Esperance and Recherche parks and reserves

management plan 84

2016

Department of Parks and Wildlife

Conservation Commission WESTERN AUSTRALIA

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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 – Parks and Wildlife
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

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Department of Parks and Wildlife

Acknowledgments

Planning team

This management plan was prepared by a Department of Parks and Wildlife planning team consisting of Aberline Attwood (planning officer), Robert Blok (district manager), Greg Mair (regional manager), Ian Hughes (district parks and visitor services coordinator), Peter Hartley (regional leader parks and visitor services), Stephen Butler (district nature conservation coordinator), John Lizamore (recovery catchment officer), Deon Utber (regional leader nature conservation), Sarah Comer (regional ecologist), Laurent Marsol (district fire coordinator) and Mick Hand (regional fire coordinator).

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 Klaus Tiedemann, John Watson, Bruce Bone, Allan Rose, Geoff Passmore, Peter Masters, Mike Fitzgerald, Geoff Young, Peter Fishwick, Adnaan Abrahams, Greg Broomhall, Cameron Hennessy, Julie Waters, Emma Massenbauer, Mick Rose, David Chadwick, Alan Danks, Theo Menne, Aaron Rivers, Burke Stephens, Jake Geddes, Tegan Laslett and Jude Allan.

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 2007b); David Johnson, Ruth Kirchner, Bill Auburn, Michael Gibbs, Mike Spragg, David (Doc) Fetherstonhaugh, Marie Fowler, John Clemenger, Ron (Doc) Reynolds and Graham Tucker.

In addition, the individuals and organisations who took the time to comment on the draft management plan (DEC 2102c) are also acknowledged.

Aboriginal people

The traditional owners, represented by the Esperance Nyungars and the Ngadju are acknowledged and their contribution to the preparation of this plan is recognised. The Department of Parks and Wildlife looks forward to working closely with the Esperance Nyungars and the Ngadju in managing the parks and reserves covered by this plan.

The Department of Parks and Wildlife recognises the important and valuable knowledge that Aboriginal people hold within the planning area. It is important that Aboriginal people's intellectual property rights are recognised and protected so 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, Njungar, Njungura, Nonga, Noongah, Nunga, Nyoongah, Nyoongar, Nyugah, Nyungah, Nyungar, Yonga, Yunga and Yungar spellings.

Summary

The Esperance and Recherche parks and reserves (the planning area) are located on Western Australia's southern coastline near the town of Esperance. The planning area incorporates the national parks and nature reserves along approximately 490km of coastline including Stokes, Cape Le Grand and Cape Arid national parks and numerous nature reserves including the offshore islands of the Recherche Archipelago.

Values

The coastal area is renowned for its rocky headlands and sweeping bays of white beaches and turquoise waters. The national parks provide numerous recreational opportunities such as camping, four-wheel driving, scenic driving, picnicking, swimming and fishing.

The wetlands and lakes around Esperance are internationally recognised and listed as Ramsar sites for their importance for waterbirds. Inland, the reserves of the planning area provide remnant vegetation for fauna populations and significant lake and granite outcrop habitats. Towards Mount Ragged, the coastal heath is replaced by woodlands and provides a major biographical transition zone between the south-west and the arid zones where there is high species richness including range-end flora and fauna from both zones. Cape Arid, and beyond to Nuytsland Nature Reserve has high wilderness qualities. It is proposed to gazette an area east of Mount Ragged as wilderness to preserve it for future generations. This portion of the planning area also contains numerous karst features which are part of a larger Nullarbor karst system. The Recherche Archipelago provides refugial habitat for fauna that was once widespread on the mainland. It also provides breeding and haul-out sites for seals, sea-lions and seabirds.

The planning area is important for Aboriginal people with a site on the *National Heritage List* and at least 88 Aboriginal heritage sites. The planning area is also important for maintaining connection with the land and carrying out activities for customary purposes. The planning area's Aboriginal cultural landscape and the history of 17th century European exploration, industry and settlement are significant values which provide a rich backdrop of stories that enhance visitors' appreciation and experiences.

Management

This plan identifies and guides long-term management directions in protecting the values of the planning area by setting a vision, desired outcomes and providing a summary of operations proposed to be undertaken (management actions) as required under the *Conservation and Land Management Act 1984* (CALM Act). This plan also provides guidance for subsidiary management documents (operational plans) that provide more management detail regarding fire response, weed and feral animal control and recreation site development.

The management actions in this plan are centred on the following themes:

- managing the natural environment
- managing cultural heritage
- managing visitor use
- managing resource use
- involving the community
- research and monitoring.

Managing the natural environment

Managing natural values in the planning area will include:

- maintaining corridors and semi-connected 'stepping stones' of native vegetation and protecting important habitats
- adding land to the conservation estate to further protect the natural values

- managing threatened and priority ecological communities and flora species including the nationally-protected Proteaceae Dominated Kwongkan Shrubland ecological community, the Russell Range threatened ecological community, *Commersonia apella*, prickly honeysuckle (*Lambertia echinata* subsp. *echinata*), underground orchid (*Rhizanthella gardneri*), Bremer boronia (*Boronia clavata*), cumquat eremophila (*Eremophila denticulata* subsp. *trisulcata*), Twin Peak Island mallee (*Eucalyptus insularis continentalis*) and *Myoporum velutinum*
- managing threatened and specially protected fauna species such as New Zealand fur-seal (*Arctocephalus forsteri*), Australian sea-lion (*Neophoca cinerea*), Recherche rock-wallaby (*Petrogale lateralis hacketti*), chuditch (*Dasyurus geoffroii*), Recherche Cape Barren goose (*Cereopsis novaehollandiae grisea*), malleefowl (*Leiopoa ocellata*), Australasian bittern (*Botaurus poiciloptilus*) and western ground parrot (*Pezoporus flaviventris*)
- managing wetlands, lakes, rivers, estuaries, coastlines and islands for the habitat protection of waterbirds and seabirds listed under international agreements
- establishing and monitoring baseline water quality, hydrological regime, extent/condition of flora and composition/abundance of fauna in Ramsar wetland systems
- maintaining the ecological character of the two Ramsar wetlands
- continuing and supporting catchment management and engineering works to manage salinisation, excessive inundation, increased nutrient loads and weed invasion in the wetlands and waterways resulting from clearing and other activities in the adjacent and upper catchments
- applying adaptive management and building in resilience for projected climate changes
- controlling weeds such as African boxthorn (*Lycium ferrocissium*), Victorian tea tree (*Leptospermum laevigatum*), bridal creeper (*Asparagus asparagoides*) and freesia (*Freesia* spp.)
- controlling introduced and other problem animals such as red foxes (*Vulpes vulpes*), feral cats (*Felis catus*), European rabbits (*Oryctolagus cuniculus*), red deer (*Cervus elaphus*) and other feral animals, particularly where threatened species and communities may be impacted
- limiting the impacts of diseases such as *Phytophthora* dieback, *Armillaria* and aerial canker
- identifying and protecting ‘protectable areas’ that are not infested by *Phytophthora cinnamomi*
- managing fire regimes and events, to protect and promote the biodiversity of ecosystems and to protect life and property (community assets and reserve infrastructure)
- improving our understanding of fire ecology of the various vegetation types within the planning area
- increasing our knowledge base of existing and potential reserves through ongoing biological surveys
- managing access and recreational activities to minimise adverse impact on the natural environment.

Managing cultural heritage

The planning area is located within the traditional lands of the Wudjari/Njunga and Ngadjunmaia Aboriginal tribes and has many Aboriginal heritage sites including artefact scatters, historical sites, camping places, structures such as lizard traps, stone cairns and stone circles, mythological places, ceremonial sites, quarries, burial sites, middens, engravings and a nationally significant rock shelter. The department will continue to work with Aboriginal people, in particular the Esperance Nyungars and the Ngadju native title holders in protecting Aboriginal heritage sites and values within the planning area.

Management arrangements with Aboriginal people may change over the life of this management plan. If priority areas for joint management within the planning area are agreed on and capacity and resources are available, a joint management agreement such as an Indigenous Land-Use Agreement may be considered. While formal joint management is explored, the Department of Parks and Wildlife will continue to work to foster cooperative and consultative management arrangements with the Esperance Nyungars and the Ngadju.

There is also a range of other Australian cultural sites throughout the planning area associated with European exploration, sealing and whaling industries, shipping, pastoralism and settlement of the area.

Managing the cultural heritage values in the planning area will include:

- continuing the development of relationships and communication with the Esperance Nyungars and Ngadju
- improving the inventory of Aboriginal and non-Indigenous heritage sites

- protecting sites and minimising disturbance
- providing for Aboriginal customary activities
- providing education and interpretation on the wide variety of cultural heritage values across the reserves.

Managing visitor use

Managing visitor use in the planning area will include:

- providing facilities at recreation sites within identified management settings
- consolidation of existing recreation sites and rationalisation of camping and day use sites
- maintaining areas of remoteness, and creating a gazetted wilderness area in the Mount Ragged area of Cape Arid National Park and Nuytsland Nature Reserve
- dealing with overcrowding of some sites and identifying the desired capacity of sites, or limits of acceptable change
- managing inappropriate activities such as incompatible use of off-road vehicles, firewood collection and the use of ground campfires and associated damage to vegetation and increase in bushfire risks, visitors bringing domestic animals into the reserves, and on occasion, vandalism and littering
- managing the public vehicular access network
- using visitor data to assist in determining recreational planning priorities.

Involving the community

The planning area is well frequented by local communities of Esperance and farming communities around Munglinup, Cascade, Salmon Gums, Grass Patch, Scaddan, Gibson and Condingup. These communities are visitors, neighbours and stakeholders of the planning area and have strong attachments to these areas.

Involving the community will include providing opportunities for involvement in further planning and management of the planning area.

Managing resource use

The planning area is subject to pressure by resource use activities such as mining exploration and development, commercial fishing and aquaculture, beekeeping, water resource use, provision of utilities and services and forestry.

Managing resource use in the planning area will include minimising the impacts of these activities on the key values by providing advice to other agencies where necessary, using environmental criteria to assess proposed developments, referring significant proposals for formal assessment, managing access and ensuring rehabilitation is carried out.

Research and monitoring

Management of the planning area should be based on up-to-date and sound knowledge. Ongoing research and monitoring will assist in the conservation of the planning area's key values. It will also aid in evaluating the effectiveness of management actions in protecting these values.

Research and monitoring in the planning area will include increasing the knowledge and understanding of key values and management issues.

Approval and implementation

This plan was published as a draft for public comment, has been changed accordingly and has now been approved by the Minister for Environment. This plan will guide management of the planning area for 10 years. At the end of the 10-year period the plan may be reviewed and a new plan prepared, otherwise it will remain in force until a new plan is approved.

Key Performance Indicators (KPIs) have been selected for each value identified as the highest priority for management over the next 10 years. These KPIs will be reported against during the life of the plan, providing a measure of success of the plan and include the following performance measures:

- protection of geological features
- hydrological and biological limits of acceptable change for the Ramsar wetlands
- wilderness quality and the gazettal of Mount Ragged wilderness area
- persistence and status of populations of threatened flora
- the vegetation remaining and reservation level of significant vegetation associations
- native fauna communities in the Ramsar wetlands
- range and population size of threatened and other conservation significant fauna
- the conservation status of threatened fauna species
- species composition and habitat of threatened and priority ecological communities
- the extent of weed species at priority locations
- *Phytophthora* infested areas within identified ‘protectable areas’
- the impact of fire on human life or community assets
- size of large, intense bushfires
- the impact of fire on biodiversity conservation
- protection of Aboriginal and other Australian cultural heritage sites
- the extent of visitor management settings
- the number and severity of visitor incidents
- visitor satisfaction levels of nature-based experiences
- social, economic and environmental visitor impact indicators
- the number of registered volunteers and the amount of volunteer hours contributed.

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Introduction

1. Management plan area

This management plan, prepared by the Conservation Commission of Western Australia (the Conservation Commission) through the Department of Parks and Wildlife (the department; or Parks and Wildlife), 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 a million hectares (1,011,677ha) and encompasses 71 existing parks and reserves (656,008ha) and more than 95 proposed additions (355,668ha). It 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 plans[1] 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 320,976ha:

- Stokes National Park: 9,726ha, located approximately 80km west of Esperance
- Cape Le Grand National Park: 31,801ha, 40km east of Esperance
- Cape Arid National Park: 279,448ha, 120km east of Esperance.

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

Nature reserves

The planning area includes 62 nature reserves that occupy an area of 331,032ha and which are mostly set aside with the

[1] Approved management plans are available on the department's website www.dpaw.wa.gov.au/parks/management-plans/approved-management-plans.

purpose of 'conservation of flora and fauna', including:

- Lake Shaster Nature Reserve, located 110km west of Esperance
- two large 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 50km west of Esperance and to the east of Stokes National Park
- 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

Warrenup Beach, 'Warrenup Lakes Nature Reserve'. Photo - Tegan Laslett

- 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, 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 7,300ha and stretching 230km from east to west and up to 50km offshore
- Investigator Island Nature Reserve, situated approximately 25km south of Lake Shaster Nature Reserve.

Other reserves

In addition, there are two miscellaneous reserves (Moir Homestead within Stokes National Park, and Helms Forestry Reserve) and four section 5(1)(h)[2] reserves (Lake Quallilup, Cape Arid trigonometric station, Cull Island lighthouse/weather station and Figure of Eight Island navigational aid infrastructure) that occupy a total area of 4,000ha.

Aerial view of Esperance Lakes, including Lake Warden, Woody Lake and Mullet Lake nature reserves. Photo - Parks and Wildlife

[2] Section 5(1)(h) of the *Conservation and Land Management Act 1984*.

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 pressures 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 departmental plans include the *Biodiversity and Cultural Conservation Strategy for the Great Western Woodlands* (DEC 2010a).

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

2. Key values and management issues

Key values

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

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

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.
- Remnant vegetation in a highly cleared and fragmented landscape.
- A rich mosaic of vegetation complexes representing woodland, mallee and coastal heath, riparian and wetland ecosystems protecting restricted vegetation communities and flora and fauna populations of conservation significance.
- A major biogeographical transition zone between the South-West Botanical Province and the semi-arid South-Western Interzone that is rich in range-end[3] flora and fauna species from both zones.
- Internationally (e.g. 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.
- Widespread karst features as part of the western portion of the Nullarbor karst system (the largest contiguous karstland in the world).
- Islands that provide haul-out and breeding sites for pinnipeds and seabirds, refugial habitat for terrestrial fauna and relictual[4] 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 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 (e.g. sealing and whaling), historically significant events, development and settlement.

Egret in flight, Esperance Lakes. Photo - Tilo Massenbauer

Recreation and social values

- An environment that provides opportunities for a wide range of nature-based recreational opportunities such as bushwalking, picnicking, camping,

[3] 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.

canoeing and wildlife interaction.

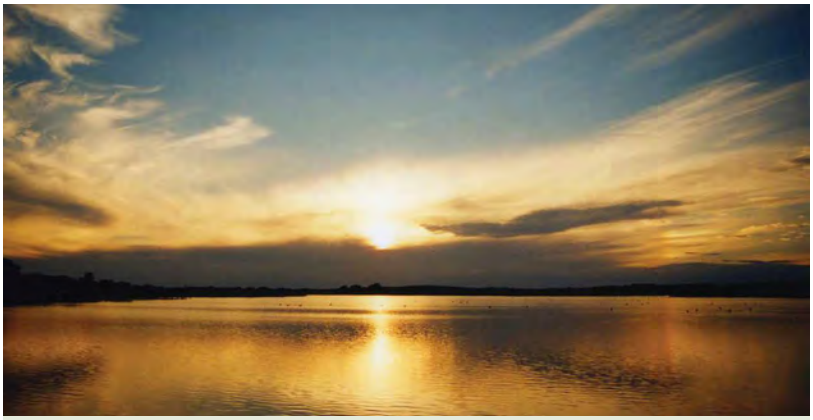
- Access to coastal and marine environments that provide opportunities for water-based recreational activities such as swimming, surfing, boating, fishing, snorkelling and diving.
- Nature-based tourism opportunities for commercial operators, and associated economic potential of tourism expenditure in the region.
- Opportunities for scientific research on aspects of the region's unique ecology.

Thistle Cove, Cape Le Grand National Park. Photo - Tegan Laslett

- 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.

Management issues

- Prior vegetation clearing and associated agriculture development 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 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, ground campfires, inappropriate use of four-wheel-drive vehicles and motorbikes, access by unlicensed off-road vehicles and overcrowding at recreation sites during peak periods.
- Unauthorised access and disturbance to cultural heritage sites.
- Potential for large-scale harvesting of existing tree plantations in the upper catchments and return to agricultural cropping which would lead to further hydrological changes and associated issues.
- Marine pollution incidents such as the *Sanko Harvest* fuel and fertiliser spillage in 1991.
- Climate change.



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 participate in the protection and conservation of these values for present and future generations through cooperative management and community involvement.

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

4. Legislative framework

The department 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.

Management plans are required for all lands and waters vested in the Conservation Commission. The CALM Act states that this plan shall be designed in the case of:

- *"national parks and conservation parks, to fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest"* [CALM Act section 56(1)(c)]
- *"nature reserves to maintain and restore the natural environment, and to protect, care for, and promote the study of, indigenous flora and fauna, and to preserve any feature of archaeological, historic or scientific interest"* [CALM Act section 56(1)(d)]
- *"other land referred to in section 5(1)(g) or (h), to achieve the purpose for which the land was vested in, or for which the care, control and management of the land were placed with, the controlling body, whether solely or jointly"* [CALM Act section 56(1)(e)].

Therefore, this plan focuses on these objectives within the planning area and proposes that some of the existing nature reserves are changed to national park for consistency with these objectives (see Section 7 *Proposed tenure changes*).

Other legislation, administered by other government departments, is also relevant in protecting the values of the planning area and/or implementing the plan and is referred to throughout the plan.

International conservation agreements

Australia is a signatory to a number of international conservation agreements (e.g. Ramsar Convention[5], Bonn Convention[6], Convention on Biological Diversity[7] and JAMBA, CAMBA and ROKAMBA migratory bird agreements[8]). These agreements 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 – Wetland habitats*). 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[9] 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), states general principles for Ramsar wetlands in Australia, including requirements for management, management planning, and environmental impact assessment and approval[10] (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*).

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[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* and came into force in 1992.

[7] The *Convention on Biological Diversity* was signed in Rio, Brazil in 1992. At the 10th meeting of the Conference of the Parties, held in Aichi Prefecture, Japan in 2010, a revised and updated *Strategic Plan for Biodiversity* was adopted, including the Aichi Biodiversity Targets, for the 2011-2020 period. Target 11 states: "*By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes*".

[8] JAMBA is the *Japan-Australia Migratory Bird Agreement*, CAMBA is the *China-Australia Migratory Bird Agreement* and ROKAMBA is the *Republic of Korea-Australia Migratory Bird Agreement*. These came into force in 1981, 1988 and 2006 respectively.

[9] In this management plan, when 'contracting parties' are referred to, this means Australia, not specifically the Department of Parks and Wildlife.

[10] 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).

5. Management arrangements with Aboriginal people

In 2012, the CALM Act was amended specifically in relation to the involvement of Aboriginal people on lands and waters managed by the department. These changes recognise Aboriginal connection to the land and enable Aboriginal people to become more involved in managing land and using parks and reserves for customary activities (see Section 23 *Aboriginal cultural heritage – Activities for Aboriginal customary purpose*). Working with Aboriginal people to manage the land will bring cultural, spiritual and economic benefits to Aboriginal people and will enhance the department's management of the land.

The Conservation Commission and the department support future joint management arrangements[11] with traditional owners, which in this planning area would involve the Esperance Nyungar and the Ngadju native title holders. These two native title groups do not overlap and broadly correspond to the historical Aboriginal tribes of the area, the Wudjari/Njunga and the Ngadjunmaia and Kalaako (see Section 23 *Aboriginal cultural heritage – Aboriginal people of the planning area*).

Native title

In March 2014, it was determined by consent[12] that the Esperance Nyungars' had non-exclusive native title over part of the planning area and an Indigenous Land-Use Agreement[13] (ILUA) between the Esperance Nyungar people and the State of Western Australia was registered in November 2014. The nature and extent of the native title rights and interests in relation to the Determination Area are that they confer, for some parts of the planning area, the following non-exclusive rights and interest on the Esperance Nyungar people:

- the right to access the land and waters
- the right to enter and remain on the land, camp and light fires for cooking, heating and lighting purposes
- the right to take and use (including by way of sharing and exchanging) flora, fauna, fish and shellfish and other traditional resources from the land and waters
- the right to take and use water
- the right to participate in cultural and religious activities, including the passing on of cultural heritage and knowledge of the Determination Area
- the right to care for, maintain and protect from harm particular sites and areas of traditional and cultural significance to the native title holders.

Native title was found to exist over some of the existing reserves in the planning area such as Barkers Inlet and Warrenup Lakes nature reserves but not to exist over other reserves such as Cape Le Grand and Cape Arid national parks, because of the creation of these areas had previously extinguished native title.

In November 2014, it was determined by litigation that the Ngadju people had exclusive and some non-exclusive rights over part of the planning area adjacent to Peak Charles National Park, Cape Arid National Park and Nuytsland Nature Reserve. The Ngadju native title determination does not cover any of the existing reserves in the planning area. The nature and extent of the native title rights and interests in relation to the Determination Area (other than the Exclusive Areas) are that they confer the following non-exclusive rights and interest on the Ngadju people:

- the right to hunt and fish (excluding commercial fishing), to gather and use the natural resources of the area, such as food and medicinal plants and trees, timber and ochre and to have access to and use of potable water

[11] Joint management refers to arrangements where Aboriginal and other parties are involved in land management; from consultative to shared decision-making and formal joint management agreements under the CALM Act. For more information refer to *Policy Statement No. 87 Aboriginal Joint Management* (Parks and Wildlife 2013d).

[12] A consent determination is a decision made by a court, usually the Federal Court of Australia, where there is agreement (consent) between the parties about native title rights and interests in relation to lands and waters, consistent with the *Native Title Act 1993* (Commonwealth).

[13] An ILUA can be negotiated over areas where native title has, or has not yet, been determined. They can be part of a native title determination, or settled separately from a native title claim. An ILUA can be negotiated and registered whether there is a native title claim over the area or not.

- the right to live, to camp, to erect shelters and other structures and to travel over and visit
- the right to do the following activities:
  - engage in cultural activities
  - conduct rituals or ceremonies
  - hold meetings
  - teach the physical and spiritual attributes of places and areas of importance on or in the land and waters
  - the right to have access to, maintain and protect, places and areas of importance on or in the land and waters, including Dreaming sites, waterholes and ceremony grounds
  - the right to share or exchange subsistence and other traditional resources obtained on or from the land and waters.

The nature and extent of the native title rights and interests in relation to the Exclusive Areas are that they confer the right to possession, occupation, use and enjoyment on the Ngadju people to the exclusion of all others (subject to various conditions). The Exclusive Areas mainly cover areas of unallocated Crown land.

Figure 1 shows the Native title outcomes[14] for both the Esperance Nyungars and the Ngadju as they relate to the planning area (it does not show outcomes outside the planning area e.g. Israelite Bay reserve which has had non-exclusive Native title determined as well as the unallocated Crown land that extends north of the planning area).

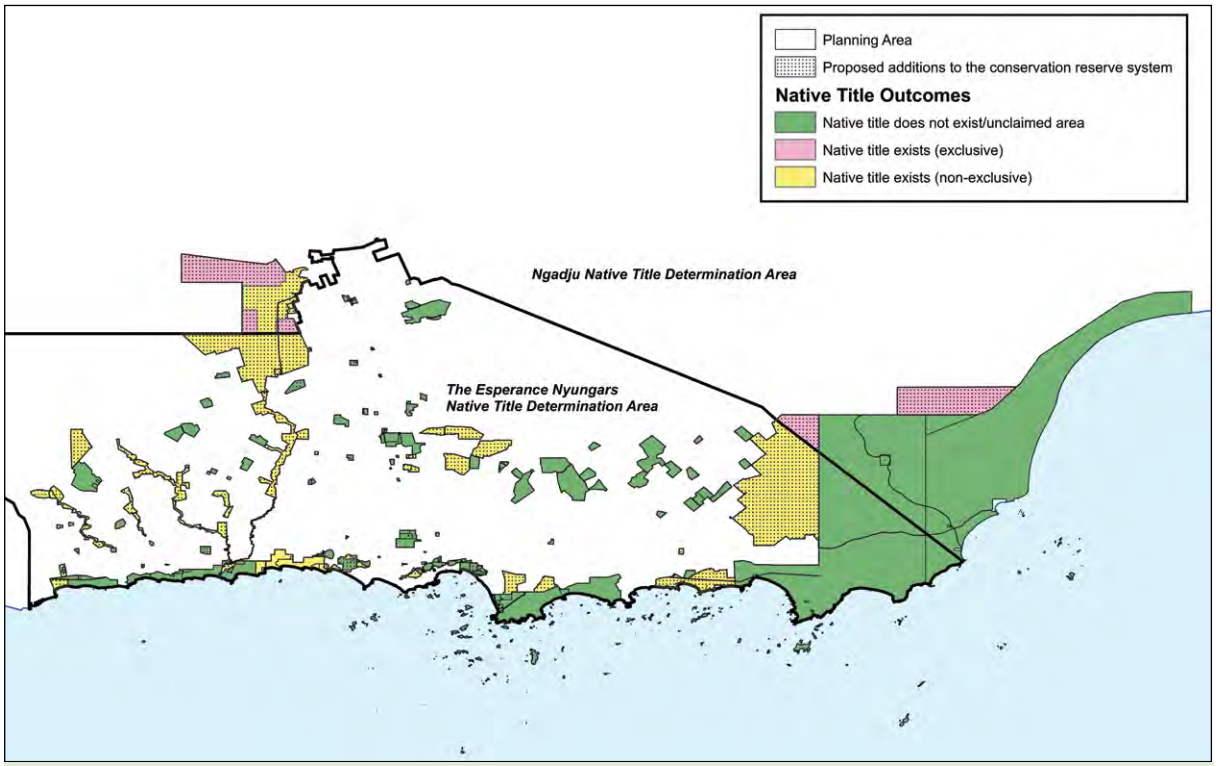


Figure 1. Native title determinations within the planning area.

The department will engage with the Esperance Nyungar and Ngadju native title holders through their prescribed bodies corporate on the management of the planning area. There is a range of formal and informal mechanisms through which this input can be made. The Esperance Nyungar and Ngadju native title holders have established prescribed bodies corporate to hold their native title, and the department will work with these bodies to facilitate input and engagement into the management of the planning area.

This plan may need to be amended to accommodate further developments in joint management over the life of the plan (see Section 9 *Term of the plan*).

[14] Native title is extinguished over the majority of the national parks and nature reserves in the planning area.

Dolphin Cove, Cape Arid National Park, named after the dolphin-shaped headland. 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[15] 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, targets and reporting requirements.

Some of the key performance indicators 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.

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

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 *Legislative framework – International conservation 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 – Wetland habitats*). Where a lack of knowledge exists, the precautionary principle[16] has been applied in setting the limits of acceptable change. In the management

[15] Refer to Conservation Commission (2014a) for guidelines on selecting key performance indicators.

[16] 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*".

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.

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 and protocols for collecting data for each indicator.

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 (see Section 4 *Legislative framework*). A change from nature reserve to national park or conservation park will allow for current recreational use. Visit numbers to these reserves are shown in Section 25 *Visitor planning – Visit numbers.*

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 ('Barker Inlet Nature Reserve')	C27888	Add to Stokes National Park following CALM (1992) recommendation E12 and to facilitate management of recreational use.
Unnamed nature reserve ('Warrenup Lake 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 add Lake Quallilup to the conservation estate. Lake Quallilup is a significant lake for moulting birds and as a refuge when other lakes dry up and it is proposed to be added to the Lake Gore Ramsar site (Environment Australia 2001a). The area around the lake also has a significant vegetation association (125) which is poorly reserved in the conservation reserve system. Whilst CALM (1992) recommended nature reserve status, national park status is now considered the best tenure as it will protect Lake Quallilup's natural values and allow for recreational facilities and use.
Helms Forestry Reserve (Misc. Reserve)	C23527	Change majority to an 'A' class nature reserve in recognition of the significant nature conservation values, including a threatened ecological community and retain two small miscellaneous reserves, providing for the arboretum and forestry.
Lake Warden Nature Reserve	A32257 C50098	Incorporate reserve C50098 into A32257 and remove recreation from purpose statement as current purpose is inconsistent with status as a nature reserve.

Woody Lake Nature Reserve	A15231	Change to national park to allow long-established recreational activities to continue.
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 national 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) where possible to enable adequate protection of their conservation values with a higher security of tenure.

In Western Australia, the security of tenure of Crown reserves created under the *Land Administration Act 1997* varies, depending upon whether the reserve is 'class A' or 'other than class A' (unclassified). However, many of the existing reserves in the planning area were created under the previous *Land Act 1933* and classified as class A, B or C. Security of tenure reflects the level of approval required to alter their area or purpose. Changes to class A reserves require the agreement of both Houses of Parliament. Changes to other than class A require approval at Ministerial level. This plan proposes that all conservation reserves in the planning area that are currently class C or other than class A should be considered for class A where appropriate.

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. The reserve also contains populations of two threatened flora species.

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 including the consultation period for the draft management plan (see Appendix 2). These proposed additions have been identified based on:

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

- developing a comprehensive, adequate and representative conservation reserve system
- protecting significant remnant vegetation communities and riparian vegetation
- protecting important fauna habitats
- protecting populations of conservation significant flora
- 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.

This approach is in line with the priorities of the *Strategy for Australia's National Reserve System 2009-2030* (National Reserve System Task Group 2009).

