle (Monks *et al.* 2001), cumquat eremophila (Fitzgerald *et al.* 2004), salt myoporum (Taylor *et al.* 2004) and the underground orchid (Brown 2003). Interim recovery plans outline the recovery actions required to address those threatening processes most affecting the ongoing survival of relevant species and begin the recovery process of threatened taxa and/or ecological communities.

These interim recovery plans will require updating during the life of this management plan. The *Declared Rare and Poorly Known Flora in the Esperance District Wildlife Management Program Number 21* (Craig and Coates 2001) also gives information about threatened and priority flora species in the planning area, and makes management recommendations. This management program does not replace the recovery plan process, but provide priorities and actions for management of threatened and priority flora species that do not have recovery plans such as sedge conostylis, *Eremophila denticulata* subsp. *denticulata*, Twin Peak Island mallee, goblet mallee and *Myoporum velutinum*. In addition, a regional strategic management plan has been produced for the threatened species and ecological communities for the South Coast (Gilfillan *et al.* 2009), which includes strategic actions for a regional approach to threatened species recovery (including priority flora).

Vegetation associations

Most of the planning area falls within the Esperance Plains and Mallee regions of the South-West Botanical Province (Beard 1973, 1975, 1980). The northern and eastern sections are in the South-Western Interzone.

There are 30 vegetation associations within existing reserves of the planning area (Beard 1973, 1975, 1980), and another three vegetation associations if the proposed additions are included. Of these vegetation associations, 15 are significant in that they have been poorly reserved or are of limited extent (based on criteria²¹ used by Hopkins *et al.* 2000). The proposed areas for addition in the planning area (see Appendix 2; maps 1a and 1b) will collectively improve the representation of 13 of the 15 significant vegetation associations within the planning area.

Work is underway on a *Native Vegetation Integrity Project*, which aims to develop and test protocols for monitoring native vegetation condition.

Desired outcome

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



The rare prickly honeysuckle (Lambertia echinata subsp. echinata). The main threats are inappropriate fire, disease, poor recruitment and limited genetic diversity. As part of the interim recovery plan, seed has been collected, plants have been propagated and translocated and populations sprayed with phosphite to reduce disease. Photo – Emma Adams

²⁰ DEC flora interim recovery plans: www.dec.wa.gov.au/content/view/865/2009/#flora

²¹ Poorly reserved is considered zero to 15 per cent of extant vegetation within conservation reserves. Highly cleared is less than or equal to 30 per cent of original (pre-1750) vegetation extant. Limited in extent is less than 2,000 hectares extant.



Remnant vegetation, Helms Forestry Reserve. Native vegetation in the reserve includes the 'Banksia scrub-heath on sandplain in the Esperance Plains Region' vegetation association. This vegetation association is significant as only 13 per cent of the pre-1750 extent remains, and only one per cent is within a conservation reserve. Within the planning area, the vegetation association is found at Helms Forestry Reserve (part of which is proposed nature reserve), Coolinup Nature Reserve, Cape Le Grand National Park, Alexander Nature Reserve and adjacent unallocated Crown land (proposed nature reserve). Photo – Tegan Laslett

Management actions

1. Undertake or support systematic flora and vegetation surveys of, but not limited to, the priority ecological communities, wetland areas and unsurveyed areas.

- 2. Continue to list rare flora under the Wildlife Conservation Act and/or the Commonwealth's EPBC Act.
- 3. Develop, update and implement recovery plans for threatened flora
- 4. Monitor populations of threatened flora, identify viable populations and record natural variations in population numbers.
- Continue to obtain biological and ecological information on threatened flora, including research into fire response, habitat degradation and other threats.
- 6. Rehabilitate areas of degraded habitat.
- 7. Conduct further translocations of threatened flora.
- 8. Collect seed and cutting material of threatened flora as necessary.
- Assess proposed operations and developments for potential impacts on threatened and other conservation significant species.
- 10. Add land to the conservation reserve system that contains
 either remnant vegetation within poorly reserved bioregions;
 vegetation associations that are either poorly reserved, highly cleared or limited in extent; or contains known populations of conservation significant flora (see Appendix 2).

The rare sedge conostylis (Conostylis lepidospermoides). Known populations are being monitored to identify key threats. Photo – Emma Adams

- 11. Continue to identify native plants and plant communities of conservation significance that may require special protection, and implement appropriate strategies to minimise the impacts from threatening processes.
- 12. Implement a trial native vegetation condition monitoring system for the planning area in conjunction with the department's *Native Vegetation Integrity Project*.

Key performance indicator

Performance measure	Objective	Reporting
The persistence and status of	Subject to natural variation, taxonomic	Every 5 years, or
populations of threatened (i.e. rare and	changes, recovery and/or maintenance	as per recovery
priority 1 and 2) flora	of viable populations of threatened flora	plan

16. Native animals and habitats

The planning area hosts rich and diverse animal populations. This is due to a number of factors, including the large size of the planning area, the natural diversity of the South-West Botanical Province and the range of habitats represented within the planning area including arid zone habitats, mallee woodlands, shrublands, wetlands, riparian zones, estuaries, intertidal zones and islands. Cape Arid National Park in particular represents an ecotone of changing habitat from the arid zone in the east to the wetter coastal zone in the south-west (see Section 15 *Native plants and plant communities*).

Thirty-one native mammal taxa from 11 families have been recorded in the planning area including seven pinnipeds (Otariidiae and Phocidae), one echidna



Mundarda or western pygmy possum (Concertetus concinnus), Cape Le Grand National Park.
Photo – Emma Adams

(Tachyglossidae), five kangaroos and wallabies (Macropodidae), one potoroo (Potoroidae), two possums (Tarsipedidae and Burramyidae), one bandicoot (Peramelidae), five dasyurids (Dasyuridae), seven rodents (Muridae) and two bats (Verspertilionidae and Molossidae).

There are records of 258 bird taxa within the planning area, with 182 recorded within Cape Arid National Park alone.



New Holland honeyeater (*Phylidonyris* novaehollandiae), Woody Island Nature Reserve. Photo – Ryan Butler

The planning area is rich in reptiles, with approximately 72 taxa representing nine families recorded in the planning area including 24 skinks (Scinidae), 13 geckos (Gekkonidae), 13 dragons (Agamidae), 10 front-fanged venomous snakes (Elapidae), five legless lizards (Pygopodidae), two blind snakes (Tylophidae), two sea snakes (Hydrophiidae), two monitor lizards (Varanidae) and a carpet python (Boidae).

Sixteen amphibians have been recorded in the planning area, two from the tree frog family Hylidae and the remainder from the ground-dwelling Myobatrachidae.

Twenty-three species of fish have also been recorded in the planning area including freshwater, estuarine and marine species. In terms of invertebrates, Cape Le Grand National Park is the type locality²² for *Peludo paraliotis* (a crustacean), a type genus for the family Phreatoicidea (Wilson and Keable 2002). It has a highly restricted distribution, is threatened by habitat disturbance, and found in freshwater streams. While the diversity of ant species has been commented on for Cape Arid National Park (Andersen and Burbidge 1992), invertebrates remain under collected across the planning area and the conservation status of these groups is generally unknown.



Barking gecko (Underwoodisaurus millii). Photo – Emma Adams

Fauna of conservation significance

Threatened and specially protected fauna

There are 20 threatened and specially protected fauna taxa listed under the Wildlife Conservation Act recorded²³ within the planning area (May 2010 data). These include:

• seven mammals – New Zealand fur-seal (*Arctocephalus forsteri*), Australian sea-lion (*Neophoca cinerea*), black-flanked rock wallaby (*Petrogale lateralis lateralis*), Recherche rock wallaby (*Petrogale lateralis hacketti*), woylie²⁴ (*Bettongia penicillata ogilbyi*), chuditch (*Dasyurus geoffroii*), and heath rat (*Pseudomys shortridgei*)²⁵



Australian sea-lion (Neophoca cinerea), Cape Arid National Park. The Australian sea-lion is Australia's only endemic, and least numerous, seal species. Populations declined significantly in the early nineteenth century due to hunting, and recovery has been much slower than that of the New Zealand fur-seal. Within the planning area, Australian sea-lions reside and breed on at least 16 of the islands of the Recherche Archipelago as well as on Investigator Island. This represents more than 50 per cent of the breeding locations in Western Australia. Unique among pinnipeds, the Australian sealion has a non-annual breeding season that differs across the breeding colonies. Breeding occurs about 18 months apart, so pupping in one colony occurs during different seasons from year to year. The females show extreme levels of breeding fidelity to the site they were born at, so previously inhabited colonies are unlikely to be recolonised by immigration from neighbouring colonies. This also leaves individual colonies vulnerable to localised depletions or extinctions caused by environmental or human disturbance. Photo – Laurent Marsol

²² The type genus is the genus that is designated as being representative of the family to which it belongs. The type locality is the geographical location where a type specimen was originally found.

²³ Lenanton (1974) refers to the existence of the western trout minnow (Galaxias truttaceus hesperius) at Lake Gore and this is included in the ecological character description for Lake Gore (DEC 2009b). However, this record is considered erroneous and is not included in this management plan.

²⁴ The woylie is now considered locally extinct in the planning area but once occurred in Cape Le Grand National Park (Kitchener et al. 1975), Cape Arid National Park (fossil records) and on three islands of the Recherche Archipelago (Serventy 1953).

²⁵ Also, there were possible bilby sightings along Fisheries Road in Cape Arid National Park after the 2002 fires, and the Munglinup River corridor after the Dec-Jan 2005 bushfire.



The threatened western ground parrot is a cryptic ground-dwelling parrot. Three of the four known populations of the parrot occur within the planning area: at Cape Arid National Park and Nuytsland Nature Reserve. There have been five other sightings within the planning area, including within three of the proposed additions (the eastern section of reserve 28170, unallocated Crown land adjacent to Alexander Nature Reserve and unallocated Crown land adjacent to Cape Arid National Park). Extensive bushfire is the major threat to this species, coupled with predation by foxes. Photo – Brent Barrett



Recherche Cape Barren geese, Wickham Island, Recherche Archipelago Nature Reserve. The Cape Barren goose breeds on islands from the Bass Strait to the Recherche Archipelago. They are grazing birds and are usually found on beaches, rocky prominences and grassed areas or, when breeding, in low scrub. There are two subspecies of Cape Barren geese, with the Recherche subspecies occurring in Western Australia. The Recherche subspecies is considered to have been naturally rare, with a historic population of only 1,000 birds. As such, it is considered vulnerable. Photo – Emma Adams

- 11 birds shy albatross (*Thalassarche cauta*), Altantic yellow-nosed albatross (*Thalassarche chlororhynchos*), wandering albatross (*Diomedea exulans*), Australasian bittern (*Botaurus poiciloptilus*), Recherche Cape Barren goose (*Cereopsis novaehollandiae grisea*), fairy tern (*Sterna nereis nereis*), peregrine falcon (*Falco peregrinus*), malleefowl (*Leiopoa ocellata*), Carnaby's cockatoo (*Calyptorhynchus laitirostris*), western rosella (*Platycercus icterotis xanthogenys*) and the western ground parrot (*Pezoporus flaviventris*)
- two reptiles carpet python (*Morelia spilota imbricata*) and Recherche dugite (*Pseudonaja affinis tanneri*).

A number of invertebrate species known to be of conservation significance within the planning area include the threatened Sarah's pill millipede (*Epicyliosoma sarahae*) found in Cape Arid and Cape Le Grand national parks, the crustacean *Daphnia jollyi* (priority 1) found in Munglinup Nature Reserve and seven species of millipede from the genus *Atelomastix* in various locations in the planning area.

Recovery plans²⁶ have been prepared for the chuditch (Orell and Morris 1994), black-flanked rock wallaby (Hall and Kinnear 1991), woylie (CALM 1995), albatrosses and giant petrels (Environment Australia 2001b), Carnaby's cockatoo (Cale 2003), malleefowl (Benshemesh 2007), an interim recovery plan for the western ground parrot (Burbidge *et al.* 1997) and a draft management program for pinnipeds (Gales and Wyre 1999).

These recovery plans will require updating during the life of the management plan. In addition, a regional strategic management plan has been produced for the threatened species and ecological communities for the South Coast (Gilfillan *et al.* 2009), which includes strategic actions for a regional approach to threatened species recovery (including priority fauna).

Two species have been reintroduced into the planning area with limited success: the chuditch and the black-flanked rock wallaby. Lessons learned from these projects may be used to develop a more successful reintroduction program in the future.

²⁶ DEC recovery plans www.dec.wa.gov.au/content/view/842/2007/ National recovery plans www.environment.gov.au/biodiversity/threatened/recovery.html



Black-flanked rock wallaby (*Petrogale lateralis lateralis*), Salisbury Island, Recherche Archipelago Nature Reserve. Two subspecies of rock wallaby occur in the planning area—the black-flanked rock wallaby on Salisbury Island and the reintroduced populations within Cape Le Grand National Park, and the Recherche rock wallaby on Wilson, Mondrain and Westall islands of the Recherche Archipelago. The black-flanked rock wallaby has declined over much of its range and now has a disjunct distribution in the Pilbara, the Wheatbelt and the South Coast. Prior to the reintroduction into Cape Le Grand National Park in 2003, the only extant population on the South Coast was on Salisbury Island (320 hectares), the third largest island in the Recherche Archipelago. Threats to the Salisbury Island population primarily relate to fire, introduction of predators and/or disease. It is unknown whether the translocated populations have survived. Photo – Emma Adams

Other possible reintroductions or translocations into the planning area based on sub-fossil records, historical records and suitable habitat include the woylie, southern dibbler (*Parantechinus apicalis*), and bilby (*Macrotis lagotis*).

Priority fauna

There are 15 priority species of vertebrate fauna within the planning area, including one priority 2, one priority 3, 10 priority 4 and two priority 5 species. These are:

 priority 2: an undescribed gecko species (*Phyllodactylus* sp. 'Cape Le Grand')



Chuditch or western quoll (Dasyurus geoffroii). This chuditch was trapped in a farm residence and released in Lort River corridor, a proposed addition to the conservation estate. Photo – Ryan Butler

- priority 3: southern death adder (*Acanthopis antarcticus*)
- priority 4: western brush wallaby (Macropus irma), water rat (Hydromys chrysogaster), little bittern (Ixobrychus minutus dubius), freckled duck (Stictonetta naevosa), grey falcon (Falco hypoleucos), Australian bustard (Ardeotis australis), hooded plover (Charadrius rubricollis), eastern curlew (Numenius madagascariensis), crested bellbird (Oreoica gutturalis), white browed babbler (Pomatostomus superciliosus ashbyi), carpet python
- priority 5: tammar wallaby (Macropus eugenii derbianus), quenda (Isoodon obesulus fusciventer).

Migratory birds

There are 49 migratory bird species listed under the Bonn convention and/or JAMBA, CAMBA and ROKAMBA agreements recorded in the planning area. In terms of shorebirds, 25 of the 36 identified migratory shorebirds in the *Wildlife Conservation Plan for Migratory Shorebirds* (DEH 2006) occur within the planning area. Migratory shorebirds are commonly found in the wetland, beach and rocky shore areas of the planning area.

Breeding seabirds

Other conservation significant species include the breeding seabirds that nest on the islands of the Recherche Archipelago such as the fleshy-footed shearwater (*Puffinus carneipes*), short-tailed shearwater (*Puffinus tenuirostris*) and little penguin (*Eudyptula minor*). Halse *et al.* (1995) recorded 359 sooty oystercatchers (*Haematopus fuliginous*) within the Recherche Archipelago in 1993, the second highest count for a single locality in Australia. Several petrels and albatrosses also frequent the planning area, which include the threatened wandering albatross and the northern giant-petrel (*Macronectes halli*) which is listed as vulnerable under the EPBC Act. Infrequent visitors include the sooty albatross (*Phoebetria fusca*), lightly-mantled albatross (*Phoebetria palpebrata*), grey-headed albatross (*Thalassarche chrysostoma*), and black-browed albatross (*Thalassarche melanophrys*).

Endemic and range-end species

The planning area contains 33 vertebrate species that are endemic to the south-west region of Western Australia, including eight mammals, three birds, 11 reptiles and nine amphibians. Furthermore, the planning area contains three subspecies that are specific to the Recherche Archipelago. The Recherche rock wallaby is found only on Mondrain, Wilson and Westall islands; the Recherche Cape Barren goose breeds only on islands of the Recherche Archipelago although in summer it can be found on the mainland; and the Recherche dugite is found only on Boxer and Figure of Eight islands.

High conservation value areas for endemic and relictual invertebrates in the planning area include Cape Arid (Mount Arid and granite outcrops) and Cape Le Grand national parks.



The spotted-thighed frog (*Litoria cyclorhyncha*) occurs in the planning area at its easterm limit of its geographic range. Photo – Laurent Marsol

Cape Arid National Park is the eastern limit for 10 Western Australian bird taxa, including the western ground parrot, scarlet robin (*Petroica multicolor*), western spinebill (*Acanthorhynchus superciliosus*) and red-eared firetail (*Stagonopleura oculata*). In addition, 18 reptiles and 13 amphibians found in the planning area are also considered to be at the eastern or western limit of their geographic range.

Wetlands

The wetlands of the planning area (see Section 12 *Hydrology*) represent a range of wetland habitats including fresh, brackish and saline systems, ephemeral and permanent systems, and support a diverse array of waterbirds which use the sites for feeding, breeding grounds and for refuge in times of drought. Since 1981, the department has conducted annual waterbird counts in selected wetlands of the planning area, and surveys are regularly conducted by Birds Australia.

Wetlands in the planning area that are particularly significant for waterbirds include the internationally significant Lake Gore, Lake Warden, Woody Lake and Mullet Lake. Other significant wetlands include Lake Shaster, Stokes Inlet, Roberts Swamp, Lake Mortijinup, Benje Benjenup Lake and Ewarts Swamp (maps 1a and 1b) (see Section 12 *Hydrology*). Stokes Inlet is also an important habitat for fish with, depending on water salinity and length of time since the bar last opened to the sea, between 12 and 22 species of fish present (see also Section 30 *Commercial fishing and aquaculture*).

Threats to the wetlands include clearing and agricultural use in the upper catchment causing salinisation, excessive inundation and increased nutrient loads in the water bodies; weeds; plant diseases; and inappropriate fire regimes (see sections 12 *Hydrology*, 18 *Environmental weeds*, 20 *Diseases* and 22 *Fire*).

Lake Gore wetlands and Lake Mortijinup

The Lake Gore Ramsar site is a wetland of 4,017 hectares of which Lake Gore comprises 740 hectares. It is a good example of a system of saline coastal lakes of varied depth and salinity. The Ramsar site includes the entire area of Lake Gore Nature Reserve, and part of a downstream system of interconnected lakes within the eastern part of Nature Reserve 26885.

Lake Gore is a significant migration stopover area for migratory shorebirds such as the hooded plover (priority 4) with sightings of up to 1,570 birds (1995), approximately one-third of the current estimated global population (Wetlands International 2006, DEC 2009b). Lake Gore is identified as the hooded plover's single most important drought refuge site (ANCA 1996, Newbey 1996, Singor 1999, Raines 2002). Lake Gore is also important for moulting birds during spring/summer, such as the Australian shelduck (*Tadorna tadornoides*)—up to 12,000 birds, and as drought refuge for thousands of other waterbirds including the banded stilt (*Cladorhynchus leucocephalus*) (Jaensch and Watkins 1999). Surveys have recorded 58 species of waterbird within the system including 17 listed under international treaties (all listed under the EPBC Act as 'migratory') and seven breeding species. See Appendix 4 for summary information on the criteria for Ramsar listing, ecological character, and limits of acceptable change for Lake Gore.

Increased water levels of the Lake Gore wetland system over the past 10 years have altered the suitability of the site, particularly the wading waterbird habitat, such as that suitable for the hooded plover and significantly reduced bird numbers using the lake (Raines 2002, Robertson and Massenbauer 2005, Massenbauer 2008, DEC 2009b, DEC2009c).

Figure 1 shows the boundary of the Lake Gore Ramsar site as well as the boundary of Lake Gore and nearby Lake Mortijinup wetlands listed as 'nationally important' in the *Directory of Important Wetlands in Australia* (Environment Australia 2001a). Note that only part of the nationally important designated area is within the planning area.

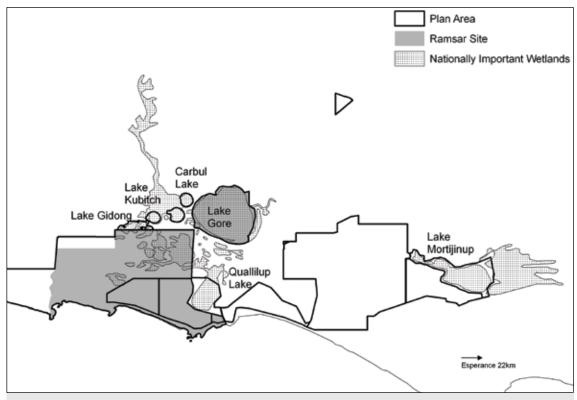


Figure 1. Lake Gore Ramsar site, Lake Gore nationally important wetlands and Lake Mortijinup nationally important wetlands.



Lake Gore, Lake Gore Nature Reserve. Photo – Tegan Laslett

Quallilup Lake (now a section 5(1)(h) reserve) has been proposed as an addition to the Ramsar site (Environment Australia 2001a) and Gidong, Kubitch and Carbul lakes (unallocated Crown land) also have the potential to be added to the Ramsar site, especially as these lakes are part of the 1,500-hectare nationally important wetland system also designated around Lake Gore.

The nearby nationally important Mortijinup Lake System (comprising Lake Mortijinup Nature Reserve and part of proposed addition Reserve 24486) is a major breeding area for the little black cormorant (*Phalacrocorax sulcirostris*), the largest in the south-west outside of the Swan Coastal Plain and a regionally significant drought refuge area for the freckled duck (priority 4) (ANCA 1996, Gillfillian 2000). At least 30 waterbird species have been recorded in the area including four that are protected by international treaties.

Lake Warden System

The Lake Warden System Ramsar site is a 2,300-hectare system of saline lakes and marsh areas behind beach-front dunes. It includes Lake Warden Nature Reserve (Lake Warden), part of Woody Lake Nature Reserve (part of Windabout Lake, Woody Lake and Lake Wheatfield), and part of Mullet Lake Nature Reserve (Station Lake, Mullet Lake and Ewans Lake).

The lakes provide important habitat and dry-season refuges for waterbirds, including a significant proportion of the hooded plover population (more than 240 were recorded at Lake Warden in February 1985), which breed regularly at Station Lake and Lake Warden. Surveys have recorded 75 species of waterbird including 27 listed under international treaties (26²⁷ of these are listed under the EPBC Act as 'migratory'). More than 30,000



Lake Warden, Lake Warden Nature Reserve. Photo – DEC

²⁷ The crested tern (Sterna bergii) is listed under JAMBA, but not the EPBC Act.



Sanderling (Calidris alba) on Lake Wheatfield, Woody Lake Nature Reserve. Sanderlings are one of the 25 species of migratory shorebird that use the Lake Warden System Ramsar site as part of their annual migration and are protected under the EPBC Act and several international migratory agreements (JAMBA, CAMBA, ROKAMBA and the Bonn Convention). Photo – Laurent Marsol

individual waterbirds were recorded using the Lake Warden System between 1981 and 1985 (Jaensch *et al.* 1988), and though no counts have reached 20,000 since then, the number of individual waterbirds that use the system regularly may still exceed 20,000. Species that use the system in large numbers include the Australian shelduck, black swan (*Cygnus atratus*), grey teal (*Anas gracilis*), banded stilt, chestnut teal (*Anas castanea*), musk duck (*Biziura lobata*), hardhead (*Aythya australis*) and hoary-headed grebe (*Poliocephalus poliocephalus*). The threatened Recherche Cape Barren goose and Carnaby's cockatoo, have also been recorded within the Lake Warden System.

Summary information on the criteria for Ramsar listing, ecological character, and limits of acceptable change for the Lake Warden System Ramsar sites is shown in Appendix 5.

Figure 2 shows the boundary of the Lake Warden System Ramsar site as well as the boundary of Lake Warden wetlands listed as 'nationally important' in the *Directory of Important Wetlands in Australia* (Environment Australia 2001a).

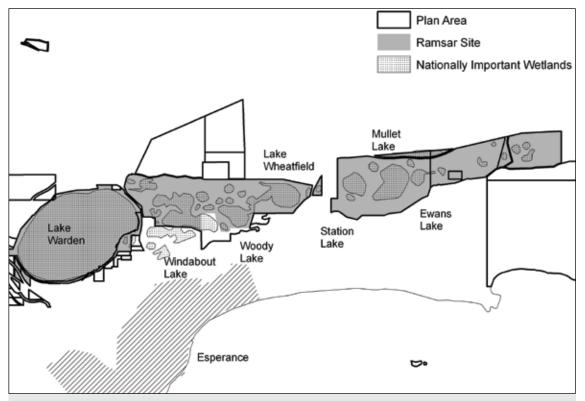


Figure 2. Lake Warden System Ramsar site and Lake Warden nationally important wetlands.

Further surveying of the wetland areas is required to enable the setting of, and monitoring against limits of acceptable change (DEC 2009b, DEC 2009c). Recommended actions to address biological knowledge gaps include:

- implement an appropriate waterbird survey method and regime to ensure that the Ramsar sites
 are surveyed with uniform frequency at appropriate times of the year, recording the maximum
 abundance and species richness
- fish surveillance/monitoring taking into account different seasons and changes in salinity
- aquatic invertebrate surveillance/monitoring taking into account different seasons and changes in salinity concentrations in all of the major wetlands of the Ramsar sites and correlate biomass changes with waterbird populations
- update the extent and distribution of vegetation communities within the Lake Warden System Ramsar site as conducted by DEC (2007d)
- ongoing monitoring of vegetation condition (previous vegetation condition assessment for Lake Gore: Massenbauer and Palmquist 2006)
- undertake regular weed mapping to ascertain rate of spread
- update map of vegetation affected by *Phytophthora cinnamomi* at Lake Gore to ascertain rate of spread
- monitor chlorophyll *a* (biomass of phytoplankton), algae (phytoplankton cell count and composition) and macro algae at the Lake Warden System.

Roberts Swamp

Roberts Swamp is an inland wetland contained within a shire reserve approximately 1,700 hectares in area and is proposed for addition to the conservation estate. The wetland and fringing vegetation communities cover approximately 300 hectares and provide an important freshwater refuge for waterbirds. The salinity levels of the water contained in Roberts Swamp have remained low, due to the short retention period of water in the swamp and accumulated salts being readily transported into the underlying soil profile.

Benje Benjenup Lake

Fifteen species of waterbird have been recorded in regionally significant Benje Benjenup Lake, unallocated Crown land to the north of Esperance. The main value of the wetland is as habitat for wading shorebirds including migratory species, as opposed to other types of waterbirds such as ducks, grebes and coots which require shelter or cover within the water body. Wading shorebird use of the lake is determined by water depth and degree of exposure of mud flat.

Ewarts Swamp

Ewarts Swamp is also regionally significant as it is the only coastal freshwater swamp east of Cape Le Grand. The threatened Australasian bittern has been recorded at this location.

Riparian zones

Riparian zones are ecologically and hydrologically linked to water bodies and often provide key corridors for small mammal and bird dispersal. Protection and restoration of riparian vegetation is important in maintaining river and wetland systems. Fringing vegetation and floodplains often provide a filtering mechanism, filtering out sediment, nutrients and other pollutants.

The average condition of riparian vegetation within the Recherche subregion was assessed in 2002 to be 'degraded' with a trend of 'declining' (NLWRA 2002). Riparian zones within the subregion identified include Lort River, Young River, Oldfield River and Dalyup River. Threats include vegetation clearance,



Young River corridor, a proposed addition to the conservation estate. Photo – Aberline Attwood

fragmentation, grazing, feral animals, weeds, increased salinity, altered hydrology, pollution and broad acre farming (CALM 2003). It is proposed to add portions of the Oldfield, Munglinup, Young and Lort river corridors to the conservation estate (Appendix 2).

Riparian vegetation within the wetland systems in the planning area is also highly degraded. For example within the Lake Gore wetland system 53 per cent of the floodplain vegetation is affected by shallow watertables and inundation (Massenbauer and Palmquist 2006) (see Section 12 *Hydrology*). The hydrological changes within the Ramsar sites have been implicated in the death and decline of the saltwater paperbark (*Melaleuca cuticularis*) (Ogden and Froend 1998, Franke *et al.* 2001, DEC 2007e, DEC 2009d), which fringes many of the lakes of the wetland systems.

Vegetation corridors

Despite the size of many of the national parks and nature reserves within the planning area, secure linkages with other areas of remnant vegetation are required to provide fauna with:

- migratory routes
- access to areas containing seasonally variable food and other resources
- escape and recolonisation routes, especially relevant in terms of large bushfires and potential longterm climatic impacts of global warming.

The *South Coast Macro Corridor Project*²⁸ has identified a network of potential major vegetated corridors that would provide a link from west to east across the coast, and from the coast into the inland regions. The major vegetation corridors in the planning area are the coastal strips either side of Esperance, which stretch across the length of the planning area (Watson and Wilkins 1999, Wilkins *et al.* 2006). Currently these two corridors are made up of a series of conservation reserves, shire reserves, and unallocated Crown land. Many of the tenure additions proposed in the plan are intended to protect this corridor by adding unallocated Crown land and unvested Crown reserves to connect existing conservation reserves or provide 'stepping stone' linkages.²⁹

²⁸ A joint project between the department and the South Coast Natural Resource Management group. See www.southcoastnrm.com.au/pages/2958/wa-south-coast-macro-corridor.

²⁹ Tracts of bush that form continuous corridors or links between large areas of native vegetation are the most effective wildlife corridors. However, a 'stepping stone' corridor occurs where a number of isolated patches of bush create a sequence of habitat nodes between substantial areas of natural vegetation. These corridors usually benefit larger animals or those able to travel across open country in short periods of time, such as parrots, birds of prey and kangaroos.