For more information on the values of these additions see Appendix 2 and sections 14 *Biogeographic regions,* 15 *Native plants and plant communities*, 16 *Native animals and habitats* and 17 *Ecological communities.*

Southern heath monitors (*Varanus rosenbergi*) fighting. Photo - Sarah Comer/Parks and Wildlife

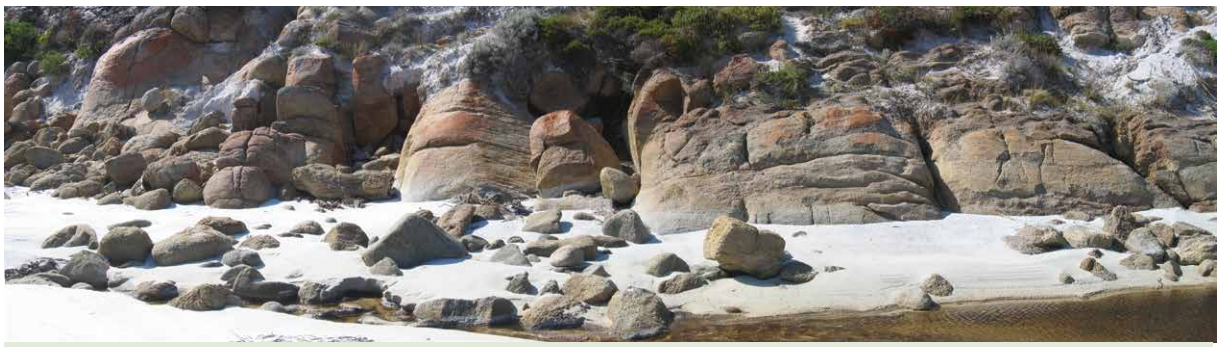
8. Administration

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.

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 ranger operational facilities will generally 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 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. If the plan is not reviewed and replaced by the end of the 10-year period, it will remain in force until a new plan is approved.



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 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 (annual rainfall of 400-700mm along the coast and 300-500mm inland). 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 with 250-300mm annual rainfall (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 and communities 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 *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 is improved while their vulnerability to climate change is decreased.

Management actions

1. Continue to incorporate the potential for climate change impacts upon threatened species and communities and develop effective response strategies (e.g. 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

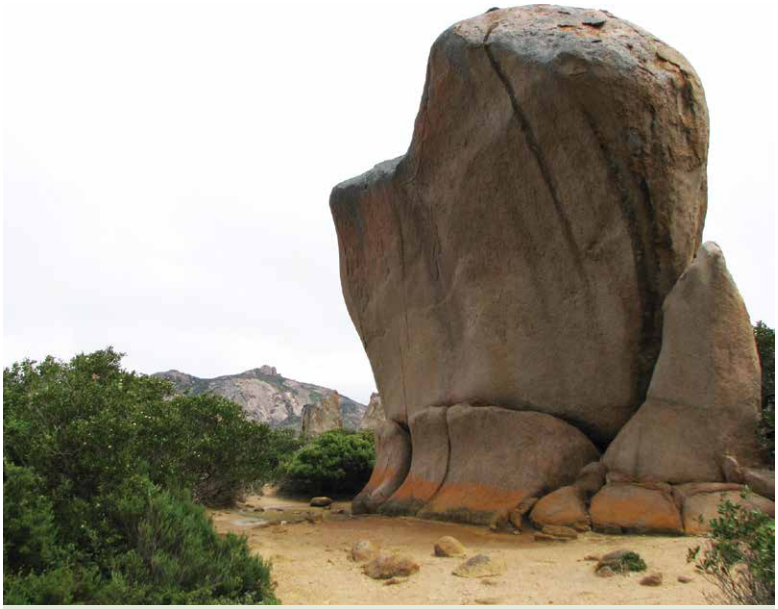
The view from the summit of Frenchman Peak, Cape Le Grand National Park, towards the granite headlands of the coast. Photo - Tegan Laslett

The western half of the planning area has a bedrock geology consisting of a Precambrian igneous basement overlain by middle Jurassic to Holocene sedimentary rocks. The igneous rocks cover the western half of the planning area and include the south-eastern part of the Archean Yilgarn Craton, and the eastern section of the Proterozoic Albany-Fraser Orogen. The granite and gneiss metamorphic terrains are interspersed with greenstone belts in the Yilgarn Craton, while the Albany-Fraser Orogen comprises several geological units from the Paleoproterozoic to the Mesoproterozoic which consist of strongly deformed amphibolites to granulite facies rocks intruded by various granitic plutons (Spaggiari *et al.* 2007). Most of the planning area, including the islands within the Recherche Archipelago Nature Reserve, are located in this geological region.

The eastern part of the planning area is dominated by the Eucla Basin (a sedimentary basin that extends across the southern Australia continental margin [Bradshaw *et al.* 2003]) consisting mostly of carbonate and siliciclastic sedimentary rocks. Parts of the Cape Arid National Park and the Nuytsland Nature Reserve extend into this area.

In the central portion of the planning area, the western extension of the Eucla Basin, previously known as the Bremer Basin, is formed as infill of paleodrainage valleys and depressions incised into the Albany-Fraser Orogen. This part of the Eucla Basin includes sedimentary rocks deposited in fluvial and backswamp environments (Hocking 1990).

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



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

not currently 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).

Bilbunya Dunes, Nuytsland Nature Reserve. Photo - Laurent Marsol

The coastline is strongly indented with numerous rugged rocky headlands interspersed with asymmetrical bays that reflect the 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, Wylie Scarp[17] and karst[18] areas within Cape Arid National Park, the Kangawarrie proposed addition and Nuytsland Nature Reserve. The karst areas of the planning area are in the western-most portion of the Nullarbor karst system. The Nullarbor karst system covers a large area from the middle of Cape Arid National Park to Nuytsland Nature Reserve and across the Nullarbor Plain into South Australia. It is the largest area of arid and semi-arid karst in the southern hemisphere and the largest contiguous karstland in the world. The majority of the caves and other significant features are outside the planning area, however those that are within the planning area are north of Fisheries Road in Cape Arid National Park, north of Wylie Scarp in Nuytsland Nature Reserve and Nature Reserve 41934 (Mount Dean and Mount Esmond) and within the Kangawarrie proposed addition (see Map 1b). Due to the values of karst features, associated habitats and their high susceptibility to irreversible damage, it is important to encourage and promote the protection and management of these areas. Threats to karst systems include altered hydrology (e.g. from flood events, vegetation clearance, road/site developments, grazing and climate change) and human disturbance.

While the geology and landforms of the planning area contribute to the high scenic value of the region, there are no formal geoheritage[19] sites within the planning area. In 1992, the Commonwealth Government commissioned a report on the suitability of the Nullarbor region (including Cape Arid National Park and Nuytsland Nature Reserve) for World Heritage Listing based on the karst system (Davey *et al.* 1992), however the recommendation did not progress.

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

Desired outcome

The geology, landforms and soils are protected and conserved.

[17] Wylie Scarp, which is up to 20km from the present shoreline, was part of the original cliffline on the southern margin of the Nullarbor during the height of the interglacial sea level maxima during the Pleistocene.

[18] 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.

[19] 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.

Management actions

1. Identify and protect geological features, landforms and soil types vulnerable to environmental damage (such as coastal dunes and/or karst areas).
2. Assess the potential for impact on geological features, landforms and soil types from land uses, proposed developments and activities, including management operations such as providing access roads/tracks, constructing firebreaks and recreational site development.
3. Control public access to caves and other sensitive karst features by classifying[20] any caves as 'restricted entry', 'adventure or wild' or 'tourist' as applicable.
4. Undertake preliminary surveys of the karst areas in the Kangawarrie proposed addition to assist in determining the final boundary for inclusion into the conservation reservation system (Cape Arid National Park).
5. Identify and then consider the potential for creating acid sulfate soils during management operations and planning (e.g. fire management), and avoid disturbing, compacting or displacing saturated soils at risk.
6. Support the survey of the salt lakes in Nuytsland Nature Reserve for stromatolite-like organisms.

Key performance indicator

Performance measure	Target	Reporting
Protection of geological features	No adverse impact on geological features as a result of management activities	Every 5 years

12. Hydrology

Surface water hydrology

In the planning area, rivers extend up to 80km 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[21] (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 26885[22] respectively. The tidal component of Stokes Inlet is surrounded by Stokes National Park and is a 'normally closed' lagoonal estuary only opening occasionally to the ocean, due mainly to increased run-off from cleared agricultural land in the upper catchment (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, Lake Quallilup, Lake Nambarup, Lake Mortijinup, Mainberup Swamp and 'Pink Lake' (Spencer Lake) (Environment Australia 2001a). These wetlands support a diverse array of waterbirds (see Section 16 *Native animals and habitats*).

Wetlands of regional significance include Lake Shaster, Paper Bark Swamp, Native Dog Swamp, Benje Benjenup Lake, Bannitup Lake, Stevens Lake, Doombup Lake, Big Boom Swamp, unnamed wetlands in Cape

[20] Access to caves is managed in accordance with the department's cave management system outlined in DEC (2006) and consistent with *Policy Statement No. 80 Protection and management of caves and karst* (Parks and Wildlife 2014a). There are four categories of caves ranging from 'tourist cave' to 'restricted access'. unless classified otherwise, all caves are considered 'restricted' access in existing reserves until an assessment has been made of the values and level of risk.

[21] Eutrophication is the process by which a body of water becomes enriched in dissolved nutrients (e.g. from fertilisers and slurry) that stimulate the growth of aquatic plant life (such as algae) usually resulting in the depletion of dissolved oxygen, which can adversely affect other aquatic organisms. Rivers and other water systems that are identified as eutrophic, have undergone this process.

[22] 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.

Le Grand National Park near Frenchman Peak and Dunns Rock, 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).

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

Water depth, salinity and pH have been recorded since 1977 in selected wetlands for the planning area as part of the department's *South West Wetland Monitoring Program* (Lane *et al.* 2015) and also the *Lake Warden Natural Biodiversity Recovery Catchment Program* (see below). 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 of the wetlands in the planning area (see also Section 38 *Research requirements*).

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) along with increasing urbanisation by semi-rural/peri-urban development 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 [Wilson 2004]), algal blooms and weeds
- potential acid sulfate soils
- altered fire regimes.

In addition, large areas of the upper catchments have been planted with tree crops. If these were to be all harvested at once and/or returned to agriculture, there would be a significant impact on the hydrology of the area

and associated threats. Working with plantation owners to minimise these impacts will be important for example by encouraging staging of tree harvests and the replacement planting of perennial crops (such as lucerne, fodder shrubs, temperate grasses, chicory and subtropical grasses) rather than annual crops (Bennett 2009 see Table 11 pgs 56 and 57, Platt *et al*. 1996).

Lake Warden catchment

Due to the significance of its biological assets under threat from 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 gravity-fed 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 provide maximum recovery of riparian vegetation and waterbird populations (see Section 15 *Native animals and habitats – Wetlands*).

To date, the Lake Wheatfield dewatering project has been successful and has contributed to previously inundated lakes achieving set dewatering target levels (allowing for seasonal fluctuations in water levels) and recreating beaches to be occupied by wading birds. The bird counts indicate diversity and numbers are returning to the pre-inundation period (Cale *et al*. 2011, Pinder *et al*. 2012a and 2012b, Pinder and Lizamore 2012). 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 will be considered if required.

Potential risks 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).

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

Pink Lake

'Pink Lake' (Lake Spencer) is a large seasonally drying hypersaline wetland south west of Lake Warden. Pink Lake is the most saline of the Esperance Lakes and it is dominated by the salt tolerant algae *Dunaliella saline*, which has a pink (beta-carotene) pigment and complex algal mat communities (Handley 1991, Massenbauer 2007).

The hydrology of Pink Lake has been altered through the construction early in the 20th Century of the Kalgoorlie-Esperance railway, rail embankments and road development severing the surface water links between Pink Lake and Lake Warden (see Section 33 *Utilities and services*). In addition, the hydrology, and probably the salt load, has been altered by the salt production works in the north-eastern end of the lake, consisting of a series of eight evaporation ponds (4 per cent of the lake) that were used for salt production from 1969 until 2009 (with an increase in production in the 1980s) (see Section 29 *Mineral and petroleum exploration and development*).

Pink Lake has not appeared pink since the early 2000s, whereas since 2011, Lake Warden has been consistently pink. Recent studies have confirmed a groundwater link between these lakes however, further research is required to determine why Pink Lake is no longer pink and why Lake Warden now is, how this relates to altered hydrology and what impact this may have on the values of the wetland system and microbialite communities. The mechanism of coloration of pink lakes in general is not well understood so studying Lake Hillier, a pink lake on Middle Island may assist.

Whilst re-establishing the colour of Pink Lake would increase tourism values, the significant conservation values of the lake such as its national significance as a wetland habitat for birds (including the former salt evaporation ponds which are locally significant for hooded plovers) and its significant microbial community (see sections 16 *Native animals and habitats – Wetland habitats* and 17 *Ecological communities – Priority ecological communities*) need to be maintained. In addition, any actions as part of the Lake Warden recovery catchment also need to maintain these conservation values.

Lake Gore

Sediment cores taken from Lake Gore indicate that deposition/ siltation of the lake has increased by a factor of 50 since European settlement. Lake Gore has been classified as a Tier 1 state biodiversity asset[23] at risk of salinity (as has Lake Warden and the upper Lort River [the river corridor is a proposed addition]) and identified as a potential natural diversity recovery catchment (DoE 2003). Sparks *et al*. (2003) recommends that Lake Gore may be successfully managed using mainly surface drains and pumping to the ocean with some revegetation in identified critical areas.

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

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.

23 The *Salinity Investment Framework* process was used to identify important natural assets which fall into four main classes: biodiversity, water resources, agricultural land, and rural infrastructure such as towns and roads. Priorities were then assigned based on three main criteria — the value of the natural asset, the threat to it, and the feasibility of options available to protect it. A Tier 1 asset has been assessed as having 'high value' and is under 'high threat'.

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. Liaise with adjacent land and plantation owners to minimise disturbance within the catchments and encourage and support perennial cropping, revegetation, creekline fencing and public and private agro-forestry.
4. Collect and establish baseline water and soil physico-chemical information and maintain an ongoing database including surface and groundwater hydrological regimes, particularly for the inlets, lakes and wetlands.
5. Improve knowledge of interactions between groundwater and surface water systems.
6. 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 (e.g. the western river corridors, Stokes Inlet, Pink Lake and various other lakes, wetlands and surrounding riparian vegetation, see appendices 2 and 3).
7. 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).
8. 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) and compare against the management trigger values.
9. Revegetate targeted areas of the Lake Warden Natural Diversity Recovery Catchment to improve wetland ecosystem function.
10. Continue the dewatering project for Lake Wheatfield and if high water levels persist in Lake Warden over an extended period consider an engineering intervention to prevent long-term inundation and restore shoreline waterbird habitat.
11. Add proposed additions to Lake Warden, Woody Lake and Mullet Lake nature reserves (see Appendix 2).
12. Continue to liaise with adjacent landowners in the Lake Warden catchment with regard to potential point source pollution (e.g. peri-urban landowners and the golf course).
13. Investigate and monitor the hydrology and biogeochemistry of the ‘pink lakes’ with particular regard to potential causes of Pink Lake losing colour, Lake Warden recently turning pink and the characteristics of Lake Hillier, and seek to maintain these within pre-determined limits.
14. Investigate Lake Gore as a potential recovery catchment to assist in restoring wetland habitat.
15. Monitor and assess the sediment transport system for Lake Gore and investigate the feasibility of an engineering intervention to Lake Gore’s water levels and reduce sediment inflow into the system.
16. Maintain Stokes Inlet in its natural state as a ‘normally closed’ lagoonal estuary by not artificially opening the sandbar and by working with landowners in the upper catchments associated with Young and Lort rivers to reduce run-off.

Key performance indicator

Performance measure	Target	Reporting
Hydrological limits of acceptable change for Ramsar wetlands	Limits of acceptable change (or interim limits as applicable) are not exceeded	Every 3 years or as per appendices 6 and 7

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) criteria[24] and specifies a NWI wilderness quality index of at least 12 and a minimum size of 8,000ha in temperate areas or 20,000ha 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 8,000ha in size remote from development would be limited other than the proposed addition to Peak Charles National Park.

Mount Ragged Wilderness Area

Balladonia Road and Gora Track provide access through Cape Arid National Park to Mount Ragged and further north to Pine Hill and beyond. There are recreation sites at Mount Ragged and Pine Hill and a walk trail to the summit of Mount Ragged. To the east of Mount Ragged and Gora Track there are no public access tracks, formed walk trails or recreation sites, and visitation to the area is very low. This area, including part of Nuytsland Nature Reserve, meet the NWI criteria for wilderness and is suitable to be maintained as wilderness (see Map 2b)[25].

Ways to experience the proposed 'Mount Ragged Wilderness Area'[26] (196,141ha) will be to climb Mount Ragged via the walk trail where bushwalkers will have extensive protected views over the proposed wilderness area or to walk into the area taking care to be fully prepared for self-reliant bushwalking/camping.

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

[24] 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.

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

[26] 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'.

Management of wilderness

The management of the wilderness area[27] will include:

Access

- use of mechanised transport will not be allowed within the wilderness area, except for emergency or essential management operations, or reasons of cultural importance
- the use of mechanised transport within the wilderness area for rescue and fire emergency operations will require the approval of the department's Director General
- access along Gora Track through Cape Arid National Park will be maintained however the road reserve will need to be realigned to match existing alignment
- the landing of motorised and non-motorised aircraft within the wilderness area will not be allowed, with the exception of non-fixed wing aircraft access for rescue and essential research and management operations.

Fire

- wherever possible, ground disturbing activities for fire management will be conducted outside of the wilderness area—this includes construction and maintenance of access roads, firebreaks, fuel-reduced buffers, and water points
- prescribed burning within the wilderness area may be carried out for the protection and maintenance of biological values and processes only
- appropriate fire mitigation strategies according to established standards may be implemented around the wilderness area where life, property and natural resource values may be threatened.

Culture

- management of the wilderness area and its surrounds will be consistent with the principles in the Malimup Communiqué[28]
- structures listed as being significant by either the National Trust of Australia or Government heritage bodies will be protected as far as practicable.

Recreation

- constructed walktrails, signs, track markers and toilets will not be provided in the wilderness area
- interpretation will not be provided within wilderness areas although it could be provided at Mount Ragged or elsewhere in the planning area
- education and/or recreation expeditions will be allowed within the wilderness area providing they are consistent with the maintenance of the qualities of the area
- recreation sites at Mount Ragged and Pine Hill to the west of the wilderness area will be maintained
- commercial recreation and tourism will not be allowed within the wilderness area.

Resource use

- the taking of forest produce will not be allowed within the wilderness area.

Refer to *Policy Statement No. 62* for further information on general guidelines for management of gazetted wilderness areas.

Other areas within the planning area that have high wilderness quality will be managed according to the 'natural' visitor management setting (see Section 25 *Visitor planning – Visitor management settings*) to maintain wilderness qualities.

[27] The proposed wilderness also will be managed as if it is a gazetted wilderness area until the specific boundaries are determined and the notice in the *Government Gazette* takes place.

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

Desired outcome

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

Management actions

1. Gazette the Mount Ragged Wilderness Area under section 62(1)(a) of the CALM Act.
2. Manage wilderness areas (proposed and/or gazetted) in terms of access, fire, culture, recreation and resource use as stated above in accordance to departmental policy (e.g. CALM [2004b]).
3. Maintain wilderness qualities within wilderness areas (proposed and/or gazetted) by 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. Realign the road reserve of Gora Track (and hence Cape Arid National Park internal boundary) to match existing alignment ahead of wilderness gazettal as appropriate.
6. Progress other wilderness areas for gazettal as appropriate.
7. Enhance visitors' understanding and appreciation of wilderness through interpretation (e.g. at Mount Ragged) and awareness programs.

Key performance indicators

Performance measure	Target	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 2016 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[29] (CAR) reserve system of protected areas to conserve Australia's biodiversity (Thackway and Cresswell 1995, National Reserve System Task Group 2009). In building the reserve system, priority[30] is given to under-represented bioregions that have less than 10 per cent of their remaining area protected in reserves.

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 bioregion (both Recherche and Fitzgerald subregions) and the Mallee bioregion (Eastern and Western Mallee subregions) with the northern part of Cape Arid National Park around Pine Hill and the western part of the proposed Kangawarrie addition within the Coolgardie bioregion (Mardabilla subregion). Figure 2 shows the bioregions and the subregions of the planning area.

[29] 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.

[30] Many other priorities include reserving a) key habitats for nationally listed threatened species or migratory species and/or Ramsar sites or wetlands of national importance and b) areas that contribute to whole-of-landscape conservation outcomes, such as places that offer refuge and or contribute to connectivity and the adaptation of biodiversity to changing climate. See Section 7 *Proposed tenure changes – Proposed additions.*

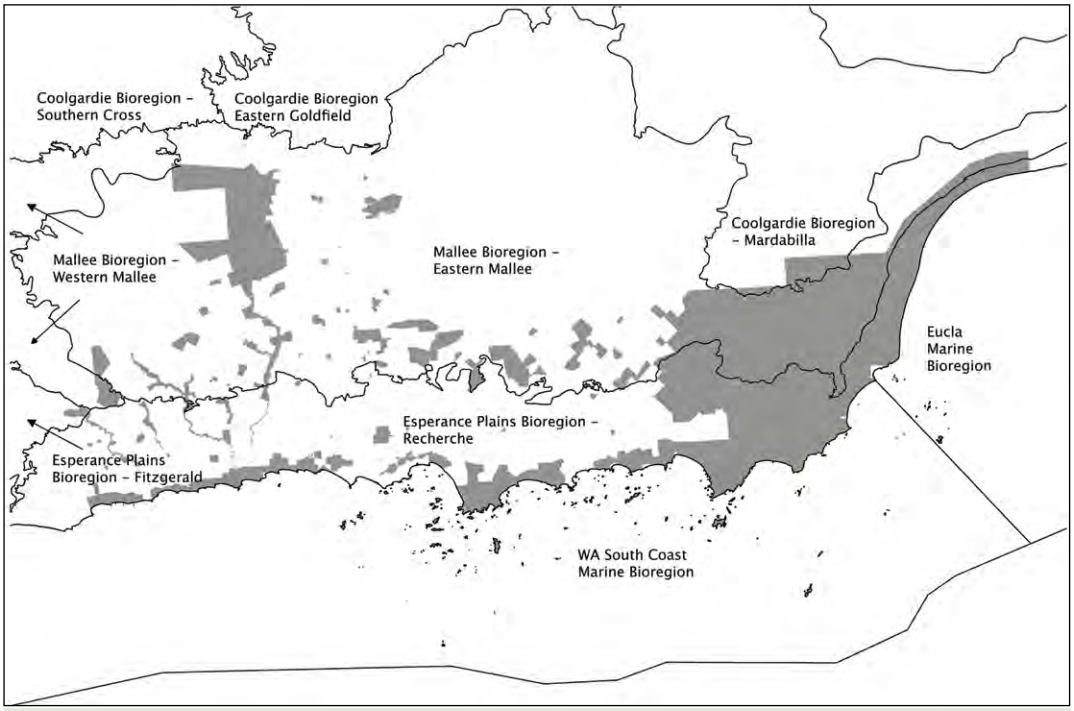


Figure 2. Bioregions and subregions of the planning area.

The Esperance Plains bioregion includes the coast of the planning area. The bioregion is characterised by proteaceous scrub and mallee heaths on sandplains rich in endemic flora. The Mallee bioregion includes the northern reaches of the river corridors, the inland nature reserves, and the Mount Ragged area of Cape Arid National Park. The bioregion 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 bioregion (the small 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 28.6 and 27.5 per cent of their area protected in conservation reserves respectively; Eastern Mallee and Western Mallee have 27.1 and 9.0 per cent respectively; and Mardabilla has 12.8 per cent (2013 data). 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[31], however the proposed Kangawarrie addition will improve reservation of the Mardabilla subregion by 1.1 per cent (19,754ha) to 13.9 per cent.

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 conservation reserves and the extensive clearing of the agricultural areas (CALM 2003). Therefore, many of the proposed additions within this management plan aim, among other things, to address this biased representation of vegetation types (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).

[31] The proposed Kangawarrie addition to Cape Arid National Park represents a small 1.1 per cent increase in reservation within the Mardabilla subregion as the subregion is very large in area. The boundary of the Kangawarrie proposed addition is still subject to investigation so it may be possible to increase reservation of the Mardabilla subregion to 15 per cent by reserving another 20,000ha through this management plan. Otherwise, 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.

15. Native plants and plant communities

Nematolepis phebalioides, Barker Inlet. Photo – Laurent Marsol

The planning area covers part of the Southwest Australian Ecoregion, Australia's only international biodiversity hotspot[32] (Gole 2006). There are more than 2,140 native vascular taxa recorded within the planning area (1,843 from existing conservation reserves) from 99 families (NatureMap naturemap.dpaw.wa.gov.au and district data, Sept 2014). The main families being Myrtaceae (eucalypts and paperbarks – 344 species), Fabaceae (legumes, peas and wattles – 232 species), Orchidaceae (orchids – 169 species), Proteaceae (banksias and grevilleas – 159 species), Cyperaceae (sedges – 103 species), Asteraceae (daisies – 102 species), Ericaceae (heaths – 94 species), Poaceae (grasses – 60 species), Goodeniaceae (herbaceous plants and small shrubs – 53 species) and Chenopodiaceae (goosefoots – 52 species). Together these represent 64 per cent of the known species of the planning area. However, survey data for many 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, particularly the nature reserves and proposed additions.

Cape Arid National Park is particularly rich in flora species with 1,045 native vascular taxa recorded, almost half of the taxa within the planning area (NatureMap September 2014 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. Over 300 species are at their eastern margins of their range in the park (with another 200 or so ending in the adjacent areas of Nuytsland Nature Reserve). These species centre on the granite outcrops, but also include a wide range of habitats (such as the wetlands and clays). 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 and Keighery in press) and matches Kalbarri National Park with approximately 25 per cent of the flora at its northern range end. The southern end of Russell Range (the eastern-most outlier of the metamorphosed sandstone ranges of the Barrens and Stirling Range) in particular, within Cape Arid National Park, has been identified as a centre of flora endemism and high species diversity (CALM 2003). Russell Range has nine of the 16 endemic plant species of Cape Arid National Park (Greg Keighery pers. comm. 2015). Cape Arid National Park also has highly disjunct populations of 20 species either from the Fitzgerald area (e.g. *Adenanthos oreophilus*) or from Albany (e.g. *Acacia robinae*). These significant values of Cape Arid National Park are threatened by climate change, *Phytophthora* dieback and inappropriate fire (see sections 10 *Climate*, 20 *Diseases* and 22 *Fire*). The reserve with the next highest number of species in the planning area is Cape Le Grand National Park with 621 native vascular taxa.

Flora of conservation significance

The planning area contains many plant species of conservation significance (see Appendix 4), such as:

- 12 taxa declared as rare flora under the Wildlife Conservation Act:
  - Critically Endangered – *Commersonia apella*, the prickly honeysuckle (*Lambertia echinata* subsp. *echinata*), underground orchid (*Rhizanthella gardneri*)

[32] For more information on international biodiversity hotspots www.environment.gov.au/biodiversity/hotspots/international-hotspots.html.

  - Endangered – Bremer boronia (*Boronia clavata*), cumquat eremophila (*Eremophila denticulata* subsp. *trisulcata*), Twin Peak Island mallee (*Eucalyptus insularis continentalis*), *Myoporum velutinum*
  - Vulnerable – small two-coloured kangaroo paw (*Anigozanthos bicolor* subsp. *minor*), sedge conostylis (*Conostylis lepidospermoides*), *Eremophila denticulata* subsp. *denticulate*, goblet mallee (*Eucalyptus merrickiae*), *Hypocalymma* sp. Cascade
- 178 priority[33] flora – 26 Priority 1, 67 Priority 2, 50 Priority 3 and 35 Priority 4
- of the 190 rare and priority flora, 66 taxa are either locally endemic (with a range of less than 150km) or endemic to the bioregion (Esperance, Mallee or Coolgardie bioregions as applicable).

A disjunct population of *Commersonia apella*[34] in Cape Le Grand National Park is the only known population of the species. Further work is required to estimate the size of this and other populations and the seeds collected and propagated. The discovery of this species during a 2012 flora survey along with incidental new and unexpected species records for Cape Le Grand National Park, species' range extensions, records of historical significance[35] and undescribed and potentially new species suggest that knowledge of the vascular flora of Cape Le Grand National Park is still not sufficient to accurately determine the level of biological diversity of the park (Markey 2012). This can also be inferred for the rest of the planning area including previously surveyed areas. During the life of this plan therefore, the flora that is considered to have conservation significance may change with survey effort (in addition to changes in threatening processes and their impacts) and management should adapt accordingly.

Interim recovery plans[36] have been prepared for the small two-coloured kangaroo paw (CALM 2006), prickly honeysuckle (Parks and Wildlife 2014), cumquat eremophila (Fitzgerald *et al*. 2004), salt myoporum (*Myoporum turbinatum*) (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 provides 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 33 vegetation associations within existing reserves of the planning area (Beard 1973, 1975, 1980), and another eight vegetation associations if the proposed additions are included (June 2015 data, see Appendix 5). Of these vegetation associations, 25 are significant in that they have been poorly reserved (24), extensively

[33] 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.

[34] The genus *Commersonia* was reviewed in 2011 and three newly described species were added. This included *Commersonia apella*, which was originally found from locations between Pemberton and Walpole. However, at the time of the publication of the description of the species, the only known living plants were grown from cuttings at the Australian Botanic Gardens in Canberra.

[35] For the first time in over 200 years, a population of *Banksia plumosa* subsp. *plumosa* has been found in Cape Le Grand National Park. The naturalist Robert Brown on board the *Investigator* collected the species in 1802, making Lucky Bay the type locality for the species. As it had not been collected east of Bremer Bay since then, it had been concluded the type locality was in error. This survey confirmed Cape Le Grand National Park as the eastern limit of the species and as the type locality for this species.

[36] The Department of Parks and Wildlife flora interim recovery plans: www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/198-approved-interim-recovery-plans.

cleared (four), or are of limited extent (three) (based on criteria[37] used by Hopkins *et al.* 2000). Nineteen of the 25 significant vegetation associations occur within the proposed additions.

The planning area, particularly when the proposed additions are reserved as conservation estate, represents the majority of the area in conservation reserve for these vegetation associations due in part to the extent of past clearing in the region as well as the large area of the planning area. This means that the management of the vegetation associations within the planning area could have significant impacts on the vegetation association as a whole. Any development within the planning area needs to take into account the effect on the vegetation associations including both proportion of pre-1750 extent remaining as well as proportion in conservation reserves.

There has been no work carried out on the condition of these vegetation associations within the planning area.

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

Poorly reserved

Twenty-four of the vegetation associations in the planning area are poorly reserved[38]. Fifty-four of the proposed areas for addition in the planning area (see Appendix 2; maps 1a and 1b) will collectively improve the representation of 18 of these poorly reserved vegetation associations within the planning area, increasing reservation of two of them to 15 per cent or above.

Vegetation association 925, the shrublands of unnamed Nature Reserve 43949 south of Peak Charles Nature Reserve is the only part of the association within a conservation reserve meaning only two per cent of the pre-1750 extent is reserved. The unallocated Crown land proposed addition to Peak Charles National Park would add 871ha of this vegetation association to the reserve system increasing reservation level to 19 per cent. Vegetation association 413, shrublands does not occur in the existing reserves within the planning area and has only one per cent reserved. The unallocated Crown land proposed addition to Peak Charles would add 796ha to the reserve system increasing the reservation level to 24 per cent. However, as this association is also limited in extent, further reservation is recommended (see below).

The other poorly reserved vegetation associations still require further investigations to identify additions to increase reservation above 15 per cent. These include:

- Vegetation association 482, the medium woodland of northern Cape Arid National Park, has only nine per cent of the pre-1750 extent reserved. Six of the proposed additions including the Kangawarrie unallocated Crown land and additions to Peak Charles would add 77,375ha to the reserve system increasing reservation level of this association to 14 per cent. An adjustment to the boundary of the Kangawarrie unallocated Crown land should be made to increase reservation to at least 15 per cent.
- Vegetation association 486, the medium woodland of inland nature reserves around the inland nature reserves such as Red Lake Townsite, Dowak and nearby unnamed nature reserves has only five per cent of

[37] 'Poorly reserved' is considered zero to 15 per cent of extant vegetation within conservation reserves. 'Extensively cleared' is less than or equal to 30 per cent of original (pre-1750) vegetation extant. 'Limited in extent' is less than 2,000ha extant.

[38] The significance of the 'poorly reserved' vegetation associations is only for as long as the vegetation associations are considered poorly reserved. Over the life of the plan, more land may be reserved with these vegetation associations or it may even be appropriate to use a higher percentage reservation level such as 20 or 30 per cent, which may mean more vegetation associations are poorly reserved.

the pre-1750 extent reserved. Seven of the proposed additions, including the additions to these nature reserves and the addition to Peak Charles National Park, would add 22,145ha to the reserve system and increase reservation level of this association to nine per cent. Further investigation of the unallocated Crown land surrounding unnamed Nature Reserve 33113 should be made in order to increase reservation to 15 per cent.

- Vegetation association 512, the shrublands of the inland nature reserves such as Bishops, Cascade, Cheadanup, Fields, Griffiths and Jeffery nature reserves has only two per cent of the pre-1750 extent reserved (entirely within the planning area). The proposed additions to Cheadanup Nature Reserve, Peak Charles and eight other additions would add 13,105ha to the reserve system and increase reservation level of this association to eight per cent. Another 11,000ha of this vegetation association would need to be reserved to raise this level to 15 per cent. Other areas to investigate include the unallocated Crown land north of Cheadanup Nature Reserve between Oldfield River and Melaleuca Road, Young River and Cascades Road and Rollond Road and Pyramid Lake.
- Vegetation association 519, the shrublands of inland nature reserves and northern Cape Arid National Park has only 10 per cent of the pre-1750 extent reserved. Thirteen of the proposed additions, including the river corridors and additions to Peak Charles and Cape Arid national parks, would add 24,018ha to the reserve system and increase reservation level of this association to 11 per cent. Further investigation of the unallocated Crown land north of the cleared agricultural zone should be made to increase reservation to 15 per cent.
- Vegetation association 6048, shrublands within Helms Forestry Reserve and in the eastern end of Cape Le Grand National Park and Alexander Nature Reserve, has less than one per cent of the pre-1750 extent reserved. Seven of the proposed additions have 473ha, not enough to change the reservation level. Other areas to investigate reservation of this association include private property around upper Coolbidge Creek, around Helms Forestry Reserve to Coramup Creek and between Cape Le Grand National Park and Burdett South and Kau Rock nature reserves.
- Vegetation association 929, the low forest in the nature reserves around Cascade, has only two per cent of the pre-1750 extent reserved. Five of the proposed additions would increase reservation in conservation estate to five per cent. Other areas to investigate reservation of this association include the unallocated Crown land north west of the Oldfield River corridor proposed addition.

Appendix 5 shows where the significant vegetation associations are within and surrounding the planning area, so further investigations can be made on reserving poorly reserved associations.

Remnant vegetation, Helms Forestry Reserve. Native vegetation in the reserve includes the 'Banksia scrub-heath on sandplain in the Esperance Plains Region' vegetation association (6048). This vegetation association is significant as less than 14 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

Extensively cleared

Four vegetation associations that occur within the planning area (512, 4801, 5048 and 6048) have been cleared by more than 70 per cent from their former extent and therefore considered vulnerable where species loss appears to accelerate exponentially at an ecosystem level (Hopkins *et. al* 2000). There are 10 proposed additions that contain 13,105ha of vegetation association 512, three that contain 296ha of 4801, and seven that contain 473ha of 6048 (see appendices 2 and 5; maps 1a and 1b).

One vegetation association (5048) has been cleared by more than 96 per cent and can be considered endangered. A third of the remaining vegetation of this association occurs in Speddingup West and Barker Inlet nature reserves. The management implication of this is that these areas cannot be cleared or developed any further.

All four of these vegetation associations are also poorly reserved.

Limited current extent

Three vegetation associations are limited in extent in that there is less than 2,000ha extant. Vegetation association 5048 as discussed above, has been extensively cleared and now only 1,181ha remain.

Vegetation association 16, which is the low forest of the Recherche Archipelago, has a naturally limited current extent of 1,156ha.

Vegetation association 413 as discussed above, which is the shrublands in the unallocated Crown land adjacent to Peak Charles National Park, has been cleared 48 per cent and now only 1,807ha remain. The proposed addition would reserve 796ha but the remaining extent, also within unallocated Crown land should also be investigated for reservation.

Desired outcome

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

Management actions

1. Undertake or support systematic flora and vegetation surveys of the planning area including proposed additions.
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 and record natural variations in population numbers.
5. Continue to obtain biological and ecological information on threatened flora, including critical habitat, research into fire response, habitat degradation, pollinator activity, seed production, recruitment, longevity, susceptibility to disease and other threats such as grazing, weed invasion and predation. If monitoring shows that there is a high level of threat from weeds or grazing appropriate control measures should be undertaken.
6. Rehabilitate areas of degraded habitat.
7. Conduct further translocations of threatened flora.
8. Collect seeds and cutting material for propagation of threatened flora as necessary.
9. 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

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

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 appendices 2 and 5).

11. Investigate further additions to the conservation reserve system of the significant vegetation associations that still are not adequately reserved by the proposed additions in this plan.
12. 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.
13. Manage significant vegetation associations so that percentage of extant vegetation is at least maintained (see Appendix 5).
14. Assess the vegetation condition of the vegetation associations within the planning area.
15. Promote conservation of flora, including threatened and other significant flora through information, interpretation and education products and programs.

Key performance indicators

Performance measure	Target	Reporting
The persistence and status of populations of threatened (i.e. rare and Priority 1 and 2) flora	Subject to natural variation, taxonomic changes, recovery and/or maintenance of populations of threatened flora	Every 2 years, or as per recovery plan
The vegetation remaining and reservation level of significant vegetation associations	The same or higher area of existing vegetation and level of reservation for significant vegetation associations	Every 2 years

16. Native animals and habitats

The planning area hosts rich and diverse animal populations (see Appendix 6). 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, karst, 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*).

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

Thirty-two native mammal taxa from 12 families have been recorded in the planning area including seven pinnipeds (Otariidae and Phocidae), one echidna (Tachyglossidae), five kangaroos and wallabies (Macropodidae), one potoroo (Potoroidae), two possums (Tarsipedidae and Burramyidae), one bandicoot (Peramelidae), seven dasyurids (Dasyuridae), four rodents (Muridae) and four bats (Verspertilionidae and Molossidae).

There are records of 271 bird taxa within the planning area, with 200 recorded within Cape Arid National Park alone.

The planning area is rich in reptiles, with approximately 78 taxa representing eight families recorded in the planning area including 29 skinks (*Scinidae*), 13 geckos (*Gekkonidae*), 15 dragons (*Agamidae*), 12 front-fanged venomous snakes (*Elapidae*), six legless lizards (*Pygopodidae*), two blind snakes (*Tylophidae*), one monitor

lizard (*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-five species of fish have also been recorded in the estuaries, wetlands and lakes of the planning area including freshwater, estuarine and marine species.

In terms of invertebrates, Cape Le Grand National Park is the type locality[39] 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), and short-range endemics[40] surveyed at sites (19) within Stokes, Cape Le Grand and Cape Arid national parks (Framenau *et al*. 2008), invertebrates remain under collected across much of the rest of the planning area (including the karst systems), and the conservation status of many of these groups is generally unknown.

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

Barking gecko (*Underwoodisaurus millii*). Photo - Emma Adams

Fauna of conservation significance

Threatened and other specially protected fauna

There are 64 threatened and other specially protected vertebrate fauna taxa listed under the Wildlife Conservation Act[41] recorded within the planning area (September 2014 data).

Under schedules 1-3 of the Wildlife Conservation Act there are 23 threatened vertebrate fauna taxa recorded[42] within the planning area (September 2014 data). These are listed as 'Critically Endangered', 'Endangered' or 'Vulnerable' and include:

- six mammals[43]
  - Critically Endangered – woylie[44] (*Bettongia penicillata ogilbyi*)

[39] 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.

[40] Along the south coast, many terrestrial invertebrates have survived in isolated and small relictual Gondwanan habitats such as deep gullies or mountain peaks. Due to their limited distributions (less than 10,000km^2), many of these are considered short-range endemic species. Of all invertebrates, their restricted distribution and specialized requirements puts these species at greatest risk of extinction from anthropogenic and natural disturbance. Generally poor dispersal capabilities restrict their ability to establish in other suitable habitats.

[41] Threatened fauna is that declared 'rare or likely to become extinct' under the Wildlife Conservation Act.

[42] Lentanton (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.

[43] 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.

[44] 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).

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 amongst pinnipeds, the Australian sea-lion 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

  - Endangered – black-flanked rock-wallaby (*Petrogale lateralis lateralis*)
  - Vulnerable – subantarctic fur-seal (*Arctocephalus tropicalis*), chuditch (*Dasyurus geoffroii*), Australian sea-lion (*Neophoca cinerea*), Recherche rock-wallaby (*Petrogale lateralis hacketti*)
- 16 birds
  - Critically endangered – western ground parrot (*Pezoporus flaviventris*)
  - Endangered – Australasian bittern (*Botaurus poiciloptilus*), Baudin's cockatoo (*Calyptorhynchus baudinii*), Carnaby's cockatoo (*Calyptorhynchus latirostris*), lesser sand plover (*Charadrius mongolus*)
  - Vulnerable – curlew sandpiper (*Calidris ferruginea*), great knot (*Calidris tenuirostris*), Recherche Cape Barren goose (*Cereopsis novaehollandiae grisea*), wandering albatross (*Diomedea exulans*), grey falcon (*Falco hypoleucos*), malleefowl (*Leiopoa ocellata*), eastern curlew (*Numenius madagascariensis*), fleshy-footed shearwater (*Puffinus carneipes*), fairy tern (*Sterna nereis nereis*), Atlantic yellow-nosed albatross (*Thalassarche chlororhynchos*), grey headed albatross (*Thalassarche chrysostoma*)
- one reptile

The threatened western ground parrot (*Pezoporus flaviventris*) 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 (*Cereopsis novaehollandiae grisea*), 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

- Vulnerable – Recherche dugite (*Pseudonaja affinis tanneri*).

Under schedule 5 of the Wildlife Conservation Act there are 46 bird taxa subject to international agreements relating to the protection of migratory birds that are declared to be in need of special protection. This includes eight taxa also listed as threatened.

Under schedule 7 of the Wildlife Conservation Act the New Zealand fur-seal (*Arctocephalus forsteri*) and the peregrine falcon (*Falco peregrinus* and *F. peregrinus macropus*) are also declared to be fauna in need of special protection.

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 - Stephen Butler

A number of invertebrate species known to be of conservation significance within the planning area include the threatened (Endangered) short-tongued native bee *Neopasiphae simplicior* in Cape Arid National Park, the threatened (Vulnerable) Cape Le Grand assassin spider (*Zephyrarchaea marki*) known only from Thistle Cove, Cape Le Grand National Park, the threatened (Vulnerable) Sarah's pill millipede (*Cyliosoma sarahae*) found in Cape Arid and Cape Le Grand national parks, the crustacean *Daphnia jollyi* (Priority 1) found in Munglinup Nature Reserve and six species of threatened (Vulnerable) millipedes from the genus *Atelomastix* (*A. anancita*, *A.brennani*, *A. dendritica*, *A. grandis*, *A. melindae* and *A. sarahae*) in Cape Arid and Cape Le Grand national parks, Woody Island and the proposed Kangawarrie addition.

Recovery plans[45] have been prepared for the chuditch (DEC 2012b), black-flanked and Recherche rock-wallabies (Pearson 2012), woylie (Yeatman and Groom 2012), albatrosses and giant petrels (DSEWPC 2011), Carnaby's cockatoo (DEC 2012a), malleefowl (Benshemesh 2007), western ground parrot (Parks and Wildlife 2014c) and a draft management program for pinnipeds (Gales and Wyre 1999). There is an action plan for seals (Shaughnessy 1999) and a recovery plan for the Australian sea-lion (DSEWPC 2013). An interim recovery plan for the Australasian bittern is being prepared (Parks and Wildlife in prep.).

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).

Western ground parrot

The western ground parrot is Western Australia's most critically endangered bird and it is one of 20 birds that are identified for recovery in Australia's first *Threatened species strategy* (Australian Government 2015).

In 2004 and 2005 the population of western ground parrots along the south coast was estimated to be fewer than 200 individuals, having declined from an estimated 378 birds in 1990 (DPaW 2014c). Although reliable estimates of numbers are difficult to obtain because of the parrots' cryptic nature and low population densities (Cale and Burbidge 1993), it does appear that this decline in numbers is supported by available data. For example, the Fitzgerald National Park population had a rapid decline in numbers between 2000 and 2011 (Burbidge *et al*. 2007, DPaW 2015). This makes the western ground parrot habitat in the remaining populations of Cape Arid National Park and Nuytsland Nature Reserve highly significant for the survival of the species in the wild.

Bushfires in Cape Arid National Park in October and November 2015 (see Section 22 *Fire*) burnt an estimated 90 per cent of the western ground parrot habitat (S. Comer pers. comm. 2015). It is still being assessed at the

[45] Parks and Wildlife recovery plans www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/197-approved-recovery-plans National recovery plans www.environment.gov.au/biodiversity/threatened/recovery.html.

time of publication of this management plan what the impact has been on the western ground parrot population. Emergency feral cat baiting was undertaken post fire in Cape Arid National Park to try and protect remaining birds. Captive breeding of this species is now even more important.

Reintroductions of threatened fauna

Two species have been reintroduced into the planning area: the chuditch[46] into Cape Arid National Park in 1999 and 2000 and the black-flanked rock-wallaby into Cape Le Grand National Park in 2003 and 2004. Camera trapping in Cape Le Grand National Park since 2011, has confirmed that the reintroduced populations of black-flanked rock-wallabies have persisted with pictures obtained including an un-tagged female with a young-at-heel. However, the chuditch reintroductions are considered unsuccessful. Lessons learned from these projects will be used in future reintroduction programs.

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 (*Petrogale lateralis hackettii*) 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, Mid-West, 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 (320ha), the third largest island in the Recherche Archipelago. Threats to the Salisbury Island population primarily relate to fire, introduction of predators and/or disease. Photo - Emma Adams

Camera trapping began in 2011 and has confirmed that the reintroduced populations in Cape Le Grand National Park have been established, with an un-tagged female with a young at heel observed. Further work is required to estimate the size of these populations. Photos - Parks and Wildlife

There are currently no further reintroductions into the planning area planned. However possible reintroductions or translocations based on sub-fossil records, historical records and suitable habitat to be considered may include the woylie, southern dibbler (*Parantechinus apicalis*), and bilby (*Macrotis lagotis*).

[46] However, there are wild populations in the west of the planning area, so considered more a restocking than a reintroduction.

Priority fauna

There are 13 priority species of vertebrate fauna within the planning area, including one Priority 2, two Priority 3, eight Priority 4 and two Priority 5 species. These are:

- Priority 2: an undescribed gecko species (*Phyllodactylus* sp. *'Cape Le Grand'*)
- Priority 3: southern death adder (*Acanthopis antarcticus*), Lake Cronin snake (*Paroplocephalus atriceps*)
- Priority 4: western brush wallaby (*Macropus irma*), greater long-eared bat (*Nyctophilus major*), little bittern (*Ixobrychus minutus dubius*), Australian bustard (*Ardeotis australis*), hooded plover (*Charadrius rubricollis*), crested bellbird (*Oreoica gutturalis*), western rosella (*Platycercus icterotis xanthogenys*), white browed babbler (*Pomatostomus superciliosus ashbyi*)
- Priority 5: tammar wallaby (*Macropus eugenii derbianus*), quenda (*Isoodon obesulus fusciventer*).

The hooded plover is priority species of note, it is considered to be Australia's most endangered resident shorebird (Taylor 2013). Sites where 20 or more birds have been sighted over the last five years include Stokes Inlet (Stokes National Park), Carbul, Gidon and Kubitch lakes (proposed additions), Lake Gore (Lake Gore Nature Reserve), Lake Warden (Lake Warden Nature Reserve), Pink Lake (proposed addition) and Station and Mullet lakes (Mullet Lake Nature Reserve) (Raines 2002). Other coastal beach areas within the planning area have supported hooded plovers in the past, but pedestrian and/or vehicle use on the beaches may have already affected hooded plover use (see Section 26 *Visitor access*).

Migratory birds

There are 46 migratory bird species listed under the Bonn convention and/or JAMBA, CAMBA and ROKAMBA agreements recorded in the planning area which are all listed under the Wildlife Conservation Act as well. 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 threatened fleshy-footed shearwater (*Puffinus carneipes*), specially protected 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 specially protected northern giant-petrel (*Macronectes halli*). 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 seven mammals, four birds, nine reptiles and 13 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 (Framenau *et al*. 2008). The narrow-winged sun-moth (*Synemon*. sp. 'Ravensthorpe') is a restricted endemic species found in Nuytsland Nature Reserve near Israelite Bay (A. Williams pers. comm. 2015).

Cape Arid National Park is the eastern limit for 10 Western Australian bird taxa, including the threatened western ground parrot, scarlet robin (*Petroica multicolor*), western spinebill (*Acanthorhynchus superciliosus*) and red-eared firetail (*Stagonopleura oculata*). In addition, 16 reptiles and all (16 species) amphibians found in the planning area are also considered to be at the eastern or western limit of their geographic range.

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

Wetland habitats

The wetlands of the planning area (see Section 12 *Hydrology*) represent a range of habitats including fresh, brackish and saline systems, ephemeral and permanent systems. They support a diverse array of waterbirds which use the sites for feeding, breeding grounds and for refuge in times of drought. Since 2006, the department has conducted annual waterbird counts in selected wetlands of the planning area, and surveys are regularly conducted by BirdLife Australia.

Wetlands in the planning area that are particularly significant for waterbirds include the Lake Gore wetlands (including Carbul, Kubitch and Gidong lakes) and the Esperance Lakes (including Pink Lake, Lake Warden and Woody, Mullet and Ewans lakes) (see Appendix 7). They are internationally significant listed as Ramsar sites and/or identified as Important Bird Areas (IBAs) by BirdLife Australia. Other significant wetlands include Lake Shaster, Stokes Inlet, Roberts Swamp, Lake Mortijinup, unnamed wetlands in Cape Le Grand National Park near Frenchman Peak and Dunns Rock, Benje Benjenup Lake, Big Boom Swamp and Ewarts Swamp (maps 1a and 1b) (see Section 12 *Hydrology* and Appendix 3).

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 Section 30 *Commercial fishing and aquaculture*).

Threats to the wetland habitats of the planning area include vegetation clearing (including the harvesting of tree plantations), agricultural use and semi-rural/peri-urban development in the upper catchment causing salinisation, excessive inundation and increased nutrient loads in the water bodies; weeds; plant diseases; inappropriate fire regimes and off-road vehicle use (see sections 12 *Hydrology*, 18 *Weeds*, 20 *Diseases*, 22 *Fire* and 26 *Visitor access*). These threats have already impacted on the values of the wetland habitats as evidenced by the reduced numbers of birds recorded. If values such as shoreline habitat cannot be restored in the long term, then they may no longer meet the criteria for Ramsar listing (see appendices 6 and 7).

Lake Gore wetlands and Lake Mortijinup

The Lake Gore wetlands are a good example of a system of saline coastal lakes of varied depth and salinity which consist of Gore, Carbul, Kubitch and Gidong lakes and a flow-through system of interconnected lakes to Quallilup Lake on the coast. These lakes have international and national importance as wetland habitats. Lake Gore Nature Reserve and part of the flow-through system within the eastern part of Warrenup Lakes Nature Reserve have been designated as the ‘Lake Gore Ramsar site’.

The Lake Gore Ramsar site is 4,017ha (Lake Gore comprises 740ha) and is a significant migration destination area for migratory shorebirds. Surveys have recorded 60 species (seven breeding) of waterbird within the system, including the great knot, Cape Barren goose, eastern curlew, fairy tern and curlew sandpiper all listed as threatened and 16 species that are listed as specially protected in Western Australia and protected under international treaties (see Appendix 7).

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

The Ramsar site supports approximately one-third of the current estimated global population of the resident shorebird hooded plover (Priority 4) (Wetlands International 2006, DEC 2009b) with sightings of up to 1,570 birds (1995). Lake Gore is identified as the hooded plover's single most important drought refuge site (ANCA 1996, Newbey 1996, Singor 1999, Raines 2002).

The Ramsar site 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).

See Appendix 8 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 shorebird 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). The hooded plover is now sighted more frequently in the proposed additions of Carbul, Kubitch and Gidong lakes than at Lake Gore.

Figure 3 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.

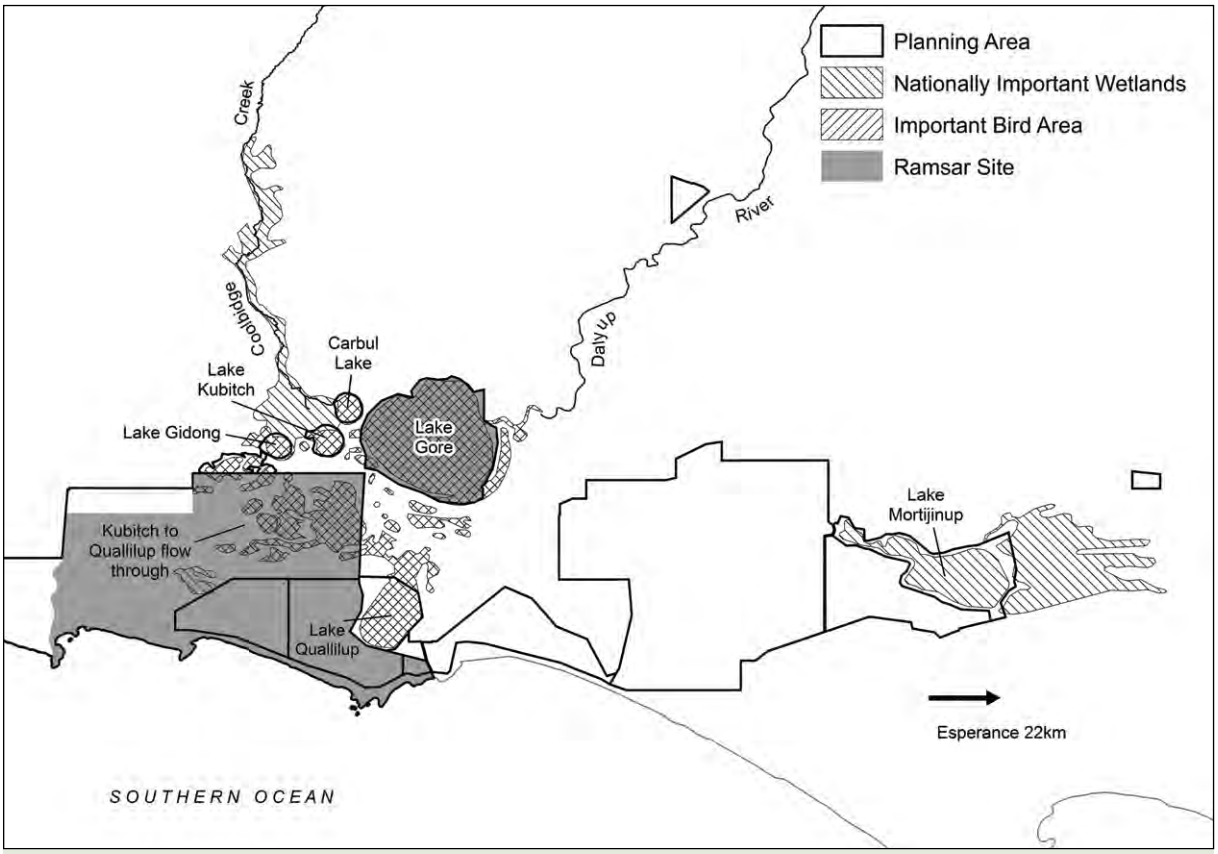


Figure 3. Lake Gore Ramsar site, Lake Gore nationally important wetlands and Lake Mortijinup nationally important wetlands.

The remainder of the Lake Gore wetlands including Gidong, Kubitch and Carbul lakes (unallocated Crown land proposed to be added to Lake Gore Nature Reserve) and Lake Quallilup (a section 5(1)(h) reserve proposed to be added to Stokes National Park) should be added to the Ramsar site as:

- they are part of the 1,500-hectare nationally important wetland system also designated around Lake Gore
- they are part of the Lake Gore IBA
- Lake Quallilup was proposed as an addition to the Ramsar site in Environment Australia (2001a)
- a significant number of hooded plovers have been recorded at Lake Kubitch (more than 1 per cent of the estimated total population) (Bennelongia 2008).

The flow-through system from Carbul, Kubitch and Gidong lakes to Lake Quallilup is across Warrenup Lake Nature Reserve and private property. If the opportunity arises to add the entire flow-through system and Coolbidge Creek to the conservation estate then this should also be progressed.

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 (ANCA 1996, Gilfillan 2000). At least 32 waterbird species have been recorded in the area including six that are listed as specially protected in Western Australia and protected under international treaties.

Lake Warden wetlands

The Lake Warden wetlands are a system of saline lakes and marsh areas behind beach-front dunes to the east of Esperance. The system includes numerous lakes such as Warden, Windabout, Woody, Wheatfield, Station, Mullet and Ewans lakes and together they are sometimes referred to as the ‘Esperance Lakes’.

The Lake Warden wetlands are a unique wetland system within the South-West Coast Drainage Division as although it is connected by a series of surface water channels, their association with each other and the groundwater is variable leading to the formation of three distinct hydrological suites with differing composition and a diversity of habitats.

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) have been designated as the 'Lake Warden System Ramsar site'.

The 2,300-hectare Ramsar site provides important habitat and dry-season refuges for waterbirds, including the great knot, curlew sandpiper and lesser sand plover (all threatened). Surveys have recorded 90 species of waterbird including 29 that are listed as specially protected in Western Australia and protected under international treaties (also all listed under the EPBC Act as 'migratory') (see Appendix 7). More than 30,000 individual waterbirds were recorded using the Lake Warden System between 1981 and 1985 (Jaensch *et al*. 1988).

Lake Warden, Lake Warden Nature Reserve. Photo - Parks and Wildlife

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 Recherche Cape Barren goose and Carnaby's cockatoo (both threatened), have also been recorded within the Lake Warden System and 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. The Lake Warden IBA includes upper catchment areas outside the Ramsar site.

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 9.

Figure 4 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).