Several other significant corridors of remnant vegetation exist within the boundaries of the planning area. These include the river corridors of the Oldfield, Munglinup, Young and Lort rivers (mostly unvested Crown reserve), some of which have been included in the proposed additions (see Appendix 2; maps 1a and 1b and Section 16 *Native animals and habitats – Riparian zones*).

Granite outcrops

Small, isolated and disjunct granite outcrop communities are interspersed throughout the planning area, notably in Cape Arid and Cape Le Grand national parks and on the islands of the Recherche Archipelago. Granite outcrops support characteristic assemblages of flora and fauna often isolated from the surrounding, relatively low-relief environment (Gole 2006). Granite outcrops including Mississippi Hill at Cape Le Grand National Park, and Mount Ragged within Cape Arid National Park are identified as refugia for threatened flora such as the prickly honeysuckle (CALM 2003). In addition, the ornate dragon lizard (*Ctenophorus ornatus*) is endemic to granite outcrops (Gole 2006).

Threats to granite outcrop communities include weed invasions, grazing by feral animals such rabbits (*Oryctolagus cuniculus*), inappropriate fire regimes and *Phytophthora* dieback (Gole 2006).

Islands

The islands of the Recherche Archipelago provide important habitat for terrestrial fauna including relictual populations of mammals once widespread on the mainland. Fauna includes the threatened blackflanked rock wallaby (the only insular population of the wallaby south of the Pilbara), Recherche rock wallaby (endemic to the Recherche Archipelago found only on Mondrain, Wilson and Westall islands), tammar wallaby (priority 5), threatened Recherche subspecies of the Cape Barren goose which only breeds on islands of the Recherche Archipelago, with Cull Island being the main breeding island for the bird and various species of reptiles including the threatened Recherche dugite (endemic to the Recherche Archipelago) and the specially protected carpet python (also priority 4).

It is presumed that since the majority of the islands were separated from the mainland at around the same time and yet display different patterns of fauna distribution, that fire is likely to have caused, or been related to, occasional extinctions (perhaps linked to subsequent drought) on the islands (D Pearson pers. comm. 2005). For example, two subspecies of rock-



Recherche rock wallaby (*Petrogale lateralis* hackettii), Westall Island, Recherche Archipelago Nature Reserve. Photo – Emma Adams

wallabies are found on only four of the islands, tammar wallabies are found on Middle and North Twin Peak islands only, and carpet pythons are only found on Mondrain and North Twin Peak islands. Other reptiles, such as dugites, death adders and crowned snakes, also have specific patterns through the islands.

In addition to providing refuges for relictual fauna, the islands also provide haul-out and breeding sites largely free from interference for marine fauna³⁰ such as the New Zealand fur-seal and Australian sea-lion

³⁰ While this management plan is for the terrestrial component of the Recherche Archipelago, management of marine fauna (such as seals, sea-lions and seabirds) is relevant within this plan in the context of management of the fauna while on land, and management of terrestrial human activities, commercial operations, pest animals, weeds and fire regimes which can impact on the marine fauna.



Shearwaters, Recherche Archipelago Nature Reserve. Photo – Aberline Attwood

(both specially protected). Pinniped breeding and haul-out sites³¹ are considered 'critical habitat' for the continuation of these species (Lee and Bancroft 2001). However, human disturbance is still a threat to some island colonies, particularly during the breeding season.

A draft pinniped management program (Gales and Wyre 1999) has identified six islands in the planning area to be key sites for New Zealand fur-seal population monitoring: Investigator Island, Seal Rock, Hood Island, Salisbury Island, Daw Island and New Year Island. Four islands have been identified to monitor Australian sea-lion populations: Investigator Island, Kimberley Island, Salisbury Island and Six Mile Island.

Islands also provide important breeding sites for birds such as the little penguin (*Eudyptula minor*), shearwaters and petrels.

Islands, or portions of islands, that either a) support major breeding colonies of pinnipeds and/or seabirds; b) are important haul-out sites; or c) are otherwise considered vulnerable to human disturbance should be considered for prohibited area status under section 62(1) of the CALM Act (see Section 26 *Visitor Access*). This would include (but is not limited to) consideration of the following islands:

- Salisbury Island, Seal Rock and Cooper Island (important breeding sites for New Zealand fur-seal [Shaughnessy 1990])
- Termination, Little and Pointer islands (important haul-out sites for New Zealand fur-seal [Shaughnessy 1990, Shaughnessy *et al.* 1994])
- Kimberley and Six Mile islands (important breeding sites for Australian sea-lion)
- Daw Island (breeding site for Australian sea-lion impacted by former use of the island for commercial fisherman [Gales 1994]).

³¹ Hauling-out is the behaviour associated with pinnipeds of temporarily leaving the water between periods of foraging activity for sites on land or ice. Hauling-out is necessary in seals for breeding and a distinction is generally made between reproductive aggregations, termed 'rookeries', and non-reproductive aggregations, termed 'haul-outs'. Other benefits of hauling-out may include predator avoidance, thermal regulation, social activity, parasite reduction and rest. There is much variety in haul-out patterns between different seal species and many species of pinniped have only a few localised rookeries where they breed, but periodically occupy hundreds of haul-out sites throughout the range.

There are four unnamed islands south of the western part of Lake Shaster Nature Reserve that have been identified as proposed additions to the conservation estate (see Appendix 2). At least one of these is known to be a haul-out site for Australian sea-lions.

Intertidal zones

The flat shallow intertidal rocky shores and platforms of the islands and along the coastline form important feeding grounds for the oystercatchers, shorebirds and marine (and terrestrial) raptors (for example, osprey and sea eagles). Many of these are protected by international agreements such as JAMBA, CAMBA and the Bonn Convention (see sections 4 Legislation and policy - International conservation agreements and 16 Native animals and habitats – Migratory birds). Threats include marine pollution, vehicle use along beaches, introduced predators and bushfire.



Sooty oystercatchers (Haematopus fuliginous), Cape Arid National Park. Photo – Laurent Marsol

Desired outcome

Native fauna and habitats of the planning area are protected.

Management actions

- 1. Undertake or support further systematic biological surveys of the wetland areas and poorly known areas.
- 2. Provide statutory protection for conservation significant species by continuing to list them under the Wildlife Conservation Act and/or EPBC Act.
- 3. Support the development and/or revision and implementation of recovery plans for threatened and specially protected fauna.
- 4. Monitor and manage threatened fauna habitat.
- Gather baseline data on populations of threatened and other conservation significant fauna, determine habitat requirements and monitor for population fluctuations, taking into account and recording variation due to natural causes.
- 6. Monitor population numbers of the New Zealand fur-seal and Australian sea-lion at selected haul-out sites.
- 7. Control access to islands that are haul-out and/or breeding sites for pinnipeds or important seabird sites under section 62(1) of the CALM Act as necessary.
- 8. Conduct surveys of possible habitat areas of threatened fauna to determine distribution, including where there has been reported sightings of fauna such as bilbies.
- 9. Reintroduce fauna into areas where they are known to have formerly occurred, once threatening processes such as predators have been identified and adequately controlled, and monitor populations.
- 10. Assess proposed operations and developments for potential impacts on conservation significant species.

- 11. Undertake or support further assessment of vegetation communities and condition of the wetland and poorly known areas.
- 12. Incorporate proposed additions to the conservation estate that contain threatened or vulnerable fauna or their potential habitats, or provide significant vegetation corridors (or 'stepping stone' linkages) (see Appendix 2).
- 13. Add portions of the Oldfield, Munglinup, Young and Lort river corridors to the conservation estate (see Appendix 2).
- 14. Add the four unnamed islands south of Lake Shaster Nature Reserve to the conservation estate (see Appendix 2).

Key performance indicators

Performance measure	Objective	Reporting
Baseline composition and abundance of native fauna communities within the	Maintain or improve baseline composition and abundance	Every 5 years
Ramsar wetlands Biological limits of acceptable change for Ramsar wetlands	Limits of acceptable change (or interim limits) are not exceeded	Every 5 years
Range and population size of threatened and other conservation significant fauna	Subject to natural variation, recovery and maintenance of viable populations of threatened and other conservation significant fauna	Every 5 years, or as per recovery plans
The conservation status of threatened fauna species	a) No decline in the conservation status of threatened fauna speciesb) Translocated fauna species are successfully established as viable breeding populations	Every 5 years, or as per recovery plans

17. Ecological communities

Threatened ecological communities

There is one threatened ecological community (TEC) with five occurrences within the planning area. The 'Russell Range mixed thicket vegetation complex' TEC is an endemic community with a range of less than 50 square kilometres across Cape Arid National Park and Nuytsland Nature Reserve. Although the community is widespread within its range and most or all of the former occurrences remain, it is classified as being vulnerable to threatening processes such as changed fire regimes and dieback caused by *Phytophthora cinnamomi*. No recovery plan has been completed for the Russell Range TEC.

Priority ecological communities

There are two priority ecological communities (PECs) within the planning area.

The 'Stromatolite-like microbialite community of a coastal hypersaline lake (Pink Lake)' is a priority 1 community. It includes microbial, invertebrate and plant assemblages of natural saline seeps. The community displays well-laminated stromatolites consisting of alternations of egg shell-like layers of inorganic aragonite precipitate and calcified microbial layers dominated by coccoid cyanobacteria and photosynthetic bacteria. These structures probably record seasonal alternations of the growth of a benthic microbial community and aragonite precipitation. Evidence of microbial activity was recently identified around Pink Lake but the microbial community requires further investigation to characterise its composition and habitat requirements. It is proposed to add Pink Lake to Pink Lake Nature Reserve.



Pink Lake, a proposed addition to the conservation estate and adjoining Pink Lake Nature Reserve. When the lake appears pink it is due to the green alga *Dunaliella salina* which at high salinities, temperatures and light accumulates the red carotenoid pigment, beta carotene, and/or the presence of the bacterium *Halobacterium cutirubrum* which is pink in colour and generally grows within the salt crust on the bottom of the lake. Photo – Tegan Laslett

The 'Scrub heath on Esperance Sandplain: Scrub on deep sand with *Banksia* and *Lambertia*' is a priority 3 community and is located within the proposed nature reserve section of Helms Forestry Reserve. The scrub heath is dominated by showy banksia (*Banksia speciosa*) and chittick (*Lambertia inermis*) and other proteaceous species such as southern plains banksia (*B. media*) and various *Hakea* spp. (as well as the occasional Western Australian Christmas tree [*Nuytsia floribunda*] and mallee species).

Desired outcome

Threatened and other ecological communities of conservation significance within the planning area are identified and protected.

Management actions

- 1. Undertake baseline surveys and develop an interim recovery plan for the Russell Range TEC.
- 2. Resolve the key habitat parameters, map the core areas of the microbial community in Pink Lake PEC and add Pink Lake to the adjacent Pink Lake Nature Reserve.
- 3. Determine the boundaries of the Esperance Sandplain PEC and change the majority of Helms Forestry Reserve to nature reserve to protect remnant vegetation including the PEC.
- 4. Monitor species composition and habitat parameters in known threatened and at risk (including priority) ecological communities and set limits for acceptable change, taking into account and recording variation due to natural causes.
- 5. Identify and protect threatened and priority ecological communities by seeking to list them under state and/or Commonwealth legislation as appropriate.
- 6. Assess management operations and/or proposed developments that may impact on the conservation values of threatened ecological communities, or other communities of conservation significance (including potential hydrological impacts to the Pink Lake PEC).

Key performance indicator

Performance measure	Objective	Reporting
Species composition and habitat of	No change in the species composition or	Every 5 years
threatened and at-risk (including	habitat parameters from 2012, outside	
priority) ecological communities	specified limits in known threatened and	
	at-risk ecological communities	

18. Environmental weeds

There are 140 taxa of introduced plants, non-native to Western Australia recorded in the planning area which are considered environmental weeds.³² Compared to the mainland reserves, environmental weeds infestations on the islands are uncommon, with Western Australian Herbarium records indicating that approximately 90 per cent of the islands are weed free and the islands that were settled and/or still visited have the most weeds (for example, Woody Island). Past European settlement on Cull Island is responsible for the domination of African boxthorn (*Lycium ferrocissium*) on the island.



Removal of Victorian tea tree (Leptospermum laevigatum) from Woody Lake Nature Reserve. Photo – Mick Rose/DEC

State and regional context

The *Environmental Weed Strategy of Western Australia* (CALM 1999b) provides a ranking of threat of weed species on a statewide basis against three criteria – invasiveness, distribution and environmental impacts. Seventy-four of the known introduced plants in the planning area have been rated as having high (11) or moderate (63) impact. In 2008, the department commenced the *Invasive Plant Prioritisation Process* to progress the *Environmental Weed Strategy* which involved the prioritisation of weed species by departmental region through the updated assessment of their invasiveness, impacts, potential and current distribution and feasibility of control. Following this prioritisation for the South Coast region³³, five of the known introduced plants in the planning area have been identified as regionally significant weeds: Geraldton carnation weed (*Euphorbia terracina*), one-leaf Cape tulip (*Moraea flaccida*), Victorian tea tree (*Leptospermum laevigatum*), blackberry (*Rubus laudatus*) and Paterson's curse (*Echium plantagineum*). Management of these weeds (i.e. eradication, control and/or monitoring) within the planning area will be considered in the context of local priorities.

Local priorities

Current local priorities for the planning area, based on impact and feasibility of control include: bridal creeper (*Asparagus asparagoides*), African boxthorn, Victorian tea tree, freesia (*Freesia* spp.), maritime pine wildlings (*Pinus pinaster*) and golden wattle (*Acacia pycnantha*). These will be the focus of weed control programs in the planning area.

Bridal creeper

Bridal creeper is the most widespread of the weeds within the planning area, found from Lake Shaster Nature Reserve to Nuytsland Nature Reserve. It is also rated a Weed of National Significance because of its invasiveness, potential to spread, and the economic and environmental impacts (State Weed Plan Steering Group 2001). Significant infestations within the planning area include:

- Lake Shaster Nature Reserve
- Stokes National Park (five main infestations with a combined area of 150 hectares)
- Moir Homestead (25 hectares)

³² Environmental weeds are unwanted plant species growing in natural ecosystems that modify natural processes, usually adversely, resulting in the decline of the communities they invade.

³³ South Coast regional weed assessment www.dec.wa.gov.au/content/view/6295/2275/

- Cape Arid National Park (the Thomas River Valley, the Ranger's residence and Thomas River camp site)
- Nuytsland Nature Reserve (Point Malcolm and along the old telegraph line)
- Daw Island in Recherche Archipelago Nature Reserve.

Physical removal of bridal creeper is not effective unless all the rhizomes are dug up and destroyed, and spraying of chemicals can affect non-target species. Since 2000, biological control agents, including the bridal creeper rust (*Puccinia myrsiphylli*) and a leafhopper (*Zygina* sp.), have been introduced to combat bridal creeper infestations at various sites within and adjacent to the planning area. Initial observations of the results of these control agents indicate new infestations are being controlled.

African boxthorn, Victorian tea tree and freesia

African boxthorn, Victorian tea tree and freesia are also significant environmental weeds in the planning area. They are becoming the dominant species in some areas, out-competing the native species especially after intense bushfires (for example, Victorian tea tree is replacing *Banksia* spp.). This is also changing the visual landscape.

African boxthorn is a major component of the vegetation on Cull Island in Recherche Archipelago Nature Reserve and also occurs in Stokes National Park, Moir Homestead, Woody Lake Nature Reserve and Woody Island Nature Reserve.



African boxthorn (Lycium ferrocissium), Moir Homestead. Photo – Aberline Attwood

The main Victorian tea tree infestation within the planning area is at Warrenup Lake system in Nature Reserve 26885. There are also sporadic infestations at Stokes National Park, Nature Reserve 26885, Lake Gore Nature Reserve, unallocated Crown land (lot 2010), Helms Forestry Reserve, Shark Lake Nature Reserve, Woody Lake Nature Reserve, Mullet Lake Nature Reserve, and Cape Le Grand National Park. Control of Victorian tea tree is extremely labour intensive (cut and paint stumps) which is not very effective at a landscape scale. However, an eradication and control program has been initiated at Warrenup Lake system. In 2010–2011, 70 per cent of the Victorian tea tree population was targeted, with 30 per cent yet to be treated. Ongoing monitoring to determine success will be required.

Freesia is a major issue in some areas of Cape Le Grand National Park.

Maritime pine and golden wattle

Maritime pine and golden wattle are rapidly encroaching and establishing themselves among the native vegetation of the inland reserves of the planning area. Maritime pine wildlings are present in Cheadanup Nature Reserve, Bebenorin Nature Reserve, Shark Lake Nature Reserve and Helms Forestry Reserve. In one area of Helms Forestry Reserve they are now the dominant species. Golden wattle is also present in Helms Forestry Reserve as well as East Naernup and Dalyup nature reserves. Both species can be managed easily with a chainsaw and applying herbicide to the stem, or with physical removal.

Weed invasion

In the west of the planning area, weed invasion from neighbouring farmland is an issue. Weed invasion along property boundaries is a common problem in agricultural landscapes, and is exacerbated by disturbance events such as fire. There are 58 taxa of weeds within two kilometres of the planning area that are not yet recorded within the planning area, therefore the spread of these weeds requires monitoring.

Desired outcome

Impacts of environmental weeds on key values are minimised.

Management actions

- Monitor weeds within the planning area to ensure that weed information is up to date and maintain
 a register of weeds, including details of distribution, history of control and relevant biological
 information such as invasiveness, distribution and environmental impact.
- Control weeds using various techniques including physical removal, herbicides and release of biological control agents in accordance with the species, its environmental impact and the resources available, consistent with *Environmental Weed Strategy for Western Australia*, the regional weed assessment and local knowledge.
- 3. Liaise with adjacent landholders and implement measures to prevent weeds from adjacent areas establishing within the planning area.
- 4. Limit the opportunity for weeds to be introduced and established by:
 - applying appropriate hygiene practices as required to machinery entering the planning area
 - minimising disturbance of soil while carrying out management activities, particularly in areas within or adjacent to sources of weeds
 - restricting the importation of soil into the planning area to only those sources with strict soil quarantine.

Key performance indicator

Performance measure	Objective	Reporting
The extent of environmental weed	Decrease in the extent of weed species	After 5 years
species at priority locations rated as	rated as 'high', 'moderate' or local	
'high', 'moderate' or local priority	priority from 2012 levels	

19. Introduced and other problem animals

Introduced and other problem³⁴ animals have potential for serious impact on natural systems through direct effects such as predation, habitat destruction, competition for food and territory, introduction of disease, and through environmental degradation by selective grazing, accelerating erosion and polluting streams. The most common and widespread introduced animals in the planning area are the red fox (*Vulpes vulpes*), cat (*Felis catus*), deer (*Cervus elaphus*) and rabbit. Other introduced animals include the goat (*Capra hircus*), house mouse (*Mus musculus*), black rat (*Rattus rattus alexandrinus*)³⁵, horse (*Equus caballus*)³⁶, camel (*Camelus dromedarius*), sheep (*Ovis aries*), wild dog (*Canis familiaris*), starling

³⁴ A 'problem animal' refers to native fauna, such as the western grey kangaroo or emu, that can have significant social and economic impacts on local communities and visitors to the planning area.

³⁵ The introduced black rat was first mentioned in a survey of Woody Island (Goodsell et al. 1976), however with recent DNA confirmation that most of the rats on Woody Island are native bush rats (Rattus fuscipes), further trapping work is required to confirm or disregard the presence of the black rat on the island.

³⁶ Wild horses are found in the unallocated Crown land near Cape Le Grand National Park, and sometimes enter the park looking for water.

(*Sturnus vulgaris*)³⁷ and honeybee (*Apis mellifera*). Gilgies/marron (*Cherax* spp.) have been introduced by park users into some of the waterways of the planning area such as at Pine Hill in Cape Arid National Park.

Since 1996, Lake Shaster Nature Reserve, nature reserves 27888 and 26885 (Barker Inlet and Warrenup area), part of Cape Arid National Park and part of Nuytsland Nature Reserve have been part of the Western Shield fauna recovery program³⁸ which included aerial baiting targeting foxes four times a year. This program has now been extended to include research to develop an effective bait for feral cats and is now known in the South Coast region as the South Coast Integrated Fauna Recovery Program. Myxomatosis, and more lately calicivirus, is used by the Department of Agriculture and Food to control rabbit populations in the region (DEC undertakes no direct rabbit control work in the planning area).



Departmental staff measuring a noolbenger or honey possum (*Tarsipes rostratus*) as part of the *Western Shield* monitoring program. Photo – Emma Adams

The majority of the island reserves do not have any introduced animals. However, Burbidge (2004a) lists nine islands within the Recherche Archipelago (including Woody Island) as having records of introduced mammals. Most occurrences of introduced animals are the result of European settlement on the islands. Prior to attaining nature reserve status, some of the islands (including Charley, Figure of Eight, Observatory, Cull, Thomas and Woody) were used to graze sheep and goats, a practice that continued up until the 1940s and 1950s. However, the only livestock remaining on the islands is a flock of goats on Cull Island, originating from an introduction in 1935. There are currently more than 70 goats on the island. The continued presence of these goats may hamper any rehabilitation of native vegetation as part of the African boxthorn control program (see Section 18 *Environmental weeds*). However, it is thought that grazing/browsing by goats is responsible for the maintenance of large grassy areas on the island, which supports the significant number of threatened Cape Barren geese found there. Therefore, it is critical that any future goat management ensures that these grassland habitats are adequately maintained.

The population of rats (which may be either the introduced black rat or native bush rat, or both) on Woody Island tend to fluctuate seasonally. Apart from being responsible for damage to the tourist facility infrastructure they are also suspected of causing the decline of the relictual populations of ash-grey mouse (*Pseudomys albocinereus*) on the island. Past attempts to locate the ash-grey mouse on the island have been unsuccessful. Any control program for rats will need to first determine whether they are the introduced black rat or native bush rat, or both.

³⁷ Starlings have been sighted within two kilometres of Lake Shaster Nature Reserve and Stokes National Park and are declared agricultural pests. The Department of Agriculture and Food is responsible for the control of this species.

³⁸ Western Shield fauna recovery program www.dec.wa.gov.au/westernshield. From 2011–2012 Stokes National Park and the western coastal nature reserves, including Lake Shaster, Barker Inlet and Warrenup are going to be withdrawn from the Western Shield aerial baiting program.

The western grey kangaroo (*Macropus fuliginosus*), native to the mainland, was introduced onto Woody Island, presumably by island users, in the 1970s (K. Tiedemann pers. comm. 2006). Some damage has subsequently been caused to the island's understorey vegetation: however, the department currently does not consider this impact a problem. On the mainland, however, western grey kangaroos and emus (*Dromaius novaehollandiae*) are both known to impact upon adjacent farmland and high numbers cause some concern to neighbouring landholders. Permits for culling kangaroos outside of the conservation estate can be issued by the department where numbers are confirmed to be 'excessive'.³⁹

Desired outcome

Impacts of introduced and other problem animals on key values are minimised.

Management actions

- 1. Maintain information on introduced animals (and other problem animals where required) including a register of animals, details of distribution, relevant biological information and history of control.
- 2. Continue to implement the *South Coast Integrated Fauna Recovery Program* to protect native fauna from introduced predators.
- 3. Remove goats on Cull Island and monitor effects on the Recherche Cape Barren geese habitat.
- 4. Undertake further surveys of Woody Island to determine whether the black rat is present on the island.

20. Diseases

Plant diseases

Plant diseases can have major impacts on vegetation communities by changing species composition, decreasing plant cover, and decreasing litter fall, which can, in turn, impact on fauna by removing food sources and destroying habitat and shelter. Plant disease knowledge is still rudimentary with much more work required on distribution, pathology, plant susceptibility and environmental processes that may facilitate spread.

Phytophthora dieback (mostly P. cinnamomi), aerial canker and Armillaria luteobubalina are the major disease threats to the vegetation of the planning area. Pattern of disease spread, in particular Phytophthora dieback, is strongly related to the native vegetation community and other site factors such as the presence of watercourses, waterlogged soil, tracks and roads, with infestation being most common where human activities have taken place.

Phytophthora

Currently, *Phytophthora* is known to have infected areas within Lake Shaster Nature Reserve, Stokes National Park⁴⁰, in and around Esperance township, parts of Helms Forestry Reserve, and large areas of Cape Le Grand National Park and Cape Arid National Park. However, more extensive surveying for *Phytophthora* is required within the planning area.

Some mapping has already been done as part of the *Dieback Project*, a project carried out by the South Coast Natural Resource Management (NRM) group in partnership with the department and other stakeholders (see Section 37 *Off-reserve management and partnerships*). These maps show low to high confidence infested and uninfested areas.⁴¹ Further *Phytophthora* interpretation and mapping has been carried out in Cape Arid National Park and the road reserves around Alexander and Kennedy roads (DEC 2009a).

³⁹ For more information refer to Fauna Notes No. 30 Western Grey Kangaroo Management Plan www.dec.wa.gov.au/component/option,com_docman/Itemid,708/task,doc_download/gid,965/.

⁴⁰ In addition to P. cinnamomi there has also been P. citricola and P. cryptogea found within Stokes National Park.

⁴¹ The Project Dieback maps have been incorporated into the Phytophthora Dieback Atlas www.dec.wa.gov.au/content/view/213/548/1/3/.



Phytophthora dieback in banksias and grass trees, Lucky Bay, Cape Le Grand National Park. Photo – Greg Freebury/DEC

There appears to be limited impact of *Phytophthora* in areas with calcareous soils but a very high impact in acidic soils such as those around granite outcrops in Cape Le Grand and Cape Arid national parks. Within Cape Le Grand National Park, the Proteaceae community within the scrub heath vegetation west of Dunn Rock—which includes populations of the threatened prickly honeysuckle—has been extensively affected by *P. cinnamomi*.

Phytophthora infestations⁴² have been established in Cape Arid National Park for 20 to 30 years, causing significant damage to 50 per cent of near-coastal⁴³ vegetation communities (Shearer 1994, Bellgard *et al.* 1995, Smith and Grant 2000). Susceptible vegetation includes vegetation bordering granite outcrops, in drainage lines, on hillslopes and in the showy banksia dominated community west of Mount Arid (Brandis *et al.* 1985, Smith and Grant 2000). The impact of *P. cinnamomi* on red swamp banksia (*B. occidentalis*) along drainage lines in the park, is so severe that it may become an example of a oncecommon species becoming locally threatened by infection (Bryan Shearer pers. comm. 2005). In addition, pollinators reliant on susceptible plant species such as banksias as key nectar sources, such as the western pygmy possum (*Cercartetus concinnus*) and the honey possum (*Tarsipes rostratus*) may become locally rare or extinct in old-infested areas.

Nature Reserve 27087, between Cape Le Grand and Cape Arid national parks, currently does not have any record of *P. cinnamomi* infestation, but the risk of introduction is high as the adjacent unallocated Crown land is known to be infested.

In May 2000, the Israelite Bay Track within Nuytsland Nature Reserve was surveyed and no impact of *Phytophthora* was found (B. Shearer pers. comm. 2005). However, due to the presence of disease-susceptible Proteaceae vegetation, surveying of areas from Point Malcolm to Israelite Bay will be a priority for the management of the reserve.

No Phytophthora infestations have been observed on the islands within the Recherche Archipelago.

Management

Management of *P. cinnamomi* within the planning area will focus on significant uninfested areas—areas likely to remain uninfested by the autonomous spread of the pathogen in the medium term and referred to as 'protectable areas'—and areas that are already infested but with significant conservation values or high visual amenity.

Areas that are able to be protected are yet to be identified within the planning area. To accurately determine the extent of *P. cinnamomi* within the planning area and to identify protectable areas, further on-ground surveys are required. However, due to resource limitations the first priority will be to produce up-to-date maps of probable disease spread (using available maps and knowledge) within the planning area. On-ground surveys should then be prioritised according to risk to conservation values or according to proposed development.

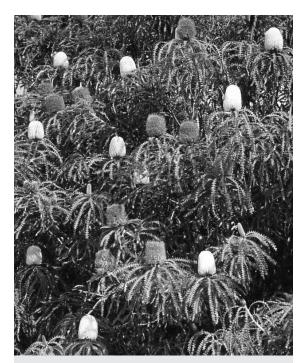
⁴² In addition to P. cinnamomi there has also been P. megasperma, P. multivora and P. cryptogea located within Cape Arid National Park (DEC 2009a).

⁴³ Within five kilometres of the coast.

Management to protect threatened species and communities from *Phytophthora* will include treatment with the chemical 'phosphite'. This has been shown to prevent *P. cinnamomi* killing susceptible native plants in the wild, provided the treatment is continual. However, application of phosphite is not cost effective to treat large areas. In addition, germplasm from threatened native plants may be collected for cryogenic storage.

Landscape-scale management to protect larger areas from *Phytophthora* include containing the spread of the disease at the boundaries of existing infestations and minimising the rate of spread/ establishment of new infestations by controlling the vectored spread by humans and feral animals.

Most of the *Phytophthora* management in the planning area has centred on Cape Arid National Park as it has been the most impacted area. In the last year, the department (partly in conjunction with the South Coast NRM group) has undertaken the following work in managing *Phytophthora* in the planning area:



Banksias, Esperance Lakes. Banksias and other Proteaceous species are highly susceptible to Phytophthora dieback. Photo – Lorna Charlton

- continued to undertake field interpretation and mapping of vegetation health and disease infected sites to update current dieback distribution maps
- upgraded infrastructure such as the access road around the Cape Arid National Park Headquarters, upgraded wash-down facilities at Cape Arid and Cape Le Grand national parks and Esperance works depot, constructed a new foot-bath cleaning station for Len Otte Nature Trail, constructed a mobile trailer mounted wash-down unit acquired for Cape Arid National Park and erected gates for temporary road closures on seasonally closed public roads (specifically for disease management)
- conducted a containment and eradication project which has involved targeting a small infestation
 on Telegraph Track before Fern Creek in Cape Arid National Park and sampling and identifying
 infestation boundaries as well herbicide treatment to remove host native species and sterilise the
 area, soil analysis and metham sodium trials
- conducted phosphite treatment of *P. cinnamomi*-infested threatened flora sites in Cape Le Grand National Park
- erected new dieback interpretation signage in each coastal national park, at the Esperance works depot and at the commercial (private) carwash in Esperance
- initiated a Green Card training program for departmental staff and contractors.

Bushfires in 2006 killed the *Phytophthora*-infested showy banksia woodland and mallee shrubland in the Thomas River area of Cape Arid National Park. Previously it had been recommended that engineering works were carried out to prevent drainage from the *Phytophthora*-infested showy banksia woodland and mallee shrubland reaching the Thomas River camp site, in order to protect the shade trees and visual amenity of the site (Smith and Grant 2000). When the vegetation in the burnt area has regrown, further soil and vegetation sampling will be required to establish the boundary of the infested area and make recommendations on the management of the area to protect the amenity of the camp site.

Other plant diseases

Various canker pathogens, mainly affecting plants from the Myrtaceae and Proteaceae families, are widely distributed throughout the south-west, although little surveying has been done within the planning area.

Botryosphaeria ribis infection has debilitated stands of showy banksia, in association with climatic stress along the south coast (Shearer 1994).

Armillaria luteobubalina is a native pathogen that mainly occurs in coastal dune vegetation and forested areas (Shearer 1994). In coastal areas of the south-west, A. luteobubalina occurs on the calcareous sands of the Holocene dune system (Shearer et al. 1997). Within the planning area, A. luteobubalina occurs along the coast from Stokes National Park as far east as Cape Arid National Park. Records include Woody Lake Nature Reserve, the Rossiter Bay Bird Sanctuary area within Cape Le Grand National Park and Barrier Anchorage Track within Cape Arid National Park.

The native fungi *Omphalotus nidiformis* is also affecting *Banksia* spp. in the Thomas River area, which will impact on recruitment and the visual amenity at the camp site.

Other diseases known to occur along the south coast include rusts, and leaf spots and blights (Shearer 1994, Shearer *et al.* 1997). Rusts are widely distributed on native plant taxa throughout the south-west. *Uromycladium tepperianum* is probably the most widely distributed pathogen in native communities in south-western Australia, however there is limited research on rusts in native communities. *U. tepperianum* occurs frequently on *Acacia* spp. in coastal areas.

Animal diseases

A wide range of pinniped diseases have been diagnosed from post-mortems of sea-lion and fur-seals in Western Australia (Mawson and Coughran 1999), such as tuberculosis (*Mycobacterium tuberculosis*). However, it is unclear whether tuberculosis has always been endemic in sea-lion and fur-seal populations or if the disease was introduced from cattle (Cousins *et al.* 1993).

Amphibians are also vulnerable to *Chytridiomycosis* caused by the amphibian chytrid fungus *Batrachochytrium dendrobatidis* (Aplin and Kirkpatrick 2001). The fungus occurs most often in waterbodies or in soil and frogs that spend more time in or near the water may be more susceptible to the disease. Adequate quarantine measures will need to be undertaken when works are carried out in or adjacent to known frog sites.

Desired outcome

Impacts of plant and animal diseases on key values are minimised.

Management actions

- 1. Review, update and implement the *South Coast* Phytophthora cinnamomi *hygiene plan*.
- 2. Prepare and implement plant and animal disease control plans.
- 3. Survey planning area for *Phytophthora* and produce and maintain operational *Phytophthora* distribution maps.
- 4. Model future spread of *Phytophthora* and identify and establish 'protectable areas'.
- Provide and maintain wash-down facilities and foot-bath stations at key locations within the planning area.
- 6. Develop where necessary, and implement appropriate hygiene measures for management operations and proposed development (for example, limit the spread of disease by minimising soil disturbance and the use of heavy machinery during fire operations in disease risk areas).
- 7. Control public access into, and bait for feral animals to reduce vectored spread in known infested and high risk of *Phytophthora* infestation areas, and create prohibited access areas under section 62(1) of the CALM Act as required.
- 8. Identify, evaluate and, where practical, implement effective and efficient measures such as phosphite treatment for the maintenance and/or restoration of significantly infested areas.

- 9. Resurvey soil and vegetation in the Thomas River area in Cape Arid National Park after the vegetation has regenerated to determine whether engineering works to divert drainage away from Thomas River camp site is required.
- 10. Restrict movement of *A. luteobubalina* by establishing quarantine areas depending on scale of infestation.
- 11. Document any outbreaks of new plant and animal diseases, and implement management responses as appropriate.
- 12. Provide the public and industry (for example, utility service providers) with information about plant disease, emphasising the need for appropriate hygiene measures prior to entry to uninfested areas and to stay on approved roads and tracks.
- 13. Continue research into the effects of *P. cinnamomi* and other plant and animal diseases on key values and adapt management accordingly.

Key performance indicator

Performance measure	Objective	Reporting
Infested areas within any identified	No new human-assisted infestations	Every 5 years
protectable areas that are a priority for	of <i>Phytophthora</i> in any identified	
protection	protectable areas that are a priority for	
	protection	

21. Marine pollution

Boating and shipping activities within Esperance Port, Esperance Bay and Recherche Archipelago have the capacity to impact on the values of the planning area, in particular the coastal and island environments. This may be by way of marine debris, pollutants from ship spills, anti-fouling paints used on ship hulls, and/or bilge pumping.

The biggest incidence of marine pollution in the planning area occurred in 1991, when the *Sanko Harvest* hit a reef 10 kilometres south of Cape Le Grand National Park. Thousands of tonnes of fuel and fertiliser were released into the ocean (Lee and Bancroft 2001) and a stretch of coastline 30 kilometres to the east and west of Esperance was partly or completely covered in oil, including nearly 25 kilometres within Cape Le Grand National Park. Approximately 75,000 kilograms of oil-soaked sand and hundreds of

litres of oil were removed from the beaches and islands. Gales (1991) reported that 200 seals were affected by pollution, mostly newborn New Zealand fur-seals aged between two weeks and two months. New Zealand fur-seal pups were treated to remove oil from their fur on nearby Hood Island and Seal Rock. New Zealand fur-seals are more vulnerable to the effects of oil contamination than Australian sea-lions (Gales and Wyre 1999, Shaughnessy 1999) because they rely on clean fur for insulation. Pacific gulls (Larus pacificus) and other seabirds in the area were also treated to remove oil contamination of their feathers.



A New Zealand fur-seal (*Arctocephalus forsteri*) sleeping, Cooper Island, Recherche Archipelago Nature Reserve. There are at least 14 breeding colonies of New Zealand fur-seal in the archipelago and at least another 17 non-breeding islands used as haul-out sites. Threats include illegal shooting, entanglement in fishing and aquaculture gear, human disturbance during breeding season, oil spills and disease. Photo – Emma Adams

Injury and fatality to vertebrate marine life (for example, seals, other marine mammals and seabirds) caused by ingestion of, or entanglement in, harmful marine debris has been listed as a key threatening process under the EPBC Act (DEH 2003).

Desired outcome

Activities within and adjacent to the marine environment are appropriately managed to reduce pollution impacts on the key values of the planning area.

Management actions

- 1. Develop a regional response plan for wildlife affected by shipping and boating pollution, such as oil spills.
- 2. Educate visitors to the marine area and adjacent areas on the damaging impacts of marine pollution.

22. Fire

The appropriate management of fire is integral to the department's activities and core management responsibilities; both within conservation estate and on other lands the department manages. Inappropriate fire regimes⁴⁴ are a key threat to the diversity, viability and long-term conservation of many of the species, communities and habitats found within the planning area (Hopkins and Harvey 1989, Burrows and Friend 1998, Hopper 2000, Burrows and Wardell-Johnson 2003, Barrett *et al.* 2009).

The challenge for the department is to devise practical and cost efficient fire regimes that conserve biodiversity, and minimise the adverse impact of bushfires on natural, cultural, recreational and social values.

Fire history

Large bushfires, caused mainly by lightning strikes, have burnt large parts of the planning area in recent years, including major fires in 2006 within Stokes, Cape Le Grand and Cape Arid national parks that led to the destruction of visitor facilities and infrastructure, loss of amenity and the closure of camp sites and walk trails (although most have since been rebuilt).

The islands of the Recherche Archipelago usually have longer



Bushfire in coastal heath, when it occurs, usually burns under the influence of wind and results in the majority of ground fuels being consumed. Photo – DEC

fire-free periods⁴⁵ than the mainland. For example, it is estimated that the 1972–1973 bushfire on Middle Island (which burnt half of the island's vegetation) was the first fire on the island for 170 years (Brown *et al.* 1984, Weston 1985) and the 2002 fire on Mondrain Island (which burnt 90 per cent of the island's vegetation) was the first fire in 58 years (Pearson *et al.* 2004).

⁴⁴ A 'fire regime' is a description of fire in terms of (a) fire frequency (how often it occurs on a site), (b) fire intensity (how much heat energy is released), (c) season (what time of year it occurs), (d) scale (how big it is), and (e) spatial diversity (how patchy it is at both a landscape and local scale). For more information on fire regimes and the environment, refer to the department's website www.dec.wa.gov.au/content/view/3501/1889/.

⁴⁵ However, despite these long fire-free periods, it is common to have at least one bushfire event—due mainly to lightning strikes—on one of the islands in the archipelago every one to two years (K. Tiedemann pers. comm. 2006).



The Lake Boolenup area in Cape Arid National Park after major bushfres in December 2006. Impacts of large intense bushfires include: loss of specialised habitat for some species, such as tree-hollow woodlands and long-unburnt heath; loss of age class diversity across the landscape; reduced chance of immigration and hence replacement of species due to reserve isolation; increased opportunities for weed invasion; short-term loss of migratory pathways; and threats to life and property. Photo – Aberline Attwood

Fire ecology

For many species, reproduction and regeneration are cued or enhanced by fire and, for some plant communities, is necessary for the maintenance of floristic and structural diversity (Burrows and Wardell-Johnson 2003). However, some species are sensitive to fire, or particular fire regimes, and no single fire regime is optimal for all species (Burrows 2008, Burrows *et al.* 2008). Extreme regimes, such as sustained, high-frequency burning or infrequent but large, intense fire regimes, are more likely to be the most damaging to biodiversity values than more moderate, intermediate regimes (Burrows and Friend 1998, Burrows and Wardell-Johnson 2003).

Typically, sensitive species are associated with moister parts of the landscape (for example, wetlands and riparian vegetation) and areas with discontinuous vegetation (for example, granite outcrops and islands) where fire is less frequent. However, even fire-sensitive species may require fire at some stage for their regeneration. Some work has been carried out into the identification and conservation of fire-sensitive species and ecosystems for the South Coast region (Barrett *et al.* 2009). However, fire management within the planning area (see Section 22 *Fire – Fire management*) will need to adapt as new scientific knowledge and management experience is obtained.

Flora

Flora species that are the most vulnerable to fire or extreme fire regimes include those that:

- are killed by fire
- have short life spans



A grasstree (Xanthorrhoea platyphylla) in Cape Arid National Park with new growth shortly after the December 2006 bushfires. Photo – Aberline Attwood



Cape Arid National Park showing further regeneration one year later. Photo – Tegan Laslett

- have long juvenile periods
- · have canopy-stored seed
- regenerate only from seed ('obligate' seeders).

Fire-sensitive species in the planning area include flora such as the small two-coloured kangaroo paw, cumquat eremophila, prickly honeysuckle and underground orchid and vegetation communities such as the mallee heaths.

The rate at which plant species are able to regenerate and produce adequate seed for regeneration after fire needs to be considered in determining the minimum prescribed frequency of burning. On the basis of current knowledge, doubling the juvenile period (which is defined as the time when at least 50 per cent of the population has reached flowering age), of the slowest maturing fire-sensitive species to allow for the replenishment of seed banks, provides a minimum interval between fires that are lethal to adults of that species. Populations will survive more frequent fires provided that the intensity of the fires is insufficient to kill the adult plants (Burrows and Wardell-Johnson 2003).

Fauna

Fauna species that are the most vulnerable to fire or extreme fire regimes include those that:

- require specialised habitats
- have low fecundity
- exist as discrete dispersed populations
- have low dispersal capacity
- require mature late successional state vegetation
- are prone to predation.

Fire-sensitive fauna species in the planning area include the Australasian bittern (extreme fire regimes may reduce the availability of nesting material or sites), western ground parrot (breeding requires dense, long-unburnt vegetation), breeding seabirds, slow-moving reptiles and insular fauna populations that would be unable to escape a fire. The Recherche rock wallaby survived the 2002 Mondrain Island fire as sufficient large patches of vegetation remained unburnt. However, other species were greatly affected including the fleshy-footed shearwater (*Puffinus carneipes*) and the southern death adder (priority 3).

Generally, overall faunal biodiversity is likely to be maximised by avoiding widespread intense bushfires and maintaining a diversity of post-fire vegetation successional stages to provide habitat diversity (Friend 1995, Friend 1999, Burbidge 2003, Bamford and Roberts 2003). The fire responses of fauna will also vary depending on the extent of, and interaction of fire with, habitat fragmentation and other ecological disturbances (for example, impacts of weeds, disease and introduced animals). Further research into the fire requirements of fauna within the planning area is required.



Australian bustard (Ardeotis australis), Cape Arid National Park. Photo – Laurent Marsol



Carpet python (Morelia spilota imbricata), North Twin Peak Island, Recherche Archipelago Nature Reserve. The carpet python is a specially protected and priority 4 species. Photo – Emma Adams



A burnt Banksia fruit, Cape Arid National Park. The fire has triggered the woody follicles to release their seed. Photo – Aberline Attwood

Fire management

The fire management system for the planning area will aim to maintain a diversity of post-fire fuel ages, seral stages⁴⁶ and habitats across the landscape that is based on the characteristics of key fire response species and communities where known, and distribution of threatened species and communities.

Fire patchiness—or an interwoven mosaic of vegetation and habitats representing a range of fire intervals, intensities, seasons and scales—is important in providing environmental heterogeneity and conserving biodiversity at a local level (Burrows 2008). This will be maintained through

the application of ecologically appropriate fire regimes based on the results of continuing research into fire impacts on the range of ecosystems within the planning area. Other factors to be taken into account when managing fire for biodiversity in the planning area include the location of significant vegetation corridors, migratory pathways and fauna refuges (for example, riparian vegetation and islands). Specific fire management guidelines will accommodate the needs of a range of species and fire-sensitive/atypical habitats in the planning area (for example, operational guidelines have been prepared by the department for coastal heath woodlands, wetlands, granite outcrops, reeds and rushes, riparian vegetation, honey possums, tammar wallaby and malleefowl).

In many cases, it is not feasible for the department to respond to bushfire on islands due to distance, time and often lack of safe landing sites for vessels. This means that entire islands may burn in one bushfire event, populations of threatened flora and fauna can be severely impacted, and islands may be exposed to erosion and increased weed invasion due to loss of native vegetation. Therefore, bushfire intervention may be pursued on the islands where significant areas of the vegetation may be burnt and/or where important fauna habitats are threatened to protect the special values of the islands. Islands of high conservation value to exclude large fires (ones that burn more than 80 per cent of the island's vegetation) may include: Figure of Eight, Boxer, Wilson, Mondrain, North Twin Peak, Middle and Salisbury islands (David Pearson pers. comm. 2005). Where practicable, for these and other islands where significant conservation values are known to exist, a program of pre-fire and post-fire monitoring should be developed to further obtain knowledge of the impact of fires.

Fire will also be used in a planned, safe, effective and environmentally sensitive way to reduce accumulated fuel loads and maintain a system of fuel-reduced buffers and strategic fuel reduction areas, which will reduce the potential severity of bushfire events and, in turn, provide safety to firefighters, neighbours and visitors as well as protection of community assets. Particularly high-value assets that should be considered in fire planning include visitor facilities at Stokes, Cape Le Grand and Cape Arid national parks, and Woody Lake and Woody Island nature reserves. All fire management activities, particularly any new construction of roads or firelines, should be planned and undertaken with strict hygiene measures in place to avoid environmental impact, and with consideration given to containing fires within existing roads.

The department's South Coast region⁴⁷ has been divided into 10 Fire Management Areas (FMAs) based on similar environmental, land-use and fire management objectives and where fire interacts with the environment in a relatively consistent manner (DEC 2007d). The planning area is mainly across four FMAs (and a very small part of FMA 8 which is across the Pine Hill area). Objectives and fire management outcomes for the period 2009 to 2014 have been summarised in Appendix 6.

⁴⁶ The developmental stages of an ecological succession.

⁴⁷ The department manages fire across conservation estate, unvested Crown reserves and unallocated Crown land outside the metropolitan area, regional centres and townsites. For further information on the department's responsibilities on managing State land: lands.rdl.wa.gov.au/mediaFiles/3_Management_of_State_Land_2010.pdf.

Effective communication and consultation with the community leads to greater cooperation, understanding and support for fire management programs. With the vast expanses of land covered by the planning area, cooperation between the department, volunteer bushfire brigades, the local community and the Fire and Emergency Services Authority (FESA) is crucial to fire management in the planning area and surrounding lands.

Desired outcome

Conservation of biodiversity, protection and promotion of natural values and protection of life and property.

Management actions

- 1. Implement the prescribed fire regimes and bushfire response as summarised in Appendix 6 (to be reviewed every five years and adapted) for the FMAs within the planning area (FMAs 5 to 8, and 10).
- 2. Implement specific fire management guidelines for protecting and conserving fire-sensitive, atypical and conservation significant species, habitats, communities and translocation sites including providing sufficient long-unburnt vegetation as required for habitat for species such as the western ground parrot and the malleefowl (for example, the operational guidelines for coastal heath woodlands, wetlands, granite outcrops, reeds and rushes, riparian vegetation, honey possums, tammar wallaby and malleefowl).
- 3. Manage fire in proposed or gazetted wilderness in accordance with the department's wilderness policy (CALM 2004b).
- 4. Undertake further research into the inter-fire periods required by different fire-sensitive species.
- 5. Establish and maintain post-fire monitoring sites to measure the impact of bushfire and prescribed fire, as well as to develop an understanding of fire ecology requirements.
- 6. Construct and maintain management access for fire suppression.
- 7. Suppress bushfire on the islands where feasible, otherwise allow natural fire to self extinguish, other than on Woody Island, where in consultation with the leaseholder, existing firebreaks and low fuel areas around the developed infrastructure will be maintained and other than on Middle and Mondrain islands where prescribed fire may be implemented.
- 8. Appropriately rehabilitate disturbances related to fireline construction during bushfire suppression.
- 9. Encourage cooperative fire management arrangements between relevant agencies, local bushfire brigades and neighbouring land managers.

Key performance indicators

Performance measure	Objective	Reporting
The impact of fire on human life or community assets	No loss of human life or community assets, or serious injury attributable to the department's fire management	Annually
Size of large, intense bushfires	Reduction in the size of large intense bushfires from 2007–2012 levels	Every 5 years
The impact of fire on biodiversity conservation	No loss due to the effects of fire on abundance and composition of major vegetation associations and fauna habitats particularly those necessary for the survival of threatened or restricted species and ecological communities	Every 5 years

Managing cultural heritage

Throughout the planning area, there is rich and varied history of both Aboriginal and other Australian cultures. In 2009, a rock shelter within Cape Le Grand National Park was included on the *National Heritage List* for its Aboriginal cultural values. Operational activities that are likely to have an impact on the national heritage values of a National Heritage site require approval from the relevant (federal) Minister responsible for the administration of the EPBC Act.

The planning area also contains 10 registered sites on the *Register of the National Estate*⁴⁸, including four Indigenous heritage sites (Mount Burdett, Truslove, Alexander Bay and Boyatup) and one European heritage site registered on the Western Australian *Register of Heritage Places* database: Moir Homestead ruins (managed by the National Trust of Australia [WA] and the department). Local governments are also required to maintain a *Municipal Inventory* of places of heritage significance; there are nine of these sites listed in the planning area (six within Cape Arid National Park, two within Recherche Archipelago Nature Reserve on Boxer and Middle islands and one at Oldfield River).

23. Aboriginal cultural heritage

Heritage sites

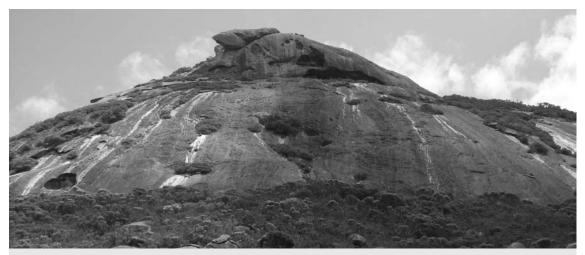
There are more than 175 Aboriginal heritage sites⁴⁹ registered within the planning area (146 in existing conservation reserves and more than 71 in proposed conservation reserves within the planning area) (Department of Indigenous Affairs *Register of Aboriginal Sites* June 2010 data). However, it is likely registered sites only represent a small proportion of the actual sites within the planning area. Under the *Aboriginal Heritage Act 1972* sites are protected whether they have been entered on the register or not and it is an offence for anyone to in any way alter an Aboriginal site or object unless permission is granted by the relevant Minister.

Heritage site density within the planning area is highest in and around large granite outcrops and their catchments and is lowest on the gently undulating, homogenously vegetated coastal plains (Veth and Moore 1989). Most of the sites are characteristically small, with generally fewer than 350 artefacts (Smith 1993).

Within the western portion of the planning area (west of the Coolgardie-Esperance Highway), there are at least 51 known archaeological and ethnographic sites. This includes 15 sites within Stokes National Park consisting of artefact scatters, a camping place, historical site (Fanny Cove), man-made structures (lizard trap, stone cairns and stone circle), an ochre quarry and mythological sites ('Walitch Benwenerup', Young and Lort rivers). River systems are traditionally very important to Aboriginal people; both Young and Lort rivers were used by as 'highways' by Aboriginal people and in winter the old people liked to camp in the bends of the rivers, so that there was water on three sides of the camp (Veth and Moore 1989). Consequently there may be a concentration of sites associated with habitation in these areas. There are also burial sites along the length of both Young and Lort rivers.

⁴⁸ Following the amendments to the EPBC Act in February 2007 and the commencement of the National Heritage List, the Register of the National Estate (which offers no statutory protection) will phase out as a statutory register within five years, after which it will be retained only as an archival record of natural, cultural and Indigenous heritage places of national value.

⁴⁹ 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.



Frenchman Peak in Cape Le Grand National Park is known as Mandooboornup and has mythological significance to the Esperance Nyungar people. Photo – Aberline Attwood

Helms Forestry Reserve has three sites including an artefact scatter, a modified tree and a camping place. Shark Lake Nature Reserve has a camping place, Pink Lake a camping place and Lake Warden and Mullet Lake nature reserves have mythological sites associated with Lake Warden and Bandy ('Barndi') Creek respectively. Mullet Lake Nature Reserve also has a historical site and camping place. Inland, Mount Burdett and Mount Ney nature reserves and Nature Reserve 32131 have artefact scatters recorded and Truslove North and Truslove Townsite nature reserves have burial sites.

Of the 132 known archaeological and ethnographic sites in the eastern portion of the planning area, 55 of these are in Cape Le Grand National Park, including a ceremonial and mythological site ('Miyat'), quarries, stone artefacts, middens, man-made structures and tools. A nationally significant rock shelter demonstrates the antiquity in Australia's cultural history of the use of cycads as a food resource and evidence that Aboriginal people had developed methods more than 13,000 years ago to detoxify the seeds. There is also evidence that Aboriginal people occupied caves in granite outcrops at 'Smiths Block' within the park (Smith 1993, Barefoot and Kalotas 2004).

In the Dreaming, the ancient time of creation, the earth was a featureless ball without mountains, rivers or seas. Beneath the earth slept a large black snake, the Norrun. The Norrun rose and slowly pushed his way through the soft earth. As he moved from the north, he formed hills, plains and gullies throughout this region. Where he slept, his weight created hollows in the landscape that filled when it rained to form the lakes.

This is the Dreaming story of the wetlands that circle Esperance which remain as evidence of the Norrun's journey.

Between Cape Le Grand and Cape Arid national parks there are eight sites within the unallocated Crown land that is proposed as an addition to the conservation estate, as well as numerous sites within the coastal shire reserves. These include chert and quartzite quarries, which are easily disturbed and damaged by vehicles driving over the surface, crushing and relocating artefacts (Smith 1984). Damage to these sites by vehicles has already been recorded (Smith 1984).

There are 40 known archaeological and ethnographic sites within Cape Arid National Park mostly associated with granite outcrops and inland hills, but also with river systems, coastal dunes, sand hills and wetlands. Sites include man-made structures, numerous stone artefact scatters, chert quarries, a hunting place, a lizard trap, an engraving, a shell midden, and one burial site at Pine Hill. In the unallocated Crown land proposed addition west of Cape Arid National Park, there are two archaeological sites including a rock shelter, rock art featuring hand stencils and stone artefacts. There are five known Aboriginal sites within Nuytsland Nature Reserve including artefact scatters and a quarry.

Two walich (eagles) from the inland flew down to Keppa Kurl (Esperance) and landed at Mandooboomup (Cape Le Grand). The mother walich made a nest and laid her eggs, while the father walich flew off to look for food at Stokes Inlet.

A group of Aboriginal people camped near the mother walich. The parents told the childen to stay in the camp with the elders while they went out hunting for food. Two children did not do as their parents asked and went off on walkabout. They came across the nest of the mother walich and stole her eggs, taking them back to their camp.

When the mother walich saw her eggs were missing, she flew after the two children. Catching them, she picked them up and carried them to the sea and dropped them in.

Everytime the children tried to swim back to shore, the mother walich would pick them up and drop them in the sea again.

Those two rocks offshore ... they are the children.

Look to the granite peak. That's the mother walich watching the sea in case those children try to come back ...

... and the water seeping from the peak are the tears of the parents crying for their children.

This is the Walich Dreaming story as told by Nyungar Aboriginal people. The granite peak of the story is Frenchman Peak. The Ngadju people to the north and east share this traditional story; however, there are slight variations in the telling between these two groups.

There are 16 known Aboriginal sites within Recherche Archipelago Nature Reserve, nine of which occur on Middle Island. The remainder of the sites include an engraving on Barrier Island and artefact scatters on Gulch, Owen and Stanley islands. The cultural significance of Middle Island is quite high with gnamma holes and approximately 350 artefacts present (Dortch and Morse 1984). Most of these artefacts date back to the late Pleistocene–middle Holocene epochs, when the Recherche Archipelago was part of the mainland, 9,000 to 11,000 years ago. Although Middle Island is just over eight kilometres from the present mainland coast, there is no enthohistorical evidence for any kind of Aboriginal watercraft in the south-west (Dortch and Morse 1984). Some of the artefacts also date back to the nineteenth and early twentieth centuries during the time that sealers camped on the islands with their Aboriginal guides/ workers (for example, the Sealers' Camp at the western end of Lake Hillier on Middle Island).

In 2009, the department and the National Trust of Australia (WA)/Gabbie Kyle Foundation signed an MOU for Aboriginal people to undertake cultural site surveys and construction works on the department-managed estate within the planning area.

Activities for Aboriginal customary purpose

The hunting and gathering of food by Aboriginal people is an important part of their culture⁵⁰, enabling them to maintain traditional relationships with the land and water, share knowledge and partake in traditional practices. Hunting and gathering by Aboriginal people in conservation reserves needs to consider the requirement for special provisions for the taking of some species (for example, threatened species) and ensure that the use of wildlife does not result in an overall decline in population abundance or altered distribution of species. In addition, the activity must not impinge upon the safety of others, has to be consistent with the objectives of the land and the food taken cannot be sold for commercial gain.

The department is currently working towards enabling Aboriginal people to access and conduct activities on department-managed land for purposes other than hunting and gathering for food. For example, traditional customary purposes may be for medicinal, artistic, ceremonial or other cultural purposes. The department will ensure conformity with any changes to legislation or government policy during the life of the plan.

⁵⁰ Aboriginal people in the region traditionally accessed the lands and waters of the planning area for a range of food that included various plants, mammals, fish, birds, reptiles, frogs and invertebrates.

The MOU signed between the department and the Goldfields Land and Sea Council recognises the need to negotiate access for traditional hunting and gathering.

24. Other Australian cultural heritage

The planning area has a rich history of European heritage associated with early explorers of the south coast, sealing and whaling industries, as well as shipping, pastoralism and settlement. The south coast of Western Australia was first charted in 1627 by the Dutchman Captain Francois Thyssen in the *Gulden Zeepaard*; later expeditions include those led by Frenchman Admiral Bruny D'Entrecasteaux in 1792 on *L'Esperance* and *La Recherche* as well as by the Englishman Captain Matthew Flinders on the *Investigator* in 1802.

In the 1800s, sealers and whalers came to the area to hunt. However, the seal industry collapsed in the 1840s due to over harvesting. Sealers and whalers often lived on islands of the Recherche. Middle Island, in particular, was used by early European settlers for seal and whale processing and for salt mining, as evidenced by remains of a tramline; and other artefacts and ruins. There are three shipwrecks known adjacent to the island, the *Belinda* (wrecked in 1824), the *Mary Ann* (wrecked in 1876) and the SS *Penguin* (wrecked in 1920). Numerous other shipwrecks exist within or adjacent to the planning area. However, much of the shipwreck remnants on beaches, such as *Dunster Castle* on Dunster Castle Bay at Stokes National Park, have been disturbed. There is evidence of other occupation and usage of the Recherche Archipelago including remnants of sealing and pastoral infrastructure on Woody, North Twin Peak, Cull and Goat islands.