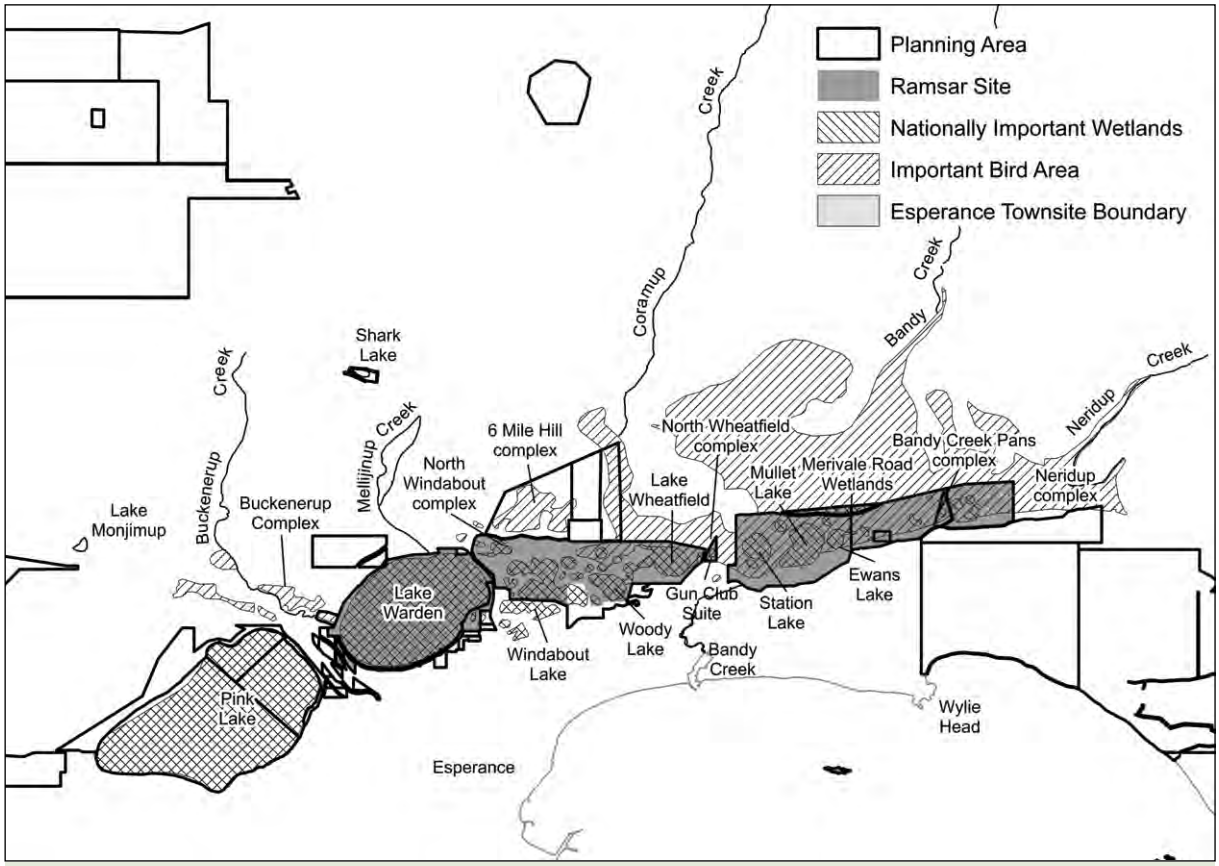


Figure 4. Lake Warden System Ramsar site and Lake Warden nationally important wetlands.

Further surveying of the Lake Gore and Lake Warden System Ramsar sites is required to enable the setting of, and monitoring against, limits of acceptable change (DEC 2009b, DEC 2009c) (see Section 6 *Performance assessment and monitoring* and appendices 6 and 7). 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 (e.g. Pinder *et al*. 2012)
- 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[47]

[47]Aquatic invertebrates are an integral biological component of the Lake Warden Wetland System. In addition to their intrinsic value as a major element of aquatic biodiversity, they are critical to processes such as sediment biogeochemistry, nutrient and carbon cycling and controlling phytoplankton. Invertebrates also constitute the primary food resource for most of the waterbirds that give these wetlands international significance. Pinder *et al.* (2010) suggests a two-pronged approach to aquatic invertebrate monitoring in the Lake Warden System:

1. Continued monitoring of aquatic invertebrate community composition at selected wetlands. This will provide greater understanding of changes in the invertebrate fauna in relation to hydrology, salinity and other factors, including responses to present and future management actions. Priorities should be to monitor responses to the effects of the present drainage system in the Lake Wheatfield to Windabout suite and to collect additional baseline data for wetlands that may be affected by any extension of the engineering works (e.g. Lake Warden).

2. Quantitative determination and monitoring of waterbird (especially wader) invertebrate food resources. The engineering solution to reduce lake depths in the Wheatfield to Windabout wetland suite is expected to expand wader habitat (especially exposed beaches and shallow water zones). The extent to which this increases the abundance (if not the diversity) of waders is also dependent on the amount of aquatic invertebrate food resources. Existing aquatic invertebrate monitoring is adequate for species composition monitoring but inadequate to provide consistent information on changes in abundance and biomass of aquatic invertebrates.

Pinder *et al.* (2010) suggests that the second approach is a priority since it directly relates to the main biodiversity asset (waterbirds) that the current management program is trying to recover.

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

- 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.

Significant wetland habitats within proposed additions include the following:

Pink Lake

Pink Lake has been identified by BirdLife Australia as an IBA because it regularly supports more than one per cent of the global population of banded stilt and usually supports significant numbers of hooded plover (particularly on the salt evaporation ponds). Pink Lake is also listed as 'nationally important' in the *Directory of Important Wetlands in Australia* (Environment Australia 2001a).

Roberts Swamp

Roberts Swamp is an inland wetland contained within a shire reserve approximately 1,700ha in area. The wetland and fringing vegetation communities cover approximately 300ha 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 the priority hooded plover and 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.

Big Boom Swamp

Big Boom Swamp within unvested Crown reserve 28170 (eastern part) adjacent to Cape Le Grand National Park regularly supports more than one per cent of the national population of the threatened Australasian bittern and hence is a significant freshwater wetland in the region.

Inland saline playas

Inland saline playas, such as those in Beaumont Nature Reserve, have high biodiversity values. They support endemic aquatic invertebrates including a number of restricted species of brine shrimp and endemic salt-lake floras, but are poorly surveyed.

Ewarts Swamp

Ewarts Swamp within unallocated Crown land adjacent to Alexander Nature Reserve is also regionally significant as it is the only coastal freshwater swamp east of Cape Le Grand. The threatened Australasian bittern has historically 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 for sediment, nutrients and other pollutants.

The average condition of riparian vegetation within the Recherche subregion (see Section 14 *Biogeographic regions*) 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, fragmentation of remnant vegetation, 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). However, as these river corridors have a high edge to area ratio and involve numerous small tributaries on private property not identified for addition, liaison with neighbouring landowners and community groups will be important in the management of the riparian habitat.

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

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 2007d, 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 long-term climatic impacts of global warming.

The *South Coast Macro Corridor Project*[48] 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 (Wilkins *et. al* 2006). The major vegetation corridor in the planning area is the coastal strip, which stretches across the length of the planning area (Watson and Wilkins 1999, Wilkins *et al*. 2006). The corridor is 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[49].

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, some of which are proposed additions (see Appendix 2; maps 1a and 1b and Section 16 *Native animals and habitats – Riparian zones*). These rivers link the coast through the agricultural areas to the inland remnant vegetation and other conservation reserves (e.g. Young and Lort river corridors link Stokes National Park on the coast to inland Frank Hann and Peak Charles national parks respectively).

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 Arid 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). Granite outcrops are also home to very specialized, endemic species of invertebrate along the south coast (Framenau *et al*. 2008). These animals are characteristically dorso-ventrally flattened for living under granite sheets or rocks which are separating from the monolith.

Threats to granite outcrop communities include weed invasions (especially by freesia [*Freesia* spp.] Greg Keighery pers. comm. 2015), grazing by feral animals such rabbits (*Oryctolagus cuniculus*), inappropriate fire regimes and *Phytophthora* dieback (Gole 2006). In addition, the removal of free granite rocks from granite outcrops leave invertebrates nowhere to shelter. Even the placement of free granite rocks as 'markers' for bushwalkers reduces the habitat for granite fauna and increases competition for the few rocks remaining flat against the monolith. Most of the rocks are placed vertically providing no habitat for invertebrates. Alternatives

[48] A joint project between the department and the South Coast Natural Resource Management group. See www.southcoastnrm.com.au.

[49] 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.

such as painted arrows on the rock face need to be considered to reduce the impact of human disturbance on granite outcrop fauna, including non-invertebrates such as lizards and snakes (Framenau *et al*. 2008).

Karst

The Nullarbor karst system contains a diverse invertebrate fauna that includes obligate subterranean species (troglobites and stygobites). However, no fauna surveys have been made specifically of the karst system within the planning area. The Nullarbor cave fauna in general exhibits a high degree of regional endemism with a unique taxonomic signature, including species, genera and families that are not characteristic of obligate subterranean faunas elsewhere in Australia (Subterranean Ecology 2007).

The caves and dolines are also important for vertebrates, and they are a critical habitat for some species of birds and bats which roost and breed inside them (Subterranean Ecology 2007). Direct threats to the Nullarbor karst are mostly due to human physical interaction with caves but other impacts include vegetation reduced organic inputs beneath areas of cleared vegetation, vibration disturbance from road traffic, habitat fragmentation, weeds in dolines and increased erosion from introduced animals destroying flora.

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 black-flanked rock-wallaby (the only insular population of the wallaby south of the Pilbara), threatened Recherche rock-wallaby (endemic to the Recherche Archipelago), tammar wallaby (Priority 5), threatened Recherche subspecies of the Cape Barren goose with Cull Island being the main breeding island for the bird and various species of reptiles including the threatened Recherche dugite and the carpet python (*Morelia spilota imbricata*).

Recherche rock-wallaby, Westall Island, Recherche Archipelago Nature Reserve. Photo - Emma Adams

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-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 fauna[50] such as the threatened Australian sea-lion and specially protected New Zealand fur-seal. Pinniped breeding and haul-out sites[51] 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,

[50] 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.

[51] 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.

particularly during the breeding season. As the Australian sea-lion has not recovered from past hunting practices and has a complicated reproductive biology and life history (see photo caption for Australian sea-lion page 33), it is even more vulnerable than the New Zealand fur-seal to human disturbance and local extinction of breeding colonies (DESEWPC 2013).

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.

Even though access is already physically difficult to the islands within the planning area, islands, or portions of islands should be considered for prohibited area status under section 62(1) of the CALM Act (see Section 26 *Visitor Access*). In particular, islands that:

1. support major breeding colonies of pinnipeds and/or seabirds
2. are important haul-out sites
3. are otherwise considered vulnerable to human disturbance.

This would include (but is not limited to) the following islands:

- breeding sites (at least 17 islands) of the Australian sea-lion, in particular Investigator, Kimberley, Salisbury and Six Mile islands (key monitoring sites)
- Daw Island (possible breeding site for Australian sea-lion impacted by former use of the island for commercial fisherman [Gales 1994])
- breeding sites (at least 14 islands) of the New Zealand fur-seal, in particular Seal Rock and Investigator, Hood, Salisbury, Daw, New Year and Cooper islands (identified as important breeding sites by Shaughnessy (1990) and key monitoring sites)
- Termination, Little and Pointer islands (important haul-out sites for New Zealand fur-seal [Shaughnessy 1990, Shaughnessy *et al.* 1994])
- Woody Island (beaches frequented by little penguins and breeding areas of the fleshy-footed shearwater).

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

All the reserves along the coast and the islands are reserved to the low water mark (apart from Mullet Lake and Investigator Island nature reserves). This means that the planning area includes a large area of intertidal zone habitat. 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 (e.g. osprey and sea eagles). Many of these are protected by international agreements such as JAMBA, CAMBA and the Bonn Convention (see sections 4 *Legislative*

Black-faced cormorant (*Phalacrocoras fuscescens*), Recherche Archipelago Nature Reserve. Photo - Aberline Attwood

framework – International conservation agreements and 16 *Native animals and habitats – Fauna of conservation significance*). 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 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. Develop, revise and/or implement recovery plans for threatened fauna.
4. Target actions for managing threats such as weeds, introduced animals, disease and inappropriate fire regimes to protect fauna of conservation significance and significant habitats.
5. 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 and breeding sites.
7. Improve the information base on behavioural ecology, trophic interactions and foraging ecology of pinnipeds.
8. Control human 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.
9. Through information, interpretation and education products and programs promote the conservation of native fauna species and their habitats, giving particular consideration to wetlands, granite outcrops and island habitats.
10. Develop and provide information to boat users to promote an understanding of the pinniped and seabird conservation issues of the Recherche Archipelago and to emphasise the importance of minimising disturbance to colonies during visits to the archipelago, in particular avoiding Australian sea-lion breeding colonies.
11. Conduct surveys of possible habitat areas of threatened fauna to determine distribution (such as targeted surveys for bilbies, malleefowl, western ground parrot and Australasian bittern).
12. Reintroduce fauna into areas where they are known to have formerly occurred, once threatening processes such as introduced predators have been identified and adequately controlled, and monitor populations.
13. Clarify population numbers, distribution and health of translocated black-flanked rock-wallabies in Cape Le Grand National Park.
14. Assess proposed operations and developments for potential impacts on conservation significant species and habitats.
15. Undertake or support assessment of vegetation communities and condition of the wetland and poorly known areas.
16. Undertake or support surveys of Lake Gore and Lake Warden Ramsar sites to enable the setting of, and

monitoring against, biological limits of acceptable change and the management trigger values and to address biological knowledge gaps.

17. Add the remainder of the Lake Gore wetlands (Gidong, Kubitch, Carbul and Quallilup lakes) to the Ramsar listing.
18. Amend the boundaries of the Ramsar sites as appropriate, for example when adjacent areas are added to the conservation estate.
19. Incorporate proposed additions to the conservation estate that contain threatened or conservation significant fauna or their potential habitats, or provide significant vegetation corridors (or 'stepping stone' linkages) (see Appendix 2).
20. Add portions of the Oldfield, Munglinup, Young and Lort river corridors to the conservation estate (see Appendix 2).
21. Liaise with and support neighbouring landholders and natural resource management groups to improve catchment quality and maintain, fence and revegetate rivers corridors within the catchments of the planning area.
22. Research the requirements of short-range endemic invertebrates to determine habitat requirements and monitor available free granite rock habitats on granite outcrops.
23. Undertake fauna surveys of the karst areas in the Mardabilla and Israelite plains areas of the Nullarbor Karst.
24. Add the four unnamed islands south of Lake Shaster Nature Reserve to the conservation estate (see Appendix 2).
25. Add private property and/or shire reserves as opportunity arises to the conservation estate that would protect significant habitats such as wetlands, riparian zones, vegetation corridors, granite outcrops and intertidal zones.

Key performance indicators

Performance measure	Target	Reporting
Composition and abundance of native fauna communities within the Ramsar wetlands	Maintain or improve baseline composition and abundance	Every 3 years
Biological limits of acceptable change for Ramsar wetlands	Limits of acceptable change (or interim limits) are not exceeded	Every 3 years or as per appendices 6 and 7
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 within the planning area	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 species due to action or inaction within the planning area b) 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 are three threatened ecological communities (TECs) in the planning area. The 'Subtropical and temperate coastal saltmarsh' listed in August 2013 as 'vulnerable' and protected under the Commonwealth EPBC Act. The 'Proteaceae dominated kwongkan shrublands of the southeast coastal floristic province of Western Australia'

listed in February 2014 as 'endangered' and protected under the Commonwealth EPBC Act. The 'Russell Range mixed thicket vegetation complex' which is a sub-unit of the Proteaceae dominated kwongkan shrubland and is included in the listing advice for the kwongkan shrublands but is also listed as a separate state-endorsed TEC.

Coastal Saltmarsh

The coastal regions of southern Australia, in particular areas near the mouths of estuaries, contain salt-adapted vegetation known as coastal saltmarsh. Although the saltmarsh areas may appear to be rather barren and harsh environments, they can be damaged by threats including harbour developments, infilling for housing, changes to drainage and water quality, and weed invasion. Coastal saltmarsh vegetation is recognised nationally and globally as an ecosystem of high ecological value that is increasingly under threat. In Western Australia, the coastal saltmarsh generally occurs in a narrow coastal margin in subtropical and temperate zones – south of the Tropic of Capricorn (23° south latitude). The boundaries of Western Australia's coastal saltmarsh are not well documented, but it is estimated that there is about 2,000-3,000ha of saltmarsh in southern Western Australia and that about half of the vegetation type has been lost to date.

The coastal saltmarsh vegetation provides very useful services in maintaining the coastal habitat in healthy condition. These include filtering water as it flows towards the ocean, providing a fish nursery habitat and food and nutrients for fauna, and helping buffer coastlines from damaging winds and wave action. The coastal saltmarsh occurs in coastal areas under tidal influence. It mainly occurs associated with sandy or muddy shorelines of estuaries and embayments and some open coasts not subject to high-level wave activity. It can also occur on near-coastal islands. The flora that occurs in Western Australia's coastal saltmarsh is richer than has been recorded in other states of Australia and mainly includes salt-tolerant vegetation (halophytes) such as grasses, herbs, reeds, sedges, and shrubs. The two most common plant families are salt bushes (Chenopodiaceae) and the grasses (Poaceae).

Within the planning area, the Coastal Saltmarsh TEC is known to occur around Poison Creek in Cape Arid and other inlets[52] towards Esperance, and around the inlet at Barker Inlet, but the largest area is around Stokes Inlet. These areas have not yet been included in the mapping for the TEC, but should be added using information from ground surveys and previous work such as Hodgkin and Clark (1989).

Hodgkin and Clark (1989) described saltmarsh within the planning area and adjacent shire reserves:

- Oldfield River Inlet (*Melaleuca cuticularis* over *Baumea juncea* and *Casuarina obesa*)
- Torradup Inlet (*Melaleuca cuticularis* over *Juncus krausssii* and sandy flats with *Wilsonia*/*Juncus*/*Ficinia* and *Sarcocornia*)
- Stokes Inlet (*Sarcocornia quiqueflora*, *Melaleuca cuticularis* woodland over *Ficinia nodosa*)
- Barker Inlet (*Melaleuca cuticularis* over *Gahnia trifida*, the western shore with saltmarsh of *Tecticornia pergranulata*, *Suaeda*/*Melaleuca cuticularis* and *Juncus kraussii*)
- Dailey River mouth (*Juncus kraussii* sedgeland)
- Mungliginup Creek mouth, Alexander River, Blackboy Creek, Thomas River, Jornadee Creek and Poison Creek (*Suaeda*/*Juncus kraussii*/samphires).

The *Conservation Advice* (TSSC 2013) for subtropical and temperate coastal saltmarsh requires that a recovery plan is prepared.

Kwongkan

The Proteaceae dominated kwongkan shrubland is mapped as occurring widely across the planning area but has undergone a severe reduction in integrity (51 per cent of its original extent has been cleared) and has a fragmented geographic distribution. The approximate mapped extent of the TEC (as mapped by the Commonwealth Department of Environment) covers over one million hectares with over 353,000 hectares within the planning area. This equates to 30 per cent of the approximate mapped extent of the TEC covering 35 per cent of the planning area.

[52] Samphire scrublands, for example at the Esperance Lakes, not under tidal influence are excluded from the TEC.

Specifically within the planning area, 29 per cent of the national parks are mapped as Kwongkan TEC (although Cape Le Grand National Park is 74 per cent Kwongkan TEC), 58 per cent of nature reserves, 88 per cent of miscellaneous reserves[53] and 23 per cent of the proposed additions (94 per cent of reserve 28170 is mapped as Kwongkan TEC). These figures do not include the Recherche Archipelago as although the TEC is likely to occur on the islands they would not have sufficient cover of Proteaceae to qualify.

The planning area will protect a significant portion of the areas mapped as the TEC (once all the proposed additions are added to the conservation estate, see Appendix 2) and this means that any management action within the planning area has the potential to significantly impact on the TEC.

The remaining areas of the TEC are vulnerable to the impacts of *Phytophthora*, changing fire regimes[54], land clearing, weed species and climate change (TSSC 2014). The ecological community provides habitat for threatened fauna in the planning area such as malleefowl, western ground parrot, Carnaby's cockatoo, peregrine falcon, Recherche rock-wallaby, black-flanked rock-wallaby, woylie, carpet python, Recherche dugite and Sarah's pill millipede.

The *Approved Conservation Advice* (TSSC 2014) for the Proteaceae dominated kwongkan shrubland does not recommend a specific recovery plan for the ecological community at this time but it does list priority conservation actions including research and monitoring priorities and threat abatement actions. Listing under the EPBC Act means that any activity (e.g. prescribed burning or constructing roads) that may have a significant impact on the ecological community (including off conservation estate) will need to be referred to the Commonwealth for environmental impact assessment and approval.

Russell Range

The 'Russell Range mixed thicket vegetation complex' state-endorsed TEC is an endemic community that has five occurrences with a range of less than 50km^2 across Cape Arid National Park and Nuytsland Nature Reserve. The community 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 is one priority ecological community (PEC) within the planning area. PECs are ecological communities that do not meet survey criteria or that are not adequately defined.

Pink Lake microbialite community

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. Parts of the lake are being degraded by recreational activities such as four-wheel driving, horse riding and land yachting resulting in crushing of some of the microbialite structures. It is proposed to add Pink Lake, including the ex-salt mining lease to Pink Lake Nature Reserve. The small salt mining operation in the north-east end of the lake had various impacts to the lake as salt mining and salt dams destroy the natural lakebed surface, remove substrate, and modify the hydrology (see Section 12 *Hydrology – Altered hydrology*). The closure of the salt mining operation now provides the opportunity for the hydrology of the lake to be recovered and for the microbialite structures to form again. In the short to medium term, the salt dams will be retained to prevent any

[53] Helms Forestry Reserve contains mostly remnant Kwongkan TEC and these parts are proposed to be changed to Nature Reserve (Table 1).

[54] Requirements for fire frequencies vary within the ecological community, however a long fire-free interval (>15-25 years) is required for much of the community (Barrett *et al.* 2009 cited in TSSC 2014).

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

further earthworks damaging the community and provide opportunity for research to be undertaken with regards to the hydrological requirements of the PEC. The addition of the entire Pink Lake to the adjoining Nature Reserve will aid in the protection of the PEC.

Similar microbialite structures have been found in Lake Hillier[55] on Middle Island and research into both these lakes will assist in management of the PEC.

Desired outcome

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

Management actions

1. Implement the priority conservation actions from the *Conservation Advice* for the Coastal Saltmarsh TEC (TSSC 2013).
2. Map boundaries and prepare species lists of the Coastal Saltmarsh TEC within the planning area and provide to the Commonwealth, through on-ground surveys and previous work.
3. Implement the priority conservation actions from the *Approved Conservation Advice* for the Proteaceae dominated kwongkan shrubland TEC (TSSC 2014).
4. Verify boundaries and condition of the Proteaceae dominated kwongkan shrubland TEC, through on-ground surveys.
5. Undertake baseline surveys and develop an interim recovery plan for the Russell Range TEC.
6. 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.
7. Exclude vehicle use along the dry margins of Pink Lake after the lake is added to the conservation estate.
8. Investigate and assess microbialite structures in Lake Hillier on Middle Island.
9. Incorporate proposed additions to the conservation estate that contain the Kwongkan and Coastal Saltmarsh

[55] Samples have been taken from Lake Hiller as part of the extreme microbiome project (www.extrememicrobiome.org). The aim of this project is to work out the best methods to use when studying microbial life in these environments (i.e. methods of sampling and DNA extraction, DNA sequencing, and bioinformatics approaches), as well as to reveal insights into the environments themselves. The samples taken at Lake Hiller will identify and characterise the genomes of microbes that exist (including *D. salina* and the halophilic archea known to inhabit salt lakes), and provide a genetic fingerprint of that unique microbial community.

TECs (see Appendix 2).

10. Change the majority of Helms Forestry Reserve to nature reserve to protect remnant vegetation including the Kwongkan TEC.
11. Monitor species composition and habitat parameters in known threatened and priority ecological communities and set limits for acceptable change, taking into account and recording variation due to natural causes.
12. Control weed species that impact on the threatened and priority ecological communities.
13. Identify and protect threatened and priority ecological communities by seeking to list them under state and/or Commonwealth legislation as appropriate.
14. 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).
15. Promote the conservation of threatened and priority ecological communities, through information, interpretation and education products and programs.

Key performance indicator

Performance measure	Target	Reporting
Species composition and habitat of threatened and priority ecological communities	No change in the species composition or habitat parameters from 2016, outside specified limits in known threatened and priority ecological communities	Every 5 years

18. Weeds

There are 157 taxa of introduced plants, non-native to Western Australia, recorded in the planning area which are considered weeds[56] (see Appendix 10).

Removal of Victorian tea tree (*Leptospermum laevigatum*) from Woody Lake Nature Reserve. Photo - Mick Rose/Parks and Wildlife

Compared to the mainland reserves, weed 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 (e.g. Woody [54 taxa], Boxer [30], Middle [24], Figure of Eight [18] and Mondrain [20]). Past European settlement on Cull Island is responsible for the domination of African boxthorn (*Lycium ferrocissium*) on the island. New weeds on islands will continue to arrive as visitation continues. For example, five new weed records for Daw Island were noted after the *Sanko Harvest* oil spill (Keighery 1995). While some of these weeds will not persist, the constant re-introductions suggest that any program to reduce weed impacts on the islands needs to focus on monitoring access sites (Lohr and Keighery 2014).

State and regional context

Environmental Weed Strategy of Western Australia

The *Environmental Weed Strategy of Western Australia* (CALM 1999b) provides a ranking of threat of weed

[56] Weeds are unwanted plant species growing in natural ecosystems that modify natural processes, usually adversely, resulting in the decline of the communities they invade.

species on a statewide basis against three criteria – invasiveness, distribution and environmental impacts. Eighty-one of the known introduced plants in the planning area have been rated as having high (12) or moderate (68) impact.

Regional weed prioritisation

In 2008, the department commenced the *Invasive Plant Prioritisation Process*[57] 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. This process is updated every two years. Following the 2014 prioritisation for the South Coast region, 13 of the known introduced plants in the planning area have been identified as regionally significant weeds: Geraldton carnation weed (*Euphorbia terracina*), golden wattle (*Acacia pycnantha*), cretan weed (*Hedypnois rhagadioloides*), *Juncus microcephalus*, Victorian tea tree (*Leptospermum laevigatum*), African box-thorn, bungle lily watsonia (*Watsonia meriana* var. *bulbillifera*), Paterson's curse (*Echium plantagineum*), googegrass (*Galium aparine*), narrowleaf cottonbush (*Gomphocarpus fruticosus*), *Lycopersicon esculentum*, tree mallow (*Malva arborea*) and blackberry (*Rubus laudatus*).

Management of these weeds (i.e. eradication, control and/or monitoring) within the planning area will be considered in the context of local priorities. Equally, local information for the planning area will need to feed back into the regional assessment reviews.

South coast island ecosystem

Several weeds have been identified that pose the greatest threat to the integrity of the south coast island ecosystem (Lohr and Keighery 2014) including bridal creeper (*Asparagus asparagoides*), sea spurge (*Euphorbia paralias*), goosegrass, African boxthorn and the annual grasses *Avena*, *Bromus*, *Ehrharta*, *Hordeum*, *Lolium* and *Vulpia* (see Appendix 10).

Local priorities

Current local priorities for the planning area, based on State and regional priorities and local impact and feasibility of control include: bridal creeper, African boxthorn, Victorian tea tree, freesia, maritime pine wildlings (*Pinus pinaster*) and golden wattle. These will be the focus of weed control programs in the planning area, although management of weeds will be adaptive during the life of the plan.

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 150ha)
- Moir Homestead (25ha)
- Cape Arid National Park (the Thomas River Valley, the Ranger's residence and Thomas River camping area)
- 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.

[57] South Coast regional weed assessment www.dpaw.wa.gov.au/plants-and-animals/plants/weeds/156-how-does-dpaw-manage-weeds.

African boxthorn, Victorian tea tree and freesia

African boxthorn, Victorian tea tree and freesia are also significant weeds in the planning area. They are becoming the dominant species in some areas, out-competing the native species especially after intense bushfires (e.g. 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 and Sandy Hook islands in Recherche Archipelago Nature Reserve and also occurs on North Twin Peak, Boxer and Figure of Eight islands as well as 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, Cape Le Grand National Park and Cape Arid National Park. Control of Victorian tea tree is extremely labour intensive (cut and paint stumps) which is not very efficient 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 and peri-urban/semi-rural landscapes, and is exacerbated by disturbance events such as fire. There are 41 taxa of weeds within 2km of the planning area that are not yet recorded within the planning area (see Appendix 10), therefore the spread of these weeds requires monitoring and control as necessary.

Island biosecurity

It will be important to maintain the integrity of natural barriers to weed dispersal through biosecurity protocols and enforcement to minimise new weed introductions to the islands and decrease future costs associated with active management of established populations (Lohr and Keighery 2014). Islands that have not been surveyed or lack recent data should be surveyed to assess weed populations. Priority should be given to islands with high conservation value and those adjacent to islands with populations of high-priority weeds.

Desired outcome

Impacts of weeds on key values are minimised.

Management actions

1. 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.
2. Control weeds using various techniques including physical removal, burning piles after felling of larger species with the aim to destroy canopy seed, herbicides and release of biological control agents in accordance with the species, its environmental impact and the resources available, consistent with State and regional context and local priorities, with local priorities the main focus (see Appendix 10).
3. Monitor effectiveness of weed control within the planning area e.g. Victorian tea tree control at Warrenup Lake system in Nature Reserve 26885.
4. Liaise with adjacent landholders including rural and peri-urban/semi-rural, other agencies and community groups to implement measures to prevent weeds from adjacent areas establishing within the planning area.
5. 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
   - raising public awareness to the significance and identification of environment weeds and promoting appropriate hygiene practices.
6. Monitor the islands to ensure biosecurity is maintained and develop protocols and contingency plans to eradicate new weed introductions rapidly.

Key performance indicator

Performance measure	Target	Reporting
The extent of environmental weed species at priority locations rated as 'high', 'moderate' or local priority	Decrease in the extent of weed species rated as 'high', 'moderate' or local priority from 2016 levels	After 5 years

19. Introduced and other problem animals

Introduced and other problem[58] 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*), feral 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*)[59], horse (*Equus caballus*)[60], camel (*Camelus*

[58] 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.