Pastoral activity began in the area in the late 1800s although extensive clearing and agriculture in the region did not commence until much later. Moir Homestead in Stokes National Park is jointly vested in the National Trust of Australia and the Director General⁵¹ of the department. A conservation plan was prepared for the homestead area in 2000 and stabilisation works were undertaken in 2003. Evidence of early pastoral activities can also be seen within the planning area at Lake Shaster Nature Reserve, Cape Arid National Park (Pine Hill north of Mount Ragged, Hill Springs Homestead and 'Gabtoobitch' near Mount Arid) and Nuytsland Nature Reserve (Tooklejenna Rocks).

Graves of early pioneers and settlers are present throughout the planning area including that of a member of Flinders' expedition—Midshipman Charles Douglas, who died of scurvy—who is buried on Middle Island. Other graves are located at Moir Homestead, and Hill Springs, Pine Hill and Poison Creek in Cape Arid National Park.

Remnants of the Overland Telegraph Line, built between 1877 and 1927, are evident in Cape Arid National Park and Nuytsland Nature Reserve. There are two huts remaining within the planning area: Dogger's Hut along the Rabbit Proof Fence in Reserve 7580 and Cahill's Hut at Barrier Anchorage in Cape Arid National Park. These huts require assessment of heritage value. There are two former Public Works Department dams within Smiths Block in Cape Le Grand National Park.



Moir Homestead, near Fanny Cove in Stokes National Park. Bushfire has already removed many of the wooden features and equipment that were at the site. Photo – Tegan Laslett

⁵¹ The office titled 'Director General' of the department refers to the 'CEO' as defined in section 3 of the CALM Act.

Desired outcome

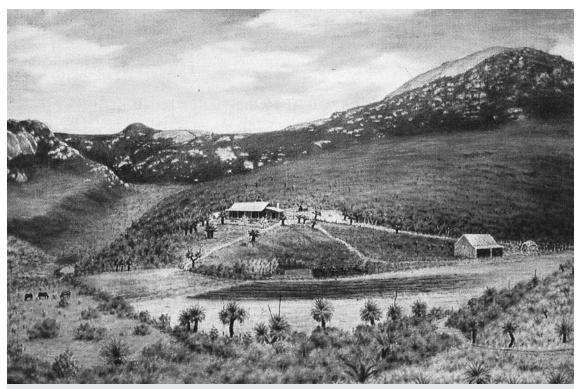
Cultural heritage is protected and conserved in consultation with relevant stakeholders.

Management actions

- 1. Control access to, maintain and monitor known or identifiable cultural heritage.
- 2. Liaise with the Department of Indigenous Affairs, the Heritage Council of WA, local government and other relevant organisations, Aboriginal people and the local community regarding the appropriate protection, conservation and management of heritage sites.
- 3. Encourage the National Trust of Australia (WA) to continue the implementation of the conservation plan for Moir Homestead.
- 4. Assess the heritage value of Dogger's Hut and Cahill's Hut.
- 5. Ensure that the cultural heritage values of the planning area inform and guide management actions.
- 6. Provide appropriate information and interpretation on cultural heritage to promote awareness, appreciation and understanding.
- 7. Consistent with legislation, provide for traditional custodians to pursue activities for customary purposes.
- 8. Encourage training, employment and economic development through cooperative or joint management arrangements with Aboriginal people.
- 9. Support surveys of cultural heritage.

Key performance indicator

Performance measure	Objective	Reporting
Protection of known or identifiable	No further disturbance without formal	Annually
Aboriginal and other Australian cultural	approval and consultation	
heritage sites		



A painting of Hill Springs Homestead 'Baesjou' 1905-1910, near Mount Arid, Cape Arid National Park. Only ruins remain. Painting – Amy Croker

Managing visitor use



Hellfire Bay, Cape Le Grand National Park. Photo – Aberline Attwood

In the planning area, recreation occurs predominantly along the coastal strip, and therefore the major focus for visitor use is at Stokes, Cape Le Grand and Cape Arid national parks, as well as Lake Shaster, Woody Lake and Woody Island nature reserves (proposed national and conservation parks). The majority of recreation sites within the planning area are associated with the provision of access to beaches and coastal inlets, and much of the activity at these sites is water based. Some day-use recreation also takes place in the inland nature

reserves and Helms Forestry Reserve. This management plan provides for a broad range of recreational opportunities—taking into account those existing on, or proposed for shire reserves⁵², to complement rather than duplicate them—while protecting the values of the conservation reserve system.

The department's *Policy Statement No.18 Recreation, Tourism and Visitor Services* (DEC 2006) outlines the principles, operational guidelines, procedures and administrative arrangements in relation to facilitating recreation and tourism within the planning area.

25. Visitor planning

Visitor numbers

The planning area is widely visited by the local communities of Esperance, Kalgoorlie and Ravensthorpe as well as by many tourists to the region. Cape Le Grand National Park receives the highest visitation of the reserves in the planning area with 159,157 people visits⁵³ in 2010–2011 (272,497 visits were recorded for the planning area). It appears there has been a steady increase in visitation to the national park in the 16 years since 1994–1995, when 63,000 people visits were recorded. Visitor numbers to Stokes National Park, Woody Island Nature Reserve and Cape Arid National Park have remained relatively stable since the mid-1990s (15,451, 12,509 and 16,319 people visits respectively). In recent years, the effects of bushfires and flooding have impacted visitation levels within the parks. The installation and monitoring of a vehicle classifier at Helms Arboretum and Woody Lake Nature Reserve has improved estimates at these sites to 8,823 and 34,348 respectively.

The South Coast Region Regional Management Plan (CALM 1992) identified Cape Le Grand National Park as the more developed national park in the area, with Stokes National Park less developed and Cape Arid National Park a more remote destination. This is consistent with current visitation levels at these sites and will remain the intent of this plan. Access will mostly remain unchanged across the planning area, however some seasonal closures may be required for safety and/or to protect the natural values (see Section 26 Visitor access).

⁵² Shire of Esperance Recreation and Camping Reserve 518 (Thomas River) is managed currently by the department on behalf of the shire via a five-year MOU agreement (2010–2014).

⁵³ A 'visit' refers to the number of people per day visiting a specific location. It comprises both recorded numbers of visits from traffic counter devices, surveys and other data sources, as well as estimated numbers of visits based on field observations.



Camp kitchen at Le Grand Beach, Cape Le Grand National Park. Within the recreational site hierarchy, Le Grand camp site is classed as 'high' due to the level of facilities provided and access. Photo – Tegan Laslett

Visitor management settings

Visitor management settings within the planning area are based on the Recreation Opportunity Spectrum (Clark and Stankey 1979) and provide a specified range of recreation opportunities in a given area, while limiting unintended incremental development and minimising visitor impacts (maps 2a and 2b). A recreation site hierarchy is used in conjunction with the visitor management settings to provide a controlled (site by site) mechanism to cap the

level of development within the planning area and maintain a diversity of experiences within a setting. The recreation site hierarchy divides sites into three categories: high, medium and low (maps 2a and 2b).

The visitor management settings for the planning area (maps 2a and 2b) will guide recreational development over the life of this plan. However, more detailed site planning will be required prior to the development of recreation sites to manage more specific visitor use issues, to design facilities and to consider the visual impact of development on the landscape and amenity.

Desired outcome

A range of suitable nature-based visitor experiences is maintained.

Management actions

- 1. Ensure that existing and future visitor activities and recreational and/or tourism developments are consistent with the allocated visitor management settings (maps 2a and 2b), and refer inconsistent non-conforming use to the Conservation Commission for determination.
- 2. Ensure a regional perspective is taken in developing recreational opportunities taking into account the opportunities adjacent to the planning area.
- 3. Use visitor data to assist in determining recreational planning priorities.
- 4. Monitor levels of change and impacts of visitor use on recreational areas and facilities, and modify management where appropriate.
- Ensure visual landscape management is considered prior to any management operation or development.
- 6. Monitor visitor satisfaction of nature-based recreation opportunities.



'Medium' camp sites in Seal Creek campground, Cape Arid National Park. Photo – Aberline Attwood

Visitor safety

Apart from the Esperance Lakes and Helms Forestry Reserve, much the planning area is relatively remote from emergency services, often difficult to access by emergency vehicles and has variable access to communication networks. The department encourages visitors to use appropriate behaviour while undertaking recreational activities that involve risk. Risks to visitors specifically within the planning area include:

- adverse weather conditions (for example, hypothermia, dehydration and heat exhaustion)
- slipping and tripping incidents associated with bushwalking on uneven, wet or unstable ground
- visitors becoming lost in remote areas far from access, contact and emergency assistance
- fauna (for example, bites and stings from snakes, insects, jellyfish, sharks and pinnipeds)
- bushfire
- specific risks associated with water activities including swimming, diving, snorkelling, surfing, rock fishing, boating and water skiing
- vehicle accidents including two- and four-wheel driving and motorbikes.

Many visitor risks can be overcome through attention to personal safety (including the registration of trip details with friends or family), appropriate maintenance of facilities by department staff, and appropriate risk warning signage. The department works closely with the State Emergency Service, WA Police, St Johns Ambulance and volunteer fire brigades in managing visitor risk within the planning area.

Desired outcome

Risks to visitors are minimised and appropriate visitor behaviour is encouraged.

Management actions

- 1. Prepare and implement a visitor risk management plan that identifies and assesses the risks associated with all recreation sites; and that monitors and regularly reviews visitor risk.
- 2. Continue to provide staff with appropriate training to undertake risk assessments.
- 3. Apply industry standards and utilise appropriate expertise in the safe design, construction and maintenance of visitor facilities.
- 4. Prepare and/or adopt codes of safe conduct for popular activities (such as four-wheel driving, hiking, swimming, fishing, sea kayaking and surfing) and promoting and publicising them as appropriate.

Information, interpretation and education

The provision of a consistent and accurate information, interpretation and education program by both the department and other providers is important in achieving effective communication with the community and the desired outcomes of this management plan.

Information

The department provides a variety of information on the planning area (for example, details of facilities, available activities, features, access and regulations) through a range of means (for example, signage, printed materials, the department's website, electronic media, social networking and departmental staff).

Park brochures and information are available at the Esperance District Office for Stokes, Cape Le Grand and Cape Arid national parks as well as for a number of walk trails. Information bays are provided at the main entry points to all three national parks as well as in the Esperance Lakes area and at Helms Forestry Reserve. Information is also available from external sources, including volunteer organisations, tour operators and the tourism industry.

Interpretation

Interpretation explains natural and cultural features and management activities to enrich visitor experiences and includes on-site signs, information shelters, brochures, and guided interpretative activities. Key interpretation sites within the planning area include the Kepwari Walk Trail in the Esperance Lakes, Woody Island Nature Reserve and at various locations within Stokes, Cape Le Grand and Cape Arid national parks.

Primary interpretive themes expressed within the planning area include:

- Landscapes and Seascapes
- *Ecology* (relating to islands and fire)
- Biodiversity (bioregions and threatened or restricted habitats)
- Wilderness (but not in the wilderness area itself)
- People (Nyungar heritage, early explorers and settlers, and Esperance today)
- Altered Landscapes (catchment management, remnant bushland, introduced species and Phytophthora dieback).



An interpretation sign for the Esperance Lakes. Photo – Aberline Attwood



Interpretation shelter at Thomas River camp site, Cape Arid National Park, Photo – Klaus Tiedemann

Education

Education programs including presentations and organised field activities are targeted at specific user groups to facilitate learning and foster greater awareness, appreciation and understanding of the area's key values. The planning area provides a base for a range of education programs for schools. Currently school groups visit the Esperance Lakes, and a Lake Warden resource package has been prepared for upper primary to lower secondary students.

Desired outcome

Community awareness, understanding and appreciation of the values of the planning area are improved through the provision of a range of interpretative and educational material, and visitor programs.

Management actions

- 1. Provide information and interpretation to visitors on the key values and management issues within the planning area such as biodiversity conservation, cultural values, threatening process, visitor safety, wildlife interactions, and appropriate visitor activities and behaviour.
- 2. Ensure that external providers such as volunteers, commercial operators and the tourism industry have relevant and factual information and interpretive material about the planning area.
- 3. Continue to foster and support local Bush Ranger WA Cadet programs.

Key performance indicators

Performance measure	Objective	Reporting
The extent of visitor management	Maintain the extent of visitor	After 5 years
settings	management settings	
The number and severity of visitor	Remains stable or decreases from 2007	After 5 years
incidents	to 2012 levels	
Visitor satisfaction levels of nature-	Maintained or increased from 2012	After 5 years
based experiences	levels	

26. Visitor access

Public access⁵⁴ to the reserves is mostly by vehicle (car and motorbike) and boat, although some areas are accessible via walk trails. Access roads and tracks available for public use in the planning area, including those managed by the department, are shown in maps 3a and 3b.

Vehicle access

Most vehicle access to the main recreation sites of the planning area is via spur roads off either the South Coast Highway/Springdale Road for the reserves west of Esperance and off Fisheries Road/Merivale Road for the reserves east of Esperance. Some parts of the planning area are accessible from the beach—for example Le Grand Beach can be accessed along the beach from Esperance usually between September and April and is a popular alternative approach to Cape Le Grand National Park. Most access roads and tracks within the planning area are to beach destinations where sightseeing, swimming, fishing and camping are the main activities.

The department supports road upgrades for safety reasons and for the prevention of the introduction and spread of *Phytophthora* dieback. However, the department seeks to broadly maintain the type of vehicle access at present levels and standards across the planning area. Access will mainly be promoted to the national parks and conservation parks (when created), while retaining Cape Arid National Park as a remote destination. This approach will maintain a range of visitor experiences and options across the planning area.



Lucky Bay Road towards Frenchman Peak, Cape Le Grand National Park. Photo – Aberline Attwood

State and local government roads

Main Roads WA and the shires of Ravensthorpe and Esperance manage the roads to the boundaries of the planning area including Springdale Road, Cape Le Grand Road, Dunns Rock Road and Merivale Road. They also manage Fisheries Road (to Israelite Bay), Gora Track and Point Malcolm Track, which are not part of the planning area but within road reserves.⁵⁵

The *Roads 2025 Regional Road Development Strategy – Goldfields Esperance Region* (MRWA 2007) proposes upgrades for several roads that may impact upon the planning area by increasing visitation.

⁵⁴ The department is committed to improving access to its services, information and facilities for people with disability, as outlined in the Disability Access and Inclusion Plan 2007–2010 (DEC 2007a).

⁵⁵ However, the roads and/or road reserves do require realigning to match the roads with the road reserves.

Upgrades to the Coolgardie-Esperance, Eyre and South Coast highways will improve all three main access routes to the planning area. The concept of an Esperance–Balladonia link, including the proposed upgrading of the western end of Fisheries Road (west of Baring Road), is recommended for review (and further study) by MRWA (2007). As the link would include upgrading Parmango or Balladonia roads to provide a through road from Esperance to the Eyre Highway, increased visitation may be expected in the Cape Le Grand and Cape Arid national parks.

The section of Fisheries Road across Cape Arid National Park and Nuytsland Nature Reserve is a four-wheel-drive unsealed track with the existing alignment containing sandy stretches and boggy areas after heavy rain events. Currently there is minimal maintenance of the track and seasonal closures are implemented only occasionally. The current management of this stretch of Fisheries Road is an issue for the planning area because:

- there is a high risk of introducing *P. cinnamomi* to surrounding vegetation from this track
- there is ongoing deterioration of the track, posing a potential risk to park visitors
- numerous detours through vegetation have been established around the boggy areas
- there is a detrimental visual impact—as there are up to a dozen detours at some sites.

Negotiation with the Shire of Esperance is required to provide improved management of this stretch of Fisheries Road including the option of adding the road reserve to the conservation reserve system for departmental management.

There are also undeveloped road reserves within the planning area (for example, within Cape Le Grand and Cape Arid national parks, and Lake Shaster Nature Reserve). These road reserves are not cleared, have significant conservation values, and consequently are recommended for cancellation and addition to the conservation reserve system.

Department-managed roads and tracks

Identified upgrades of department-managed roads and tracks include sealing the roads to Rossiter Bay in Cape Le Grand National Park, and potentially Stokes Inlet Road and access to Benwenerup Campground within Stokes National Park.

Within the coastal reserves, visitors access many of the beaches using vehicles. This access provides remote recreation opportunities and is highly valued by many visitors. However, vehicle use on beaches can be a significant environmental, amenity and/ or safety risk. For example, vehicle use on beaches can impact on migratory shorebirds including the sanderling (Calidris alba) and red-necked stint (*Calidris ruficollis*), the hooded plover⁵⁶ and other nesting shorebirds such as the sooty and pied oystercatchers (Haematopus fuliginosus and H. longirostris). Driving along the beach can also be a visitor risk with beach driving conditions changing quickly with soft sand being like quicksand in some areas and drop-offs formed by creeks draining to the ocean in winter. At high tide, some vehicles are driven along the foredunes, damaging the dune and



Hooded plover (*Thinornis rubricollis*), Cape Arid National Park. The hooded plover is low in numbers and is a ground-nesting plover that breeds on coastal beaches and on the edges of salt lakes within the planning area. The hooded plover eggs and flightless hatchlings are at risk from introduced predators, domestic dogs, and pedestrian and vehicular traffic (Garnett and Crowley 2000, Raines 2002, Baird and Dann 2003). Those that breed on the beach rely on the tidal zone for feeding for approximately two months between eggs being laid and the young fledging (Singor 1999). Photo – Laurent Marsol

⁵⁶ Pedestrian or vehicle use on the beaches within the planning area may have already caused breeding hooded plovers to avoid many suitable areas within the planning area.

vegetation systems. Also a regular complaint in visitor satisfaction surveys is the visual impact of vehicles on beaches. Therefore, seasonal beach closures are recommended to protect specific beaches during bird breeding seasons, and for minimising visitor risk when conditions are dangerous.

Driving on beaches in the planning area will be allowed within:

- Cape Le Grand National Park: Wylie Bay to Cape Le Grand Beach, Lucky Bay Beach, Rossiter Beach, east from Dunn Rocks, along Wharton Beach
- Cape Arid National Park: Thomas River to Barrier Anchorage
- Nuytsland Nature Reserve: Israelite Bay to Point Culver (see maps 3a and 3b).



Vehicles on the beach at Thomas River, Cape Arid National Park. Photo – Tegan Laslett

Management access

Tracks used for management purposes only are required for operations such as feral animal baiting, fire management, flora and fauna monitoring, weed control and/or for evacuation purposes. These will be signposted accordingly. Access tracks that are no longer needed for management purposes will be closed and rehabilitated to deter unauthorised use. The department may pursue additional management access to facilitate protection of conservation values.

Air access

A department-managed airstrip is situated within the planning area at Nuytsland Nature Reserve near Israelite Bay, and is used primarily during fire management and in the case of emergencies. However, some small private planes are known to occasionally land at this strip to visit the nearby Israelite Bay Telegraph Station (National Trust managed). Private airstrips exist to the north of Cape Arid National Park near the Tagon Road and Merivale Road junction and on a private property enclave at Point Malcolm within Nuytsland Nature Reserve.

The department may install a helicopter landing pad on Woody Island to provide management access in the event of an emergency, particularly bushfires. Cull Island section 5(1)(h) reserve in the Recherche Archipelago has an automated lighthouse and weather station, which is leased and managed by the Australian Maritime Safety Authority. The Australian Maritime Safety Authority usually accesses the section 5(1)(h) reserve by helicopter.



Occasionally one commercial tour operator will run licensed day trips to Middle Island, Recherche Archipelago Nature Reserve. Photo – Aberline Attwood



Boats can launch directly from the beach at Lucky Bay, Cape Le Grand National Park. Photo – Aberline Attwood

Boat access

There are no specific boat launching facilities provided within the planning area but Starvation Boat Harbour, Esperance and Bandy Creek Harbour and Duke of Orleans Bay, all outside the planning area, provide boat-launching facilities. There are many informal areas where recreational boats can be launched from the beach (for example, at Le Grand Beach and Lucky Bay within Cape Le Grand National Park). Commercial fishermen regularly use the beaches for launching boats (for example, within Stokes and Cape Arid national parks and Nuytsland Nature Reserve).

Landing on most islands of the Recherche Archipelago is difficult and visitation is generally low (except Woody Island). There is good access to Middle Island, a popular anchorage providing safe landing for boats. Islands with boat access may have access restricted if there is the potential for impacts on their natural and/or cultural values (see sections 16 *Native animals and habitats* and 23 *Aboriginal cultural heritage*).

Boat access by the Australian Maritime Safety Authority to Figure of Eight Island (and sometimes Cull Island) is required occasionally to service an automated light beacon.

Desired outcome

Access is provided and maintained that minimises the impact on natural, cultural and recreation values.

Management actions

- 1. Provide public access as shown in maps 3a and 3b, consistent with the appropriate visitor management setting (maps 2a and 2b), and in consultation with visitors and relevant stakeholders.
- Close and where appropriate, rehabilitate access that is poorly located, in poor condition, difficult to maintain, unsuitable for recreation and conservation purposes, no longer required or where there is adverse and unacceptable impact on the environment.
- 3. Temporarily or seasonally close public access as required for conservation or visitor safety reasons such as during breeding bird season, fire damage or dangerous beach driving conditions.
- 4. Prohibit vehicles driving off roads and tracks as shown on maps 3a and 3b.
- 5. Where appropriate, classify land under section 62(1) of the CALM Act to manage access for the conservation of natural and/or cultural values such as wilderness and/or islands that are important for breeding seabirds or as breeding or haul-out areas for pinnipeds.
- 6. Ensure management access tracks are effectively closed to the public and any public access only provided in exceptional circumstances with prior approval of the District Manager.

- Liaise with Main Roads WA and local government authorities to ensure the appropriate management and alignment of regional roads, road reserves and road development to, and through, the planning area.
- 8. Liaise with the appropriate authorities regarding the cancellation of unused road reserves.
- 9. Install a helicopter landing pad on Woody Island to provide management access, if deemed feasible.



Eroded beach access at Munroes, Nature Reserve 26885. Photo – Tegan Laslett

27. Visitor activities

The impact of visitation on the physical environment, while generally low, can vary depending on soil conditions, landform, vegetation type and intensity of use. High visitation levels in some areas has the potential to lead to the loss of vegetation, introduction and spread of weeds and disease, localised soil compaction and erosion problems, habitat destruction, fauna disturbance, braiding of tracks around difficult areas and increased fire risk. Sensitive areas include coastal dune fields, wetland, estuarine and riparian vegetation, salt lakes, exposed bluffs, and heathlands.

Strategic assessment of recreation sites are continually undertaken across the planning area to ensure that the number and style of camping areas and day-use sites provide reasonable access to different recreational opportunities and that the environment is protected (see maps 3a and 3b). This has meant that:

- some camping areas have been converted to day-use only
- some camping areas have been expanded
- some existing camping areas have been formalised
- visitor management settings and site classifications have been applied to guide the level of development and facilities provided.

Land-based activities

Day-use sites

A range of day-use sites is available in the planning area (see maps 3a and 3b). They include picnic and barbecue areas, lookouts, interpretive stops, short walks and nature viewing spots. In addition it is proposed to convert several informal camping sites to day-use only and consolidate several small clustered day-use sites into one single day-use site. Future development of day-use facilities will be in keeping with visitor management settings (see maps 2a and 2b) and will be compatible with the key values of the planning area. The development of new day-use sites during the life of the plan will require detailed planning, public consultation and a review of visitor management settings.



Day-use site at Helms Forestry Reserve. Photo – Aberline Attwood

Bushwalking

Existing walking trails within the planning area are described in Table 2, along with additional bushwalking opportunities identified in the planning process. Over the life of the plan, regional staff will assess these and other walk trail opportunities following established assessment processes. Future development of walk trails will be in keeping with visitor management settings and be compatible with key values. The development of new walk trails during the life of the plan will require detailed planning, public consultation and a review of visitor management settings. Walking off established walking trails (along natural, not constructed walking routes) is generally permitted.



Kepwari Wetland Trail, Woody Lake Nature Reserve. Photo – Aberline Attwood

Table 2. Walk trails within the planning area

Walk	VMS*	Class^	Trail length	Comment
Existing				
Stokes Inlet Walk Trail, Stokes National Park	Recreation	2	4.3km return	
Moir Homestead Historical Walk, Moir Homestead	Recreation	2	0.6km return	National Trust-listed buildings and jointly vested
Kepwari Wetland Trail, Woody Lake Nature Reserve	Natural- recreation	2	3.6km one way	Interpretive trail, bird hides
Frenchman Peak, Cape Le Grand National Park	Natural- recreation	4	3km return	
Coastal Trail (Le Grand to Hellfire Bay), Cape Le Grand National Park	Recreation	4	6km one way	
Coastal Trail (Hellfire Bay to Thistle Cove), Cape Le Grand National Park	Natural- recreation	5	4.5km one way	
Coastal Trail (Thistle Cove to Lucky Bay), Cape Le Grand National Park	Recreation	3	2.5km one way	
Coastal Trail (Lucky Bay to Rossiter Bay), Cape Le Grand National Park	Recreation	3	6km one way	Rare flora in close proximity of trail, realignment may be required by up to 1km
Bird Sanctuary, Cape Le Grand National Park	Recreation	2	0.4km return	
Boolenup Walk Trail, Cape Arid National Park	Natural- recreation	2	4km return	Closed due to bushfire, not proposed to be re-opened due to presence of Aboriginal artefact sites and <i>Phytophthora</i> infestations
Tagon Coastal Trail (Thomas River to Tagon Beach), Cape Arid National Park	Natural- recreation	3	5km one way	
Len Otte Nature Trail, Cape Arid National Park	Natural- recreation	2	2km loop	
Hill Springs Walk Trail, Cape Arid National Park	Recreation	2	0.4km return	
Mount Arid Summit Walk, Cape Arid National Park	Natural- recreation	4	2km return	Access to walk trail by 4WD only
Mount Ragged Summit Trail, Cape Arid National Park	Natural- recreation	4	4km return	Access to walk trail by 4WD only
Woody Island Summit Trail, Woody Island Nature Reserve	Recreation	3	1.8km loop	

Walk	VMS*	Class^	Trail length	Comment
Twiggy's Landing Trail, Woody Island Nature Reserve	Natural- recreation	3	0.4km one way	
Skinny Dip Bay Trail, Woody Island Nature Reserve	Natural- recreation	3	0.5km one way	
Heritage Trail via Lake Hillier, Middle Island, Recherche Archipelago Nature Reserve	Recreation	2	0.4km one way	Currently closed due to bushfire, trail needs to be reestablished
Proposed				
Stokes Inlet Walk Trail extension, Stokes National Park	Natural	3	~3.5km one way	West of the inlet to foredunes for scenic lookout and possibly to the beach for access when inlet water levels high
Ewans Lake Wetland Trail, Mullet Lake Nature Reserve	Natural- recreation	2	2km loop	Access from Merivale Road to Ewans Lake then to Mullet Lake with raised platform and bird hides at both lakes
Loop heritage walk from existing Coastal Trail (Lucky Bay to Thistle Cove), Cape Le Grand National Park	Recreation	3	~4km loop	Opportunity for loop trail. Heritage trail section originally established in 1988, but closed in 2004. Requires reestablishment and on-site signs with historical interpretation
Len Otte Nature Trail extension, Cape Arid National Park	Recreation	2	1.5km one way	Establish trail connection to the Thomas River campground/ coastal area
Walk trail to climb Flinders Peak on Middle Island, Recherche Archipelago Nature Reserve	Recreation	3	6km return	Select and develop environmentally sustainable trail alignment from Cormorant Bay to the summit of Flinders Peak

^{*} Visitor management setting (see Section 25 Visitor planning).

Recreational driving

Many of the visitors to the planning area use four-wheel-drive vehicles to access recreation sites and for recreational driving experiences. While the department acknowledges four-wheel driving as a legitimate activity on the conservation estate, four-wheel-drive vehicles and motorbikes can impact the values of the planning area when driven inappropriately. Therefore, the use of licensed four-wheel-drive vehicles and motorbikes in the planning area is restricted to the tracks and beaches shown on maps 3a and 3b.

All vehicles being used on land managed by the department must be registered under the *Road Traffic Act* 1974, and all drivers must possess a current driver's licence. Relevant road rules, such as not driving under the influence of alcohol or drugs and not using excessive speed, also apply. Vehicles registered under the *Control of Vehicles (Off-road Areas) Act 1978* are not permitted to operate on department-managed land except under exceptional circumstances with permission from the District Manager.

[^] Australian Standard Walking Tracks (Standards Australia 2001) classes 1 to 6, where Class 1 is a broad, hard-surfaced track suitable for wheelchair use and Class 6 is a trail where there is no modification to the natural environment.



Despite this, many unlicensed off-road vehicles, including four-wheel motorbikes, trail bikes and occasionally dune buggies, are used in parts of the planning area and frequently drive off track. Promotion of the shire-managed Off-Road Vehicle Reserve to the west of Esperance may help to avoid this.

Adventure activities

Adventure activities include hang-gliding, paragliding, abseiling and sandboarding.

The main area for hang-gliding in the Esperance region is outside the planning area along the Great Ocean Drive (between Twilight Beach and Eleven Mile Beach), to the west of Esperance. However, occasionally hang-gliders launch from Mount Le Grand and land on Le Grand Beach in Cape Le Grand National Park. This is a potential conflict of use and a visitor safety risk as the stretch of beach from Le Grand Beach to Wylie Bay is used as an alternative vehicle access point to Cape Le Grand National Park. As there are no other safe landing areas for either hang-gliding or paragliding within the planning area, these activities will not be permitted.

There are also limited opportunities in the planning area for abseiling. Abseiling on Frenchman Peak within Cape Le Grand National Park has been assessed as unsafe, even as part of a commercial operation (Lodge *et al.* 2002). One other recognised abseiling site occurs within the planning area, apart from Frenchman Peak, but this is considered not suitable, as it is a registered Aboriginal cultural site. Therefore, abseiling will not be permitted within the planning area. Alternative abseiling opportunities exist outside the planning area within Peak Charles National Park approximately 200 kilometres northwest of Esperance and at Dempster Head near West Beach, Esperance.