[59] Since 1953, it has been assumed that the introduced black rat occurred on Woody Island (Goodsell *et al.* 1976), and that the native bush rat (*Rattus fuscipes*) was locally extinct. However, recent trapping and identification, including sequencing of mitochondrial DNA, has confirmed that all the rats on Woody Island are native bush rats (Burbidge *et al.* 2011). The apparent misidentification of the 1950 specimen and failure to collect vouchers since has led to unforeseen consequences, including a proposal to eradicate the *Rattus* population. There are also historical records of black rats on Boxer and North Twin Peak islands in the Recherche Archipelago Nature Reserve, however it has also been confirmed that the rat on North Twin Peak is also the native bush rat. At this stage it is unknown which rat is present on Boxer Island.

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

dromedarius), sheep (*Ovis aries*), wild dog (*Canis familiaris*), starling (*Sturnus vulgaris*)[61] 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.

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

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 program[62] which included aerial and ground baiting targeting foxes up to four times a year. This program has now been extended to include baiting for feral cats using *Eradicat*® and is known in the South Coast region as the *South Coast Integrated Fauna Recovery Program*. Myxomatosis, and more recently calicivirus, is used by the Department of Agriculture and Food to control rabbit populations in the region (Parks and Wildlife undertakes no direct rabbit control work in the planning area).

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 *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 native bush rats on Woody Island tends 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 find the ash-grey mouse on the island have been unsuccessful.

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, 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 the conservation estate can be issued by the department where numbers are confirmed to be 'excessive'[63].

[61] Starlings have been sighted within 2km 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.

[62] *Western Shield* fauna recovery program www.dpaw.wa.gov.au/management/pests-diseases/westernshield.

[63] For more information refer to *Fauna Notes No. 30 Western Grey Kangaroo Management Plan* www.dpaw.wa.gov.au/images/documents/plants-animals/animals/kangaroos/30_grey_kangaroo_plan.pdf.

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. Control introduced animals elsewhere in the planning area as required.
4. Monitor the islands to ensure biosecurity is maintained and develop protocols and contingency plans to enable rapid intervention if an exotic introduction is detected.
5. Remove goats on Cull Island in conjunction with African boxthorn removal and monitor effects on the Recherche Cape Barren geese habitat.
6. Undertake further surveys of Boxer Island to determine whether the black rat is present on the island.
7. Raise public awareness to the significance and impact of introducing exotic animals onto the islands.

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 Park[64], Warrenup Lakes Nature Reserve, 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 *Project Dieback*, 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. 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).

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*.

[64] In addition to *P. cinnamomi* in a small area in the north west corner, there has also been *P. multivora* and *P. cryptogea* found within the national park.

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

Phytophthora infestations[65] have been established in Cape Arid National Park for 40 to 50 years, causing significant damage to 50 per cent of near-coastal[66] 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 once-common 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 *Phytophthora* dieback 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.

Management to protect threatened species and communities from *Phytophthora* will include treatment with the chemical 'phosphite'. This has been shown to trigger the plants' own immune response to be better able to

[65] In addition to *P. cinnamomi* there has also been *P. multivora*, *P. cryptogea* and several other *Phytophthora* spp. located within Cape Arid National Park (DEC 2009a).

[66] Within 5km of the coast.

ward off the disease, 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 the largest area of susceptible vegetation and it is near Cape Le Grand National Park, where there has been the most impact. Recently, 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, 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 spot infestations on Telegraph Track west of 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
- seasonally closed tracks
- erected new dieback interpretation signage in each coastal national park, at the Esperance works depot and at the commercial carwash in Esperance
- initiated a Green Card training program for departmental staff and contractors.

The threatened western ground parrot occurs in only two areas in Western Australia, one in Fitzgerald National Park and the other in Cape Arid National Park and adjoining Nuytsland Nature Reserve. In Cape Arid National Park, the western ground parrot habitat is highly susceptible to *Phytophthora* disease. Therefore, as a precautionary measure, public access along Telegraph Track between Poison Creek Road and Pasley management access track will be closed as Poison Creek Track is infected with *Phytophthora* and Telegraph Track contains several creek crossings (two of these are currently infested pers. comm. Greg Freebury 2015) and adjacent populations of western ground parrot. This area will also be designated a ‘Plant Disease Risk Area’ under section 53 of the CALM Act. Alternate public access to Bellinger Island and Point Malcolm recreation sites will be provided via Fisheries Road, Pasley Track (to be re-opened to the public) and the eastern portion of

Telegraph Track. This route will still be seasonally closed in wet conditions as is the current Poison Creek Track and Telegraph Track route. In addition, research will continue on the relationship between *Phytophthora* and the habitat requirements of the western ground parrot, including the impact on food supply and habitat suitability.

Bushfires in 2006 killed the *Phytophthora*-infested showy banksia woodland and mallee shrubland in the Thomas River area of Cape Arid National Park. Now 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 camping area. 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 camping area (Smith and Grant 2000).

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 Lake Shaster Nature Reserve as far east as Cape Arid National Park. Stokes National Park has the most extensive areas of *A. luteobubalina* in the planning area (Greg Freebury pers. comm. 2015). Other 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 camping area.

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

Pinniped diseases

The tendency of some pinniped species to form aggregations on islands and, in some cases, at sea near haul-out sites, provides good opportunities for transmission of infectious diseases. A wide range of pinniped diseases has been diagnosed from post-mortems of sea-lion and fur-seals in Western Australia (Mawson and Coughran 1999), including tuberculosis (*Mycobacterium tuberculosis* complex specifically *Mycobacterium pinnipedii*). The prevalence of tuberculosis in Australian seals is unknown but is likely to be low according to the peak body Wildlife Health Australia[67]. It is also unclear whether tuberculosis has always been endemic in pinniped populations or if the disease was introduced from cattle (Cousins *et al*. 1993).

M. pinnipedii is capable of infecting humans and other mammals so appropriate protective measures should be adopted by those at risk of infection to prevent and monitor transmission (Cousins *et al*. 1993). Groups at most risk of infection from seals are those that have close contact and/or contact of a prolonged duration with infected animals. Such groups include staff working in facilities holding captive pinnipeds particularly those that accept wild seals for treatment and rehabilitation. Other groups potentially at risk are research scientists working

[67] Wildlife Health Australia maintains the national electronic Wildlife Health Information System database, a web-enabled, secure database capturing information relating to wildlife health surveillance and disease investigation in Australia as well as providing fact sheets on wildlife diseases.

with wild pinnipeds and wildlife officers who may handle infected animals. Staff working closely with seals in captive and rehabilitation facilities should be monitored at regular intervals for exposure to *M. tuberculosis* complex bacteria. Appropriate personal protection (e.g. gloves, protective clothing and mask) should be employed when conducting post mortem examinations on pinnipeds (Australian Wildlife Health Network 2010).

Amphibian chytrid fungus

Amphibians are 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. 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 and departmental staff 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 potential future spread of *Phytophthora* and identify and establish ‘protectable areas’.
5. 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 (e.g. 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. Undertake or support existing research, mapping and monitoring and control methods for *Phytophthora cinnamomi* (or dieback from other plant pathogens, such as *P. multivora* or aerial canker-causing fungi).
9. Identify, evaluate and, where practical, implement effective and efficient measures such as phosphite treatment for the maintenance and/or restoration of significantly infested areas.
10. Close public access along Telegraph Track between Poison Creek Track and Pasley management access track and provide alternate access to Bellinger Island and Point Malcolm.
11. Determine the relationship between *Phytophthora* and the habitat requirements of the western ground parrot.
12. Resurvey soil and vegetation in the Thomas River area in Cape Arid National Park to determine whether engineering works to divert drainage away from Thomas River camping area is required.
13. Restrict movement of *A. luteobubalina* by establishing quarantine areas depending on scale of infestation.
14. Document any outbreaks of new plant and animal diseases, and implement management responses as appropriate.
15. Implement appropriate protective measures when handling wild pinnipeds or animals with a potential infectious disease and monitor staff for exposure to animal diseases.
16. Implement appropriate quarantine measures when undertaking works in or adjacent to known frog sites to minimise spread of amphibian chytrid fungus.
17. Provide the public and industry (e.g. utility service providers) with information about plant and animal diseases, emphasising the need for appropriate hygiene measures when working or recreating in natural areas and to stay on approved roads and tracks.
18. 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	Target	Reporting
Infested areas within any identified protectable areas that are a priority for protection	No new human-assisted infestations of *Phytophthora* in any identified protectable areas that are a priority for protection	Every 5 years

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, introduced pests, land-based run-off and/or bilge pumping.

Ship spills

The biggest incidence of marine pollution in the planning area occurred in 1991, when the *Sanko Harvest* hit a reef 10km 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 30km to the east and west of Esperance was partly or completely covered in oil, including nearly 25km 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[68] 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. Pacific gulls (*Larus pacificus*) and other seabirds in the area were also treated to remove oil contamination of their feathers.

The *Western Australian oiled wildlife response plan* (Parks and Wildlife and AMOSC 2014) sets out guidance and best practice procedures for oiled wildlife response agencies, including both the department and the petroleum industry, as to the approach to an oiled wildlife marine pollution incident in WA. Sitting beneath and providing a regional context and detail for the State plan will be a south coast regional operational plan, corresponding to the departmental regional boundary that will apply to the planning area. The regional plan will outline detailed 'on ground' regional information required to carry out an oiled wildlife response, including wildlife values, high-risk wildlife areas, identified oiled wildlife facilities, equipment, resource and contact lists.

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

Marine debris

Injury and fatality to vertebrate marine life (e.g. 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). The *Threat Abatement Plan for the Impact of Marine Debris on Vertebrate Marine Life* (DEWHA

[68] 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.

2009) provides a framework for the abatement of injury and fatality to marine species caused by harmful marine debris, however the most effective way to reduce the impacts of marine debris remains to prevent it entering the marine environment.

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 in line with *Australia's National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances* (AMSA 2007) and the State plan (Parks and Wildlife and AMOSC 2014).
2. Undertake an annual practical or desktop exercise of the regional response plan.
3. Educate visitors to the marine area and adjacent areas on preventing marine pollution and the damaging impacts of marine pollution.

22. Fire

The appropriate management of fire is integral to the department's activities and core management responsibilities. Inappropriate fire regimes[69] 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, DPaW 2015b). 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

Lightning strikes are the most common source of ignition for known bushfire in the planning area. The bushfire history of the planning area for the last 15 complete fire seasons is shown in Table 2. Over this period, lightning strikes caused 369,684ha of the planning area to be burnt in bushfire, which accounts for 95% of the burnt area (although the same area may have burnt multiple times).

Table 2. Bushfire history within the planning area July 2000 to June 2015

Fire season	Existing reserves	Proposed reserves	Total planning area	
	Area burnt* (Ha)	Area burnt* (Ha)	Number of fires	Area burnt* (Ha)
2014/15	38	145	4	183
2013/14	3,540	0	5	3,540
2012/13	287	25	2	312
2011/12	476	1,604	6	2,080
2010/11	7,178	2,575	5	9,759
2009/10	10,344	762	>11	11,106
2008/09	4,490	1,287	5	5,777
2007/08	2,058	112	>4	2,170
2006/07	17,082	36,925	>21	54,007
2005/06	11,871	8,072	>3	19,943
2004/05	25,028	12,928	>12	37,956

[69] 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).

2003/04	2,252	1,035	>11	3,287
2002/03	153,515	32,477	>6	185,992
2001/02	2,178	3,639	>11	5,817
2000/01	41,959	5,573	>11	47,532
TOTAL	282,302	107,159	>117	389,461

• Note: These bushfires may extend further than the extent of the planning area and bushfires in remote areas are not always recorded, especially if no departmental response is required. The areas are calculated from departmental fire shapes and are an approximation of area burnt, for example they do not take into account patchiness of burns.

October and November 2015 complex bushfires

In October and November 2015, a complex of bushfires across the inland agricultural areas, Esperance Lakes and Cape Arid National Park, ignited by lightning, burnt over 21 per cent of the planning area. These fires burnt 187,313ha of existing reserves (including 122,546ha of Cape Arid National Park and 53,768ha of Nuytsland Nature Reserve) and 27,614ha of proposed additions (including 6,592ha of Kangawarrie and 6,095ha of the unallocated Crown land adjacent to Peak Charles National Park).

Close to 100 per cent of some inland nature reserves were burnt such as Truslove North, Kendal Road, Nature Reserve 43949, Bishops and Truslove Townsite. As well as some proposed additions such as additions to Truslove Townsite Nature Reserve, Roberts Swamp, additions to Mullet Lake Nature Reserve, additions to Cape Le Grand National Park and Lort River corridor. Mullet Lake Nature Reserve, part of the Lake Warden System Ramsar site was burnt 65 per cent.

The area of the planning area burnt in these complexes (214,932ha) when compared to the area burnt in the previous 15 years (389,461ha which may include overlapping burns) highlights the unprecedented extent of these bushfires within the planning area.

Previously, the last major fires across the planning area were in 2006 when large parts of Stokes, Cape Le Grand and Cape Arid national parks were burnt (8,430ha of vegetation was burned). Impacts included the loss of visitor facilities and infrastructure, the closure of camp sites and walk trails (although most have since been rebuilt) and a temporary loss of visual amenity in the affected areas. Whereas these fires had major impacts on the recreational values and facilities of the planning area, the 2015 fires have mainly impacted conservation values of the planning area with some recreational facilities lost in the Seal Creek and Poison Creek area of Cape Arid National Park in the October fires (see Section 27 *Visitor Activities*).

Recovery planning from the fires will include assessment of the areas burnt and appropriate action to rehabilitate areas. Immediate action has already taken place to fence the primary dune system from Jorndee to Sandy Bight in Cape Arid National Park with areas within Mullet Lake Nature Reserve also likely. Emergency cat predator baiting has also been undertaken in Cape Arid National Park to protect any remaining western ground parrots (see Section 16 *Native animals and habitats – Fauna of conservation significance*). Conservation values to be taken into account include:

- significant vegetation complexes
- Kwongkan TEC
- threatened and priority flora and fauna (including threatened invertebrates)

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 - Parks and Wildlife

- western ground parrot habitat
- international and nationally significant wetlands
- connectivity and vegetation corridors
- wilderness.

Islands

The islands of the Recherche Archipelago usually have longer fire-free periods[70] 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).

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 that feature sustained, high-frequency burning or infrequent but large, intense fires are more likely to be the most damaging to biodiversity values compared with more moderate, intermediate regimes that feature smaller and more mild fires (Burrows and Friend 1998, Burrows and Wardell-Johnson 2003).

Typically, sensitive species are associated with moister parts of the landscape (e.g. wetlands and riparian corridors) or areas with discontinuous vegetation (e.g. 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 in 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 that are sensitive to fire are usually species that:

- are killed by fire
- have short life spans
- have long juvenile periods
- have canopy-stored seed
- regenerate only from seed ('obligate' seeders)
- have a small range and/or few populations.

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

[70] 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).

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 plant communities such as the Kwongkan TEC, heath and mallee heath.

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).

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

Fauna

Fauna species that are the most sensitive to fire are usually 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 habitat opportunities (Friend 1995, Friend 1999, Burbidge 2003, Bamford and Roberts 2003). Both these may be achieved by maintaining a diversity of post-fire seral stages[71] in the vegetation. The responses of fauna species to fire will also be affected by habitat fragmentation and other ecological disturbances (e.g. impacts of weeds, disease and introduced animals). Further research into the fire requirements of fauna habitat within the planning area is required.

[71] The developmental stages of an ecological succession.

Fire management

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

Carpet python (*Morelia spilota imbricata*), North Twin Peak Island, Recherche Archipelago Nature Reserve. Photo - Emma Adams

The aim of the fire management system for the planning area is to maintain a diversity of post-fire fuel ages, vegetation seral stages 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 aimed for 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 (e.g. 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 (e.g. operational guidelines have been prepared by the department for coastal heath woodlands, wetlands, granite outcrops, reeds and rushes, riparian vegetation, western ground parrots, honey possums, tammar wallaby and malleefowl).

Prescribed fire will also be used to manage bushfire risk by reducing fuel loads in the planning area, maintaining a system of fuel-reduced buffers and strategic fuel reduction areas, which will reduce the potential size and severity of bushfires. This will increase firefighter safety during bushfire suppression, and mitigate bushfire risk to neighbours, visitors and community assets. Particularly high-value assets that should be considered in fire management 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.

Logistics limit the department's capacity to respond to bushfires on islands. 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 where large fires (ones that burn more than 80 per cent of the island's vegetation) should be excluded 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.

The department's South Coast region[72] has been divided into seven 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 2007c[73]). The planning area is mainly across four FMAs (and a very small part of FMA 7 which is across the eastern end of Nuytsland Nature Reserve). Objectives and fire management outcomes have been summarised in Appendix 11.

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

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 Department of Fire Emergency Services (DFES) is crucial to fire management in the planning area and surrounding lands.

For public safety, some areas of the planning area are closed temporarily on Extreme or Catastrophic fire danger rating days. For example, Lake Wheatfield, Woody Lake and Lake Windabout are gated off on high fire danger days, as there is only one-way vehicle and foot access/egress.

Managing fire in wilderness areas

The planning area includes a proposed wilderness area in the Mount Ragged and Wylie Scarp area of Cape Arid National Park and Nuytsland Nature Reserve (see Section 13 *Wilderness*). As wilderness areas are to have minimal internal disturbance in terms of fire access and fire breaks, they must be considered as a much larger single burn unit.

A range of fire management strategies and tactics will be considered during the life of the plan for the conservation of biodiversity values within and adjacent to wilderness areas including consideration of longer inter-fire intervals within wilderness areas. This may require the maintenance of shorter inter-fire intervals in surrounding areas to prevent bushfires entering or leaving the long unburnt wilderness area.

The introduction of prescribed fire to wilderness areas is acceptable to achieve biodiversity outcomes and strategic protection of natural values in and outside of the wilderness areas (see Section 13 *Wilderness – Management of wilderness – Fire* and *Policy Statement No. 62 Identification and Management of Wilderness and Surrounding Areas*).

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

The introduction of prescribed fire into wilderness areas will be further planned and managed within the regional fire management plan process. The regional fire management process will focus on achieving ongoing fire management that protects the natural values and ecological processes of the area and surrounding areas.

[72] 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: www.lands.rdl.wa.gov.au/mediaFiles/3_Management_of_State_Land_2010.pdf.

[73] This document is currently under review and the draft in preparation indicates that the 10 FMAs used in 2007 will reduce to 7, with the main change for the planning area being that the Woodland and Mallee FMAs will be merged.

Desired outcome

Biodiversity is conserved and the risk from bushfire to the community, park visitors, infrastructure and the natural environment is maintained within acceptable limits.

Management actions

1. Implement the prescribed fire regimes and bushfire response as summarised in Appendix 11 (to be reviewed every five years and adapted) for the FMAs within the planning area (FMAs 5 to 8, and 10).
2. Develop and implement fire recovery programs subsequent to major bushfire events.
3. Implement specific fire management guidelines for protecting and conserving fire-sensitive, atypical and conservation significant species, habitats, communities (e.g. Kwongkan TEC) and translocation sites including providing sufficient long-unburnt vegetation as required for habitat for species such as the western ground parrot and the malleefowl (e.g. apply the operational guidelines for coastal heath woodlands, wetlands, granite outcrops, reeds and rushes, riparian vegetation, western ground parrots, honey possums, tammar wallaby and malleefowl).
4. Manage fire in proposed or gazetted wilderness in accordance with the department's wilderness policy (CALM 2004b).
5. Undertake further research into ecologically appropriate fire regimes for the planning area including the inter-fire periods required by different fire-sensitive species.
6. Nominate fire-sensitive species and habitats to be monitored for performance assessment.
7. 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.
8. Maintain management access for fire suppression.
9. Attempt to suppress fires on islands of high conservation value (e.g. Figure of Eight, Boxer, Wilson, Mondrain, North Twin Peak, Middle and Salisbury islands) where large fires threatened the values of the island.
10. Suppress bushfire on other islands where feasible, otherwise allow natural fire to self extinguish.
11. Maintain firebreaks and low fuel areas around the developed infrastructure on Woody Island in consultation with the leaseholder.
12. Investigate implementing and if appropriate conduct prescribed burning on Middle and Mondrain islands.
13. Appropriately rehabilitate areas disturbed by related to fireline construction during bushfire suppression.
14. Encourage cooperative fire management arrangements between DFES, other relevant agencies, local bushfire brigades, traditional owners and neighbouring land managers.
15. Close public access and recreation sites as required for public safety during bushfires or on days rated as Catastrophic or Extreme fire danger and notify the public via on-site (signs) and off-site (websites, apps and social media) alerts.

Key performance indicators

Performance measure	Target	Reporting
The impact of bushfire 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
	Prescribed burns are completed according to the annual program, which is regularly reviewed, implemented, evaluated and adapted where necessary	Annually

Size of large, intense bushfires	Reduction in area of large intense bushfires from July 2010–December 2015 levels	Every 5 years
The condition of nominated fire-sensitive habitats and communities	Fire-sensitive habitats and communities are maintained	Every 5 years
The persistence of fire-sensitive species within the planning area (e.g. western ground parrot, breeding seabirds, rock-wallabies)	Nominated populations of species maintained	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, Cheetup rock shelter within Cape Le Grand National Park was included on the *National Heritage List* for its Aboriginal cultural values[74]. Archaeological excavations have uncovered a number of stone artefacts, flora and fauna material with radiocarbon dates indicating human use of this site intermittently from 13,000 years to 200 years ago. Operational activities that are likely to have an impact on the 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 contains 10 registered sites on the *Register of the National Estate*[75], 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).

Amendments to the CALM Act and various regulations in 2012 enabled joint management of lands and waters between the department and other parties including Aboriginal people. The amendments also enable Aboriginal people to undertake certain activities for customary purposes on reserves and other lands and introduced a new management objective for the department to protect and conserve the value of the lands and waters to the culture and heritage of Aboriginal people. The department's *Policy Statement 86 Aboriginal Customary Activities* (Parks and Wildlife 2013c) and *Policy Statement 87 Aboriginal Joint Management* (Parks and Wildlife 2013d) reflect these amendments. In addition native title has been found to exist over part of the planning area and it has been determined certain rights and interests exist for these areas of the planning area (see Section 5 *Management arrangements with Aboriginal people – Native title*).

23. Aboriginal cultural heritage

Aboriginal People of the Planning Area

The planning area falls within the traditional lands of the members of the Esperance Nyungar and Ngadju native title groups, which have been recognised by the Federal Court as having native title rights and interests based on a system of law and culture that has endured since settlement.

In *Aboriginal Tribes of Australia*, Tindale (1974) records the inhabitants within the western part of the planning area as being known as the Wudjari, and along the coastal strip east to Point Malcolm and inland for 50km as the Njunga. East of Young River, the Njunga had become a separate tribe from the Wudjari as they had begun to practice circumcision, yielding to the pressure of their eastern neighbours, the Ngadjunmaia (the Ngadjunmaia had both circumcision and subincision).

Alternate names for the Wudjari/Njunga include: "Nunga, Njungar, Nyungar, Nonga, Yunga, Yungar, Njungura…" (Tindale 1974).

[74] Due to cultural sensitivities, public information on the Cheetup rock shelter is restricted and its location is to be kept confidential. The site does not appear on the publicly available *National Heritage List* but more information on its importance and listing is available here: www.environment.gov.au/system/files/resources/591a141a-0148-4f56-b400-604d7141dd84/files/national-heritage-cheetup.pdf. Cheetup Cave is also registered on the Register of Aboriginal Sites under the *Aboriginal Heritage Act 1972*.

[75] 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.

Helms (1896) also notes of the inhabitants of the area:

"The Yunga is a coastal tribe, the centre of their district being about Esperance Bay. The extent of their territory to the east and west I could not correctly ascertain, but they claim the ground inland to about 40 or 50 miles from the coast".

According to Veth and Moore (1989) the Aboriginal people themselves describe the area from the Young and Lort rivers emptying into Stokes Inlet, in the west, to Thomas River in the east, as "one country" and note that within this country there traditionally lived about four family groups.

The Ngadjunmaia inhabited the coastal area east of Israelite Bay with the Ngadjunmaia, and the Wudjari/ Njunga disputing the territory between Point Malcolm and Israelite Bay. The Njunga are believed to have had more in common in terms of linguistic and cultural practices (such as dress and ceremony) with the south-west Aboriginal tribal groups or 'South West cultural bloc', than with the Ngadjunmaia who could be considered part of the 'Desert cultural bloc' (Smith 1978, Smith 1993).

The areas described by Tindale as Njunga and Ngadjunmaia roughly reflect the boundaries of the Esperance Nyungar and Ngadju native title determinations respectively.

Inland around Scaddan, Grass Patch and Salmon Gums the Kalaako/Malpa tribes inhabited the area. See Figure 5 for Tindale's Aboriginal tribes of the planning area.

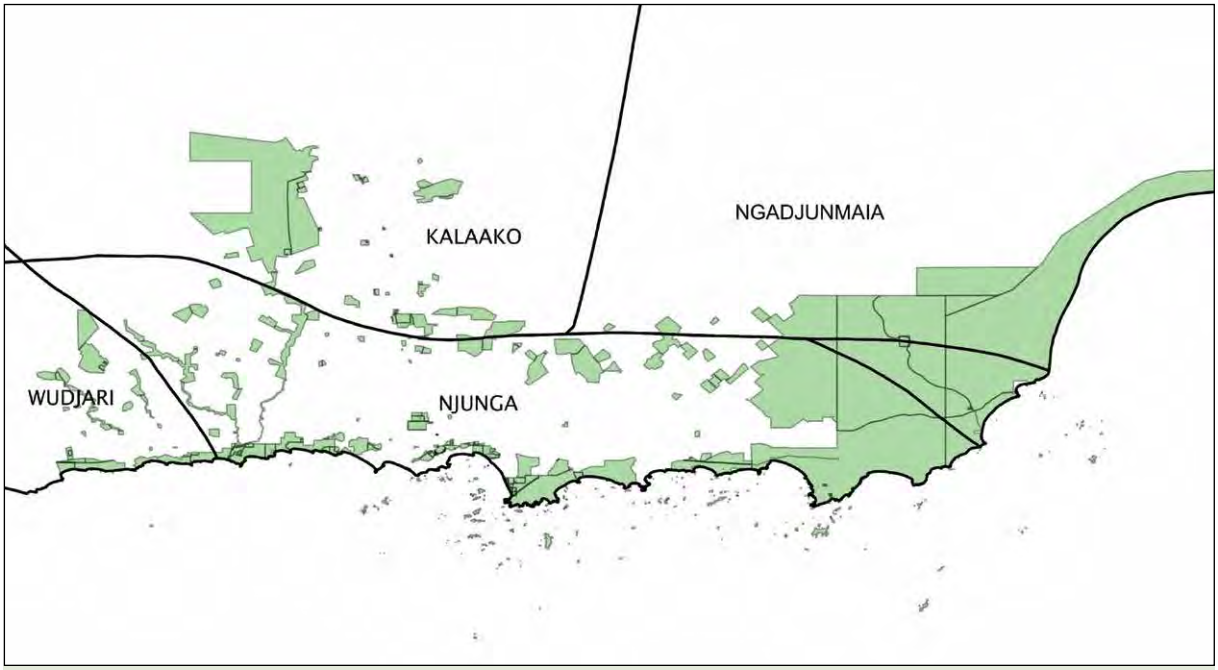


Figure 5. Aboriginal tribes of the planning area (Tindale 1974).

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.

Regional surveys suggest that Aboriginal groups were rather small and dispersed across the coast from Young River to past Cape Arid. Large groups were rare, and when present were closely connected to permanent water sources (Veth and Moore 1989). From examining archaeological sites, similar patterns of Aboriginal land use in the region are expected to have occurred over the last 13,000 years, with no increase in population levels either when new stone tools were developed or when increases in site occupation are noted in many other regions of the arid zone (Veth and Moore 1989).

The initial contact between south-west Aboriginal people and Europeans was followed by expansion of European settlements, displacement of Aboriginal people from their traditional lands as European farmers cleared and settled the country and townships and stations became the focal point for Aboriginal living, alteration of Aboriginal traditional life and population decimation as a result of introduced diseases. Despite the impacts of colonisation, members of the Esperance Nyungar and Ngadju native title determinations have continued to exercise a system of law and culture over the planning area since settlement.

The department seeks to involve the Esperance Nyungar and Ngadju Aboriginal peoples as the traditional owners of the planning area in managing the land (see Section 5 *Management arrangements with Aboriginal people*). In addition, the connection of Aboriginal people to country can be recognised through the incorporation of Aboriginal language in signage, interpretation and naming of new 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.

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

A group of Aboriginal people camped near the mother walich. The parents told the children 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.

Heritage sites

There are 88 Aboriginal heritage sites[76] registered (67 sites in existing conservation reserves and 25 in proposed [some overlap with existing reserves] conservation reserves within the planning area) (Department of Aboriginal

76 Aboriginal site as defined in accordance with the Aboriginal Heritage Act. 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 ethnographic 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

Affairs *Register of Aboriginal Sites* June 2015 data). There may be other sites to which the Aboriginal Heritage Act applies that are not listed on the Register of Aboriginal sites within the planning area. For example, there are many other sites lodged but not registered within the planning area. Under the Aboriginal Heritage Act 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. The Department of Aboriginal Affairs has guidelines for the management of cultural heritage sites (DAA 2013).

Heritage site density within the planning area is highest in and around large granite outcrops and their catchments (eastern portion of the planning area) 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 14 registered archaeological and ethnographic sites. This includes seven 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 the Young and Lort rivers were used 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. Helms Forestry Reserve has one site, which includes an artefact scatter, a modified tree and a camping place.

Of the 66 registered archaeological and ethnographic sites in the eastern portion of the planning area, 25 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. There is evidence that Aboriginal people occupied caves in granite outcrops at 'Smiths Block' within the park (Smith 1993, Barefoot and Kalotas 2004). Cheetup rock shelter, a nationally significant site 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.