According to the department's *Policy Statement No. 18* (DEC 2006), sandboarding is generally an unacceptable recreation activity on land managed by the department, particularly in coastal areas of high conservation value. It can be dangerous and damaging to the environment and therefore is not permitted in the planning area.

Desired outcome

Opportunities are provided for visitors to undertake appropriate land-based activities that facilitate visitor enjoyment, appreciation and understanding of the key values, while environmental and other impacts are minimised.

Management actions

- 1. Provide a range of day-use and bushwalking opportunities (maps 3a and 3b) consistent with the appropriate visitor management settings (maps 2a and 2b) and according to established planning procedures, design standards and environmental capability.
- 2. Prohibit any vehicles not registered under the Road Traffic Act 1974 (for example, quad motorbikes).
- 3. Ensure all recreation and tourism developments as well as visitor activities are consistent with the department's *Policy Statement No. 18* (DEC 2006), visitor management setting (maps 2a and 2b), and are designed and constructed to minimise environmental, cultural and social impacts.
- 4. Avoid unnecessary duplication of recreation opportunities with those occurring outside the planning
- 5. Monitor the impacts of day-use activities for environmental degradation and visitor safety.
- 6. Not permit hang-gliding, paragliding, sandboarding and abseiling and/or variations thereof, within the planning area.

Water-based activities

Water-based activities include swimming, snorkelling, diving, surfing, fishing, recreational boating and water skiing. Ocean conditions can change quickly and unexpectedly and visitors intending to undertake these activities must take appropriate safety precautions.

Fishing is permitted in waters in national parks, nature reserves and where provided for in other parts of the terrestrial conservation estate in accordance with the *Fish Resources Management Act 1994*, any CALM Act management plan (for example, this management plan) and the Conservation and Land Management Regulations 2002 (CALM Regulations). Recreational fishing (both freshwater and coastal) is generally controlled through orders and regulations made under the fisheries legislation in respect to size and bag limits, gear control, fishing seasons and licensing, and managed by the Department of Fisheries. However, access to fishing sites is managed by DEC to prevent environmental degradation of riverbanks and foreshores. All recreational fishing areas currently used will remain open to the public except where safety or environmental issues become a problem.

Boating and water skiing

There is an existing canoe trail between Lake Wheatfield to Woody Lake and it is proposed to extend this from Woody Lake to Lake Windabout (see map 3a).

Canoeing, kayaking, sailing and sailboarding pose relatively few threats to the surrounding environment and other visitors, but activities involving motorised boating (including jetskiing and water skiing) can impact upon local bird life and other fauna, and has the potential to conflict with and pose a danger to other recreational users.



Lake Quallilup, Lake Quallilup 5(1)(h) reserve. Photo – Aberline Attwood

There are two gazetted water ski zones in the planning area at Woody Lake and Lake Quallilup, which were gazetted by the Department of Transport in 1990 and 2009 respectively. Water skiing is permitted in all waters of Woody Lake apart from within 60 metres of the foreshore, and within a 100-metre-wide

designated take-off and landing area as marked by signs. Public water skiing is prohibited when the water depth is less than 1.8 metres. When the water depth is between 1.8 and 1.4 metres, the Esperance Water Ski Club is still able to use the designated Tournament Water Ski Area. When the water depth is below 1.4 metres all water skiing on the lake is prohibited. The other water ski area is within a defined area of Lake Quallilup 5(1)(h) reserve. The environmental impacts of water skiing are yet to be assessed. If the environmental impacts are manageable, a CALM Act lease will be negotiated with a club to allow water skiing to continue as the primary water ski zone in the region. The department will then seek for Woody Lake water ski zone to be de-gazetted.

Water skiing is prohibited outside of gazetted water ski zones and jetskiing is prohibited except when used in place of a boat to tow water skiers in gazetted water ski zones.

Desired outcome

A range of opportunities are provided for water-based activities that facilitate visitor enjoyment, appreciation and understanding of the key values while environmental impacts are minimised.

Management actions

- 1. Provide a range of water-based opportunities consistent with the appropriate visitor management settings (maps 2a and 2b).
- 2. Maintain access for water-based activities according to established standards, and where necessary, design and construct access to address site capability and minimise environmental impacts.
- 3. Control recreational fishing activities including the issuing of access permits, and/or re-alignment or closure of tracks (temporarily or permanently) as required.
- 4. Monitor sites where water-based activities occur for environmental degradation and visitor risk in liaison with users.
- 5. In the long term, close the water ski zone in Woody Lake and monitor water skiing use at Lake Quallilup in liaison with the Department of Transport.

Overnight stays

Overnight stays within the planning area are predominantly catered for through the provision of camping facilities, while currently there is limited provision of built accommodation. There are numerous overnight stay options provided outside of the planning area with hotel accommodation, caravan parks, cabins, chalets and campgrounds provided by private enterprise or the local shire.



Lucky Bay, Cape Le Grand National Park, is the most accessible of the national parks in the planning area and has the highest visitation with issues of overcrowding at peak periods and ageing facilities. Photo – Peter Masters/DEC

Built accommodation

In the planning area, built accommodation is available on Woody Island Nature Reserve (see Section 28 *Commercial tourism*) and at Barrier Anchorage in Cape Arid National Park (Cahill's Hut). Cahill's Hut is used by commercial fishermen during the crayfish and abalone seasons, and will continue to be available for commercial fisherman through formalised leasing arrangements. It is proposed to change Woody Island Nature Reserve to a conservation park to address inconsistencies with its purpose and facilitate management of recreation (see Section 7 *Proposed tenure changes*).

Other built accommodation such as eco-lodges or safari tents are being considered at appropriate locations within the planning area. However, suitable locations on private property or shire reserves adjacent/close to the national parks should also be considered as alternative sites for such developments, thereby minimising direct impacts within the conservation reserves themselves.

Camping

There are multiple camping opportunities within the planning area, including at Stokes, Cape Le Grand and Cape Arid national parks (see maps 3a and 3b). There are also many shire reserves that provide for camping adjacent to the planning area and the department currently manages Thomas River Shire Reserve 518 under an MOU with the Shire of Esperance. There are some camping sites in the nature reserves of the planning area, which are inconsistent with the purpose and



Vehicle-based camping at Cape Le Grand National Park. Photo – Tegan Laslett

management objective of nature reserves. Where these camping sites are significant for recreation use, it is proposed to change these areas to national park and where these camping sites are in areas of high conservation value and only used intermittently, it is proposed to retain nature reserve status and convert these sites to day use only (see Section 7 *Proposed tenure changes*).

Many of the existing camping areas within the planning area show signs of environmental degradation and require upgrading/formalising, relocation, or some other form of improved management.

Lucky Bay in Cape Le Grand National Park is one of the busiest recreation sites in the planning area and is under increasing visitor pressure. It is recommended that the site be expanded and facilities improved to increase the separation between day-use sites and the camping areas. Introducing an online booking system for camping at selected sites within Cape Le Grand National Park will assist in management by controlling numbers.

In the past there have been suggestions that Middle Island could also be developed for overnight use. However, due to high conservation significance of the island, its nature reserve status, the fragile nature of the environment and that accommodation is already provided at Woody Island, the department does not currently plan to develop Middle Island for overnight use.

Waste management

Visitation to the recreation sites within the planning area generates waste, including human waste. Inappropriate waste disposal from camp sites or from boats can pollute the environment within and adjacent to the planning area. Visitors are encouraged at many of the recreation sites within the planning area to take their rubbish with them when they leave, and pick up any rubbish they find floating at sea or on the coast (see Section 21 *Marine pollution*). In other areas such as at Cape Le Grand National



Tent camping at Cape Le Grand National Park. Photo – Peter Masters/DEC

Park, limited facilities for recycling waste are provided. Management of sewage varies across the area. A combination of toilet systems are used within the planning area including sealed vaults, hybrid and leach septic systems.

Campfires

Campfires and firewood collection can 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 source of bushfires. Campfires (ground fires or fires in containers) are not permitted, either on the beach or in camping areas, except at Mount Ragged and the department-managed Thomas River Shire Reserve 518 (where campfires are permitted in the concrete fire rings located in the camping area except between 1 November and 30 April inclusive when a total fire ban applies across the district).

Desired outcome

Opportunities are provided for visitors to stay overnight in appropriately designed built accommodation and camp sites, and visitor enjoyment, appreciation and understanding of the key values is facilitated while environmental and other impacts are minimised.

- 1. Provide a range of camping opportunities for individuals and groups consistent with appropriate visitor management settings according to established planning procedures, design standards and site environmental capability (see maps 2a, 2b, 3a and 3b).
- 2. Introduce a booking system for camping as required (for example, at Lucky Bay in Cape Le Grand National Park).
- 3. Monitor visitor impacts and review access where impacts are unacceptable.
- 4. Convert informal camping sites in nature reserves to day use or change the nature reserve (or part of) to national park or conservation park to provide for overnight stays (for example, the eastern portion of Lake Shaster Nature Reserve, Woody Island Nature Reserve and the western portion of Nuytsland Nature Reserve, see Section 7 *Proposed tenure changes*).
- 5. Require that visitors remove the rubbish and waste generated during their visit to the reserve.
- 6. Monitor toilet systems such as septic tanks to reduce risk of contamination of the groundwater and receiving waters.

- 7. Educate visitors to the planning area and adjacent areas on the appropriate management of waste, the harmful effects of marine debris and encourage waste minimisation.
- 8. Permit campfires in fire rings provided by the department only.
- 9. Provide information to visitors about the environmental impacts of firewood collection and campfires.

Key performance indicator

Performance measure	Objective	Reporting
Social, economic and environmental	Social, economic and environmental	Every 5 years
visitor impact indicators	visitor impact indicators will be	
	developed during the life of the plan	

Domestic animals

Domestic animals are not permitted⁵⁷ 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. The exceptions are specially trained dogs for visitors with visual and hearing impairments, emergency search and rescue operations, and/or feral animal tracking, which may be allowed in all areas.

Wharton Beach in Cape Le Grand National Park is accessed via a two-wheel-drive road leading though a shire-managed reserve and is a popular destination for dog owners. However, because there is no barrier between the shire beach and the department-managed beach, dogs regularly enter the national park. Therefore, a designated area where visitors may bring a dog (to remain on a lead at all times) is proposed for Wharton Beach in Cape Le Grand National Park although dogs will continue to be prohibited in the rest of the planning area. This area will be designated during the life of the management plan and will be sign posted with information provided to visitors.

Biological and physical impacts of horseriding include conflict with other users, trampling and grazing of plants, spreading weeds and disease, disturbing native fauna, soil compaction and erosion (Newsome and Phillips 2002, Newsome *et al.* 2004). The level of impact is dependent on the extent, frequency and intensity of use, topography and soil type. Climatic aspects such as rainfall and wind speed are also compounding factors. Some sites are therefore susceptible to more damage than others, especially areas with steep slopes, sandy or clayey soils, and wetland areas. The landscapes of the planning area generally have a very low capability to sustain uses that involve disturbance of the soil or vegetation, such as horseriding. Therefore, in accordance with departmental policy (*Policy Statement No. 18* [DEC 2006]) horseriding will not be provided for within the planning area. However, once-off managed treks for special interest groups may be allowed at the discretion of the District Manager if environmental and social impacts are considered manageable.

Desired outcome

Natural values and visitors are protected from the impacts of domestic animals.

- 1. Manage domestic animals in accordance with department policies and relevant legislation.
- 2. Prohibit domestic animals within the planning area except for specially trained dogs for visitors with visual and hearing impairments, emergency search and rescue operations, feral animal tracking, or in other special cases as determined by the department.
- 3. Designate an area at Wharton Beach in Cape Le Grand National Park where domestic dogs on leads are allowed, ensuring dog owners comply with the *Dog Act 1976*.

⁵⁷ If taken into national parks or nature reserves, dogs and other domestic pets can be poisoned by fox baits, predate on native fauna, leave a lasting scent that can scare some native fauna away and/or interfere with the enjoyment of other visitors.

28. Commercial tourism

Commercial concessions, such as leases and licences for commercial tourism operations, provide an opportunity for private business to offer high quality tourism and recreation opportunities, facilities and services to the public. This assists the department in providing quality visitor experiences in the planning area. Commercial concessions are granted in consultation with the Conservation Commission and must be consistent with the purpose of the reserve, the protection of its values and with the objectives of this management plan.

Naturebank

Cape Le Grand National Park has been identified as a potential location for one of a number of *Naturebank* sites in Western Australia. The *Naturebank* program is an initiative of the Western Australian government implemented by Tourism Western Australia in partnership with the department. *Naturebank* involves the assessment and release of 'investor ready' land for low impact visitor accommodation predominantly within Western Australia's conservation reserve system. If a *Naturebank* site is located within the planning area, then associated leases and licences in accordance with the CALM Act and Regulations will be required. The tourism vision for development of the region includes low impact outdoor-based experiences such as walking, water-based and interpretive activities centred on a range of quality eco-style accommodation options including high-end eco-lodges (Tourism Western Australia 2006).

Licences

There are 104 commercial tour operators (as of January 2010) licensed to operate in Cape Le Grand National Park, 76 in Cape Arid National Park, 76 in Stokes National Park, 69 in Nuytsland Nature Reserve, one in Woody Island Nature Reserve and one on Middle Island, in Recherche Archipelago Nature Reserve. Activities include bushwalking, sightseeing and wildflower tours, and other nature-based appreciation activities. Tours that have a minimal impact on nature reserves such as nature appreciation, bushwalking and birdwatching will continue to be permitted on a restricted basis.

There are four commercial marine mammal interaction licences issued for vessels operating within the Recherche Archipelago providing whale watching, dolphin and seal tours (as of November 2010). Angling and underwater diving tours also occur in waters adjacent to islands.

Leases

The only commercial tourism lease currently within the planning area is for Woody Island and is held by Mackenzie's Towing and Stowage. The current developments are restricted to a defined area and comprise a large reception centre and kiosk, toilets and a campground with semi-permanent safari tents. Further development has been approved within the lease area. After a long association with Woody Island, Mackenzie's Towing and Stowage have recently ceased their boat tours to the island and operation of the camping area. Negotiations are underway to transfer the lease to another operator, however a two-year trial has been requested.



Landing at Woody Island Nature Reserve where a commercial tourism lease is held for tourism infrastucture. Photo – Tegan Laslett



Campgrounds at Woody Island Nature Reserve which include tents and furnished safari-style tents. Photo – Tegan Laslett

As there is a commercial tour operator licensed to operate tours to Middle Island, there may be pressure to provide commercial tourism facilities. However, as with the approach on built accommodation on Middle Island (see Section 27 *Visitor activities – Overnight stays*), no development of commercial tourism facilities will be permitted.

Desired outcome

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

- 1. Evaluate and grant proposals for licences and commercial tourism leases according to departmental policy (DEC 2006).
- 2. Ensure all commercial operations operate under a lease, licence or permit agreement with appropriate conditions.
- 3. Investigate opportunities for partnerships with commercial operators to provide built accommodation and camping within the planning area as required.
- 4. Review the licences for nature reserves in the planning area and restrict use as appropriate (for example, restrict tour operators to the proposed national park section of Nuytsland Nature Reserve and/or restrict use of Middle Island to a single operator with limited visits and numbers).
- Review licence and lease conditions to include requirements where deemed necessary, to provide information to enable impact assessment of the tourism activity and monitor compliance with general conditions.

Managing resource use

29. Mineral and petroleum exploration and development

Potential low-grade limestone resources occur in coastal areas that are of interest to the agricultural and mining sectors. Around Esperance, salt is harvested from Pink Lake and gypsum is mined mostly in the Scaddan/Grass Patch area. There is exploration for lignite in the areas around Salmon Gums and Scaddan. DEC will work with the Department of Mines and Petroleum to evaluate exploration and/or development proposals within the planning area and to progress the proposed additions to the conservation estate that may have mining interest.

There are two current mining leases (M63/194 and M63/193) over part of the unallocated Crown land proposed addition north of Truslove Townsite Nature Reserve, one (M63/639) over Truslove Townsite Nature Reserve and two pending (M63/638 and M63/157) over parts of the unallocated Crown land and nature reserve respectively.

Another mining lease (M63/602) lies within Reserve 30672, a proposed addition to Stokes National Park. The lease was granted on 9 February 2007, but no mining activity has yet been proposed. Under the current MOU between the Department of Mines and Petroleum and the Environmental Protection Authority (EPA), as the mining tenement lies within two kilometres of the coastline, any proposed mining activity will have to be referred to the EPA. The EPA will then seek DEC's comments (and the Conservation Commission's depending on the tenure of the land at the time of referral).

Other current mining tenements (as of September 2010) within or intersecting with the planning area include:

- 17 exploration licences, mostly across proposed additions as well as part or all of Kendall Road, Red Lake Townsite and Truslove Townsite nature reserves
- four prospecting licences over Truslove Townsite Nature Reserve
- a general purpose lease and a miscellaneous lease over parts of the proposed additions to Lake Warden Nature Reserve.

There are also a further 29 exploration licences pending within the planning area, including three within Cape Arid National Park and proposed addition, and three within Nuytsland Nature Reserve.

Desired outcome

Impacts of mineral and petroleum exploration and development, including basic raw material extraction and development activities, on the key values are minimised.

- 1. Work with the Department of Mines and Petroleum to evaluate exploration and/or development proposals that may impact on the planning area.
- Liaise with the Department of Mines and Petroleum in their monitoring of existing exploration and/ or development activities within and adjacent to the planning area and request they take any necessary action where conditions are breached.

- 3. Refer exploration or development proposals with the potential to impact upon the planning area to the EPA for their consideration of assessment under the *Environmental Protection Act 1986*.
- 4. Ensure that all areas in which mining activity occurs within the planning area are rehabilitated according to the conditions of the mining lease as well as departmental rehabilitation standards and guidelines (for example, *Policy Statement No. 10 Rehabilitation of Disturbed Land* [CALM 1986]).
- 5. Rehabilitate disused gravel pits in accordance with departmental guidelines.

30. Commercial fishing and aquaculture

Commercial fishing

At present, commercial netting of fish is allowed by the Department of Fisheries in Stokes Inlet (proposed for addition to Stokes National Park) with restrictions (for example, with a defined open season). The inlet is one of 13 estuaries that make up the South Coast Estuarine Fishery with an average of around 12 tonnes, mostly black bream (Mylio butcheri) being one of the most abundant, caught from it each year by commercial fishers (Fletcher and Santoro 2010, Department of Water 2008). The inlet is also an important recreational fishery with an estimated 3,441 fisher hours spent and 2,103 kilograms of black bream retained in the period from December 2002 to November 2003 (Department of Water 2008). Should the inlet be added to the conservation reserve system, the issue of commercial fishing in Stokes Inlet will be examined further. Torradup Inlet, which is within Stokes National Park, has been closed to commercial net fishing since 2001.



Stokes Inlet within Stokes National Park. Photo – Aberline Attwood

Several sites within Stokes National Park (at Fanny Cove and Margaret Cove) are used as a base for commercial fishing operations in adjacent offshore waters. Commercial fishing operations also use other sites within the planning area such as Nature Reserve 27888 (Barker Inlet), Cape Arid National Park (Barrier Anchorage, Thomas Fishery and Seal Creek) and Nuytsland Nature Reserve (near Point Malcolm and at Bellinger Island).

These shore-based sites are used as camp sites supporting the commercial fishing operations. Camping by commercial fishers is generally not problematic, but sites do need to be regulated to prevent conflict with recreational camping (for example, further separation of recreational and commercial fishing camping may be required).

Aquaculture

There has been interest shown in developing commercial aquaculture within the Recherche Archipelago. To date no proposal has been successful, or progressed far in the environmental approvals process.

Aquaculture is listed as one of the many threats to the Australian sea-lion under the conservation advice for listing of the sea-lion under the EPBC Act (DEH 2005a). Gales and Wyre (1996) also highlight that the potential increase in sea cage aquaculture in Western Australia may be a problem for pinnipeds. The action plan for Australian seals (Shaughnessy 1999) recommends that establishing fish farms near seal colonies or haul-out sites is avoided, due to the vulnerability of fish farms to attacks by seals (Pemberton and Shaughnessy 1993).

Desired outcome

Impacts of aquaculture and commercial fishing activities on the key values are minimised.

Management actions

- 1. Manage access by commercial managed fishery operators in accordance with department policies and guidelines.
- 2. Liaise with the Department of Fisheries and commercial fishers to ensure that fishing operations do not adversely affect the key values of the planning area or experiences of visitors.
- Ongoing site management of existing use sites and input into planning conditions to any proposed new site to ensure that onshore environmental and social impacts of commercial fishing and aquaculture operations within and/or adjacent to the planning area are minimised.

31. Beekeeping

Commercial beekeeping has developed into a small but significant industry in Western Australia. Apiarists, who have traditionally relied on large areas of native vegetation for honey production, are increasingly dependent on lands managed by the department, as other areas are cleared for urban development and agriculture. Almost half of all apiary sites on Crown land are on conservation reserves managed by the department. Approximately 75 per cent of the honey resource in Western Australia is located on these lands. However, when allowing an introduced pollinator to persist within a conservation reserve, the dynamics between the native pollinators (which includes mammals, birds and insects) and the native flora and dependent fauna need to be considered.

Honey bees may impact on the recreational and natural values of the planning area in the following ways:

- via increasing the risk of visitors to the planning area being stung
- via competition for tree hollows (many tree-dwelling mammals and birds such as cockatoos use tree hollows for breeding sites and shelter; however, once a tree hollow is occupied by feral honey bees they can remain for 20 to 50 years)
- via competition for floral resources, such as pollen and nectar (feral and managed hive honey bees
 can remove 80 per cent or more of the floral resources produced, due in part to the longer foraging
 hours of the honey bee). Increased competition can displace native species which can thereby affect
 all other dependent or related flora and fauna. Also native bees may be forced to forage for greater
 periods of time, thereby exposing nest brood to more predators in their absence. Native birds that
 depend on nectar resources may also be forced to occupy larger territories, thereby excluding smaller
 birds from these resources
- via affecting pollination and seed set of native flora species due in part to inefficient transfer of pollen or physically damaging flowers
- via increasing seed set in some weeds as the honey bee and introduced plants may be interacting as invasive mutualists.

While it is recognised that feral honey bees are more of a threat to the values of conservation reserves than managed honey bees, there is little knowledge about the range of conditions under which honey bees leave the hive and become feral. The department's draft revised *Policy Statement No. 41 Beekeeping on Public Land* (CALM 2004a) provides for general guidance for the management of apiculture on Crown land including conservation reserves. As part of this policy, the department is to assess through the management planning process, whether access for beekeeping is either retained at the current level, increased, decreased or phased out. Therefore, predicted impact between honey bees and values within the

planning area have been assessed using the environmental and management criteria from the draft revised policy. Consequently, the planning area has been categorised as being either:

- 'suitable' for apiary sites
- 'suitable but conditional'
- 'highly constrained'.

There are 24 current apiary sites within the planning area (October 2010 data), seven within Lake Shaster Nature Reserve, two within Cheadanup Nature Reserve, one in Munglinup Nature Reserve, three within Nature Reserve 27888, two within Nature Reserve 26885, two within Truslove Townsite Nature Reserve and seven within proposed additions the conservation estate (nature reserves). There are also 14 vacant sites.

Subsequent to the planning area being categorised into either one of the three levels of suitability for apiary sites, a review was made of the current sites within the planning area (Appendix 7). The review identified 10 of the current sites as suitable, 10 sites that were suitable but conditional and four sites that were highly constrained. The four sites that are highly constrained (5501, 5605, 5607, 5614) will be cancelled and relocated, where possible, in negotiation with the apiarists. This may include sites within the planning area that have existing public access and have been evaluated as being suitable, or suitable but conditional or in an area outside of the planning area. No new sites will be permitted within the highly constrained areas unless reassessment shows a change in category of suitability (this may happen, for example, if an area was classed as highly constrained due to increased seed set of a high or moderate rated environment weed and subsequently the environmental weed is successfully eradicated within two kilometres of the site). Appendix 7 shows additional conditions that should be placed on each permit that has been classed suitable but conditional. Several sites held by different apiarists have also been assessed as being within the stipulated three kilometres of each other and may need to be relocated.

While the approach outlined above will be maintained throughout the life of the plan, the methodology of categorising the planning area into classes of suitability will need to be adaptive over the life of this plan, to ensure that the criteria used are the best available, and the categorisation of the planning area remains in line with current knowledge of the planning area values. Any change in the categories of the planning area or criteria should ideally coincide with the time that the apiary permits are due for renewal.

Sites adjoining the planning area may also impact on its natural values. Where these are located on lands managed by the department the same process as that used for the planning area should be applied. Where sites are located on other lands and a significant environmental impact to recognised values may occur, such proposals could be referred to the EPA for assessment if a suitable resolution cannot otherwise be reached.

Further information on beekeeping, including the standard conditions for apiary sites, can be obtained from the department's website (www.dec.wa.gov.au/content/view/884/1994/).

Desired outcome

Impacts of beekeeping and introduced honey bees on key values are minimised.

- 1. Subject to the review of the apiary analysis, renew apiary permits and consider new sites, transfer of sites, cancellation or relocation of sites in accordance with the assessment criteria.
- 2. Not permit any new sites within conservation reserves that have no historical use.
- 3. Review every five years the apiary analysis for the planning area to determine whether access for beekeeping is either retained at the current level, increased, decreased or phased out based on environmental and management criteria (Appendix 7).

- 4. Control feral bees within the planning area where practicable.
- 5. Liaise with beekeepers, the Beekeepers Consultative Committee, and the Department of Agriculture and Food to ensure the most efficient and sustainable use of sites.
- 6. Support research on the impact of beekeeping on biodiversity and adapt management to incorporate new knowledge.
- 7. Monitor apiary use within the planning area and any corresponding impacts within the areas identified as suitable but conditional, to aid in the review process.

32. Water resource use

The responsibility for the regulation, protection and management of water resources in the planning area rests with the Department of Water and DEC. Drinking water sources and catchments in the Esperance region are protected by proclaiming areas under the *Country Areas Water Supply Act 1947*. These areas are collectively referred to as Public Drinking Water Source Areas. Areas that have been proclaimed as Public Drinking Water Source Areas may have constraints placed on land use, development, public access and land/water-based activities.

Water extraction and abstraction

There are no major public water supplies existing, or proposed within the existing national parks and nature reserves within the planning area. However, the Water Corporation has requested a joint Management Order with the department over the whole of Butty Harbour Reserve (Reserve 24486) for groundwater abstraction. Part of Butty Harbour Reserve is a proposed addition to Lake Mortijinup Nature Reserve. Both Butty Harbour Reserve and Lake Mortijinup Nature Reserve are part of a nationally important wetland system, which may be impacted upon by water abstraction.

Ewart's Swamp (within unallocated Crown land adjacent to Alexander Nature Reserve), Lynburn Washpool Swamp (Cape Arid National Park) and Shark Lake (Shark Lake Nature Reserve) have all been used for water extraction for drought relief purposes. The department has not refused any reasonable request for access to water in drought years; however, approval will only continue to be given as long as the conservation values of the planning area are maintained.

Water to the ranger houses and recreation sites within the reserves is provided by rainwater tanks with some groundwater bores. Further infrastructure development is required to provide adequate potable water in some of the reserves as well as for fire control purposes.

Desired outcome

Impacts of water resource use on key values are minimised.

- 1. Manage public drinking water source protection areas that occur in the planning area to promote the conservation of water (quantity and quality).
- 2. Refer any proposals for significant use of water resources to the EPA for formal assessment where such proposals are likely to adversely affect the key values of the planning area.
- 3. Maintain potable water supply within the planning area for rangers, recreational use and commercial accommodation developments.
- 4. Follow an appropriate level of assessment and approval for issuing Water Removal Permits under the CALM Act for the extraction (taking) and/or abstraction of water from the planning area as required.

33. Utilities and services

Utility corridors are sometimes requested through conservation estate so that electricity, gas, telephone, fibre optic cable, water and rail services can be provided to enclaves of private property, or as the most direct route for these services to townsites or other nearby lands. The construction and subsequent maintenance of these corridors in proximity to the planning area, as with all access routes, can result in impacts on scenic quality, soil erosion, the introduction of weeds and disease as well as create problems for managing visitor access.

A railway line runs north-south along the Coolgardie-Esperance Highway which crosses Truslove North Nature Reserve and alongside the South Coast Highway between Lake Warden Nature Reserve and Pink Lake. There is also a natural gas pipeline that runs alongside the railway but through a corridor between the parcels of freehold land proposed to be added to Lake Warden Nature Reserve.

Numerous Western Power power lines servicing Esperance and surrounding farms and properties occur adjacent to the planning area, some crossing the planning area over some of the proposed additions, in particular the four river corridors (Oldfield, Munglinup, Young and Lort) as well as Kau Rock Nature Reserve and Beaumont Nature Reserve north of Condingup. Closer to Esperance, power lines run along the Coolgardie-Esperance Highway within Woody Lake Nature Reserve and Helms Forestry Reserve, as well as along the South Coast Highway within the railroad reserve between Lake Warden Nature Reserve and Pink Lake.

Some of the road reserves adjacent to the planning area contain underground Telstra telephone cables and Telstra fibre optic cable (Beaumont area). VHF radio repeater towers serving emergency services and departmental communication requirements are located in Mount Burdett Nature Reserve.

Some of these corridors cross conservation estate and may need to be excised as section 5(1)(h) reserves and some require the corridor to be amended to match actual alignment.

Desired outcome

Impact of utilities and services on key values are minimised.

- 1. Recommend any new utilities or services be located within existing corridors and/or off conservation estate.
- 2. Liaise with providers to ensure that the operation and maintenance of utility and services are in accordance with departmental lease conditions including:
 - the responsible management of environmental issues, particularly the introduction and/or spread of weeds, problem animals and disease
 - the removal of infrastructure (except if the department considers it to have cultural heritage value) and rehabilitation of land, if utilities and services are no longer required.
- 3. Where necessary, excise land containing existing utility and service infrastructure and reserve these areas as section 5(1)(h) reserves or amend corridors to fit actual alignment.

34. Forest produce

Uncontrolled removal of forest produce can damage vegetation, disturb habitats, reduce genetic diversity and lead to the spread of *P. cinnamomi*. Firewood collection and the extraction and sale of craft wood from national parks and nature reserves are not permitted.

Within the planning area Helms Forestry Reserve contains commercial pine (*Pinus pinaster*) plantations, which are currently being harvested by a private contractor and being replanted with pine by the Forest Products Commission. The reserve also contains an area that has been planted with other commercial species. It is proposed that the native vegetation areas of this reserve are to be changed to a nature reserve and the existing arboretum and the plantation areas to remain as miscellaneous reserves.

A yate (*Eucalyptus cornuta*) plantation has recently been established on part of a former private property ('Manners Block'), purchased by the department as part of the Lake Warden Recovery Catchment Program (see Section 12 *Hydrology*). The plantation is adjacent to Woody Lake Nature Reserve and is proposed to be a 5(1)(h) reserve.

Desired outcome

Forestry operations within Helms Forestry Reserve are managed appropriately and removal of native forest produce elsewhere in the planning area is prevented, unless authorised for safety or management purposes.

- Reserve the native vegetation areas of Helms Forestry Reserve as nature reserve and retain the plantation and arboretum areas as miscellaneous reserves.
- Continue the current agreement with Forest Products Commission to maintain the areas planted with commercial species in Helms Forestry Reserve and Manners Block
- Prohibit the removal of any native forest produce for commercial use (enforced by the CALM Act).
- 4. Harvest introduced trees that do not have landscape value.
- Remove trees that pose a threat to the public or facilities, or that obstruct designated access tracks and use these trees as much as possible for park management and facilities.



Helms Arboretum within Helms Forestry Reserve. The arboretum consists of more than 120 plots of various trees. The plots were established between 1973 and 1978 to determine which trees would flourish on the Esperance Sandplain in combination with agriculture. The plots determine the suitability of each species for use in salt-affected areas, for shade, windbreaks, timber or as an ornamental. The arboretum occupies two per cent of Helms Forestry Reserve. Photo – Lorna Charlton

Involving the community

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

35. Public participation in planning process

The community has been involved in the preparation of this draft management plan by attending public meetings, being part of the Esperance and Recherche Community Advisory Committee and providing comment on the issues paper for the coastal reserves of the planning area (DEC 2007c).

Additional community involvement is invited during the public submission period of this draft management plan (see *Invitation to comment*).

36. Ongoing community involvement and support

Ongoing community involvement and support from Aboriginal people, adjacent landowners, visitors, tour operators and interest groups is essential for the successful implementation of the management plan. Volunteer activities not only increase the department's work capabilities and skills base, but also foster communication links and understanding with the community.

There are several groups that work with the department on aspects of managing the planning area, including the Esperance Wildflower Society, who participate in surveys, collections and maintain a herbarium, and the Esperance Weed Action Group which tackle invasive weeds in the district. Conservation Council (WA) volunteers have been involved in the control of weeds and the undertaking of fauna monitoring on Woody Island. The planning area also has strong involvement from volunteers in the campground host program which operates seasonally at Stokes, Cape Arid and Cape Le Grand national parks. Conservation Volunteers Australia have also assisted in undertaking a range of recreational and environmental projects. Birds Australia, Esperance Bird Observers Group and the Friends of the Western Ground Parrot volunteers have also been involved with assessments of bird numbers across the planning area. Valuable assistance is received from wildlife carers who rehabilitate injured fauna.



Australian pelicans (Pelecanus conspicillatus). Photo – David Chadwick

Working with Aboriginal people has been of significant value in heritage preservation and conservation of the environment, as well as enriching cross-cultural awareness. The future involvement of Aboriginal people in management of the planning area is outlined in Section 5 *Management arrangements with Aboriginal people*.



Conservation Volunteers of Australia at Woody Island. During the 2009–2010 financial year, volunteers contributed more than 19,982 hours to the Esperance District. Photo – Klaus Tiedemann

Desired outcome

Community involvement and support in planning and management.

Management actions

- Continue to provide and promote opportunities for community groups to be involved in management of the planning area, including community members who have a particular interest in the Ramsar wetlands and/or and may be affected by the management of the wetlands.
- 2. Work together with Aboriginal people to preserve cultural heritage, conserve the environment and enrich cross-cultural awareness.
- Continue to support volunteer involvement in departmental programs, and maintain records of the number of registered volunteers and the amount of volunteer hours contributed.



Red leschenaultia (Leschenaultia formosa), Speddingup West Nature Reserve. Photo – Laurent Marsol

Key performance indicator

Performance measure	Objective	Reporting
The number of registered volunteers	Maintenance or increase in the number	Every 5 years
and the amount of volunteer hours	of registered volunteers and the amount	
contributed	of volunteer hours contributed	

37. Off-reserve management and partnerships

Management objectives for this plan cannot be achieved in isolation as various land tenures (for example, shire reserves, private property, unallocated Crown land and other Crown reserves) adjoin department—managed lands. For example, catchment management, feral animals, weeds, threatened species and fire management in particular need to be approached from a broader, integrated land management perspective in order to achieve management objectives for the planning area. Managers and owners of nearby land will be encouraged to manage their land in a way that is sympathetic with, and complementary to, management of the planning area. Ongoing liaison with neighbours, local communities and agencies will be required to facilitate the effective, coordinated management of cross boundary issues and to minimise adverse impacts on key values.



Agricultural land adjoining Woody Lake Nature Reserve. View over Lake Windabout towards Cape Le Grand National Park in the distance. Photo – Lorna Charlton

Principles for effective neighbour relations, outlined in the department's *Good Neighbour Policy* (DEC 2007b) are important for and will be fostered through developing partnerships with the community. The policy addresses issues such as boundary fences, fire management, control of weeds and pest animals, straying stock, and access.

Many threatened fauna (for example, the woylie, chuditch, Carnaby's cockatoo and Recherche Cape Barren goose) are highly mobile and often travel across tenures in search of food, shelter or social interaction, and often occur outside of department-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 assist in the recovery effort.

As well as neighbouring landholders, the department liaises with several levels of government. The department liaises with the relevant Commonwealth department responsible for the Ramsar-listed Lake Gore and Lake Warden System, migratory species and threatened plants and animals as 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 drainage and 'declared' plants and animals (Department of Agriculture and Food) and water resource use (Department of Water). Liaison with the shires of Esperance and Ravensthorpe is also particularly important given:

- there are many shire reserves existing within or adjacent to parks and reserves managed by the department
- local governments broadly represent the views of local communities within their constituencies

- local governments are able to encourage planning and land management practices that complement
 management of the planning area through a range of planning instruments (for example, town
 planning schemes and local planning strategies)
- the department maintains working arrangements with local governments, FESA, local Bush Fire Brigades and volunteers to provide cooperative and coordinated fire fighting on and off department-managed lands
- local governments share responsibilities in the provision and maintenance of the public road network.

The South Coast NRM group help deliver, in partnership with state governments, local shires, Indigenous groups, industry bodies, land managers, farmers, Landcare groups and communities, the Commonwealth government's *Caring for our Country* initiative. Effective partnerships and financial grants from this initiative contribute significantly towards the management of the planning area.



Little penguin (Eudyptula minor), Mondrain Island. The little penguin breeds on at least 30 islands of Recherche Archipelago Nature Reserve as well as on Woody Island and Investigator Island nature reserves. Photo – DEC

A range of covenant and voluntary management schemes (for example, the department's *Nature Conservation Covenant* and *Land for Wildlife* scheme, the Department of Agriculture and Food's *Agreement to Reserve* covenant, and National Trust [WA]'s covenant scheme) have properties that occur adjacent to or within close proximity of the planning area. The department's and the National Trust's conservation covenant schemes provide linkage benefits for natural values as well as support and advice for landholders.

Desired outcome

Biodiversity conservation is supported and promoted by good working relationships with neighbours and partners.

- Liaise with neighbouring landowners and managers, local shires, relevant government agencies, conservation groups and other stakeholders in the management of crossboundary issues.
- Work with relevant neighbours and land managers to protect and conserve wider catchment values.
- Develop catchment recovery plans and participate in catchment recovery projects aimed at conserving significant wetlands (for example, Ramsar wetlands).
- 4. Expand the regional departmental fire management program to recognise off-reserve biodiversity assets in liaison with external stakeholders.



Painted lady (Gompholobium scabrum), Speddingup West Nature Reserve. Photo – Laurent Marsol

Research and monitoring

Research and monitoring are essential components of management, and are required to successfully implement this management plan. They can lead to a better understanding of the values of the planning area, increase knowledge, aid in performance assessment against the objectives of the management plan and provide a scientific basis for improving and adapting future management to achieve best practices.

38. Research requirements

There are many ongoing research and monitoring programs undertaken by the department and external agencies occurring in the planning area that are likely to continue. These include:

- geo-chemistry monitoring in the Lake Warden System
- water quality monitoring in the Lake Warden System and at Lake Gore
- monitoring of the impact of dewatering at Lake Wheatfield: sea grass monitoring, nutrient movement and hydro-dynamics
- systematic biological survey within poorly surveyed reserves
- monitoring of rare and priority flora across the planning area
- seed collecting and survey work for the Threatened Flora Seed Centre and other parts of the department
- herbaria flora collections by the department
- monitoring and research associated with the reintroduction of fauna: chuditch to Cape Arid National Park and rock-wallabies to Cape Le Grand National Park
- Western Shield fauna monitoring in Stokes, Cape Le Grand and Cape Arid national parks and Lake Shaster Nature Reserve and Integrated Predator Management Program monitoring in Cape Arid National Park
- bird surveys including ground parrot survey work
- monitoring invertebrate fauna and waterbirds in the Lake Warden System



Monitoring vegetation plots for fire research, Mondrain Island, Recherche Archipelago Nature Reserve. Photo – Emma Adams

- Phytophthora dieback research conducted by the South Coast NRM group and the department
- monitoring of the effectiveness of phosphite treatment of threatened flora
- post-fire vegetation regeneration monitoring
- fire ecology research on islands within the Recherche Archipelago including Mondrain and Middle islands
- visitation levels and surveys at Stokes, Cape Le Grand and Cape Arid national parks, Esperance Lakes and Helms Arboretum.



Departmental staff measuring the specially protected carpet python (Morelia spilota imbricata) on Mondrain Island, Recherche Archipelago Nature Reserve. Photo – DEC

Desired outcome

Knowledge and understanding of the natural, cultural, recreational and social values is increased through research and monitoring and aids in implementing this management plan.

- 1. Conduct integrated research and monitoring programs that facilitate management of the planning area, with a focus on key issues and values identified in this management plan, the establishment of baseline information, meeting key performance indicators, and other departmental research priorities.
- 2. Ensure relevant information gained through research, monitoring and experience is available in regional and district office libraries/databases, and updated when required.
- 3. Develop and maintain a database of historical, current and required research in the planning area.
- 4. Incorporate research and monitoring findings into performance assessment against the objectives of the management plan and adapting future management where appropriate.
- 5. Encourage and support, wherever possible, external agencies and individuals where their research contributes directly to departmental strategies or the implementation and auditing of this management plan.
- 6. Pursue external funding sources to assist in achieving research and monitoring objectives.



Research expedition to the Recherche Archipelago. Photo – DEC

References

Please note that many of these references are either available on the internet or are publicly available through DEC's Conservation Library (see www.dec.wa.gov.au/content/view/123/2122/ for more information on how to search the department's catalogue, the location of the library and how to make loan requests).

ANCA (1996). A Directory of Important Wetlands in Australia: Second edition. Australian Nature Conservation Agency, Canberra.

Andersen, A.N. and Burbidge, A.H. (1992). An overview of the ant fauna of Cape Arid National Park, Western Australia. *Journal of the Royal Society of Western Australia* 75:41–46.

Aplin, K. and Kirkpatrick, P. (2001). In pursuit of the frog fungus. *Landscope* 16(3): Autumn 2001, 10–16. Department of Conservation and Land Management, Kensington.

Bamford, M.J. and Roberts, J.D. (2003). The impact of fire on frogs and reptiles in south-west Western Australia. In: Abbott, I and Burrows N. (eds.) (2003). Fire in Ecosystems of the South-West of Western Australia: Impacts and management:349–361.

Baird, B. and Dann, P. (2003). The breeding biology of hooded plovers, <u>Thinornis rubricollis</u>, on Phillip Island, Victoria. *Emu* 103:323–328.

Bancroft, K.P., Deeley, D.M. and Paling, E.I. (1997). South Coast Terrestrial and Marine Reserve Integration Study: A review of estuaries and their catchments between Broke Inlet and Israelite Bay. Report to Marine Conservation Branch, Department of Conservation and Land Management. Marine and Freshwater Research Association, Murdoch University, Perth, Western Australia.

Barefoot, M. and Kalotas, A. (2004). *Ethno-ecological Investigation of the Proposed Cape Le Grand-Smiths Block Heritage Trail*. Goldfields Land & Sea Council.

Barrett, S., Comer, S., McQuoid, N., Porter, M., Tiller, C. and Utber, D. (2009). *Identification and Conservation of Fire Sensitive Ecosystems and Species of the South Coast Natural Resource Management Region*. Department of Environment and Conservation, Albany.

Beard, J.S. (1973). *Vegetation Survey of Western Australia*, 1:250 00 Series – The vegetation of the Esperance and Malcolm area, map and explanatory memoir. Vegmap Publications, Applecross.

Beard, J.S. (1975). *Vegetation Survey of Western Australia. Nullarbor, 1:1,000,000 Vegetation Series, Explanatory Notes to Sheet 4 – The Vegetation of the Nullarbor Area.* University of Western Australia Press, Perth.

Beard, J.S. (1980). A new phytogeographic map of Western Australia. *Western Australia Herbarium Research Notes* 3:37–58.

Bellgard, S.E., Crane, C.E. and Shearer, B.L. (1995). *The Impact of <u>Phytophthora megasperma</u> in Cape Arid National Park – June 1995*. Unpublished report to the Department of Conservation and Land Management.

Benshemesh, J. (2007). *National Recovery Plan for Malleefowl*. Department for Environment and Heritage, South Australia.

Brandis, A., Hill, T., Keighery, G.J. and Tippett, J. (1985). *Dieback in the Cape Arid National Park and other Areas of Concern*. Department of Conservation and Land Management.

Brown, A., Batty, A., Brundrett, M. and Dixon, K. (2003). *Underground Orchid* (*Rhizanthella gardneri*) *Interim Recovery Plan 2003–2008*. Interim Recovery Plan No. 127. Department of Conservation and Land Management, Perth, Western Australia.

www.dec.wa.gov.au/pdf/plants_animals/threatened_species/irps/flora/rhi_gar_irp127.pdf

Brown, J.M., Hopkins, A.J.M., Trudgen, M.E. and Weston, A.S. (1984). Regeneration after fire in 170 year old vegetation on Middle Island, south western Australia. In: Dell, B. (ed.) *Medecos IV: Proceedings of the 4th International Conference on Mediterranean Ecosystems*:18–19. Botany Department, University of Western Australia, Perth.

Burbidge, A.H. (2003). Western bristlebirds at Nuyts. In: South Coast Threatened News.

Burbidge, A.H., Blyth, J., Danks, A., Gillen, K. and Newbey, B. (1997). Western Ground Parrot (<u>Pezoporus wallicus flaviventris</u>) Interim Recovery Plan 1996 to 1999. Interim Recovery Plan No. 6. Department of Conservation and Land Management, Western Australia. www.dec.wa.gov.au/pdf/plants_animals/threatened_species/irps/fauna/pez_wal_irp6.pdf

Burrows, N.D. (2008). Linking fire ecology and fire management in south-west Australian forest landscapes. *Forest Ecology and Management* 255:2394–2406.

Burrows, N.D. and Friend, G. (1998). Biological indicators of appropriate fire regimes in southwest Australian ecosystems. In: T. Priden and L. Brennan (eds.). *Fire In Ecosystem Management: Shifting the paradigm from suppression to prescription*. Tall Timbers Fire Ecology Conference Proceedings No 20. Tall Timbers Research Station, Tallahasse.

Burrows, N. and Wardell-Johnson, G. (2003). Fire and plant interactions in forested ecosystems of south-western Western Australia. In: Abbott, I. and Burrows, N. Fire in Ecosystems of the South-West of Western Australia: Impacts and management: 225–268.

Burrows N.D., Wardell-Johnson G., Ward B. (2008). Post-fire juvenile period of plants in south-west Australia forests and implications for fire management. *Journal of the Royal Society of Western Australia* 91:163–174.

Cale, B. (2003). *Carnaby's Black Cockatoo* (*Calyptorhynchus latirostris*) *Recovery Plan*. Department of Conservation and Land Management, Kensington.

www.dec.wa.gov.au/pdf/plants_animals/threatened_species/frps/Carnaby_WA_Rec_Plan_2003.pdf

CALM (1986). *Policy Statement No. 10 Rehabilitation of Disturbed Land*. Department of Conservation and Land Management, Kensington.

CALM (1992). *South Coast Region Regional Management Plan*. Department of Conservation and Land Management. www.dec.wa.gov.au/pdf/nature/management/south_coast.pdf

CALM (1995). Western Australian Wildlife Management Program No.16: Woylie Recovery Plan. Department of Conservation and Land Management, Kensington.

CALM (1999a). Esperance Lakes Nature Reserves Management Plan 1999–2009. Department of Conservation and Land Management, Kensington.

www.dec.wa.gov.au/component/option,com_docman/task,doc_download/gid,3566/Itemid,1/

CALM (1999b). *Environmental Weed Strategy for Western Australia*. Department of Conservation and Land Management, Kensington. www.dec.wa.gov.au/content/view/847/2275/

CALM (2003). A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002. J.E. May and N.L. McKenzie (eds). www.naturebase.net/content/view/960/1397/

CALM (2004a) *Draft Policy Statement No. 41 (Revised) Beekeeping On Public Land.* Department of Conservation and Land Management.

www.dec.wa.gov.au/component/option,com_docman/task,doc_download/gid,3075/Itemid,1/

CALM (2004b). *Policy Statement No. 62 Identification and Management of Wilderness and Surrounding Areas*. Department of Conservation and Land Management, Crawley. www.dec.wa.gov.au/content/view/82/1929/

CALM (2006). Small Two-coloured Kangaroo Paw (<u>Anigozanthos bicolor</u> subsp. <u>minor</u>) Interim Recovery Plan 2006-2011. Interim Recovery Plan No. 223. Department of Conservation and Land Management, Perth, Western Australia.

www.dec.wa.gov.au/pdf/plants_animals/threatened_species/irps/flora/ani_bic_min_irp223.pdf

Clark, R.N. and Stankey, G.H. (1979). Determining the acceptability of recreational impacts, an application of the outdoor recreation opportunity spectrum. *Recreational Impact on Wildlands*: Conference proceedings: 32–42. US Dept. of Agriculture, Portland, Oregon.

Colman, J.G. (1998). *South Coast Terrestrial and Marine Reserve Integration Study*. Department of Conservation and Land Management, Marine Conservation Branch, Fremantle, Western Australia.

Cousins, D.V., Williams, S.N., Reuter, R., Forshaw, D., Chadwich, B., Coughran, D., Collins, P., and Gales, N. (1993). Tuberculosis in wild seals and characteristics of the seal bacillus. *Australian Veterinary Journal* 70:92–97.

Craig, G.F. and Coates, D.J. (2001). *Declared Rare and Poorly Known Flora in the Esperance District*. Wildlife Management Program Number 21. Department of Conservation and Land Management.

DEC (2006). *Policy Statement No.18 Recreation, Tourism and Visitor Services*. Department of Environment and Conservation, Kensington.

www.dec.wa.gov.au/component/option,com_docman/task,doc_download/gid,4655/Itemid,/

DEC (2007a). *Disability Access and Inclusion Plan 2007-2010*. Department of Environment and Conservation, Kensington.

www.dec.wa.gov.au/component/option,com_docman/Itemid,708/task,doc_download/gid,1234/

DEC (2007b). *Good Neighbour Policy*. Department of Environment and Conservation, Crawley. www.dec.wa.gov.au/component/option,com_docman/task,doc_download/gid,987/Itemid,1/

DEC (2007c). *Management Plan for Esperance Coastal Reserves: Issues Paper*. Department of Environment and Conservation, Kensington.

www.dec.wa.gov.au/component/option,com_docman/task,doc_download/gid,745/

DEC (2007d). South Coast Regional Fire Management Plan 2008-2013. Department of Environment and Conservation, Albany.

DEC (2007e Unpublished). *Vegetation Community and Change Analysis of Remote Sensing Imagery* 2004–2007. Conducted by T. Massenbauer, Department of Environment and Conservation, Esperance, Western Australia.

DEC (2009a Unpublished). *Dieback Interpretation Report Cape Arid, Kennedy, Alexander and Daniel Rd Reserves*. Department of Environment and Conservation, Albany.

DEC (2009b). Ecological Character Description of the Lake Gore Ramsar Site: A report by the Department of Environment and Conservation. Department of Environment and Conservation. www.dec.wa.gov.au/content/view/814/1939/

DEC (2009c). Ecological Character Description of the Lake Warden System Ramsar Site: A report by the Department of Environment and Conservation. Department of Environment and Conservation. www.dec.wa.gov.au/content/view/814/1939/

DEC (2009d). Resource Condition Report for a Significant Western Australian Wetland: Lake Gore. Department of Environment and Conservation, Perth, Western Australia. www.dec.wa.gov.au/component/option,com_docman/task,doc_download/gid,4389/Itemid,/

DEC (2010a). *Biodiversity and Cultural Conservation Strategy for the Great Western Woodlands*. Department of Environment and Conservation. www.dec.wa.gov.au/content/view/6115/2183/

DEC (2010b). South Coast Draft Regional Marine Strategic Plan. Department of Environment and Conservation. www.dec.wa.gov.au/content/category/40/716/2044/

DEH (2003). *Harmful Marine Debris Key Threatening Process Information Sheet*. Department of the Environment and Heritage, Canberra.

DEH (2005). Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee on Amendments to the list of Threatened Species under the Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment and Heritage, Canberra.

DEH (2006). Wildlife Conservation Plan for Migratory Shorebirds. Department of Environment and Heritage, Canberra.

Department of Water (2008). *Benwenerup: A management plan for Stokes Inlet*. Department of Water. www.water.wa.gov.au/PublicationStore/first/80212.pdf

Dortch, C.E. and Morse, K. (1984). Prehistoric stone artefacts on some offshore islands in Western Australia. *Aust. Archael.* 19:31–47.

Environment Australia (2001a). A Directory of Important Wetlands in Australia – Third edition. Environment Australia, Canberra.

Environment Australia (2001b). *Recovery Plan for Albatrosses and Giant-petrels*. Department of the Environment and Heritage, Canberra.

Fitzgerald, M., Butler, R. and Brown, A. (2004). *Cumquat Eremophila* (*Eremophila denticulata subsp. trisulcata ms*) *Interim Recovery Plan 2004–2009*. Department of Conservation and Land Management, Western Australia.

www.dec.wa.gov.au/pdf/plants_animals/threatened_species/irps/flora/ere_den_tri_irp184.pdf

Fletcher, W.J. and Santoro, K. (eds) (2010). *State of the Fisheries and Aquatic Resources Report 2009/10*. Department of Fisheries, Western Australia.

Franke, B., Gurner, R., and Froend, R. (2001). *Salinity Action Plan: Wetland vegetation monitoring* 2000/2001. Prepared for the Department of Conservation and Land Management. Edith Cowan University, Centre for Ecosystem Management, Perth, Western Australia.

Gales, N.J. (1991). New Zealand Fur Seals and Oil: An overview of assessment, treatment, toxic effects and survivorship, the 1991 Sanko Harvest oil spill. August 1991. Report to the Department of Conservation and Land Management. Perth, Western Australia.

Gales, N.J. and Wyre, G. (1999). Western Australia Pinniped Management Program 1999–2008. Draft Western Australian Wildlife Management Program. Department of Conservation and Land Management, Kensington.

Galloway, P. and Clarendon, S, (2009). *Esperance Area Acid Sulfate Soil Hazard Mapping*. Resource Management Technical Report 347. Department of Agriculture and Food, Esperance. www.agric.wa.gov.au/objtwr/imported_assets/content/lwe/land/rmtr_mapping_esperance.pdf

Garnett, S.T. and Crowley, G.M. (2000). *The Action Plan for Australian Birds*. Environment Australia, Canberra.

Gilfillan, S. (2000). *Terrestrial Fauna of the South Coast – A review*. South Coast Management Group, Albany.

Gilfillan, S., Mitchell, P., Newell, J., Danks, A. & Comer, S. (2009). *South Coast Threatened Species and Ecological Communities Strategic Management Plan*. Department of Environment and Conservation, Albany. www.southcoastnrm.com.au/files/1/files/Threatened%20Species%20and%20Ecological%20 Communities...%20Jun%2009.pdf

Gole, G. (2006) *The Southwest Australia Ecoregion: Jewel of the Australian continent*. Southwest Australia Ecoregion Initiative.

Goodsell, J., Tingay, A. and Tingay, S.R. (1976). A Resource Survey of Woody Island, Archipelago of the Recherche. Dept. of Fisheries and Wildlife Report No. 21.

Government of Western Australia (1996). Western Australian Salinity Action Plan. Government of Western Australia, Perth, Western Australia.

Government of Western Australia (2000). *Natural Resource Management in Western Australian: The salinity strategy*. Government of Western Australia, Perth, Western Australia.

GSWA (1974). *Geology of Western Australia: West. Australia Geol. Survey, Mem.* 2. Geological Survey of Western Australia, Perth.

Gunby, C., Arrowsmith, N. and Bryant, J. (2004). Southern Prospects 2004–2009 South Coast Regional Strategy for Natural Resource Management: Background paper 4 water resources in the south coast region. SCRIPT, Albany, Western Australia.

Hall, G.P. and Kinnear, J.E. (1991). *Recovery Plan for the Black-Flanked Rock-Wallaby*, <u>Petrogale lateralis lateralis</u> (Gould). A report submitted to the Australian National Parks and Wildlife Service Endangered Species Program (Project 149). Department of Conservation and Land Management, Western Australia.

Halse, S.A., Burbidge, A.A., Lane, J.A.K., Haberley, B., Pearson, G.B. and Clarke, A. (1995). Size of the Cape Barren goose population in Western Australia. *Emu* 95:77–83.

Hopper, S.D. (2000). Creation of conservation reserves and managing fire on granite outcrops—a case study from Chiddarcooping Nature Reserve in the Western Australian wheatbelt. *Journal of the Royal Society of Western Australia* 83(3):173–176.

Hopkins, A.J.M. and Harvey, J.M. (1989). Fire on offshore islands – problems and management solutions. In: *Australia and New Zealand Islands: Nature conservation values and management: Proceedings*: 83–95. Department of Conservation and Land Management.

Hopkins, A., Morgan, R. and Shepherd, D. (2000). *Bush and Biodiversity – A preliminary assessment of biodiversity values in the south west catchments natural resource management region*. Department of Conservation and Land Management and Agriculture Western Australia, Perth.

Kitchener, D.J., Chapman, A. & Dell, J. (1975). *Biological Survey of Cape Le Grand National Park*. Records of the Western Australian Museum, Supplement No. 1, 1975.

Lee, S. and Bancroft, K.P. (2001). *Review of Existing Ecological Information for the Proposed Recherche Archipelago Marine Conservation Reserve*. Marine Conservation Branch, Department of Conservation and Land Management, Fremantle.

Lentanton, R.J.C (1974). Fish and crustacea of the Western Australian south coast rivers and estuaries. *Fisheries Research Bulletin* 13:1–17. Western Australian Marine Research Laboratories, Department of Fisheries and Fauna, Perth, Western Australia.

Lodge, K., Williams, K. and Loveday, B. (2002). *Geotechnical Consultant Inspection of Hazardous Sites*. Kevin Lodge Engineering.

Marimuthu, S., Reynolds, D.A., and Le Gal La Salle, C. (2005). A field study of the hydraulic, geochemical and stable isotope relationship in a coastal wetlands system. *Journal of Hydrology* 315:93–116.

Massenbauer, T. and Palmquist, E. (2006). *Vegetation Change Analysis and Plant Community Mapping of the Lake Gore Ramsar Listed Nature Reserves Using Remote Sensing GIS (Draft)*. Department of Environment and Conservation, Esperance, Western Australia.

Mawson, P.R. and Coughran, D.K. (1999). Records of sick, injured and dead pinnipeds in Western Australia 1980-1996. *Journal of the Royal Society of Western Australia* 82:121–128.

Monks, L., Stack, G., Evans, R. and Brown, A. (2001). *Prickly Honeysuckle* (*Lambertia echinata subsp. echinata*) *Interim Recovery Plan 2001–2004*. Interim Recovery Plan no. 97. Department of Conservation and Land Management, Wanneroo, Western Australia.

www.dec.wa.gov.au/pdf/plants_animals/threatened_species/irps/flora/lam_ech_ech_irp97.pdf

Morgan, K.H. and Peers, R. (1973). *Geological Survey of Western Australia – 1:250,000 Series Explanatory Notes. Esperance-Mondrain Island*. Australian Government Publishing Service, Canberra.

MRWA (2007). Roads 2025 Regional Road Development Strategy – Goldfields Esperance Region. Main Roads WA.

Myers, J.S. (1995). *Geological Survey of Western Australia – Geology of the Esperance 1:100,000 Sheet.* Department of Minerals and Energy, Perth.

National Health and Medical Research Council and Natural Resource Management Ministerial Council 2004. *Australian Drinking Water Guidelines*.

National Reserve System Task Group (2009). *Strategy for Australia's National Reserve System 2009-2030*. Prepared by the National Reserve System Task Group convened under the Natural Resource Policies and Program Committee 2009. Australian Government, Canberra.