Between Cape Le Grand and Cape Arid national parks there are seven registered 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 28 registered 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 three registered Aboriginal sites within Nuytsland Nature Reserve including artefact scatters and a quarry. Tooklejenna Rocks in particular has small flake fragments and formal tools at a capped gnamma[77].

There are eight registered Aboriginal sites within the Recherche Archipelago Nature Reserve, all of which occur on Middle Island. Other sites lodged, but not registered 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 gnammas 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 8km from the present mainland coast, there is no ethnohistorical 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 (e.g. the Sealers' Camp at the western end of Lake Hillier on Middle Island).

In 2014, as part of the Esperance Nyungar ILUA, the department entered into the *Esperance Nyungar Standard Heritage Agreement*, which applies to the management of heritage issues within the Esperance Nyungar determination area (see Section 5 *Management arrangements with Aboriginal people*).

Activities for Aboriginal customary purpose

The ability to carry out customary activities including hunting and gathering of food[78], is an important part of Aboriginal culture as it defines Aboriginal people's fundamental connection to the land, in that it "*…expresses the vital linkage of Aboriginal people to their country, reinforces their spiritual beliefs governing their existence and responsibility for their land, and provides a means for passing on social and cultural knowledge to their children*" (WA Law Reform Commission 2006).

The department will pursue local area arrangements[79] with regard to hunting and gathering by Aboriginal people in the planning area to facilitate Aboriginal customary activities and as a means to communicate and enhance understanding of management issues relating to the conservation estate. 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. All uses of a firearm have to comply with the *Firearms Act 1973* and have to be at least 1.5km from a camp site, sealed road or visitor use area including a car park.

In addition, the native title determinations have conferred rights and interests in relation to customary purposes within those areas (see Section 5 *Management arrangements with Aboriginal people – Native title*).

Other customary activities provided for in legislation and departmental policy now includes medicinal, artistic, ceremonial or other cultural purposes.

[77] Gnammas are natural holes in rocks (surface karst landforms) used by Aboriginal people to collect water. The water supply in gnammas was a very important resource in Aboriginal life and most are surrounded by numerous Aboriginal sites. Smaller gnammas have been equipped by Aboriginal people at some time past with a 'lid' consisting of one or more flat limestone flagstones to minimise evaporation and keep animals from polluting the water (Davey *et al.* 1992).

[78] 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.

[79] For further information refer to *Corporate Guideline No. 22 Guidelines regarding Aboriginal customary activities* (Parks and Wildlife 2013b) and www.dpaw.wa.gov.au/parks/aboriginal-involvement/92-customary-activities.

Desired outcome

Aboriginal cultural heritage is protected and conserved in consultation with traditional owners and other relevant stakeholders.

Management actions

1. Control access to, maintain and monitor Aboriginal cultural heritage sites.
2. Liaise with the Department of Aboriginal Affairs, native title prescribed bodies corporate and other relevant stakeholders regarding the appropriate protection, conservation and management of Aboriginal heritage sites.
3. Apply the Department of Aboriginal Affairs *Due Diligence Guidelines* and the *Esperance Nyungar Standard Heritage Agreement* to ensure Aboriginal heritage is protected.
4. Liaise with Esperance Nyungar and the Ngadju native title holders with regard to management of cultural heritage, customary activities and reservation of the proposed additions.
5. Name new recreational sites and/or reserves with indigenous names where appropriate and support dual naming on existing sites and reserves.
6. Ensure that the Aboriginal cultural heritage values of the planning area inform and guide management actions.
7. Ensure that department staff are trained in Aboriginal heritage site identification, and record and submit site information to the Department of Aboriginal Affairs.
8. Provide culturally appropriate information and interpretation on Aboriginal cultural heritage to promote awareness, appreciation and understanding.
9. Consistent with legislation, provide for traditional owners to pursue activities for customary purposes and enter into local area arrangements to ensure public safety and the protection of flora and fauna of the planning area.
10. Encourage training, employment and economic development through cooperative or joint management arrangements with Aboriginal people.

Key performance indicator

Performance measure	Target	Reporting
Protection of Aboriginal cultural heritage sites	No further disturbance without formal approval and consultation	Annually

24. Other Australian cultural heritage

The planning area has a rich 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'Espérance* 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 Archipelago. 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; whaling station remnants and other artefacts and ruins. There are three known shipwrecks 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. Other places of maritime heritage significance include 19th century shore whaling stations at Barrier Anchorage and Thomas Fishery in Cape Arid National Park with associated stone lookout shelters and other features.

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, a Miscellaneous Reserve surrounded by Stokes National Park, is jointly vested in the National Trust of Australia and the Director General[80] of the department. A conservation plan was prepared for the homestead area in 2000 and stabilisation works were undertaken in 2003. In 2015, the National Trust approached the department to take over sole vesting of Moir Homestead (and Israelite Bay Reserve currently not in the planning area but surrounded by Cape Arid National Park). Ongoing discussions are required whether Moir Homestead should be incorporated in Stokes National Park (currently the reserve's purpose is 'national park and historic building').

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

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 proposed addition 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.

Desired outcome

Other Australian cultural heritage is protected and conserved in consultation with relevant stakeholders.

Management actions

1. Identify, research, document and map other Australian cultural heritage.
2. Control access to, maintain and monitor known or identifiable other Australian cultural heritage.
3. Liaise with the Heritage Council of WA, WA Museum, local government and other relevant organisations, and the local community regarding the appropriate protection, conservation and management of heritage sites.
4. Encourage the National Trust of Australia (WA) to continue the implementation of the conservation plan for Moir Homestead.
5. Liaise with the National Trust of Australia (WA) on the future vesting of Moir Homestead and consider options regarding Israelite Bay Reserve.
6. Assess the heritage value of Dogger's Hut and Cahill's Hut.

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

7. Ensure that other Australian cultural heritage values of the planning area inform and guide management actions.
8. Provide appropriate information and interpretation on other Australian cultural heritage to promote awareness, appreciation and understanding.

Key performance indicator

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

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

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 reserves[81], 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

Visit 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. In 2014-2015, the planning area recorded 287,710 people visits[82] with 74 per cent of these visits being to the national parks.

Cape Le Grand National Park receives the highest visitation of the reserves in the planning area with 151,757 visits in 2014–2015 (53 per cent of the visitation to the planning area, see Figure 6).

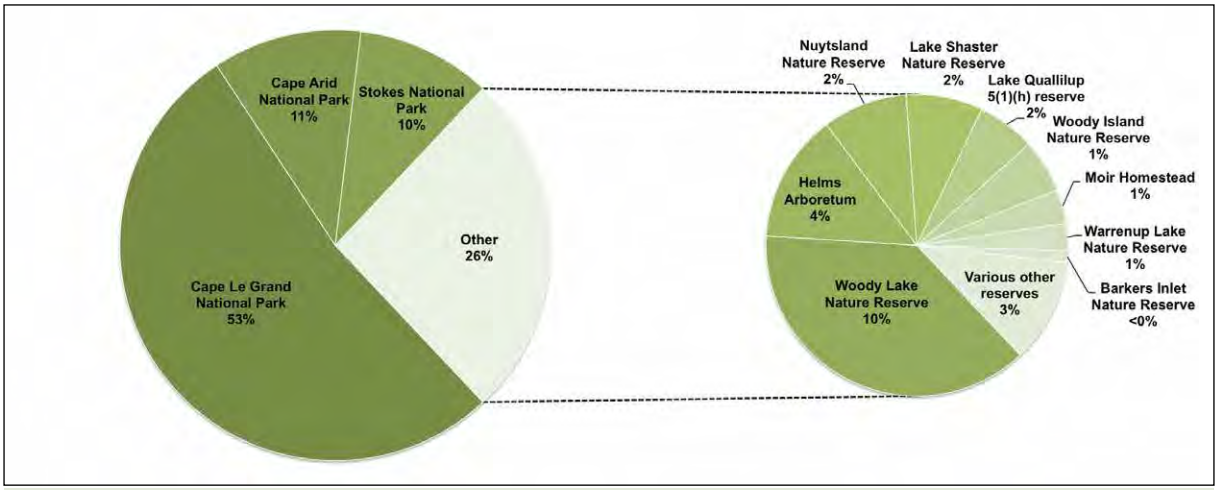


Figure 6. Visit numbers to the planning area 2014-2015.

[81] The Shire of Esperance Recreation and Camping Reserve 518 (Thomas River) has been managed by the department on behalf of the shire via two five-year MoU agreements (2004-2014), however the shire was advised in 2015 that the department will not renew this arrangement and will only manage this reserve in the future if it becomes part of the conservation estate.

[82] A 'visit' refers to the number of people 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. Typically, the visit statistic has no length of stay data associated with it. This means that if a person leaves the park and re-enters at a later time, then a second visit data unit is recorded.

Visitation numbers to Cape Arid and Stokes national parks were relatively stable, remaining between 10,000 and 20,000 visits. However, numbers in recent years have fluctuated due to the effects of bushfire, flooding, rebuilding recreation facilities and the re-opening of recreation sites within the parks. In 2014-2015, Cape Arid and Stokes national parks received 32,191 and 29,113 visits respectively.

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

After the national parks, the reserves with the next highest visitation numbers are Woody Lake Nature Reserve (28,379 visits), Helms Arboretum (10,281 visits), Nuytsland Nature Reserve (6,800 visits) Lake Shaster Nature Reserve (6,146 visits), and Lake Quallilup 5(1)(h) reserve (4,624 visits)[83]. To facilitate management of the recreational use these reserves (apart from Helms Forestry Reserve) are to be changed to National Park tenure (see Section 7 *Proposed tenure changes*).

In contrast to the reserves receiving high visitation in the planning area, visit numbers to Woody Island Nature Reserve have decreased from 16,359 in 2009-2010 to 4,275 visits since 2011 due to changes in commercial tour operations (see Section 28 *Commercial tourism*).

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. Access will mostly remain unchanged across the planning area during the life of the plan, however some seasonal and/or temporary closures may be required for safety and/or to protect the natural values (see Section 26 *Visitor access*).

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 (see Appendix 12; 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 (see Appendix 13; maps 2a and 2b).

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

[83] The visitor number estimates at Woody Lake Nature Reserve and Helms Arboretum markedly increased in 2010-2011 after the installation and monitoring of vehicle classifiers.

The visitor management settings for the planning area (maps 2a and 2b) reflect existing and proposed developments and as such 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.

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

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.
5. Change nature reserves with high visitation and recreational use not compatible with nature reserve status to national park as per Table 1 in Section 7 *Proposed tenure changes.*
6. Ensure visual landscape management is considered prior to any management operation or development.
7. Monitor visitor satisfaction of nature-based recreation opportunities.

Visitor safety

Apart from the Esperance Lakes and Helms Forestry Reserve, much of 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 (e.g. 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 (e.g. 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, DFES 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 and departmental 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 (e.g. details of facilities, available activities, features, access and regulations) through a range of means (e.g. signage, printed materials, the department's website, electronic media, social networking and departmental staff).

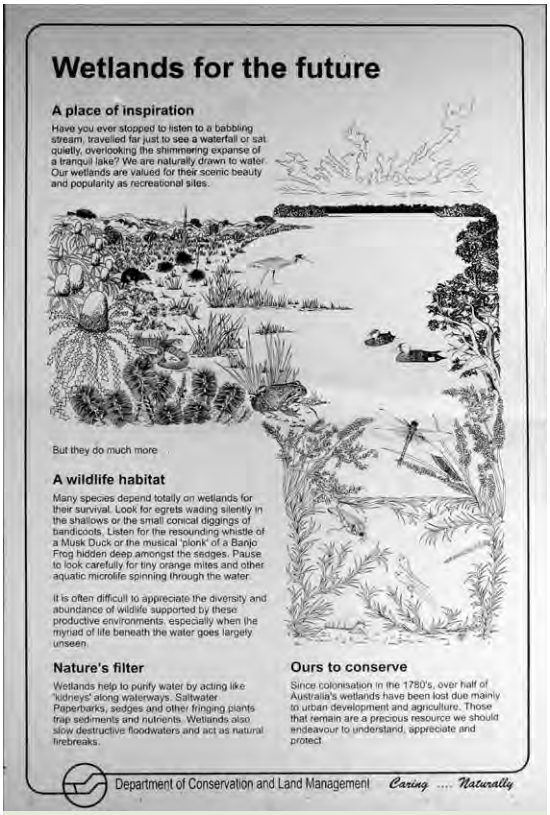
Park brochures and information are available at the Esperance District Office for Stokes, Cape Le Grand and Cape Arid national parks as well as for a number of walk trails. Information bays are provided at the main entry points to all three national parks as well as in the Esperance Lakes area and at 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 to be developed and maintained 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)
- (Nyungar and Ngadju 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

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.

Interpretation shelter at Thomas River camping area, Cape Arid National Park. Photo - Klaus Tiedemann

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	Target	Reporting
The extent of visitor management settings	Maintain the extent of visitor management settings	After 5 years
The number and severity of visitor incidents	Remains stable or decreases from 2010 to 2015 levels	After 5 years
Visitor satisfaction levels of nature-based experiences	Maintained or increased from 2016 levels	After 4 years

26. Visitor access

Public access[84] 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.

[84] 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 2012–2017* (DEC 2012c).

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 South Coast and Coolgardie-Esperance highways as well as 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 Road (to the private property enclave), which are not part of the planning area but within road reserves[85].

The *Roads 2030 Regional Strategies for Significant Local Government Roads – Goldfields Esperance Region* (MRWA 2013) proposes upgrades for several roads that may impact upon the planning area by increasing visitation. 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 to provide a through road from Esperance to the Eyre Highway has been recommended by Main Roads WA (MRWA 2013). As the link would include upgrading Parmango or Balladonia roads and the western end of Fisheries Road (west of Baring Road), increased visitation may be expected in the Cape Le Grand and Cape Arid national parks.

Fisheries Road east of Baring Road across Cape Arid National Park and Nuytsland Nature Reserve is a four-wheel-drive unsealed local government road 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.

There are also undeveloped road reserves within the planning area (e.g. 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 (see Appendix 14 for preliminary road reserves identified to be cancelled).

Department-managed roads and tracks

Identified upgrades of department-managed roads and tracks include sealing the roads to Rossiter Bay in Cape

[85] However, the roads and/or road reserves do require realigning to match the formed roads with the road reserves.

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. Even though a regular complaint in visitor satisfaction surveys is the visual impact of vehicles on beaches, this access is long established and provides remote recreation opportunities and is highly valued by many visitors. Therefore, it is not proposed to change existing permitted vehicle access across the planning area other than closing part of Telegraph Track and rerouting traffic to a re-opened Pasley Track (see Section 20 *Diseases*).

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

Specifically, driving on beaches in the planning area (see maps 3a and 3b) will be allowed within:

- Lake Shaster Nature Reserve: Darkies, Christies to The Pincers (West)
- Stokes National Park: Margaret Cove, Dunster Castle Bay, part of Fanny Cove
- 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, Poison Creek partway to Cape Pasley (access over Cape Pasley specifically is not allowed and has been closed with bollards, signs and boulders placed over the track. The historical track that crosses over Mount Pasley is a high disease risk area and east of Cape Pasley, there are severe water erosion issues along the track)
- Nuytsland Nature Reserve: Point Malcolm to Point Dempster, Israelite Bay to Point Culver.

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-

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

necked stint (*Calidris ruficollis*), the hooded plover[86] 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 vegetation systems. Therefore, even the beaches with vehicle access sometimes need to be temporarily closed or partially closed with fencing and appropriate signage to protect breeding shorebirds and to minimise visitor risk when conditions are dangerous.

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 (the department can use this airstrip with an arrangement with the landowner) and on a private property enclave at Point Malcolm within Nuytsland Nature Reserve.

The department has identified a helicopter landing area on Woody Island suitable 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 a 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

[86] 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.

(e.g. at Le Grand Beach and Lucky Bay within Cape Le Grand National Park). Commercial fishermen regularly use the beaches for launching boats (e.g. within Stokes and Cape Arid national parks and Nuytsland Nature Reserve). Corridors for boat launching may be established during shorebird breeding seasons as required.

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*).

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

Desired outcome

The visitor access that is provided 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.
2. 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 (e.g. closing Telegraph Track due to disease risk, see Section 20 *Diseases*).
3. Temporarily or partially 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.
7. Work together with recreation and conservation groups to raise awareness on beach vehicle access and the mitigation of environmental impacts.
8. 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.
9. Liaise with the appropriate authorities regarding the cancellation of unused road reserves.

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 is continually undertaken across the planning area to ensure that the number and style of camping areas and day-use sites provides 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.

Eroded beach access at Munroes, 'Warrenup Lakes Nature Reserve'. Photo - Tegan Laslett

The sustainability of visitor use[87] will continue to be monitored through the life of the plan to ensure impacts are minimised and that a high quality of recreational opportunities are maintained.

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.

It is proposed to construct a bird watching hide at Mullet Lake Nature Reserve. This hide will have to be sited carefully to provide optimum nature viewing, boardwalks and access car park while being mindful to not open additional access for inappropriate vehicle use of the salt flats.

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

[87] For more information on current practices in monitoring and reporting on sustainability of visitor use of protected areas see Higginbottom *et al.* (2010).

Bushwalking

Existing walk trails within the planning area are described in Table 3, 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 the key values of the planning area. 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 allowed.

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

Table 3. 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
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 Phytophthora 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	
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 re-established
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 re-establishment 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*).

^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.

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 conservation estate such as national parks, four-wheel-drive vehicles and motorbikes can impact the values of the planning area when driven in sensitive areas. Therefore, the use of licensed four-wheel-drive vehicles and motorbikes in the planning area should only be on 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 allowed to operate on department-managed land except under certain circumstances with permission from the District Manager.

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.

Damage by vehicles to the foredunes at Victoria Harbour, Cape Le Grand National Park. Photo - Aberline Attwood

Adventure activities

Recreational rock climbing will be allowed in Cape Le Grand National Park in the Lucky Bay area with approval from the District Manager. The department will work together with the Climbers' Association of Western Australia (CAWA) and traditional owners to ensure rock climbing within the area is undertaken with regard to cultural and natural values. Climbers will need to abide by the CAWA codes (Code of conduct www.climberswa.asn.au/cawa/ethics and Code of Bolting and New Route Development www.climberswa.asn.au/cawa/cawa-code-of-bolting-and-new-route-development/) and also by designations regarding the use of fixed protection (bolts).

There are 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). Apart from Frenchman Peak, the former 'Smiths Block' also within Cape Le Grand National Park is a potential abseiling site. However, this site is considered not suitable for abseiling, as it is a registered Aboriginal cultural site and the traditional owners have requested that the department does not develop any recreation site or encourage recreational activities in this area. Therefore, abseiling cannot occur within the planning area.

If the situation changes and abseiling for small organised recreational or education groups (on an equitable basis) is approved by the traditional owners at 'Smiths Block', and the activity does not have an impact on the heritage values of the sites in the area, then the activity may be allowed with approval from the District Manager. Alternative abseiling opportunities exist outside the planning area within Peak Charles National Park approximately 200km north-west of Esperance and at Dempster Head near West Beach, Esperance.

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 with other visitors 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 allowed.

According to the department's *Policy Statement No. 18 Recreation, Tourism and Visitor Services* (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 a dangerous activity and damaging to the environment and therefore is not allowed in the planning area.

Special Events

It is possible that during the life of this plan that 'one-off' special events are proposed within the planning area. These could involve large groups of people and camping in the planning area. Special events have the potential to have a significant impact on the planning area and on the experience of other visitors. In general, many group activities and events are an acceptable use of conservation estate, provided that they are:

- sensitively located to maintain values
- properly planned and managed
- do not interfere with other forms of recreation
- are not resource-demanding on the department.

Special events must be consistent with the department's *Policy Statement No. 18 Recreation, Tourism and Visitor Services*—where requests are made to conduct special events for activities that are inconsistent with the policy, the event must be of national significance and approval is required from the Conservation Commission.

The following general criteria apply:

- the event must be consistent with the visitor management setting in which it is to be held (see Section 25 *Visitor planning – Visitor management settings*)
- strict hygiene controls must be enforced to eliminate the risk of disease spreading further in the planning area
- any permitted temporary fixtures or facilities constructed for the event must be removed at the completion of the event
- any site disturbance such as trail markings must be removed and the site rehabilitated at the completion of the event.

Before events are approved, the availability of suitable areas outside the planning area will be considered. Similarly, the potential impacts on the environment and other visitors, the safety risks to the people involved in the event and the cost-benefits for the management of the area will also be considered. Competitive car rallies and other motor sports will not be allowed.

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* (e.g. quad motorbikes).
3. Ensure all recreation and tourism developments as well as visitor activities are consistent with the department's *Policy Statement No. 18 Recreation, Tourism and Visitor Services* (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 area.
5. Monitor the impacts of day-use activities for environmental degradation and visitor safety.
6. Allow rock climbing with permission from the District Manager in the Lucky Bay area of Cape Le Grand National Park in accordance with CAWA's codes of conduct.
7. Not allow competitive car rallies, motor sports, hang-gliding, paragliding, sandboarding and abseiling and/or variations thereof, within the planning area.

Water-based activities

Water-based activities within and adjacent to the planning area 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 allowed 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 (e.g. 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 the Department of Parks and Wildlife 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 arise.

Boating and water skiing

There is a self-guided canoe trail through the Esperance Lakes between Lake Wheatfield, Woody Lake and Lake Windabout complete with signage and markers (see map 3a). The 5.5km trail suits beginner, intermediate and experienced paddlers. Paddlers have the option of launching at any of the three lakes and can choose whether to paddle from lake to lake or limit their trip to just one. There is an information sign at each of the launch sites, providing distance and time information and general tips on personal safety. Markers on the lakes guide paddlers across a pre-determined route and indicate access to the smaller inter-connecting channels. When water levels are lower during the summer months, the channels linking the three main lakes may be too low for craft, so depth markers have been placed at the entrances.

Canoeing, kayaking, sailing and sailboarding have little impact on 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.

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 allowed in all waters of Woody Lake apart from within 60m of the foreshore, and within a 100m-wide designated take-off and landing area as marked by signs. Public water skiing is not allowed when the water depth is less than 1.8m. When the water depth is between 1.8 and 1.4m, the Esperance Water Ski Club is still able to use the designated Tournament Water Ski Area. When the water depth is below 1.4m all water skiing on the lake is not allowed. The other water ski area is within a defined area of Lake Quallilup 5(1)(h) reserve. Lake Quallilup (proposed to be added to Stokes National Park) is the preferred site for water skiing in the planning area. The problems associated with water skiing on Woody Lake include the potential impacts on fauna, littering, compliance with regulations (e.g. jet skis have been observed trying to access Lake Wheatfield through the channel from Woody Lake) and noise complaints received by semi-rural neighbours of the lake. A CALM Act lease will be negotiated with a club to allow Lake Quallilup to continue as the primary water ski zone in the region for as long as the environmental impacts of water skiing on Lake Quallilup continue to be manageable.

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

The department will then seek for Woody Lake water ski zone to be de-gazetted.

Water skiing is not allowed outside of gazetted water ski zones and jetskiing is also not allowed 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 of the planning area 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 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. Allow water-skiing at Lake Quallilup as long as the environmental impacts of water skiing use are assessed as minimal, the conditions of the lease area continue to be met and the regulations of the water ski zone are complied with, in liaison with the Department of Transport.
6. Close the water ski zone in Woody Lake and rehabilitate area as required.

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.

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 national 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 can also be considered as alternative sites for such developments, thereby minimising direct impacts within the conservation reserves themselves.

Lucky Bay, Cape 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/Parks and Wildlife

Camping

There are multiple camping opportunities within the planning area, including at Stokes, Cape Le Grand and Cape Arid national parks (maps 3a and 3b). There are also many shire reserves that provide for camping adjacent to the planning area. There are some camping sites in the nature reserves of the planning area, which are inconsistent with the purpose and 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*).

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

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. Camping areas in the planning area will aim to be consistent with the recreation site hierarchy in Appendix 13, however there may be some historical anomalies.

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. The site will 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 also assist in management by controlling numbers.

Informal camping occurs at Dunn Rocks, Cape Le Grand National Park and at Lake Quallilup. These sites will be considered for formalising with the provision in this management plan of ‘medium’ recreation sites and ‘recreation’ visitor management settings for these developments (maps 2a, 2b, 3a and 3b).

Prior to the late 1980s, informal camping was allowed at Poison Creek. However, when this activity began impacting upon riparian vegetation the department closed the site down and established an alternative camping area at Seal Creek. At the time, areas around Poison Creek were recovering from recent bushfire so the Seal Creek site was chosen because it was the only area to offer some wind protection and shade. However, both areas were completely burnt in the October 2015 bushfires (see section *Fire*) and as the Seal Creek camping area is: (i) being threatened by the movement of a large mobile dune and (ii) can be subject to seasonal inundation from cyclonic rains as it lies in a water gaining site as evident by the presence of paperbarks, it is no longer the preferable site. Therefore an area at Poison Creek on the south of the road near the headland that could offer a ‘medium’ camping area (6 to 20 sites) will be pursued in addition to an enlarged Jorndee camping area as a replacement to the Seal Creek camping area.

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 camping areas 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 as opposed to providing bins at recreation sites, and pick up any rubbish they

Tent camping at Cape Le Grand National Park. Photo - Peter Masters/Parks and Wildlife

find floating at sea or on the coast (see Section 21 *Marine pollution*). In other areas such as at Cape Le Grand National Park, 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 allowed in the planning area, either on the beach or in camping areas, except at Mount Ragged and Thomas River Shire Reserve 518 (where campfires are allowed 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). If the department continues management of the Thomas River Shire Reserve into the future, then campfire use will be reviewed.

Desired outcome

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

Management actions

1. Provide a range of camping opportunities for individuals and groups consistent with the appropriate visitor management settings and recreation site definitions which are according to established planning procedures, design standards and site environmental capability (appendices 7 and 8; and maps 2a, 2b, 3a and 3b).
2. Introduce a booking system for camping as required (e.g. at Lucky Bay in Cape Le Grand National Park).
3. Assess the need for formal camping sites at Lake Quallilup in Lake Quallilup 5(1)(h) reserve and Dunn Rocks in Cape Le Grand National Park and develop as required according to the visitor management settings and recreation site definitions.
4. Develop social, economic and environmental visitor impact indicators (e.g. relating to compliance, track proliferation, site compaction, track erosion, vegetation cover, littering, disease/weed spread, disturbance zones, informal camping sites and/or site condition).

5. Monitor visitor impacts and review access where impacts are unacceptable.
6. Convert informal camping sites in nature reserves to day use or change the nature reserve (or part of) to national park or conservation park consistent with greater recreational use (e.g. 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*).
7. Require that visitors remove the rubbish and waste generated during their visit to the reserve.
8. Monitor toilet systems such as septic tanks to reduce risk of contamination of the groundwater and receiving waters.
9. 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.
10. Allow campfires only in fire rings provided by the department and review use at Thomas River as necessary.
11. Provide information to visitors about the environmental impacts of firewood collection and campfires.

Key performance indicator

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

Domestic animals

Domestic animals are not allowed[88] in nature reserves and are not usually allowed in national parks or conservation parks although, under the CALM Regulations, dogs or horses can be allowed in designated areas. The exceptions are specially trained dogs for visitors with visual and hearing impairments, companion dogs where a doctor requests it for other medical reasons, 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 not be allowed 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.

[88] 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.

Management actions

1. Manage domestic animals in accordance with department policies and relevant legislation.
2. Not allow domestic animals within the planning area except in designated areas and for specially trained dogs for visitors with visual and hearing impairments, companion dogs where a doctor requests it for other medical reasons, emergency search and rescue operations, feral animal tracking, or in other special cases as determined by the department.
3. Designate under the CALM Regulations, 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*.
4. Educate visitors to the planning area about the harmful impacts of domestic pets and the necessary measures to protect wildlife, and the dangers to their pets in areas where feral animal baiting programs are conducted.

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 desired outcomes of this management plan.

Naturebank

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 subject to environmental and cultural assessment.

If a suitable *Naturebank* site is located within the planning area[89], 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 84 commercial tour operators (as of September 2014) licensed to operate in Cape Le Grand National Park, 59 in Cape Arid National Park, 60 in Stokes National Park, 56 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 allowed on a restricted basis. One licence has been issued for a commercial food van in Cape Le Grand National Park.

There are three commercial marine mammal interaction licences issued for two vessels operating within the Recherche Archipelago providing whale watching, dolphin and seal tours (as of June 2015). These tours approach seals and sea-lions whilst hauled out on islands and rocks of the Recherche Archipelago (see Section 16 *Native animals and habitats – Islands*). Flying Fish Charters has licences for seal/sea-lion interaction and dolphin interaction for the vessel *Flying Fish V* and Esperance Diving Academy has a licence for dolphin, seal/sea-lion and whale interaction for the vessel *The Southern Spirit.* Angling and underwater diving tours also

[89] Cape Le Grand National Park was identified as a potential location for a *Naturebank* site, and initially a site at New Island Bay was investigated. However a flora survey recorded 22 significant flora species including threatened species and the presence of Kwongkan TEC. It was determined that development in that area would have significant environmental impact so the site was discontinued. It is a principle of *Naturebank* that developments will not proceed where there are potential environmental or cultural impacts.

occur in waters adjacent to islands.

Standard licence conditions for the Marine Mammal (Seal/Sea-Lion) Interaction Tour Licence include:

- *"The licensee shall, within one month of the expiration of this licence, furnish to the Director General a return showing full details of operations for the term of this licence. The return must include the number of days operated at sea, the number of passengers conveyed and a record of seal/sea-lion sightings including seal/sea-lion numbers and locations (GPS)."*

Additional licence conditions include:

- *"The licensee shall ensure at all times that persons involved in licensed operations maintain a minimum 10m distance away from any seal/sea-lion 'hauled out' on land, rocks or navigations markers etc. Any person in the water when a seal/sea-lion enters the water from a hauled out position is to immediately return to the vessel…"*
- *"The licensee shall ensure that the vessel maintains a minimum 50m distance from islands inhabited by breeding seal/sea-lion populations."*

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. Esperance Diving and Fishing is providing eco-tours to the island on arrangement with the leaseholder.