Newsome, D., Cole, D.N. and Marion, J.L. (2004). Environmental impacts associated with recreational horse-riding. In: Buckley, R. (ed.) *Environmental Impacts of Ecotourism* pp:61–82. CABI Publishing, Wallingford, UK.

Newsome, D. and Phillips, N. (2002). Effects of horse riding on national parks and other natural ecosystems in Australia: Implications for management. *Journal of Ecotourism* 1(1):52–74.

NLWRA (2002). Australian Terrestrial Biodiversity Assessment 2002. National Land & Water Resource Audit, Commonwealth of Australia, Canberra.

Ogden, G. and Froend, R. (1998). *Salinity Action Plan: Wetland vegetation monitoring 1997/1998*. For the Department of Conservation and Land Management. Edith Cowan University, Centre for Ecosystem Management, Perth, Western Australia.

Orell, P. and Morris, K. (1994) *Chuditch Recovery Plan*. Wildlife Management Program No. 13. Department of Conservation and Land Management, Western Australia. www.dec.wa.gov.au/pdf/plants_animals/threatened_species/frps/chuditch_wmp13.pdf

Pearson, D., Hopper, S., Cochrane, A., Comer, S. and Danks, A. (2004). Fire in the arc. *Landscope* (20)1:10–17. Department of Conservation and Land Management, Kensington.

Pemberton, D. and Shaughnessy, P.D. (1993). Interaction between seals and marine fish-farms in Tasmania, and management of the problem. *Aquatic Conservation* 3:149–158.

Raines, J. (2002). Hooded Plover Management Plan (2002–2012) Western Australia. *Western Australian Bird Notes* Supplement No. 7, July 2002.

Ramsar Convention (2005). *Resolution IX.1 Annex A. A Conceptual Framework for the Wise Use of Wetlands and the Maintenance of their Ecological Character*. Paper presented at the 9th Meeting of the Conference of the Parties to the Convention on Wetlands (Ramsar, Iran, 1971) "Wetlands and water: supporting life, sustaining livelihoods", Kampala, Uganda.

Serventy, V.N. (1953). Part 4 – Mammals. In: Australian Geographical Society Reports No.1. *The Archipelago of the Recherche* 1:40–48.

Shaughnessy, P.D. (1990). *Distribution and Abundance of New Zealand Fur Seals <u>Arctocephalus forsteri</u> in Western Australia.* Report to the Department of Conservation and Land Management. CSIRO Division of Wildlife and Ecology, Canberra.

Shaughnessy, P.D. (1999). The Action Plan for Australian Seals. Environment Australia, Canberra.

Shaughnessy, P.D., Gales, N.J., Dennis, T.E. and Goldsworthy, S.D. (1994). Distribution and abundance of New Zealand fur seals, *Arctocephalus forsteri* in South Australia and Western Australia. *Wildl. Res.* 21:667–695.

Shearer, B.L. (1994). The major plant pathogens occurring in native ecosystems of south-west Australia. In: Plant diseases in ecosystems: Threats and impacts in south-western Australia. *Journal of the Royal Society of Western Australia* 77:113–122.

Shearer, B.L., Crane, C.E., Fairman, R.G. and Grant, M.J. (1997). Occurrence of *Armillaria luteobubalina* and pathogen-mediated changes in coastal dune vegetation of south-western Australia. *Australian Journal of Botany* 45:905–917.

Singor, M. (1999). Hooded plover report no. 2 1996–1999. *Western Australian Bird Notes* Supplement No. 4 (Suppl. to WA Bird Notes 90, June 1999).

Smith, M. (1984). Aboriginal Sites in Crown Land between Cape Le Grand and Cape Arid National Parks: A preliminary survey.

Smith, M. (1993). Recherche a L'Esperance: A prehistory of the Esperance region of south western Australia. PhD Thesis.

Smith, R. and Grant, M. (2000). *The <u>Phytophthora cinnamomi</u> Infestation at Cape Arid: Background and options for management.*

Standards Australia (2001). *Australian Standard Walking Tracks: Part 1 classification and signage*. Standards Australia, Sydney.

State Weed Plan Steering Group (2001). A Weed Plan for Western Australia. Department of Agriculture, Bentley, Western Australia.

Taylor, H., Butler, R. and Brown, A. (2004). *Salt Myoporum (Myoporum turbinatum) Interim Recovery Plan 2004–2009*. Interim Recovery Plan No. 186. Department of Conservation and Land Management, Perth, Western Australia.

www.dec.wa.gov.au/pdf/plants_animals/threatened_species/irps/flora/myo_tur_irp186update.pdf

Thackway, R. and Cresswell, I.D. (1995). *An Interim Biogeographic Regionalisation for Australia: A framework for setting priorities in the National Reserves System Cooperative Program*. National Reserves System Cooperative Program (Australia).

Thackway, R. and Cresswell, I.D. (eds.) (1998). *Interim Marine and Coastal Regionalisations for Australia: An ecosystem-based classification for marine and coastal environments*. Environment Australia, Canberra.

Tourism Western Australia (2006). *Esperance Tourism Planning Strategy: Position paper*. Tourism Western Australia.

Veth, P. and Moore, P. (1989). Report of an Archaelogical and Ethnographic Survey on the South Coast Highway, Stokes Inlet Road to Young River, West of Esperance, Western Australia.

Watson, J.R. (2005). *Protecting the Snowless Wonderland: Conserving biodiversity of low-altitude mountains in south western Australia*. In: Proceedings of Open Science Conference on Global Change in Mountain Regions, Perth 2-6 October 2005 (unpublished).

Watson, J. and Wilkins, P. (1999). The Western Australian South Coast Macro Corridor Project – A bioregional strategy for nature conservation. *Parks* 9(3):7–16.

Weston, A.S. (1985). Fire – and persistence of the flora of Middle Island, a south-western Australian offshore island. In: Ford, J.R. (ed.). *Fire Ecology and Management in Western Australian Ecosystems*: 111–118. Western Australian Institute of Technology, Perth.

Wetlands International (2006). *Waterbird Population Estimates - Fourth edition*. Wetlands International, Wageningen, The Netherlands.

Wilkins P., Gilfillan, S., Watson, J. and Sanders, A. (2006). *The Western Australian South Coast Macro Corridor Network – A bioregional strategy for nature conservation*. Department of Environment and Conservation and South Coast Natural Resource Management Group, Albany, Western Australia. www.southcoastnrm.com.au/files/1/files/MacroCorridorReport-Full-WEB.pdf

Wilson, G.D.F. and Keable, S.J. (2002). New genera of Phreatoicidea (Crustacea: Isopoda) from Western Australia. *Records of the Australian Museum* 54: 41–70.

Personal communications

Department of Environment and Conservation

David Pearson – Senior Research Officer, Woodvale Research, Science Division. [email 17 August 2005]

Bryan Shearer – Principal Research Scientist, Kensington Research, Science Division. [email 19 May 2005]

Klaus Tiedemann – District Manager, Esperance District, Regional Services Division.



Thistle Cove, Cape Le Grand National Park. Photo – Aberline Attwood

Appendices

Appendix 1. Existing reserves within the planning area

Name	No.	Size (ha)	Purpose
Mainland reserves west to east	(67)		
National parks (3)			
Stokes National Park	A32590	9,726.46	National park
Cape Le Grand National Park	C22795	31,578.09	National park
Cape Le Grand National Park	C44987	222.61	National park
Cape Arid National Park	A24047	278,184.00	National park
Cape Arid National Park	A14234	1,261.00	National park and water
	Sub-total area	320,972.16	
Nature reserves (61)			
Lake Shaster Nature Reserve	C32339	10,504.50	Conservation of flora and fauna
Cheadanup Nature Reserve	A31754*	6,813.00	Conservation of flora and fauna
East Naernup Nature Reserve	C31755*	824.56	Conservation of flora and fauna
Munglinup Nature Reserve	C26410	150.11	Conservation of flora and fauna
Griffiths Nature Reserve	A30583*	5,417.70	Conservation of flora and fauna
Springdale Nature Reserve	C28168	25.47	Conservation of flora and fauna
Unnamed nature reserve	C35659*	1,008.90	Conservation of flora and fauna
Unnamed nature reserve	C31745*	87.50	Conservation of flora and fauna
Cascade Nature Reserve	A31744*	288.30	Conservation of flora and fauna
Unnamed nature reserve	C43949*	716.00	Catchment protection and conservation of flora and fauna
Cascade Nature Reserve	A31743*	95.70	Conservation of flora and fauna
Fields Nature Reserve	A31742*	1,179.40	Conservation of flora and fauna
Unnamed nature reserve ('Barker Inlet Nature Reserve')	C27888	4,615.00	Conservation of flora and fauna
Unnamed nature reserve ('Warrenup Lakes')	C26885	5,199.51	Conservation of flora
Unnamed nature reserve	C43221*	131.70	Conservation of flora and fauna
Speddingup West Nature Reserve	A36183*	357.53	Conservation of flora and fauna
Lake Gore Nature Reserve	A32419	792.43	Water and conservation of flora and fauna
Bishops Nature Reserve	A29012*	1,403.60	Conservation of flora and fauna
Dowak Nature Reserve	A36608*	80.60	Conservation of flora and fauna
Dalyup Nature Reserve	C19628	57.09	Conservation of flora and fauna
Lake Mortijinup Nature Reserve	A35557	486.28	Water and conservation of flora and fauna

Name	No.	Size (ha)	Purpose
Swan Lagoon Nature Reserve	A8019*	346.70	Conservation of flora and fauna
Jeffrey Lagoon Nature Reserve	A3042*	121.40	Conservation of flora and fauna
Red Lake Townsite Nature Reserve	A29680*	76.10	Conservation of flora and fauna
Truslove North Nature Reserve	C16801*	194.10	Conservation of flora and fauna
Truslove Townsite Nature Reserve	C27985*	6,065.80	Conservation of flora and fauna
Unnamed nature reserve	A31313*	19.39	Conservation of flora and fauna
Kendall Road Nature Reserve	A28846*	56.00	Conservation of flora and fauna
Speddingup East Nature Reserve	C25958*	69.49	Conservation of flora and fauna
Unnamed nature reserve	A33113*	8,859.60	Conservation of flora and fauna
Unnamed nature reserve	C33501*	203.40	Conservation of flora and fauna
Unnamed nature reserve	C4182*	158.73	Conservation of flora and fauna and water
Unnamed nature reserve	C24953	42.52	Conservation of flora
Ridley South Nature Reserve	C27768*	1,105.90	Conservation of flora and fauna
Unnamed nature reserve ('Pink Lake Nature Reserve')	C24511*	173.83	Conservation of flora and fauna
Ridley North Nature Reserve	C28300*	393.10	Conservation of flora and fauna
Lake Warden Nature Reserve	A32257*	699.01	Recreation and conservation of flora and fauna
Lake Warden Nature Reserve	C32259*	6.30	Conservation of flora and fauna
Shark Lake Nature Reserve	A31197*	11.03	Conservation of flora and fauna
Woody Lake Nature Reserve	A15231*	613.44	Recreation and conservation of flora and fauna
Mullet Lake Nature Reserve	A23825*	1,917.40	Conservation of flora and fauna
Mount Ridley Nature Reserve	A27386*	1,417.20	Conservation of flora and fauna
Mount Burdett Nature Reserve	A27384*	604.70	Conservation of flora and fauna
Burdett North Nature Reserve	A27387*	812.20	Conservation of flora and fauna
Burdett South Nature Reserve	A27388*	4,467.10	Conservation of flora and fauna
Burdett Nature Reserve	A27385*	70.70	Conservation of flora and fauna
Kau Rock Nature Reserve	A32776*	4,732.10	Conservation of flora and fauna
Kau Rock Nature Reserve	A32777*	8,550.80	Conservation of flora and fauna
Kau Rock Nature Reserve	A32780*	1,485.10	Conservation of flora and fauna
Kau Rock Nature Reserve	A32779*	1,045.80	Conservation of flora and fauna
Coolinup Nature Reserve	A27354*	215.56	Conservation of flora and fauna
Mount Ney Nature Reserve	A32782*	609.80	Conservation of flora and fauna
Beaumont Nature Reserve	A32130*	2,480.50	Conservation of flora and fauna
Beaumont Nature Reserve	A32783*	7,082.10	Conservation of flora and fauna
Beaumont Nature Reserve	A32129*	1,751.60	Conservation of flora and fauna
Beaumont Nature Reserve	A32128*	444.54	Conservation of flora and fauna
Unnamed nature reserve	C27087	37.71	Conservation of flora
Alexander Nature Reserve	C27086	807.06	Conservation of flora and fauna
Muntz Nature Reserve	A31799*	3,617.50	Conservation of flora and fauna
Unnamed nature reserve	A32131*	1,057.70	Conservation of flora and fauna

Name	No.	Size (ha)	Purpose	
Unnamed nature reserve	A38334*	407.80	Conservation of flora and fauna and water	
Neredup Nature Reserve	A32784*	1,708.90	Conservation of flora and fauna	
Bebenorin Nature Reserve	A32799*	20.26	Conservation of flora and fauna	
Clyde Hill Nature Reserve	A38545*	1,670.50	Conservation of flora and fauna	
Niblick Nature Reserve	A38544*	839.00	Conservation of flora and fauna	
Unnamed nature reserve (Mount Dean and Mount Esmond)	C41934	6,738.00	Conservation of flora and fauna	
Nuytsland Nature Reserve (part)	A27632^	208,946.20	Primitive area for preservation and study of flora, fauna, geological and anthropological features	
	Sub-total area	322,988.55		
Other reserves (3)				
Moir Homestead (Misc Reserve)	C32601	16.19	National park and historic building	
Lake Quallilup 5(1)(h) reserve	C50792	236.10	Conservation and recreation	
Helms Forestry Reserve (Misc Reserve)	C23527*	3,747.90	Forestry purposes	
	Sub-total area	4,000.19		
Island reserves west to east (4)				
Investigator Island Nature Reserve	A36056	40.08	Conservation of flora and fauna	
Recherche Archipelago Nature Reserve	A22796	7,087.50	Conservation of flora and fauna	
Cull Island 5(1)(h) reserve	C42379	0.04	Conservation, navigation, communication, meteorology and survey	
Woody Island Nature Reserve	A39435	195.00	Conservation of flora and fauna, recreation and tourist development	
Sub-total area		7,322.62		
Total area of 71 e:	xisting reserves	655,283.52		

^{*} These reserves were added to the planning area after the issues paper (DEC 2007c) was released.

Note: All reserves are vested in the Conservation Commission except Moir Homestead which is co-vested in the National Trust of Australia and Executive Director of the department, and Helms Forestry Reserve which is vested in the Executive Director of the department.

[^] Only part of this reserve is included in the planning area; whole reserve size is 625,343.6 hectares.

Appendix 2. Proposed additions to the conservation estate within the planning area

Name	No.	Tenure	Size (ha)	Current	Proposed change
Unvested Crown reserve east of the Rabbit Proof Fence	C7580	Unvested Crown reserve	1,605.10	partment	Add to Lake Shaster Nature Reserve as per CALM (1992) recommendation R12 to provide a vegetation corridor between Lake Shaster Nature Reserve and Jerdacuttup Lakes Nature Reserve (west of the Rabbit Proof Fence), to protect vegetation communities highly cleared and poorly reserved and populations of priority flora.
Unvested Crown reserve	C18030	Unvested Crown reserve	202.44	Water	Add to Lake Shaster Nature Reserve to include vegetation communities under represented in the conservation reserve system and to extend the
Unallocated Crown land surrounding C18030	n/a	Unallocated Crown land	630.79	n/a	vegetation corridor.
Unvested Crown reserve	A29447	Unvested Crown reserve	217.38	Stopping place for travellers and stock	Create an 'A' class nature reserve to include vegetation communities highly cleared and under represented in the conservation reserve system as well as protect populations of rare flora.
Unvested Crown reserve	A29446	Unvested Crown reserve	157.14	Stopping place for travellers and stock	Create an 'A' class nature reserve to include vegetation communities under represented in the conservation reserve system and populations of rare flora and habitat for the threatened Carnaby's cockatoo.
Unvested Crown reserve	A29448	Unvested Crown reserve	165.18	Stopping place for travellers and stock	Create an 'A' class nature reserve to include vegetation communities under represented in the conservation reserve system and protect habitat of the threatened Carnaby's cockatoo.
Unvested Crown reserve	A29713*	Unvested Crown reserve	2,046.00	Parklands	Create an 'A' class nature reserve to protect remnant riparian vegetation, rare and priority flora, vegetation communities highly cleared and
Unvested Crown reserve	A29715*	Unvested Crown reserve	2,502.70	Parklands	poorly reserved, and protect habitat of the threatened Carnaby's cockatoo and relictual and endemic reptile species.
Oldfield River corridor	A31756*	Unvested Crown reserve	730.00	Park	
Oldfield River corridor	A31757	Unvested Crown reserve	1,539.00	Park	
Oldfield River corridor	A31758	Unvested Crown reserve	290.73	Park	
Oldfield River corridor	A7352	Shire Reserve	261.25	Resting place/ waterway	

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change
Honeymoon Island	n/a	Unallocated Crown land	0.41	n/a	Create an 'A' class nature reserve to protect potential haul-out sites for Australian sea-lions. At least one island is a known haul-out site.
Unallocated Crown land island	n/a	Unallocated Crown land	0.26	n/a	
Unallocated Crown land island	n/a	Unallocated Crown land	1.16	n/a	
Unallocated Crown land island	n/a	Unallocated Crown land	2.49	n/a	
Freehold land adjacent to Cheadanup Nature Reserve	*Lots 21,	Freehold	325.36	n/a	Add to Cheadanup Nature Reserve to protect vegetation communities highly cleared.
Munglinup River corridor	C30869*	Unvested Crown reserve	2,465.16	Parklands	Create an 'A' class conservation park to provide for existing horseriding use and to protect remnant riparian vegetation, vegetation communities highly cleared and poorly reserved and possible bilby habitat (potential sightings after Dec/Jan 2005 bushfire).
Unvested Crown reserve	C25376	Unvested Crown reserve	91.42	Timber and water	Create an 'A' class nature reserve as per CALM (1992) recommendation E2 to protect vegetation communities highly cleared and poorly reserved.
Young River corridor	A31749*	Unvested Crown reserve	1,279.00	Park	Create an 'A' class nature reserve as per CALM (1992) recommendations E5 to E8 to protect riparian vegetation and remnant
Young River corridor	A31750*	Unvested Crown reserve	2,956.00	Park	vegetation for the catchment of Stokes Inlet, vegetation communities highly cleared and poorly reserved and populations of priority flora.
Young River corridor	A31751*	Unvested Crown reserve	2,909.00	Park	
Young River corridor	A31762*	Unvested Crown reserve	3,477.79	Park	
Young River corridor	A31763	Unvested Crown reserve	57.00	Park and protection of river and foreshore	

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change
Unvested Crown reserve	A31765*	Under management of the Department of Agriculture and Food	881.30	Agricultural research station	Create an 'A' class nature reserve to protect wetlands and remnant vegetation in a fragmented landscape.
Unvested Crown reserve	A31764*	Unvested Crown reserve	2,191.62	Park	Create an 'A' class nature reserve to protect and vegetation communities highly cleared and remnant vegetation that is currently unmanaged.
Stokes Inlet	n/a	Unallocated Crown land	1,109.93	n/a	Add back to Stokes National Park to integrate management and protect habitat for migratory and marine shorebirds, and priority bird species (hooded plover and eastern curlew). In 1981 Stokes Inlet was excluded from Stokes National Park after it was considered that the vesting of the inlet conflicted with the <i>Land Act 1933</i> . The Land Act has since been superseded by the <i>Land Administration Act 1997</i> and the inlet can now be included back into the terrestrial conservation reserve system. This recommendation is supported by previous recommendations for the tidal parts of Stokes Inlet to be reserved as a marine reserve for the purposes of 'conservation of flora and fauna and public recreation', and managed in conjunction with Stokes National Park (CALM 1994). The inlet is a 'normally closed' lagoonal estuary (Bancroft <i>et al.</i> 1997), only opening occasionally to the ocean, due mainly to increased runoff from cleared agricultural land in the upper catchment. A terrestrial and marine integration study by the department in 1998 recommended that estuaries and inlets previously identified for marine reservation in CALM (1994) that are 'normally' or 'permanently closed', should be considered for inclusion in the surrounding terrestrial reserves (Colman 1998).
Lort River corridor	A31739*	Unvested Crown reserve	11,963.00	Parklands	Create an 'A' class nature reserve as per CALM (1992) recommendations E9 to E11 to protect riparian vegetation and remnant
Lort River corridor	C26913*	Unvested Crown reserve	1,214.10	Public utility	vegetation for the catchment of Stokes Inlet, regionally significant Native Dog Swamp, vegetation communities highly cleared and poorly
Lort River corridor	A31761	Unvested Crown reserve	809.00	Park and protection of river and foreshore	reserved, populations of rare and priority flora and habitat for the threatened chuditch.

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change
Roberts Swamp Shire Reserve	C26912*	Shire Reserve	1,662.00	Recreation and parklands	Create an 'A' class nature reserve to protect regionally significant Roberts Swamp, remnant vegetation in a fragmented landscape, vegetation communities highly cleared and poorly reserved and populations of <i>Leucopogon rugulosus</i> (priority 1).
Unvested Crown reserve	C26915*	Unvested Crown reserve	122.39	Public utility	Create an 'A' class nature reserve to protect remnant vegetation in a fragmented landscape, vegetation communities highly cleared and poorly reserved, populations of priority flora and granite outcrop habitats.
Lake Gidong	n/a	Unallocated Crown land	66.52	n/a	Pursue as additions to Lake Gore Nature Reserve as they are within the boundary of the nationally important Lake Gore wetland system and
Unallocated Crown land lake	n/a	Unallocated Crown land	35.54	n/a	have the potential to be added to the Ramsar site. The lakes are also where the hooded plover, a priority species, has been sighted regularly
Lake Kubitch	n/a	Unallocated Crown land	50.92	n/a	in numbers of 20 or more at a time.
Carbul Lake	n/a	Unallocated Crown land	39.66	n/a	
Unvested Crown reserve (part)	C30672	Unvested Crown reserve	468.20	Preservation of natural vegetation and ocean foreshore	Add to Stokes National Park to provide a vegetation corridor linking Nature Reserve 26885, Lake Quallilup 5(1)(h) reserve and Lake Mortijinup Nature Reserve, and to protect vegetation communities highly cleared and poorly reserved.
Shire reserve adjacent to Dowak Nature Reserve	C21360*	Shire Reserve	425.81	Tank	Add to Dowak Nature Reserve to protect vegetation communities highly cleared and poorly reserved, habitat for the specially protected
Unallocated Crown land adjacent to Dowak Nature Reserve*	n/a	Unallocated Crown land	316.86	n/a	peregrine falcon.
Butty Harbour Reserve (part)	C24486	Unvested Crown reserve	2,191.50	Conservation of flora	Add part to Lake Mortijinup Nature Reserve as per CALM (1992) recommendation E15 to protect vegetation not sufficiently represented in the conservation reserve system and add areas within the nationally important Lake Mortijinup System.

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change
Freehold land west of Scaddan	Lot 532*	Freehold	344.17	n/a	Create an 'A' class nature reserve to protect vegetation communities highly cleared and remnant vegetation that is currently unmanaged.
Freehold land north west of Red Lake Townsite Nature Reserve	Lots 225*, 264*	Freehold	466.82	n/a	Create an 'A' class nature reserve to protect vegetation communities highly cleared and poorly reserved and remnant vegetation that is currently unmanaged.
Unvested Crown reserve	C8102*	Unvested Crown reserve	63.69	Resting place for travellers and stock	Create an 'A' class nature reserve to protect remnant vegetation including pockets of <i>Eucalyptus eremophila</i> that is currently unmanaged and vegetation communities highly cleared and poorly reserved.
Unvested Crown reserve	C14112*	Unvested Crown reserve	249.70	Townsite, waterway	Create an 'A' class nature reserve to protect vegetation communities highly cleared and poorly reserved.
Unallocated Crown land adjacent to Scaddan Road	*Esperance locations 2009, 2010	Unallocated Crown land	1,091.97	n/a	Create an 'A' class nature reserve to protect populations of priority flora (2 priority 1, 1 priority 2, 3 priority 3).
Unvested Crown reserve	C2780	Unvested Crown reserve	405.15	Resting place for travellers and stock	Add to Truslove Townsite Nature Reserve to enlarge the reserve and protect remnant vegetation.
Pink Lake (part)*	n/a	Unallocated Crown land	842.85	n/a	Add to Pink Lake Nature Reserve as per CALM (1999) Table 1 recommendation, and to protect the priority 1 ecological community within lake and nationally important wetlands.
Unallocated Crown land	Lot 2199*	Unallocated Crown land	1.30	n/a	Add to Shark Lake Nature Reserve to protect remnant riparian vegetation. The road reserve is undeveloped, vegetated and unlikely to
Road reserve at Shark Lake*	n/a	Shire Reserve	1.82	Road reserve surrounding Shark Lake	be required in the future.
Freehold land adjacent to Lake Warden	*Lots 25, 26	Freehold	4.36	n/a	Add to Lake Warden Nature Reserve to protect remnant riparian vegetation and prevent further clearing of the catchment.
Freehold land adjacent to Lake Warden	Lot 282*	Freehold	4.02	n/a	

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change
Shire Reserve adjacent to Lake Warden	C4181*	Shire Reserve	109.72	Common	Add to Lake Warden Nature Reserve as per CALM (1999) Table 1 recommendation to protect remnant riparian vegetation and vegetation
Shire Reserve adjacent to Lake Warden	C33660*	Shire Reserve	10.12	Public recreation	communities highly cleared and poorly reserved and prevent further clearing of the catchment.
Shire Reserve adjacent to Lake Warden	C24284*	Shire Reserve	2.74	Building sand	
Unallocated Crown land adjacent to Lake Warden*	Lots 566, 560, 510, 196, 219, 207, 215, 300	Unallocated Crown	51.39	n/a	Add to Lake Warden Nature Reserve to protect remnant riparian vegetation and prevent further clearing of the catchment.
Unallocated Crown land adjacent to Lake Warden*	Lots 500, 501, 511, 512, 513 and 304	Unallocated Crown	19.94	n/a	
Freehold land acquired by the department north of Woody Lake	*Lots 3000, 3001, 3002, 110	Freehold	414.64	n/a	Add 3000, 3002 and 110 to Woody Lake Nature Reserve (proposed conservation park) and re-vegetate to lower watertable for the protection of the wetland system as well as to protect populations of priority flora. Create a section 5(1)(h) reserve (because it is planted with treecrops) over 3001.
Unallocated Crown land north of Mount Ridley Nature Reserve adjacent to Lignite Road*	Esperance locations 1999 and 2000	Unallocated Crown	6,080.03	n/a	Create an 'A' class nature reserve to protect rare and priority flora populations.
Unvested Crown reserve Benje Benjenup Lake	C14563	Unvested Crown reserve	149.44	Waterway	Create an 'A' class nature reserve to protect regionally significant lake, vegetation communities highly cleared and poorly reserved, and habitat for the priority hooded plover.
Unallocated Crown land adjacent to Mount Ridley Nature Reserve*	Esperance Location 1992	Unallocated Crown land	5,000.22	n/a	Add to Mount Ridley Nature Reserve to protect priority flora populations.

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change
Unvested Crown reserve (western part)* adjacent to Mullet Lake Nature Reserve	C28170	Unvested Crown reserve	1,765.30	Use and requirements of government	Add to Mullet Lake Nature Reserve as per CALM (1992) recommendation E25 to protect regionally significant Stevens, Doombup and Bannitup lakes and vegetation communities highly
Unallocated Crown land (Bannitup Lake)	n/a	Unallocated Crown land	204.59	n/a	cleared and poorly reserved.
Unvested Crown reserve (eastern part) adjacent to Cape Le Grand National Park	C28170	Unvested Crown reserve	4,191.94	Use and requirements of government	Add to Cape Le Grand National Park to protect populations of the threatened Australasian bittern, priority flora and vegetation communities poorly reserved. There have also been records of western ground parrot in this area (pers. comms. cited in McNee 2000 and McNee 2001).
Unallocated Crown land north of Cape Le Grand National Park	Esperance locations 2073, 2134	Unallocated Crown land	2,693.92	n/a	Add to Cape Le Grand National Park as per CALM (1992) recommendation E25a to increase the South Coast Macro Corridor and protect vegetation communities highly cleared.
Unallocated Crown land south of Alexander Nature Reserve	Neridup locations 513, n/a	Unallocated Crown land	12,314.90	n/a	Add to Alexander Nature Reserve as per CALM (1992) recommendation E28a to protect vegetation communities highly cleared and poorly reserved and populations of priority flora and regionally significant Ocean View wetlands and Ewart's Swamp. In addition the threatened Australasian bittern and the western ground parrot have been recorded here.
Unallocated Crown land west of Cape Arid National Park	n/a	Unallocated Crown land	106,406.00	n/a	Add to Cape Arid National Park to protect vegetation communities highly cleared and poorly reserved, previously identified populations of rare flora <i>Stachystemon vinosus</i> and other rare and priority flora, and threatened malleefowl and western ground parrot habitats. There has been an unconfirmed sighting of the latter.
Various unused road reserves	n/a	n/a	n/a	n/a	Add back into the surrounding nature reserve or national park in consultation with the shire(s).
Tota	ıl area of 82+	Total area of 82+ proposed additions	190,351.85		

 $\ensuremath{^{*}}$ This reserve was added to the planning area after the issues paper (DEC 2007c) was released.

Appendix 3. Significant wetlands and lakes

Wetland	Reserve	Conservation	Significance		
		estate*	International	National	Regional
Lake Shaster	Lake Shaster Nature Reserve	Existing			Y
Paper Bark Swamp	Nature reserves 27888 and 26885	Existing			Y
Native Dog Swamp	Lort River Corridor Reserve 31739	Proposed			Y
Roberts Swamp	Roberts Swamp Shire Reserve	Proposed			Y
Lake Gidong, Lake Kubitch and Carbul Lake	Unallocated Crown land	Proposed		Y	
Quallilup Lake	Lake Quallilup 5(1)(h) reserve	Existing^		Y	
Lake Gore	Lake Gore Nature Reserve	Existing	Y	Y	
Lake Nambarup	Butty Harbour Reserve	Proposed		Y	
Lake Mortijinup and Mainberup Swamp	Lake Mortijinup Nature Reserve	Existing		Y	
Swan Lagoon	Swan Lagoon Nature Reserve	Existing			Y
Jeffery Lagoon	Jeffery Lagoon Nature Reserve	Existing			Y
Truslove Lagoon	Truslove Townsite Nature Reserve	Existing			Y
Pink Lake	Unallocated Crown land	Proposed		Y	
Lake Warden System	Lake Warden, Woody Lake, Mullet Lake nature reserves	Existing	Y	Y	
Benje Benjenup Lake	Reserve 14563	Proposed			Y
Bannitup Lake	Unallocated Crown land adjacent to Reserve 28170	Proposed			Y
Stevens and Doombup lakes	Reserve 28170	Proposed			Y
Ocean View	Nature Reserve 27087 and unallocated Crown land adjacent to Alexander Nature Reserve	Existing and proposed			Y
Ewarts Swamp	Unallocated Crown land adjacent to Alexander Nature Reserve	Proposed			Y
Boolenup Lake	Cape Arid National Park	Existing			Y
Lake Hillier (Middle Island)	Recherche Archipelago Nature Reserve	Existing			Y

^{*} Existing or proposed conservation estate within the planning area, in that the reserves are vested in the Conservation Commission. Note that some wetlands extend outside of planning area across a variety of tenures.

[^] Section 5(1)(h) reserves are not considered part of the formal conservation reserve system, but Lake Quallilup 5(1)(h) reserve is vested in the Conservation Commission for conservation and recreation.

Appendix 4. Lake Gore Ramsar site

Following are extracts from the ecological character description for Lake Gore Ramsar site (DEC 2009b). Numbers have been updated to include further waterbird records.

Criteria for listing

At the time of listing the Lake Gore Ramsar site met three criteria, however following more recent surveys that reflect the altered hydrological regimes and subsequent changes to waterbird species richness and abundance, the Ramsar site has now been assessed as meeting the following two⁵⁸ qualifying criteria (DEC 2009b):

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. Lake Gore regularly supports thousands of moulting Australian shelducks and is therefore an important aspect of their life cycle, providing a refuge during this vulnerable period. The lake is also used as a drought refuge by large numbers of other waterbirds (Jaensch and Watkins 1999).

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.

Lake Gore has, until relatively recently, supported more than one per cent of the Western Australian population of hooded plover (more than one per cent was last recorded in 2002) and more than one per cent of the Australian population of banded stilt (more than one per cent last recorded in 1998). The available data suggests that these population thresholds may again be met in the future. The one per cent population threshold is also met for the Australian shelduck and the chestnut teal. Regular counts exceeding population estimates (Wetlands International 2006) have occurred at Lake Gore.

The full Ramsar information sheet for Lake Gore (and updates during the life of the plan) can be accessed via the webpage of the relevant Commonwealth department (www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=55#).

Critical ecosystem components and processes (ecological character)

Critical ecosyste	m component/process
Climate	 Mediterranean: warm, dry summers; cool, wet winters Evaporation exceeds rainfall most months with annual average rainfall approximately 620mm and average annual evaporation rate 1,657mm During the years 1999, 2000 and 2007 Esperance has received unseasonal episodic rainfall events January and February (summer) averaging approximately 26°C. The lowest temperatures are experienced in July (winter) with an average of approximately 8°C
Geomorphology	 The Ramsar site is confined by a granite escarpment to the north and by Quaternary dunes to the south Lake Gore bathymetry ranges from approximately 15 to 20m Australian Height Datum (AHD). However, the bathymetry is comparatively consistent with heights not usually varying by more than 2m, resulting in a broad shallow basin

⁵⁸ After consideration of the most recent waterbird estimates and guidelines for the definition of 'regularly', Criterion 5: 'A wetland should be considered internationally important if it regularly support 20,000 or more waterbirds' was no longer considered to be met at Lake Gore. The highest number of waterbirds recorded at the lake was 29,273 in March 1988 due mostly to a count of more than 20,000 banded stilts and bird counts have not reached these numbers since.

Critical ecosyste	m component/process
Hydrology Water quality	 Mainly surface water fed from the Dalyup catchment Some groundwater influence (unquantified) Shallow < 2m and perennially inundated (Lake Gore) Hydrological regime has provided habitats for a diversity of waterbirds i.e. wading to deeper feeding species Altered hydrological regime has caused increases in the extent and duration of water inundation threatening waterbird habitats and riparian vegetation Salinity concentrations saline to hypersaline
(physico-chemical)	 Alkaline pH Nutrient enriched Algal blooms recorded
Physical processes	 Sedimentation occurring at an accelerated rate since catchment clearing Sedimentation has possible implications on the bathymetry and hydrological regime of Lake Gore
Wetland soils	 Clay based units Alkaline sediments Elevated nutrient concentrations Potential acid sulfate soils maybe present
Waterbirds	 Highest waterbird count >20,000 (1988) 58 species of waterbird recorded 30 waterbirds listed under the EPBC Act: 29 marine, 17 migratory species listed under international migratory agreements (CAMBA, JAMBA, ROKAMBA and Bonn Convention) Notable species (exceeding 1% population thresholds): Australian shelduck, banded stilt, chestnut teal and hooded plover (listed as priority 4 species by the department and listed as near threatened under the IUCN Red List)
Fish	 Western trout minnow, blue spotted gobi (<i>Ellogobius olorum</i>) and black bream have been recorded at Lake Gore, though not recently confirmed Western trout minnow is listed as critically endangered under the EPBC Act Hardy head (<i>Leptatherina wallacei</i>) and the Swan River gobi (<i>Pseudogobius olorum</i>) have been recorded in the lower Dalyup River where it terminates at Lake Gore
Aquatic	Low richness due to high salinities
invertebrates Vegetation	 Species composition has been variable Lake Gore has fringing vegetation consisting of <i>Melaleuca cuticularis</i>
vegetation	 Lake Gore has fringing vegetation consisting of <i>Metatetica cuticularis</i> High water mark of Lake Gore consists of <i>Schoenus brevifolius</i> and <i>Gahnia trifida</i>, samphire species (<i>Suaeda australis</i> and <i>Sarcocornia quinqueflora</i>) and the grass species <i>Sporobolus virginicus</i> and herb <i>Samolus repens</i> <i>Melaleuca cuticularis</i> is replaced by <i>Acacia</i> sp. as the elevation increases on the northerly side of Lake Gore The majority of the riparian vegetation of the Lake Gore catchment is dead or declining due to an altered hydrological regime

Source: DEC (2009b)

Summary of limits of acceptable change

Due to a changing hydrological regime (see Section 12 *Hydrology*) Lake Gore Ramsar site was already on a downward trajectory in terms of ecological character at the time of listing under the Ramsar Convention. The ecological character of the site at the time of listing has already been exceeded (see Section 16 *Native animals and habitats – Wetlands*). Therefore, the limits of acceptable change for Lake Gore have been set under the assumption that waterbirds are the biological indicator and indirectly represent a historical hydrological regime through identification of optimum waterbird habitats. Some additional limits have be set based on accepting a new hydrological regime and it is envisaged they will be used to detect any further changes in the ecological character of the site.

Baseline condition	Limits of acceptable change	Reporting
Hydrology		
Catchment surface water inputs are yet to be quantified, however an altered hydrological regime is recognised with increased surface water run-off occurring Fresh and saline water inputs from	Baseline must be identified before limits can be set New hydrological regime – no further increase in surface water inputs into Lake Gore Baseline must be identified before limits	Not specified Not specified
surrounding aquifers into Lake Gore are likely to occur. The relationship between groundwater and the Ramsar site are not fully understood Many of the aquifers, including those thought to influence Lake Gore, are close to capacity	can be set New hydrological regime – no further increase in groundwater inputs into Lake Gore	Not specified
Prior to listing, Lake Gore had a history of dry periods. Since listing, Lake Gore has remained inundated. Although no significant increases in water depth have occurred, an increase in the extent and duration of inundation has resulted in a reduction in the available shore zone. This has reduced wading waterbird habitat and has inundated vegetation Current depth range is 16.2m to 17.03 AHD with the optimum depth range for waterbird species richness and abundance being 15.8m AHD (200ha exposed shore zone) to 16.6m AHD (45ha exposed shore zone)	Seasonal drying i.e. during autumn/ summer period in 1 out of every 5 years At all other times the depth of Lake Gore should not exceed 16.6m AHD; and/or the exposed shore zone should not fall below 45ha New hydrological regime interim limit – no further increase in water depth i.e. water depth must be below 17.03m AHD	5 yearly
Water quality		
Salinity – baseline information is not sufficient to derive seasonal trends	Spring salinity concentrations must not be greater than 100ppt for more than 2 consecutive years	Every 2 years
pH for September and November is between 6.8 and 9.8 Waterbirds have been recorded at average pH values between 6.3 and 8.7 (min. 1.9 and max. 11.5)	The minimum pH must not fall below 6.5 and the maximum pH must not be greater than 11	Not specified

Baseline condition	Limits of acceptable change	Reporting
Baseline data for nutrients is not sufficient to derive seasonal trends. It is also inconclusive if known concentrations represent natural variability or pose a threat to the ecological character of the site Baseline information for Chorophyll a, heavy metals and spatial variability of sedimentation is also unknown	Insufficient data at this time Interim limit for sedimentation rates – no further increase	Not specified
Waterbird diversity		
>1% of the South-west Australian population of the Australian shelduck	>1% in at least 4 out of 5 years	Every 5 years
>1% of the South-west Australian population of the chestnut teal	>1% in at least 2 out of 5 years	Every 5 years
>1% of the Western Australian population of the hooded plover	>1% in at least 2 out of 5 years	Every 5 years
>1% of the Australian population of the banded stilt	>1% in at least 1 out of 5 years	Every 5 years
Thousands of moulting Australian shelducks regularly	>0.5% of the South-west Australian population, during the moulting period, in at least 4 out of 5 years	Every 5 years
Fish and aquatic invertebrates		
No current information on fish within the Ramsar site	Baseline must be identified before limits can be set	Not specified
28 species of aquatic invertebrate species recorded, results varying according to water quality The mollusc <i>Coxiella</i> sp. (likely to be <i>C. exposita</i>) has been recorded along the shoreline and is an important food source for waterbirds, particularly the hooded plover	Insufficient information at this time, although no changes in the presence of <i>Coxiella</i> sp. should occur	Every 5 years
Vegetation		
Approximately 53% of the riparian vegetation of the Lake Gore catchment is either dead or in decline due to an altered hydrological regime	Baseline must be identified before limits can be set New hydrological regime precautionary interim limit – no further decline in the riparian vegetation (i.e. >53%)	Every 5 years

Source: DEC (2009b)

Appendix 5. Lake Warden System Ramsar site

Following are extracts from the ecological character description for Lake Warden System Ramsar site (DEC 2009c). Numbers have been updated to include records of the crested tern and common sandpiper (*Tringa hypoleucos*).

Criteria for listing

The Lake Warden System Ramsar site currently meets the following three Ramsar criteria (DEC 2009c):

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 Ramsar site is considered to be unique in the South-West Coast Drainage Division. The wetlands within the site form a system of interconnected lakes. This system is distinctive as the lakes are highly variable in terms of their element and hydrochemical composition (Marimuthu *et al.* 2005).

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 Ramsar site is considered to be a major dry-season refuge for waterbirds in south-western Australia (ANCA 1996). Twenty-seven migratory waterbird species recognised under the international migratory bird agreements CAMBA (24 species), JAMBA (24 species), ROKAMBA (20 species) and Bonn Convention (21 species) use the site as part of their annual migration.

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.

The Ramsar site has, until relatively recently, supported more than one per cent of the global population of hooded plover (one per cent last recorded in 2003). The available data suggests that these population thresholds may again be met in the future. The one per cent population threshold is also met for the chestnut teal. Regular counts exceeding the one per cent population estimates (Wetlands International 2006) have occurred at the site.

The full Ramsar information sheet for the Lake Warden System (and updates over the life of the plan) can be accessed via the webpage of the relevant Commonwealth department (www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=39).

Critical ecosystem components and processes (ecological character)

Critical ecosyste	em component/process
Climate	Refer to Appendix 4
Geomorphology	 The Ramsar site is situated between Quaternary dunes to the south and a granite escarpment to the north The catchment is characterised by broad flat valley floors which gently undulate from 150m to 2m AHD along the coastal plain Wetlands are generally a series of broad, shallow basins with bathymetry not usually varying by more than 2m
Hydrology	 The site consists of three distinct hydrological suites Wetlands have a variable relationship with each other and local groundwater systems Hydrological regime has provided habitats for a diversity of waterbirds i.e. wading to deeper feeding species

Critical ecosyste	m component/process
Water quality (physico-chemical)	 Salinity concentrations are saline to hypersaline depending on the wetland Alkaline pH Nutrient enriched
Physical processes	 Sedimentation occurring at an accelerated rate since catchment clearing Sedimentation has possible implications on the bathymetry and hydrological regimes of the wetlands within the Ramsar site
Wetland soils	 Elevated nutrient concentrations – natural and anthropogenic sources Moderate to high risk of potential acid sulfate soils
Waterbirds	 75 species of waterbird recorded 44 EPBC Act listed species, 44 are listed as marine species and 26 species are listed as migratory and are included under the international migratory bird agreements CAMBA (24), JAMBA (24), ROKAMBA (20) and the Bonn Convention (21) Species exceeding 1% population thresholds: chestnut teal and hooded plover (listed as a priority 4 species by the department and listed near threatened under the IUCN Red List) Notable species recorded include fairy tern and the Cape Barren goose, both listed as vulnerable under the EPBC Act
Fish	Swan River gobi, hardy head, mullet and black bream have been recorded in the surrounding Esperance area
Aquatic invertebrates	 Wetlands are variable in terms of species richness and composition due to differences in salinity concentrations Marine influences
Vegetation	Vegetation forms part of the south coast macro-corridor

Source: DEC (2009c)

Summary of limits of acceptable change

Due to a changing hydrological regime (see Section 12 *Hydrology*) Lake Warden System Ramsar site was already on a downward trajectory in terms of ecological character at the time of listing under the Ramsar Convention. The ecological character of the site at the time of listing has already been exceeded (see Section 16 *Native animals and habitats – Wetlands*). Therefore, the limits of acceptable change for the Lake Warden System are set under the assumption that waterbird richness and abundance, and vegetation condition are the biological indicators for the ecological character of the Ramsar site and indirectly represent the historical hydrological regime of the site. As these limits are in consideration of the current engineering dewatering targets, should the engineering dewatering program (see Section 12 *Hydrology*) fail, an alternative set based on accepting a new hydrological regime may be developed and they will be used to detect any further changes in the ecological character of the site.

Baseline condition	Limits of acceptable change	Reporting
Hydrology		
Lake Warden – current depth is ~1.2m to 2.5m. Optimum depth range for waterbird species richness and abundance is 0.3m to 1.4m (250ha to 50ha of exposed shore zone)	Seasonal drying i.e. <0.5m during summer/autumn period annually At all other times the depth should not exceed 1.4m and/or the exposed shore zone should not fall below 50ha (other than during extreme storm events) Interim limit – water depth to remain below 2.5m	Not specified

Baseline condition	Limits of acceptable change	Reporting
Windabout Lake, Woody Lake and Lake Wheatfield – Optimum depth range for waterbird species richness and abundance and vegetation condition is 0.8m to 1.6m	Seasonal drying i.e. <1.0m during summer/autumn period annually at Lake Wheatfield At all other times depth should not exceed 1.6m (other than during extreme storm events) Interim limit – water depth to remain below 1.7m	Not specified
Station Lake, Mullet Lake and Ewans Lake – Station Lake water depths have ranged between 0m and 1.73m. Optimum depth range for waterbird species richness and abundance the depth of Station Lake should remain < 0.8m There is insufficient baseline information for Mullet Lake and Ewans Lake	Seasonal drying i.e. 0m during summer/ autumn period in 1 out of 3 years At all other times depth of Station Lake should not exceed 0.8m (other than during extreme storm events)	Every 3 years
Water quality		
Salinity at Lake Warden has ranged from ~ 15ppt to 369ppt	Lake Warden median summer salinities 100ppt	Not specified
Waterbirds have been recorded at a range of <2ppt to >35ppt		
Salinity at Windabout Lake has ranged from ~ 6ppt to 22ppt, Woody Lake ~ 2ppt to 16ppt, Lake Wheatfield ~ 2ppt to 15ppt Waterbirds have been recorded at a range of <2ppt to >35ppt	Windabout Lake median summer salinities 10ppt, Woody Lake 7ppt, Lake Wheatfield 9ppt	Not specified
Salinity at Station Lake has ranged from ~ 5ppt to 297ppt, Mullet Lake 5ppt to 67ppt, Ewans Lake 5ppt to 20ppt Waterbirds have been recorded at a range of <2ppt to >35ppt	Station Lake median summer salinity 20ppt, Mullet Lake 25ppt, Ewans Lake 15ppt	Not specified
pH at Lake Warden 6.4 to 10, Station Lake 6.9 to 9.6, Ewans Lake and Mullet Lake 6.9 to 9.5, Lake Wheatfield 6.7 to 9.6, Woody Lake 6.5 to 9.6, Windabout Lake 7 to 10.7	Minimum pH must not fall below 6.5 and maximum pH value must not be greater than 11	Not specified
Baseline data for nutrients is not sufficient to derive seasonal trends and is limited spatially to Station Lake, Lake Wheatfield and Lake Warden. It is also inconclusive if known concentrations represent natural variability or pose a threat to the ecological character of the site Baseline information for Chorophyll a, heavy metals and sedimentation rates is also unknown	Insufficient data at this time Interim limit for sedimentation rates – no further increase	Not specified

Baseline condition	Limits of acceptable change	Reporting
Waterbird diversity		
>1% of the South-west Australian population of the chestnut teal	>1% in at least 2 out of 3 years	Every 3 years
>1% of the Western Australian population of the hooded plover	>1% in at least 2 out of 5 years	Every 5 years
75 species of waterbirds, 26 listed under the EPBC Act as 'migratory'	All 26 listed as 'migratory' recorded over a 2-year period	Every 2 years
Fish and aquatic invertebrates		
No current information on fish within the Ramsar site, apart from black bream	Baseline must be identified before limits can be set	Not specified
Invertebrate species composition within the Ramsar site is variable, dependent on water quality	Insufficient information at this time, although no changes in <i>Coxiella</i> spp. should occur	Not specified
Molluscs <i>Coxiella</i> spp. have been recorded and are an important food source for the hooded plover		
Vegetation		
Some vegetation in decline, notably the <i>Melaleuca</i> woodland (mainly saltwater paperbark) which forms the fringing vegetation	Baseline must be identified before limits can be set	Not specified
However, overall vegetation condition has not been quantified		

Source: DEC (2009c)

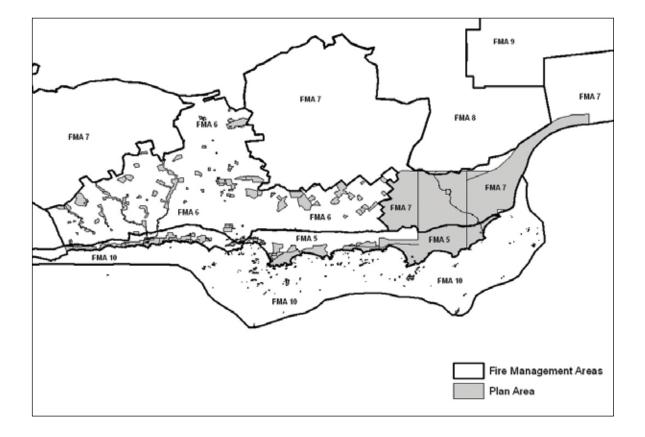
Appendix 6. Summary of fire management by fire management area and vegetation type

Vegetation type and indicator species	Fire management outcome	Prescribed fire regime	Bushfire response
Fire Management A	rea 5 – Esperance Coastal		
Coastal heath and banksia woodlands	Establish a fine grained mosaic with grain size <200ha with a variety of fuel age classes Provide adequate protection to surrounding community values	Avoid re-burning areas within 1.5 juvenile periods of key indicator species (excluding low fuel buffers)	Minimise bushfire size
Coastal tea tree, coastal dune scrub and wetlands/river corridors	Protect from fire	No planned fire	Minimise bushfire size Minimise ground disturbance from suppression operations
Yate swamps	Protection of yate stands from repeated high intensity bushfire	Frequent application (5 to 7 years) of fire to surrounding fuels to achieve a fine grain mosaic of fuel ages Apply low intensity prescribed fire to yate stands at appropriate intervals	Minimise bushfire size
Fire Management A	rea 6 – Esperance Agricultural		
All reserves	Prevent entire reserve from being burnt in a single event Establish and maintain a mosaic of fuel ages where possible Minimise synergy of fire with other threatening processes Establish and maintain strategic management access, where appropriate	Avoid re-burning areas within 1.5 juvenile periods of key indicator species (excluding low fuel buffers)	Minimise bushfire size, appropriate to capability, current commitments and adjoining property and assets
Smaller reserves (>100ha)	Establish and maintain management access where appropriate	Avoid re-burning areas within 1.5 juvenile periods of key indicator species (excluding low fuel buffers)	Minimise bushfire size, appropriate to capability, current commitments and adjoining property and assets Attempt to exclude bushfire where possible

Vegetation type and indicator species	Fire management outcome	Prescribed fire regime	Bushfire response
Fire Management A	rea 7 – Mallee (part in planning a	area)	
Scrub mallee heath (Cape Arid National Park and adjacent UCL)	Establish a fine grained mosaic with grain size of <1,000ha with a variety of fuel age classes Provide adequate protection to surrounding community values and departmental managed assets	Avoid re-burning areas within 1.5 juvenile periods of key indicator species Avoid fire under low to moderate fire danger conditions	Minimise bushfire size, appropriate to potential impacts, capability and current commitments
Fringing vegetation associated with salt lakes (Cape Arid National Park and Nuytsland Nature Reserve)	Protect from fire	No planned fire	Minimise bushfire size, appropriate to potential impacts, capability and current commitments
Roe Plain coastal mallee and boree (Nuytsland Nature Reserve)	Minimise the extent and impact of fire Provide adequate protection to historic sites and departmental managed assets	No planned fire	Minimise bushfire size, appropriate to potential impacts, capability and current commitments
Proteaceous heath (Cape Arid National Park for example, Russell Range)	Avoid unplanned fire affecting entire proteaceous heath communities in single events Establish a fine grained mosaic with a grain size of <200ha with a variety of fuel age classes Provide adequate protection to department-managed assets	Avoid re-burning areas within 1.5 juvenile periods of key indicator species	Minimise bushfire size, appropriate to potential impacts, capability and current commitments
Fire Management A	rea 8 – Woodland (part in planni	ng area)	
Eucalyptus woodland (Cape Arid National Park – Pine Hill area)	Establish a fine grained mosaic with grain size of <1,000ha No damage to mature woodland from bushfire	Apply low intensity prescribed fire at 10 to 15 year intervals Apply prescribed fire to maintain fuel loads within acceptable limits	Minimise bushfire size, appropriate to potential impacts, capability and current commitments
Fringing vegetation associated with salt lakes and rock outcrops (Cape Arid National Park)	Protect from bushfire	No planned fire	Minimise bushfire size, appropriate to potential impacts, capability and current commitments

Vegetation type and indicator species	Fire management outcome	Prescribed fire regime	Bushfire response
Fire Management A	rea 10 – South Coast Islands		
Woody, Middle and Mondrain islands	Minimise bushfire size	Research fire plots to be implemented	Minimise bushfire size, appropriate to potential impacts, capability and current commitments
Other Recherche Archipelago islands and other islands	Minimise bushfire size	No planned fire	Possible use of aerial suppression to minimise fire intensity, otherwise allow natural fire to extinguish

Source: DEC (2007d)



Appendix 7. Commercial beekeeping site assessment

Assessment of current beekeeping sites within the planning area

constrained. The table below shows the result of the assessment and indicates criteria that require additional conditions. Some of these additional conditions have been included Beekeeping sites within the planning area were assessed against the environmental and management criteria# and categorised as suitable but conditional or highly as guidance and should be seen as a minimum set.

1.3	-												- 1315 V
no.	status	Rare and priority 1, 2 flora	Other	TEC and priority 1,		2 PEC	rity	Wilderness			agse	Weed	conditions
		visited	conservation				3, 4		sites		risk	management	
		ct Impact	flora visited	ţ	Impact	No	PEC	Candidate Gazetted		walk			
		year seasonal predicted round		year round	seasonal	predicted impact						seasonal year round	
Suita	ble (14, 10	Suitable (14, 10 current, 4 vacant)											
3994	C												
3996	C							_					
4741	C							_					
5283	>							_			_		
5 5590	>												
5603	C											_	
9095	C							_					
2608	C												
5610	C												
5611	C												
5612	>											_	
5753	C												
5932	C							_					
S936 V	^												
Suita	ble but co	Suitable but conditional (14, 10 current, 4 vacant)	acant)										
3997	С		X										Э
4647	С		X										Э
4742	С	X	X										A(Jul-Sep), C
5155	Λ	X											A(Jun)
5176	С	X	X										A(Sep-Oct), C

Site Current		Environmental criteria	eria						Management criteria	nt criteria						Additional
no. status^		Rare and priority 1, 2 flora	2 flora	Other	TEC and	IEC and priority 1, 2	PEC	jį.	Wilderness		Recreation	Class	ase	Weed		conditions
	visited			conservation				3, 4			sites	1 or 2	risk	management	ent	
	Impact	Impact	No	flora visited	Impact	Impact	_	PEC	Candidate Gazetted	Gazetted		walk		Impact	Impact	
	year round	seasonal	predicted impact			seasonal	predicted impact					trail		seasonal	year round	
5419 C		X		X												A(Jan-Feb, Sep-
																Oct, Dec), C
5502 C				X												C
5523 V		X														A(Jul-Oct)
5560 V		X														A(Jul-Oct)
5567 V				X												C
5602 C		×														A(Oct)
5609 C				X												C
5613 C				X												C
5947 C		X		X												A(Sep-Nov), C
Highly constrained (9, 4 current,	trained (9,	4 current	t, 5 vacant)													
4850 V		X		X										X	X	
5453 V		X		X											X	
5501 C		X		X										X	X	
5556 V		X		X				X						X	×	
V 8579		X		X									X			
5591 V										- 1	X					
5605 C			X												X	
5607 C															X	
5614 C				Х										X	X	
Sites within 2km of planning area* (11, 7	2km of pla	inning are	ea* (11, 7 c	current, 4 vacant)	int)											
4643 C				X												C
5433 V																
5465 C										. 1	X					Note: shire rec site
5615 V		×														A(Apr-Jun, Aug,
																Sep, Nov, Dec)
5933 C		X		X												A(not specified), C
5934 C				X												C

Site	Current	Current Environmental criteria						Management criteria	criteria						Additional
no.	status^	status^ Rare and priority 1, 2 flora		Other	TEC and priority 1, 2 PEC	1, 2 PEC	Priority	Priority Wilderness		Recreation Class Disease Weed	Class	Disease	Weed		conditions
		visited		conservation			3, 4			sites	1 or 2 risk		management	ent	
		Impact Impact No		flora visited	Impact Impact	:t No	PEC	Candidate Gazetted	sazetted		walk		Impact	Impact	
		year seasonal predicted	edicted		year seasonal	nal predicted					trail		seasonal year	year	
		round	mpact		round	impact								round	
5936 V	Λ														
5981 C	С														
5982	С														
5983 (С														
6061 V	Λ														

#This process has been based on where there is spatial data available. This apiary assessment should be adaptive through the life of the plan and the best data incorporated.

AC Current, V Vacant

*Sites within two kilometres of the planning area have not be classified as 'suitable', 'suitable but constrained' or 'highly constrained' as only values within the planning area, and two kilometres surrounding the planning area were used in the assessment. It may be that the site impacts on conservation values elsewhere, so this assessment is just a partial guide for management of these sites outside of the planning in order to protect values of the

Guidance for additional conditions

- Seasonal restriction based on flowering period of flora or target flora with respect to pollen or nectar feeding birds/mammals. Site must be available for a minimum of one month otherwise the impact is year round. Placement and number of hives also may be restricted if threatened flora/fauna occurs at apiary site.
- These flora and communities are still of high conservation significance and a precautionary approach is warranted. Placement (at least 100 metres from populations) and number of hives may be restricted. Monitoring of representative samples for health of adult populations and seedling recruitment or TEC/PEC to ensure there is no decline due to apiary management, taking into account other factors such as drought, disease, fire, environmental weeds and other disturbances. If unacceptable impacts are shown or observed later, then treatment will be the same as A.
- populations are significant to the conservation of the species (for example, the population may be (1) at the species' range-end, (2) the largest viable population or (3) genetically significant). If deemed significant then These flora and communities are still of high conservation significance and a precautionary approach is warranted. There may be a need to review populations within the planning area to determine whether these ن
- When a feral honey bee program is in place, then use of the site will be restricted during periods when the queen may swarm, such as spring or a suitable method to restrict the queen should be implemented. Ö.
- For new sites in old growth forest where there are no feral honey bees present, a condition may be that if during the period of the permit, feral honey bee hives are located within two kilometres of the site, the site will be temporarily restricted until the feral honey bees are controlled
- Seasonal restriction based on flowering period of environmental weed however, only until the environmental weed has been successfully eradicated Ľ.