Landing at Woody Island Nature Reserve where a commercial tourism lease is held for tourism infrastucture. 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 allowed.

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.

Management actions

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 or licence 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 (e.g. 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).
5. 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.
6. Collect and compile data from tour operators as required to be submitted under the various conditions of the leases and licences.
7. Monitor impacts of commercial tourism on Australian sea-lions and New Zealand fur-seals with regard to marine mammal interaction licences issued for vessels operating within the Recherche Archipelago.

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

Managing resource use

29. Mineral and petroleum exploration and development

The planning area has a broad range of mineral and petroleum commodities and basic raw materials. Potential low-grade limestone, titanium-zircon and silica sand 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 (which has the potential to be processed into petroleum products) in the areas around Salmon Gums and Scaddan. In addition, there is potential for nickel, cobalt, gold, copper, magnesite and graphite resources over the western portion of the planning area. Also the Department of Mines and Petroleum has indicated that there are geothermal energy resources and possible greenhouse storage potential within the planning area.

Under section 38 of the *Environmental Protection Act 1986* and the MoU between the Department of Mines and Petroleum and the Environmental Protection Authority (EPA), exploration and development proposals that may cause significant impact on and risks to key values will be referred to the EPA for assessment. Developments that may have a significant impact on matters of national significance[90] may also be referred to the Australian Government Minister for the Environment (or equivalent) for assessment under the *Environment Protection and Biodiversity Conservation Act 1999.*

Minerals and petroleum

There are 45 live and pending mining tenements within or intersecting the planning area (June 2015 data). This includes five granted mining leases:

- M63/193 and M63/194 over part of the unallocated Crown land proposed addition north of Truslove Townsite Nature Reserve (Esp Loc 2000)
- M63/602 within Reserve 30672, a proposed addition to Stokes National Park
- M63/249 over part of Pink Lake, a proposed addition to Pink Lake Nature Reserve
- M74/245 overlaps a slight portion of proposed addition Munglinup River Corridor (Reserve 30869).

The lease within Reserve 30672 was granted on 9 February 2007, but no mining activity has yet been proposed. Under the MoU between the Department of Mines and Petroleum and the EPA, as the mining tenement lies within 2km of the coastline, any proposed mining activity will have to be referred to the EPA. The EPA should then seek the Department of Parks and Wildlife's comments (and the Conservation Commission's depending on the tenure of the land at the time of referral).

The department is negotiating with the leaseholder of M63/249 and the Department of Mines and Petroleum to close the salt mine at Pink Lake and add the area to Pink Lake Nature Reserve (see sections 12 *Hydrology – Altered hydrological regimes* and 16 *Native animals – Wetland habitats*).

As of June 2015, there was one pending mining lease (M63/157) under consideration by the Department of Mines and Petroleum over Truslove Townsite Nature Reserve.

Other current mining tenements within or intersecting with the planning area include:

- 24 exploration licences, mostly across proposed additions as well as part or all of Stokes and Cape Arid national parks and Lake Shaster, East Naernup, Springdale, Nature Reserve 24953, Truslove Townsite, Ridley North, Mount Ridley, Mount Burdett, Mount Ney and Beaumont nature reserves, as well as Helms Forestry Reserve.

[90] There are nine matters of national environmental significance protected under the Act. Four of them are relevant to the planning area: national heritage places, wetlands of international importance (listed under the Ramsar Convention), listed threatened species and ecological communities and migratory species protected under international agreements.

- one retention licence[91] over part of the unallocated Crown land adjacent to Peak Charles National Park
- a miscellaneous lease[92] associated with the access road to the salt mine at Pink Lake over parts of the proposed additions to Pink Lake Nature Reserve/Lake Warden Nature Reserve (lots 510, 511 and Shire Reserve 22422).

There are also a further 13 exploration licences pending within the planning area, including three within Cape Arid National Park and proposed addition and six within Nuytsland Nature Reserve (one of which overlaps the Recherche Archipelago Nature Reserve).

There are also petroleum exploration interests in the Bremer Sub-basin offshore between Esperance and Albany, which might require pipeline access onshore.

Basic raw materials

Basic raw materials including gravel, sand and limestone should be preferentially sourced from outside conservation reserves. When this is not feasible, basic raw materials can be sourced from within the planning area for use within the boundary of the reserve (or adjacent conservation reserve) the material is extracted from. This may occur for activities such as constructing and maintenance of roads and recreational sites and walk trails.

Desired outcome

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

Management actions

1. Review and advise Government (including the Conservation Commission or equivalent statutory body) on the effect of resource development proposals on the conservation values and integrity of the conservation reserve system relative to the planning area.
2. 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 or recommend referral of exploration or development proposals with the potential to impact significantly on the values of the planning area to the EPA for consideration of assessment under the Environmental Protection Act.
4. Make exploration or development proponents aware of their legal obligation to refer proposals that could have a significant impact on conservation values that are matters of national significance to the Australian Government Minister for the Environment, Heritage and the Arts for assessment under the Environment Protection and Biodiversity Conservation Act.
5. Ensure that all areas in which mining activity occurs within the planning area are rehabilitated according to the approval conditions of the proposal as well as departmental rehabilitation standards and guidelines (e.g. *Policy Statement No. 10 Rehabilitation of Disturbed Land* [CALM 1986b]).
6. Liaise with the Department of Mines and Petroleum and the mine operator on the closure plan for the salt operations at Pink Lake and the addition of the lease area to Pink Lake Nature Reserve.
7. Rehabilitate disused gravel pits in accordance with departmental guidelines.
8. Ensure that all mineral and petroleum operations and basic raw material extraction adhere to departmental disease hygiene practices.

[91] A retention licence is used to retain ground containing a mineral resource which has been identified as a result of exploration activity which for economic reasons is not able to be further explored or mined. A retention licence remains in force for five years and is renewable for further periods of five years.

[92] A miscellaneous licence is for purposes such as road, pipeline, power line, to extract water, or any purpose which is directly connected with mining.

30. Commercial fishing and aquaculture

Commercial fishing

Stokes Inlet within Stokes National Park. Photo - Aberline Attwood

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 (e.g. 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 (*Acanthopagrus butcheri*) being one of the most abundant, caught each year by commercial fishers (Department of Water 2008, Fletcher and Santoro 2010). 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, commercial fishing will still be managed by the Department of Fisheries. It would be the only commercial fishery within the planning area as Torradup Inlet, which is also within Stokes National Park, has been closed to commercial net fishing since 2001. Unlike Stokes Inlet, Torradup Inlet is of low value to the commercial fishing sector.

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 [Cahill's Hut], Thomas Fishery and Seal Creek) and Nuytsland Nature Reserve (mainland adjacent to Bellinger Island and near Point Malcolm). These shore-based sites are used as camping 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 (e.g. further separation of recreational and commercial fishing camping may be required). Access to these sites will be maintained as shown in maps 3a and 3b but may need to be closed temporarily for conservation or visitor safety reasons (see Section 26 *Visitor access*).

The Southern Demersal Gillnet and Demersal Longline Managed Fishery operates along the south coast of Western Australia and targets mainly sharks using powered-hauled reels. Although observed fatal interactions with Australian sea-lions have been very low to date, demersal gillnet fisheries have been identified as a potential risk to Australian sea-lions. Parks and Wildlife will need to liaise with the Department of Fisheries to monitor the impact of gillnet and long-line fishing on pinnipeds in the Recherche Archipelago.

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) and the national recovery plan (DSEWPC 2013). 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.
3. 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 via:

- increasing the risk of visitors to the planning area being stung
- 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)
- 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
- affecting pollination and seed set of native flora species due in part to inefficient transfer of pollen or physically damaging flowers
- 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 (see Appendix 15). Consequently, the planning area has been categorised as being either:

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

There are 43 current apiary sites within the planning area (August 2015 data), 18 in nature reserves (Lake Shaster Nature Reserve [7], Cheadanup Nature Reserve [2], Munglinup Nature Reserve [1], Nature Reserve 35659 [1], Nature Reserve 27888 [3], Nature Reserve 26885 [2] and Truslove Townsite Nature Reserve [2]) and 25 within proposed additions to the conservation estate. There are also 31 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 (see Appendix 15). The review identified six of the current sites as suitable, 10 sites that were suitable but conditional and 27 sites that were highly constrained. Many of the highly constrained sites are within the mapped boundaries of the Kwongkan TEC listed under the EPBC Act in 2014 (see Section 17 *Ecological communities – Threatened ecological communities*). The TEC is widespread throughout the coastal areas of the planning area and has been assessed as a highly constrained area for apiary use.

In negotiation with the apiarists, the sites that are highly constrained will be cancelled and relocated, where possible. Relocation may include sites within the planning area that have existing public access and have been evaluated as being suitable (including 11 vacant sites), or suitable but conditional (including three vacant sites) but given the large area covered by the Kwongkan TEC, relocation will mostly likely to be an area outside of the planning area. No new sites will be allowed 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 2km of the site). Appendix 15 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 3km 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 and departmental policy. 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 (see Appendix 15 for assessment of 21 apiary sites within 2km of the planning area).

Further information on beekeeping, including the standard conditions for apiary sites, can be obtained from the department's website (www.dpaw.wa.gov.au/plants-and-animals/animals/60-beekeeping-on-crown-land-in-western-australia).

Desired outcome

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

Management actions

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 and departmental policy and regulations.
2. 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 (see Appendix 15).
3. Control feral bees within the planning area where practicable.
4. Liaise with beekeepers, the beekeeping industry, and the Department of Agriculture and Food to ensure the most efficient and sustainable use of sites.
5. Adapt management to incorporate new knowledge on the impact of beekeeping on biodiversity.
6. 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 the Department of Parks and Wildlife. 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.

The Conservation Commission expects to be consulted by relevant government agencies including the Department of Parks and Wildlife and the Office of the Environmental Protection Authority in cases where potential direct or indirect environmental impacts on surface and groundwater biodiversity values of lands vested in the Conservation Commission are anticipated (Conservation Commission 2014b).

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.

Ewarts 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.

Management actions

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 from Kalgoorlie to Esperance 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.

Horizon Power (a State Government-owned corporation) has numerous power lines servicing Esperance and surrounding farms and properties. Some of these power lines occur adjacent to or cross the planning area, in particular the four river corridor proposed additions (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.

As some of these utilities and services cross conservation estate as opposed to having their own reserve, they may need to be excised as section 5(1)(h) reserves. Others require the corridor to be amended to match actual alignment.

Desired outcome

Impact of utilities and services on key values are minimised.

Management actions

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 bushfire prevention and 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 allowed.

Within the planning area, Helms Forestry Reserve contains commercial maritime 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. Ongoing control of the maritime pine seedlings will be important to protect the values of the native vegetation of Helms Forest Reserve (see Section 18 *Weeds*).

A yate (*Eucalyptus cornuta*) plantation has 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 to allow for the ongoing commercial thinning and harvest of firewood.

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.

Management actions

1. Reserve the native vegetation areas of Helms Forestry Reserve as nature reserve and retain the plantation and arboretum areas as miscellaneous reserves.
2. Continue the current agreement with Forest Products Commission to maintain the areas planted with commercial species in Helms Forestry Reserve and Manners Block.
3. 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.
5. Liaise with Forest Products Commission when they want to remove non-pine species within the plantation in Helms Forestry Reserve.
6. 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 over 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 plan by attending public meetings, completing Have Your Say brochures, being part of the Esperance and Recherche Community Advisory Committee and providing comment on the issues paper (DEC 2007b) and the draft management plan (DEC 2012d).

The analysis of public submissions (DPaW 2016) summarises the comments received on the draft management plan (DEC 2012d), discusses the key comments and states how this plan has been amended to reflect the comments.

If this plan is amended, then the proposed changes will be released for public comment (see Section 9 *Term of the plan*).

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. BirdLife 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 department has worked closely on a number of joint projects, including various training programs and numerous Coastcare/Coastwest projects. 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 2014-2015 financial year, volunteers contributed more than 29,705 hours to the Esperance District. Photo - Klaus Tiedemann

Desired outcome

Community involvement and support in planning and management.

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

Management actions

1. 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.
3. Continue to support volunteer involvement in departmental programs, and maintain records of the number of registered volunteers and the amount of volunteer hours contributed.

Key performance indicator

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

37. Off-reserve management and partnerships

Management objectives for this plan cannot be achieved in isolation as various land tenures (e.g. 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 2007a) 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 (e.g. 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

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 - Parks and Wildlife

- local governments are able to encourage planning and land management practices that complement management of the planning area through a range of planning instruments (e.g. town planning schemes and local planning strategies)
- the department maintains working arrangements with local governments, DFES, 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.

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

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.

A range of covenant and voluntary management schemes (e.g. 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.

Management actions

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

Research and monitoring

Research and monitoring are essential components of management, and are required to successfully implement this management plan. Research leads to improved knowledge and a better understanding of the values of the planning area, while long-term monitoring should inform adaptive management and performance assessment against the objectives of the management plan.

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 and level 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 and fauna across the planning area
- monitoring and research associated with flora translocations
- seed collecting and survey work for the Threatened Flora Seed Centre and other parts of the department
- herbaria flora collections by the department
- taxonomic work to support the identification and curating of specimens collected during surveys including describing new taxa
- monitoring and research associated with the reintroduction of fauna: 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 western ground parrot and Australasian bittern survey work
- surveying water quality and hydrology at wetlands with suitable Australasian bittern habitat
- monitoring aquatic macro-invertebrate fauna and waterbirds in Lake Gore and the Lake Warden System
- *Phytophthora* dieback research conducted by the South Coast NRM group and the department

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

- monitoring of the effectiveness of phosphite treatment of threatened flora and communities
- 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 a carpet python (*Morelia spilota imbricata*) on Mondrain Island, Recherche Archipelago Nature Reserve. Photo - Parks and Wildlife

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.

Management actions

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. 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.
6. 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.
7. Pursue external funding sources to assist in achieving research and monitoring objectives.

Research expedition to the Recherche Archipelago. Photo - Parks and Wildlife

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

Appendices

APPENDIX 1. Existing reserves within the planning area

All reserves extend to low water mark—including the Recherche Archipelago Nature Reserve—except Mullet Lake Nature Reserve (which is proposed to be changed to low water mark to facilitate management along the coast) and Investigator Island Nature Reserve.

Name	No.	Size (ha)#	Purpose
Mainland reserves west to east (66)			
National parks (3)			
Stokes National Park	A32590	9,726.46	National park
Cape Le Grand National Park	A22795	31,578.09	National park
	C44987	222.61	National park
Cape Arid National Park	A24047	279,448.40	National park
	Sub-total area	*320,975.56*	
Nature reserves (59)			
Lake Shaster Nature Reserve	C32339	10,504.50	Conservation of flora and fauna
Cheadanup Nature Reserve	A31754*	7,139.27	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 Nature Reserve’)	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*	701.81	Recreation and conservation of flora and fauna
	C50098	1.40	Public recreation and conservation
	C32259*	7.30	Conservation of flora and fauna
Shark Lake Nature Reserve	A31197*	11.03	Conservation of flora and fauna
Woody Lake Nature Reserve	A15231*	944.90	Recreation and conservation of flora and fauna
Mullet Lake Nature Reserve (currently to High Water Mark)	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
	A32777*	8,550.80	Conservation of flora and fauna
	A32780*	1,485.10	Conservation of flora and fauna
	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
	A32783*	7,082.10	Conservation of flora and fauna
	A32129*	1,751.60	Conservation of flora and fauna
	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

Name	No.	Size (ha)#	Purpose
Muntz Nature Reserve	A31799*	3,617.50	Conservation of flora and fauna
Unnamed nature reserve	A32131*	1,057.70	Conservation of flora and fauna
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	A32800*	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		*323,651.48*	
Other reserves (4)			
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
Cape Arid 5(1)(h) reserve	C44191	0.04	Conservation and trigonometric station
Sub-total area		*4,000.23*	
Island reserves west to east (5)			
Nature reserves (3)			
Investigator Island Nature Reserve	A36056	40.08	Conservation of flora and fauna
Recherche Archipelago Nature Reserve	A22796	7,145.49	Conservation of flora and fauna
Woody Island Nature Reserve	A39435	195.00	Conservation of flora and fauna, recreation and tourist development
Sub-total area		*7,380.57*	
Other reserves (2)			
Cull Island 5(1)(h) reserve	C42379	0.04	Conservation, navigation, communication, meteorology and survey
Figure of Eight 5(1)(h) reserve	C48955	0.06	Navigation, communication, meteorology, survey and conservation
Sub-total area		*0.10*	
Total area of 71 existing reserves		**656,007.94**	

The areas given are the mapped areas which can be different to the gazetted area.
* These reserves were added to the planning area after the issues paper (DEC 2007b) was released.
^ Only part of this reserve is included in the planning area; whole reserve size is 625,343.6ha.
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.

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

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change#
Unvested Crown reserve east of the Rabbit Proof Fence	C7580	Unvested Crown reserve	1,605.10	Rabbit department	Add to Lake Shaster Nature Reserve as per CALM (1992) recommendation R12. This would increase the reservation level of significant vegetation associations (41, 125) and protect Kwongkan TEC and populations of *Eucalyptus preissiana* subsp. *lobata* (Priority 4). The addition also forms part of the South Coast Macro Corridor providing a vegetation corridor between Lake Shaster Nature Reserve and Jerdacuttup Lakes Nature Reserve (west of the Rabbit Proof Fence).
Unvested Crown reserve	C18030	Unvested Crown reserve	202.44	Water	Add to Lake Shaster Nature Reserve. This would increase representation of vegetation communities under represented in the conservation reserve system and protect Kwongkan TEC. The addition also forms part of the South Coast Macro Corridor.
Unallocated Crown land surrounding C18030	n/a	Unallocated Crown land	630.79	n/a	
Unvested Crown reserve	A29447	Unvested Crown reserve	217.38	Stopping place for travellers and stock	Create an 'A' class nature reserve. This would increase reservation level of a significant vegetation association (128) and protect Kwongkan TEC. In addition, the hooded plover (Priority 4) has been recorded here.
Unvested Crown reserve	A29446	Unvested Crown reserve	157.14	Stopping place for travellers and stock	Create an 'A' class nature reserve. This would increase representation of vegetation communities under represented in the conservation reserve system and protect Kwongkan TEC and populations of rare flora (*Conostylis lepidospermoides*). In addition, the threatened Carnaby's cockatoo has been recorded here.
Unvested Crown reserve	A29448	Unvested Crown reserve	165.18	Stopping place for travellers and stock	Create an 'A' class nature reserve. This would increase representation of vegetation communities under represented in the conservation reserve system, and protect Kwongkan TEC. In addition, the threatened Carnaby's cockatoo has been recorded here.
Unallocated Crown land north of Cheadanup Nature Reserve^	n/a	Unallocated Crown land	6,212.18	n/a	Add to Cheadanup Nature Reserve as per CALM (1992) recommendation R39 and Map 2 DEC 2010a. This would increase reservation level of significant vegetation associations (512, 519, 931) and protect a highly cleared vulnerable vegetation association (512), as well as protect Kwongkan TEC, populations of *Eremophila serpens* (Priority 4) and Eucalyptus stoatei (Priority 4).
Unvested Crown reserve*	A29713	Unvested Crown reserve	2,046.00	Parklands	Create an 'A' class nature reserve. This would increase reservation level of significant vegetation associations (128, 519, 929, 2048) and protect a north-south vegetation corridor, riparian habitat, Kwongkan TEC, populations of rare *Conostylis lepidospermoides* and *Rhizanthella gardneri*, populations of Acacia nitidula (Priority 2), *Hopkinsia adscendens* (Priority 3), *Melaleuca similis* (Priority 1) and *Stylidium pulviniforme* (Priority 3). In addition, the threatened Carnaby's cockatoo has been recorded here.
Unvested Crown reserve*	A29715	Unvested Crown reserve	2,502.70	Parklands	
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#
Road reserve (unconstructed) through western Lake Shaster Nature Reserve	n/a	Public road	10.43	Road reserve	Add to Lake Shaster Nature Reserve. This would protect Kwongkan TEC which covers the entire reserve.
Honeymoon Island	n/a	Unallocated Crown land	0.41	n/a	Create an 'A' class nature reserve. This would protect potential haul-out sites for the threatened Australian sea-lion. At least one island is a known haul-out site.
Unallocated Crown land island south of Lake Shaster Nature Reserve	n/a	Unallocated Crown land	0.26	n/a	
Unallocated Crown land island south of Lake Shaster Nature Reserve	n/a	Unallocated Crown land	1.16	n/a	
Unallocated Crown land island south of Lake Shaster Nature Reserve	n/a	Unallocated Crown land	2.49	n/a	
Munglinup River corridor*	C30869	Unvested Crown reserve	2,465.16	Parklands	Create an 'A' class conservation park. This would provide for existing horseriding use, increase the reservation level of significant vegetation associations (929, 931) in the IUCN V-VI category and provide some protection for remnant riparian vegetation, Kwongkan TEC and bilby habitat (possible 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. This would increase reservation of a significant vegetation association (41) and protect Kwongkan TEC.
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. This would increase the reservation level of significant vegetation associations (125, 128, 512, 519, 929) and protect a highly cleared vulnerable vegetation association (512), riparian habitat, the north-south vegetation corridor to Frank Hann National Park, remnant vegetation for the catchment of Stokes Inlet, Kwongkan TEC and populations of *Eucalyptus stoatei* (Priority 4). In addition, two bird species listed as specially protected in Western Australia and protected under international agreements have been recorded here.
Young River corridor*	A31750	Unvested Crown reserve	2,956.00	Park	
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	
Unvested Crown reserve* (adj. to tributary of Young River)	A31765	Under management of the Department of Agriculture and Food	881.30	Agricultural research station	Create an 'A' class nature reserve. This would protect wetlands, remnant vegetation in a fragmented landscape and Kwongkan TEC. In addition, the curlew sandpiper, Baudin's cockatoo, eastern curlew and fairy tern (all threatened), as well as Australian bustard (Priority 4) and 18 bird species listed as specially protected in Western Australia and protected under international agreements have been recorded here.

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change#
Unvested Crown reserve*	A31764	Unvested Crown reserve	2,191.62	Park	Create an 'A' class nature reserve. This would increase the reservation level of significant vegetation associations (128, 512, 519) and protect a highly cleared vulnerable vegetation association (512), other remnant vegetation that is currently unmanaged and Kwongkan TEC.
Stokes Inlet	n/a	Unallocated Crown land	1,109.93	n/a	Add back to Stokes National Park. This would integrate management of the inlet with the national park and protect populations of *Velleia exigua* (Priority 2) and occurrences of the Coastal Saltmarsh TEC. In 1981, Stokes Inlet was excluded from Stokes National Park after it was considered that the vesting of the inlet conflicted with the Land Act. The Land Act has since been superseded by the Land Administration Act 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 et al. 1997), only opening occasionally to the ocean, due mainly to increased run-off 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). In addition, the eastern curlew, curlew sandpiper and fairy tern (all threatened), the specially protected peregrine falcon, as well as the hooded plover (Priority 4) and 15 species birds listed as specially protected in Western Australia and protected under international agreements have been recorded here.
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. This would increase the reservation level of significant vegetation associations (128, 482, 512, 519, 552) and protect a highly cleared vulnerable vegetation association (512), riparian habitat, remnant vegetation for the catchment of Stokes Inlet, the north-south vegetation corridor to Peak Charles National Park, regionally significant Native Dog Swamp, Kwongkan TEC (A31739 and A31761), populations of *Caladenia longifimbriata* (Priority 1) and *Hopkinsia adscendens* (Priority 3). In addition, the threatened chuditch and crested bellbird (Priority 4) have been recorded here.
Lort River corridor*	C26913	Unvested Crown reserve	1,214.10	Public utility	
Lort River corridor	A31761	Unvested Crown reserve	809.00	Park and protection of river and foreshore	
Unallocated Crown land surrounding Peak Charles National Park^	n/a	Unallocated Crown land	116,033.94	n/a	Add to Peak Charles National Park as per CALM (1992) recommendations E33 and Ds4 and Map 2 DEC 2010a. This would increase the reservation level of significant vegetation associations (125, 413, 482, 486, 512, 519, 521,522, 552, 925, 936, 1413) and protect a highly cleared vulnerable vegetation association (512) and limited extent vegetation association (413). This would protect populations of *Acacia amyctica* (Priority 2), *Acacia glaucissima* (Priority 3), *Acacia improcera* (Priority 3), *Aotus prosacris* (Priority 1), *Aotus* sp. *Dundas* (Priority 2), *Baeckea* sp. Exclamation Lake (Priority 1), *Bossiaea flexuosa* (Priority 3), *Conostephium marchantiorum* (Priority 3), *Cyathostemon* sp. Dowak (Priority 1), *Cyathostemon* sp. Esperance (Priority 1), *Cyathostemon* sp. Salmon Gums (Priority 3), *Dicrastylis archeri* (Priority 1), *Drosera salina* (Priority 2), *Eremophila biserrata* (Priority 4), *Eremophila compressa* (Priority 3), *Eucalyptus brockwayi* (Priority 3), *Eucalyptus dolichorhyncha* (Priority 4), *Eucalyptus misella* (Priority 1), *Frankenia glomerata* (Priority 3), *Grevillea aneura* (Priority 4), *Haegiela tatei* (Priority 4), *Leucopogon rugulosus* (Priority 1), *Leucopogon* sp. Bonnie Hill (Priority 1), Persoonia baeckeoides (Priority 1), *Persoonia cymbifolia* (Priority 3), *Pilostyles collina* (Priority 4), *Pimelea pelinos* (Priority 1), *Sowerbaea multicaulis* (Priority 4), *Stylidium pulviniforme* (Priority 3), *Stylidium sejunctum* (Priority 3), *Thysanotus brachyantherus* (Priority 2). In addition, the threatened malleefowl, specially protected peregrine falcon, hooded plover and crested bellbird (both Priority 4) and Lake Cronin snake (Priority 3) have been recorded here.

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change#
Unvested Crown reserve^	C2786	Unvested Crown reserve	404.56	Resting place	Add to Peak Charles National Park as per CALM (1992) recommendations E33a and Map 2 DEC 2010a. This would increase the reservation level of significant vegetation associations (482, 486).
Roberts Swamp Shire Reserve*	C26912	Shire Reserve	1,662.00	Recreation and parklands	Create an 'A' class nature reserve. This would increase the reservation level of significant vegetation associations (51, 482, 512) and protect a highly cleared vulnerable vegetation association (512), remnant vegetation for the catchment of Stokes Inlet, regionally significant Roberts Swamp, and populations of *Leucopogon rugulosus* (Priority 1).
Unvested Crown reserve*	C26915	Unvested Crown reserve	122.39	Public utility	Create an 'A' class nature reserve. This would increase the reservation level and protect a highly cleared vulnerable vegetation association (512), remnant vegetation in a fragmented landscape, populations of *Hydrocotyle* sp. Vigintimilia (Priority 1) and granite outcrop habitats.
Lake Gidong	n/a	Unallocated Crown land	66.52	n/a	Add to Lake Gore Nature Reserve. Reservation as an 'A' class nature reserve dates back to the CTRC (1974) 'green book' and EPA (1976) 'red book'. These lakes are part of the Lake Gore hydrological system and are included as part of the nationally important Lake Gore wetland system and have the potential to be added to the Ramsar site. The lakes are also where the hooded plover (Priority 4) has been sighted regularly in numbers of 20 or more at a time. The lakes form part of the South Coast Macro Corridor providing a link from Warrenup Lakes Nature Reserve to Lake Gore Nature Reserve. In addition, the threatened curlew sandpiper and four bird species listed as specially protected in Western Australia and protected under international agreements have been recorded here.
Unallocated Crown land lake	n/a	Unallocated Crown land	35.54	n/a	
Lake Kubitch	n/a	Unallocated Crown land	50.92	n/a	
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. This would increase the reservation level of a significant vegetation association (125) and protect Kwongkan TEC. The addition is part of the South Coast Macro Corridor linking Warrenup Lakes Nature Reserve, Lake Quallilup 5(1)(h) reserve and Lake Mortijinup Nature Reserve.
Shire reserve adjacent to Dowak Nature Reserve*	C21360	Shire Reserve	425.81	Tank	Add to Dowak Nature Reserve. This would increase the reservation level of a significant vegetation association (486). In addition, the specially protected peregrine falcon has been recorded here.
Unallocated Crown land adjacent to Dowak Nature Reserve*	n/a	Unallocated Crown land	316.86	n/a	
Butty Harbour Reserve (part)	C24486	Unvested Crown reserve	3,504.94	Conservation of flora	Add part to Lake Mortijinup Nature Reserve as per CALM (1992) recommendation E15. This would increase the reservation level and protect a highly cleared vulnerable vegetation association (6048) and add areas within the nationally important Lake Mortijinup System as well as protect Kwongkan TEC. The addition is part of the South Coast Macro Corridor.
Freehold land west of Scaddan*	Lot 532	Freehold	344.17	n/a	Create an 'A' class nature reserve. This would increase the reservation level and protect a highly cleared vulnerable vegetation association (512) and protect 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. This would increase the reservation level of significant vegetation association (486) and protect remnant vegetation that is currently unmanaged.

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change#
Unvested Crown reserve*	C8102	Unvested Crown reserve	63.69	Resting place for travellers and stock	Create an 'A' class nature reserve. This would increase the reservation level of significant vegetation association (486) and protect remnant vegetation including small pockets of nearly pure stands of *Eucalyptus eremophila* that is currently unmanaged and small lake features.
Unvested Crown reserve (south of Telegraph Road) Bayemup Lake^	C14209	Department of Water management	27.49	Water and conservation of flora and fauna	Create an 'A' class nature reserve. This would increase the reservation level of significant vegetation association (6048) which has been extensively cleared and protect Kwongkan TEC as well as populations of *Astartea reticulata* (Priority 3) and Bayemup Lake wetland.
Unvested Crown reserve*	C14112	Unvested Crown reserve	249.70	Townsite, waterway	Create an 'A' class nature reserve. This would increase the reservation level of significant vegetation association (41) and protect Kwongkan TEC.
Unallocated Crown land adjacent to Scaddan Road*	Esp locations 2009, 2010	Unallocated Crown land	1,091.97	n/a	Create an 'A' class nature reserve. This would protect populations of *Beyeria physaphylla* (Priority 1), *Conostephium marchantiorum* (Priority 3), *Eucalyptus foliosa* (Priority 3), *Hydrocotyle* sp. Decipiens (Priority 2), *Hydrocotyle* sp. Truslove (Priority 1), *Isopogon alcicornis* (Priority 3), *Melaleuca dempta* (Priority 3).
Unvested Crown reserve	C2780	Unvested Crown reserve	405.15	Resting place for travellers and stock	Add to Truslove Townsite Nature Reserve. This would protect remnant vegetation, Kwongkan TEC and populations of *Beyeria physaphylla* (Priority 1) and *Isopogon alcicornis* (Priority 3).
Pink Lake*^	n/a	Unallocated Crown land (including ex-mining lease)	1061.54	n/a	Add to Pink Lake Nature Reserve as per CALM (1999) Table 1 recommendation. This would increase the reservation level of a significant vegetation association (125) and protect Kwongkan TEC, the Priority 1 ecological community within the lake, nationally important wetlands, populations of Leucopogon rotundifolius (Priority 3). In addition, the threatened curlew sandpiper, great knot, Recherche Cape Barren goose as well as hooded plover (Priority 4) and eight species listed as specially protected in Western Australia and protected under international agreements which have been recorded here.
Shire Reserve adjacent to Pink Lake^	C22422	Shire Reserve	38.10	Recreation	
Unallocated Crown land*	Lot 2199	Unallocated Crown land	1.30	n/a	Add to Shark Lake Nature Reserve. This would increase reservation and protect a highly cleared vulnerable vegetation association (6048), riparian habitat and provide a buffer for the lake. The threatened Carnaby's cockatoo has been recorded here. The road reserve is undeveloped, vegetated and unlikely to be required in the future.
Road reserves at Shark Lake*	n/a	Shire Reserve	3.28	Road reserve surrounding Shark Lake	
Unallocated Crown land south of Lake Warden*	Lots 510, 511, 513, 512, 501, 304	Unallocated Crown land	28.77	n/a	Add to Lake Warden Nature Reserve (or Pink Lake Nature Reserve). The addition would increase reservation of a significant vegetation association (125) and protect remnant vegetation, riparian habitat and prevent further clearing of the catchment.
Unallocated Crown land west of Lake Warden*	Lots 566, 560, 500	Unallocated Crown land	19.50	n/a	Add to Lake Warden Nature Reserve. Lake Warden Nature Reserve is part of a Ramsar site and is designated a Recovery Catchment. The addition would increase reservation of a significant vegetation association (125) and protect remnant vegetation, riparian habitat and prevent further clearing of the catchment.

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. Lake Warden Nature Reserve is part of a Ramsar site and is designated a Recovery Catchment. The addition would increase reservation of a significant vegetation association (125) and protect riparian habitat, Kwongkan TEC and prevent further clearing of this part of the catchment.
Shire Reserve adjacent to Lake Warden*	C33660	Shire Reserve	10.12	Public recreation	
Shire Reserve adjacent to Lake Warden*	C24284	Shire Reserve	2.74	Building sand	
Unallocated Crown land east of Lake Warden*	Lots 196, 219, 207, 300, 215	Unallocated Crown land	23.23	n/a	Add to Lake Warden Nature Reserve. Lake Warden Nature Reserve is part of a Ramsar site and is designated a Recovery Catchment. This would increase reservation of a significant vegetation association (125) and protect remnant vegetation, riparian habitat and prevent further clearing of the catchment.
Freehold land adjacent to Lake Warden*	Lot 282	Freehold	4.02	n/a	Add to Lake Warden Nature Reserve. Lake Warden Nature Reserve is part of a Ramsar site and is designated a Recovery Catchment. The addition would protect remnant riparian habitat and prevent further clearing of this part of the catchment, which has contributed to the high water levels and associated issues.
Freehold land acquired by the department north of Woody Lake*	Lot 3001	Freehold	90.61	n/a	Create a CALM Act section 5(1)(h) reserve, allowing for commercial thinning and harvesting for firewood and re-vegetate to lower the watertable for the protection of the wetland system.
Area between High Water Mark and Low Water Mark adjacent to Mullet Lake Nature Reserve^	n/a	Unallocated Crown land	7.19	n/a	Add to Mullet Lake Nature Reserve to take reserve down to low water mark and match all the other coastal reserves in the planning area.
Unallocated Crown land north of Mount Ridley Nature Reserve adjacent to Lignite Road*	Esperance locations 1999 and 2000	Unallocated Crown land	6,080.03	n/a	Create an 'A' class nature reserve. This would protect populations of rare *Eucalyptus merrickiae* and *Acacia euthyphylla* (Priority 3), Conostephium uncinatum (Priority 2), *Melaleuca fissurata* (Priority 4) and *Tecticornia indefessa* (Priority 2). In addition, hooded plover (Priority 4) has been recorded here.
Unvested Crown reserve Benje Benjenup Lake	C14563	Unvested Crown reserve	149.44	Waterway	Create an 'A' class nature reserve. This would increase the reservation level of significant vegetation associations (125, 6048) and protect a highly cleared vulnerable vegetation association (6048) and protect a regionally significant lake and Kwongkan TEC. In addition, the threatened curlew sandpiper, hooded plover (Priority 4) and two other bird species listed as specially protected in Western Australia and protected under international agreements have been recorded here.
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. This would protect populations of *Astroloma* sp. Grass Patch (Priority 2), *Conostephium marchantiorum* (Priority 3), *Eremophila glabra* subsp. Scaddan (Priority 1), *Goodenia laevis* subsp. laevis (Priority 3), Hydrocotyle sp. Truslove (Priority 1), Isopogon alcicornis (Priority 3), *Kunzea salina* (Priority 2), *Melaleuca dempta* (Priority 3) and *Stachystemon vinosus* (Priority 4). In addition, the threatened Carnaby's cockatoo, hooded plover (Priority 4) and 10 bird species listed as specially protected in Western Australia and protected under international agreements have been recorded here.

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change#
Unallocated Crown land adjacent to Mount Ridley Nature Reserve^	Esperance Location 1996	Unallocated Crown land	5896.45	n/a	Add to Mount Ridley Nature Reserve. This would protect Kwongkan TEC which covers the entire reserve and populations of threatened goblet mallee (*Eucalyptus merrickiae*) and *Eremophila glabra* subsp. Scaddan (Priority 1).
Unvested Crown reserve (western part) adjacent to Mullet Lake Nature Reserve (Stevens and Doombup lakes)*	C28170	Unvested Crown reserve	1,765.30	Use and requirements of government	Add to Mullet Lake Nature Reserve as per CALM (1992) recommendation E25. This would increase the reservation level of significant vegetation associations (125) and protect nationally significant Stevens, Doombup and Bannitup lakes. The threatened curlew sandpiper and hooded plover (Priority 4) have been recorded here. The addition forms part of the South Coast Macro Corridor.
Unallocated Crown land (Bannitup Lake)	n/a	Unallocated Crown land	204.59	n/a	
Unvested Crown reserve (eastern part) adjacent to Cape Le Grand National Park (includes Big Boom Swamp)	C28170	Unvested Crown reserve	4,191.94	Use and requirements of government	Add to Cape Le Grand National Park. This would increase the reservation level of significant vegetation associations (128) and protect Kwongkan TEC and populations of *Acacia incanicarpa* (Priority 2), *Astartea eobalta* (Priority 2), *Comesperma lanceolatum* (Priority 2), *Eucalyptus semiglobosa* (Priority 3), *Gonocarpus simplex* (Priority 4), *Thelymitra variegata* (Priority 3) and important fauna habitats (such as potential black-flanked rock-wallaby habitat). The threatened Australasian bittern (Big Boom Swamp) and little bittern (Priority 4) have been recorded here. There have also been records of the threatened (Critically Endangered) western ground parrot in this area (pers. comm.s cited in McNee 2000 and McNee 2001). Forms part of the South Coast macro corridor.
Unallocated Crown land north of Cape Le Grand National Park	Esperance locations 2073, 2134, n/a	Unallocated Crown land	2,759.71	n/a	Add to Cape Le Grand National Park as per CALM (1992) recommendation E25a. This would increase the reservation level of significant vegetation associations (128) and protect populations of *Leucopogon multiflorus* (Priority 2). Forms part of the South Coast Macro Corridor.
Unallocated Crown land south of Alexander Nature Reserve	Neridup Location 513, n/a	Unallocated Crown land	12,314.90	n/a	Add to Alexander Nature Reserve as per CALM (1992) recommendation E28a. This would increase the reservation level of significant vegetation associations (128, 4801, 6048) and protect a highly cleared vulnerable vegetation association (6048), populations of *Lasiopetalum parvuliflorum* (Priority 3) and regionally significant Ocean View wetlands and Ewarts Swamp. Ewarts Swamp is an important source of freshwater in the region (less than 1% of lakes are freshwater in the region). In addition, the Recherche rock-wallaby, Australasian bittern and the western ground parrot (all threatened) have been recorded here as well as the hooded plover (Priority 4) and two bird species listed as specially protected in Western Australia and protected under international agreements. Forms part of the South Coast Macro Corridor.
Road reserve (unconstructed) through Unallocated Crown land adjacent to Alexander Nature Reserve	n/a	Public road	43.81	Road reserve	Add to Alexander Nature Reserve. This would increase the reservation level of a significant vegetation association (6048) which has been highly cleared and protect Kwongkan TEC which covers the majority of the reserve.
Unallocated Crown land north of Fisheries Road^	Lot 105	Unallocated Crown land	293.00	n/a	Create an 'A' class nature reserve. This would increase the reservation level of significant vegetation associations (41, 4801) and protect a highly cleared vulnerable vegetation association (4801). The threatened Carnaby's cockatoo has been recorded here.

Name	No.	Tenure	Size (ha)	Current purpose	Proposed change#
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. This would increase the reservation level of significant vegetation associations (41, 125, 128, 482, 519, 4801) and protect a highly cleared vulnerable vegetation association (4801), populations of *Darwinia* sp. Mt Baring (Priority 1**), *Eucalyptus balanopelex* (Priority 1), *Eucalyptus litorea* (Priority 2), *Eucalyptus semiglobosa* (Priority 3), *Gonocarpus pycnostachyus* (Priority 3), *Grevillea baxteri* (Priority 4), *Gyrostemon ditrigynus* (Priority 4**), *Hibbertia hamata* (Priority 3), *Kennedia beckxiana* (Priority 4), *Leucopogon florulentus* (Priority 3**), *Leucopogon remotus* (Priority 1), *Micromyrtus elobata* subsp. scopula (Priority 3), *Microtis quadrata* (Priority 4**), *Myriophyllum petraeum* (Priority 4), *Paracaleana parvula* (Priority 2), *Persoonia spathulata* (Priority 2**), *Philotheca apiculata* (Priority 2**), *Stachystemon vinosus* (Priority 4), *Thelymitra variegata* (Priority 3) and malleefowl and western ground parrot habitats. There has been an unconfirmed sighting of the latter. In addition, the threatened Carnaby's cockatoo, Australian bustard (Priority 4) and crested bellbird (Priority 4) have been recorded here. **Not found anywhere else in planning area.
Thomas River Shire reserve	518	Shire reserve	104	Camping, recreation	Since 2004, the department has managed this reserve under an MoU with the Shire of Esperance. It is now proposed to add the reserve to Cape Arid National Park to integrate management of this enclave camping area adjacent to the departmental camping area. This would protect populations of *Hibbertia hamata* (Priority 3), and Kwongkan TEC which covers the majority of the reserve. The Carnaby's cockatoo and grey falcon (both threatened) as well as the hooded plover (Priority 4) and six bird species listed as specially protected in Western Australia and protected under international agreements have been recorded here.
Unallocated Crown land north of Cape Arid National Park 'Kangawarrie'^	n/a	Unallocated Crown land	35,300.00	n/a	Add to Cape Arid National Park as per suggestion during public consultation period. This would increase the reservation level of significant vegetation associations (221, 482) and the under reserved Mardabilla subregion and protect karst systems, natural grasslands and scenic landscapes. Boundary subject to further examination of values and field inspections. For example, additional area of vegetation association 482 is required to raise reservation level to 15% and an additional 20,000ha is required to adequately reserve the Mardabilla subregion.
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).
Total area of 95+ proposed additions			**355,668.80**		

It is desired that all existing and proposed conservation reserves within the planning area are 'class A' (see Section 7 *Proposed tenure changes*), however if this is not possible in the first instance, reservation should still be pursued with a long-term goal for the reserve to be 'class A'.

* This reserve was added to the planning area after the issues paper (DEC 2007b) was released.

^ This reserve was added to the planning area after the draft management plan (DEC 2012d) was released.

APPENDIX 3. Significant wetlands and lakes

Wetland	Reserve	Conservation estate*	Significance		
			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 (west)	Proposed		Y#	
Stevens and Doombup lakes	Reserve 28170 (west)	Proposed		Y#	
Big Boom Swamp	Reserve 28170 (east)	Proposed		Y#	
Unnamed wetland east of Frenchman Peak	Cape Le Grand National Park	Existing			Y
Unnamed wetland east of Dunns Rocks	Cape Le Grand National Park	Existing			Y
Unnamed wetlands	Unallocated Crown land north of Cape Le Grand National Park	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 and is proposed to be added to Stokes National Park.

These wetlands are not included in the *National Directory of Important Wetlands* (Environment Australia 2001a) however, there is recent survey work to support that these lakes are nationally significant. In Spring 2012, on Lake Bannitup red-capped plover numbers exceeded one per cent of the estimated 95,000 world population. At the same time, the lake was supporting over 2,000 red-necked stints and a total bird count on the lake on 9 November 2012 was 7,500, including ducks. The lake is a feeding ground for waders at a time when many of the other lakes in the system are flooded from winter rains. During Summer, with Lake Bannitup dry apart from the easterly spring-fed stream, the lake still remains an important area for red-capped plovers, red-necked stints (feeding for their migration) and the occasional hooded plover. The numbers fluctuate but the former are often in the hundreds (Birdlife Australia submission to the draft management plan [DPaW 2016]).

APPENDIX 4. Conservation flora

There are more than 2,142 native vascular taxa recorded within the planning area from 99 families. Of these, there are 190 taxa of rare and priority flora (12 rare, 26 P1, 67 P2, 50 P3, 35 P4) with 66 being either locally endemic (with a range of less than 150km [LE]) or endemic to the bioregion (Esperance [ESP], Mallee [MAL] or Coolgardie [COO]).

Family	Species	Cons. code	Endemic	Existing reserves	Proposed additions
Anarthriaceae	*Hopkinsia adscendens*	P3		Lake Shaster NR	Oldfield and Lort river corridors
Anthericaceae	*Caesia viscida*	P2	E(ESP)	Cape Arid NP	
	Thysanotus brachyantherus	P2		Cape Arid NP	Unallocated Crown land adj Peak Charles
	Thysanotus parviflorus	P4		Cape Le Grand NP, Burdett South NR	
	Thysanotus volubilis	P2	LE, E(ESP)	Cape Le Grand NP	
Apiaceae	*Xanthosia collina*	P3		Cape Arid NP	
Apodanthaceae	*Pilostyles collina*	P4			Unallocated Crown land adj Peak Charles
Araliaceae	*Hydrocotyle* sp. Decipiens (G.J. Keighery 463)	P2			Unallocated Crown land Lot 2009
	Hydrocotyle sp. Truslove (M.A. Burgman 4419)	P1		Truslove Townsite NR	Unallocated Crown land Lot 2009, Unallocated Crown land Esp. Loc. 1992
	Hydrocotyle sp. Vigintimilia (P.G. Wilson 7940)	P1			Reserve 26915 (W of Scaddan)
	Trachymene anisocarpa var. *trichocarpa*	P3	LE	Truslove Townsite NR	
Asparagaceae	*Sowerbaea multicaulis*	P4			Unallocated Crown land adjacent to Peak Charles
Asteraceae	*Angianthus micropodioides*	P3		Beaumont NR 32783	
	Chthonocephalus multiceps	P2	LE	Cape Arid NP	
	Haegiela tatei	P4		Beaumont NR 32783	Unallocated Crown land adjacent to Peak Charles
	Myriocephalus biflorus	P2	LE, E(MAL)	Cape Arid NP	
	Olearia laciniifolia	P2		Cape Arid NP	
	Vittadinia blackii	P2	LE, E(COO)	Cape Arid NP	
Casuarinaceae	*Allocasuarina hystricosa*	P4		Cape Arid NP	
Centrolepidaceae	*Centrolepis cephaloformis* subsp. *murrayi*	P3		Recherche Archipelago NR	
Chenopodiaceae	*Tecticornia indefessa*	P2		Truslove Townsite NR, Mullet Lake NR, Beaumont NR 32783, Nuytsland NR, Mullet Lake NR	Unallocated Crown land Esp. Loc 2000
Cyperaceae	*Isolepis australiensis*	P3		Recherche Archipelago NR	
	Schoenus benthamii	P3		Cape Arid NP	
	Schoenus sp. Grey Rhizome (K.L. Wilson 2922)	P1		Helms	
Dilleniacece	*Hibbertia hamata*	P3	LE, E(ESP)	Cape Arid NP	UCL west of Cape Arid NP, Thomas River 518
	Hibbertia turleyana	P2		Helms	
Droseraceae	*Drosera salina*	P2	E(MAL)		UCL adj to Peak Charles

Family	Species	Cons. code	Endemic	Existing reserves	Proposed additions
Ericaceae	*Andersonia carinata*	P2		Cape Arid NP	
	Andersonia setifolia	P3		Cape Le Grand NP	
	Astroloma sp. Grass Patch (A.J.G. Wilson 110)	P2		Ridley North NR, Mt Ridley NR	UCL Esp. Loc. 1992, Ridley North NR
	Conostephium marchantiorum	P3		Bishops NR, Truslove North NR, Mt Ridley NR	UCL adj to Peak Charles, UCL lot 2009, UCL Esp. Loc. 1992
	Conostephium uncinatum	P2		NR 33113	UCL Esp. Loc 2000
	Dielsiodoxa propullulans	P2	LE	Cape Arid NP	
	Leucopogon apiculatus	P3		Cape Le Grand NP, Cape Arid NP, Mt Dean and Mt Esmond NR, Woody Island NR, Recherche Archipelago NR	
	Leucopogon blepharolepis	P4		Stokes NP, Barker Inlet NR	
	Leucopogon bossiaea	P2		Nuytsland NR	
	Leucopogon compactus	P4		Cape Arid NP	
	Leucopogon corymbiformis (prev. *Leucopogon* sp. Cape Arid)	P2	E(ESP)	Helms, Cape Arid NP	
	Leucopogon florulentus	P3			UCL west of Cape Arid NP
	Leucopogon interruptus	P3		Cape Le Grand NP, Cape Arid NP, Recherche Archipelago NR	
	Leucopogon multiflorus	P2	E(ESP)	Cape Le Grand NP, Cape Arid NP	UCL Esp Loc 2073
	Leucopogon remotus	P1		Niblick NR, Nuytsland NR	UCL west of Cape Arid NP
	Leucopogon rotundifolius	P3		Cape Le Grand NP, Mt Burdett NR, Cape Arid NP, Nuytsland NR, Woody Island NR, Recherche Archipelago NR	Pink Lake
	Leucopogon rugulosus	P1	LE, E(MAL)		UCL adjacent to Peak Charles NP, Roberts Swamp
	Leucopogon sp. Bonnie Hill (K.R. Newbey 9831)	P1	E(MAL)		UCL adjacent to Peak Charles NP
	Leucopogon sp. Israelite Bay (G.F. Craig 2558)	P2		Nuytsland NR	
Euphorbiaceae	*Beyeria physaphylla*	P1	LE		UCL Lot 2009, UCL Lot 2010, Reserve 2780
	Beyeria simplex	P2		Cape Arid NP, Nuytsland NR	
	Ricinocarpos pilifer	P2		Cape Le Grand NP	
	Stachystemon vinosus	P4		Cape Arid NP	UCL Esp. Loc. 1992, UCL west of Cape Arid NP

Family	Species	Cons. code	Endemic	Existing reserves	Proposed additions
Fabaceae	*Aotus prosacris*	P1	LE, E(MAL)		UCL adjacent to Peak Charles NP
	Aotus sp. Dundas (prev. *Otion rigidum*)	P2		NR 33113	UCL adjacent to Peak Charles NP
	Bossiaea flexuosa	P3			UCL adjacent to Peak Charles NP
	Daviesia pauciflora	P2		Cascade NR, Helms	
	Pultenaea vestita	P3		Woody Lake NR	
Fabroniaceae	*Fabronia hampeana*	P2		Lake Mortijinup NR	
Frankeniaceae	*Frankenia brachyphylla*	P2		Truslove Townsite NR	
	Frankenia glomerata	P3			UCL adjacent to Peak Charles NP
Goodeniaceae	*Dampiera decurrens*	P2	LE, E(ESP)	Cape Le Grand NP, Woody Island NR, Recherche Archipelago NR	
	Dampiera sericantha	P3		Helms	
	Dampiera triloba	P3		Helms	
	Goodenia laevis subsp. *laevis*	P3		Kau Rock NR	UCL Esp. Loc. 1992
	Goodenia quadrilocularis	P2		Cape Le Grand NP, Cape Arid NP, Woody Island NR	
	Scaevola archeriana	P1	E(MAL)	Beaumont NR 32783	
	Scaevola brookeana	P2	LE, E(MAL)	Cape Arid NP, Mt Dean and Mt Esmond NR	
	Scaevola paludosa	P2	LE, E(ESP)	Cape Le Grand NP, Recherche Archipelago NR	
	Velleia exigua	P2		Stokes NP, Helms	Stokes Inlet UCL
Gyrostemonaceae	*Gyrostemon ditrigynus*	P4			UCL west of Cape Arid NP
Haemodoraceae	*Anigozanthos bicolor* subsp. minor	R(S3) VU		Lake Shaster NR, Stokes NP, Dalyup NR, Cape Arid NP	
	Conostylis lepidospermoides	R(S3) VU			Oldfield River Corridor, Reserve 29446 (W of Oldfield River)
	Conostylis seorsiflora subsp. *longissima*	P2	E(ESP)	Cape Le Grand NP	
Haloragaceae	*Gonocarpus pycnostachyus*	P3		Helms, Cape Arid NP	UCL west of Cape Arid NP
	Gonocarpus simplex	P4		Cape Le Grand NP	R28170 East
	Myriophyllum balladoniense	P4		Cape Arid NP	
	Myriophyllum petraeum	P4		Cape Le Grand NP, Cape Arid NP	UCL west of Cape Arid NP
	Myriophyllum sp. Mt Arid (L.S.J. Sweedman 6767)	P2	LE, E(ESP)	Cape Arid NP	
Iridaceae	*Patersonia inaequalis*	P2	E(ESP)	Cape Le Grand NP, Recherche Archipelago NR	
Lamiaceae	*Dicrastylis archeri*	P1	E(MAL)	Bishops NR	UCL adjacent to Peak Charles NP
	Prostanthera carrickiana	P4		Cape Arid NP, Clyde Hill NR	
Lentibulariaceae	*Utricularia helix*	P2	LE, E(ESP)	Cape Le Grand NP	
	Utricularia westonii	P2	LE, E(ESP)	Cape Le Grand NP	

Family	Species	Cons. code	Endemic	Existing reserves	Proposed additions
Malvaceae	*Commersonia apella*	R(S1) CE		Cape Le Grand NP	
Mimosaceae	*Acacia amyctica*	P2	E(MAL)	Dowak NR	UCL adjacent to Peak Charles NP
	Acacia bartlei	P3		Swan Lagoon NR, Truslove North NR, Kau Rock NR	
	Acacia diaphana	P1		Clyde Hill NR	
	Acacia diminuta	P1		Griffiths NR, Truslove Townsite NR	
	Acacia euthyphylla	P3		Kau Rock NR	UCL Esp. Loc. 1999, UCL Esp. Loc. 2000
	Acacia glaucissima	P3		Swan Lagoon NR, Mt Ney NR	UCL adjacent to Peak Charles NP
	Acacia improcera	P3		Cheadanup NR	UCL adjacent to Peak Charles NP
	Acacia incanicarpa	P2	LE, E(ESP)	Cape Le Grand NP	R28170 East
	Acacia nitidula	P2		Cape Le Grand NP, Neredup NR, Cape Arid NP, Recherche Archipelago NR	Oldfield River Corridor
Myoporaceae	*Eremophila biserrata*	P4			UCL adjacent to Peak Charles NP
	Eremophila chamaephila	P3		Dowak NR	
	Eremophila compressa	P3			UCL adjacent to Peak Charles NP
	Eremophila denticulata subsp. *denticulata*	R(S3) VU		Cheadanup NR	
	Eremophila denticulata subsp. *trisulcata* ms	R(S2) EN	LE	Cape Arid NP	
	Eremophila glabra subsp. Scaddan (C. Turley s.n. 10/11/2005)	P1	LE		UCL Esp. Loc. 1996, UCL Esp. Loc. 1992
	Eremophila serpens	P4			UCL north of Cheadanup NR
Myrtaceae	*Astartea eobalta* (prev. *Astartea* sp. eastern swamps)	P2		Cape Le Grand NP, Cape Arid NP	R28170 East
	Astartea reticulata (prev. *Astartea* sp. Hopetoun area A.S. George 10594)	P3		Lake Shaster NR, Stokes NP	Bayemup Lake
	Astus wittweri	P2	LE, E(MAL)	Cape Arid NP, Nuytsland NR	
	Baeckea sp. Exclamation Lake (M.E Trudgen 1524)	P1	LE, E(MAL)		UCL adjacent to Peak Charles NP
	Baeckea sp. Gibson (K.R. Newbey 11084)	P1		NR 32131, NR 38334	
	Cyathostemon sp. Dowak (J.M. Fox 86/271)	P1	LE, E(MAL)		UCL adjacent to Peak Charles NP
	Cyathostemon sp. Esperance (A. Fairall 2431) (prev. *Astartea* sp. Esperance)	P1		NR 33113	UCL adjacent to Peak Charles NP
	Cyathostemon sp. Salmon Gums (B. Archer 769)	P3		Bishops NR, NR 33113	UCL adjacent to Peak Charles NP
	Darwinia polycephala	P4	E(MAL)	Truslove Townsite NR, Cape Arid NP	

Family	Species	Cons. code	Endemic	Existing reserves	Proposed additions
Myrtaceae	*Darwinia* sp. Gibson (R.D. Royce 3569)	P1		Mt Ridley NR	
	Darwinia sp. Mt Baring (K.R. Newbey 9775)	P1			UCL west of Cape Arid NP
	Darwinia sp. Mt Burdett (N.G. Marchant 80/42)	P4		Mt Burdett NR, Burdett South NR, Kau Rock NR	
	Darwinia sp. Mt Ragged (S. Barrett 663)	P2		Speddingup West NR, Cape Arid NP	
	Eucalyptus annettae	P2	LE	Nuytsland NR	
	Eucalyptus aquilina	P4	LE, E(ESP)	Cape Le Grand NP, Recherche Archipelago NR	
	Eucalyptus brockwayi	P3			UCL adjacent to Peak Charles NP
	Eucalyptus dolichorhyncha	P4		Bishops NR, Mt Burdett NR	UCL adjacent to Peak Charles NP
	Eucalyptus famelica	P3	LE	Helms	Reserve 7580
	Eucalyptus foliosa	P3	LE	Helms	UCL Lot 2009
	Eucalyptus fraseri subsp. *melanobasis*	P2	E(COO)	Cape Arid NP	
	Eucalyptus insularis subsp. *continentalis*	R(S2) EN	LE, E(ESP)	Cape Le Grand NP	
	Eucalyptus insularis subsp. *insularis*	P4	LE, E(ESP)	Recherche Archipelago NR	
	Eucalyptus ligulata subsp. *ligulata*	P4		Cape Le Grand NP, Cape Arid NP	
	Eucalyptus litorea	P2	LE, E(ESP)	Cape Arid NP, Nuytsland NR	UCL west of Cape Arid NP
	Eucalyptus luculenta	P2	LE	Cape Arid NP	
	Eucalyptus merrickiae	R(S3) VU		Jeffery Lagoon NR, Truslove Townsite NR, NR 33113, Ridley South NR, Nuytsland NR	UCL Esp. Loc. 1999, UCL Esp. Loc. 2000, UCL Esp. Loc. 1996
	Eucalyptus misella	P1		Helms	UCL adjacent to Peak Charles NP
	Eucalyptus preissiana subsp. *lobata*	P4	LE, E(ESP)	Lake Shaster NR, Stokes NP, Barker Inlet NR, Warrenup Lakes NR	Reserve 7580
	Eucalyptus semiglobosa	P3		Stokes NP, Barker Inlet, Cape Le Grand NP, Cape Arid NP, Nuytsland NR	R28170 East, UCL west of Cape Arid NP
	Eucalyptus stoatei	P4			UCL north of Cheadanup NR, Young River Corridor
	Eucalyptus surgens	P2	LE	Nuytsland NR	
	Eucalyptus sweedmaniana	P2		Cape Arid NP	
	Eucalyptus x *missilis*	P4		Cape Le Grand NP	
	Hypocalymma sp. Cascade (R. Bruhn 20896)	R(S3) VU		Griffiths NR	
	Kunzea salina	P3		Truslove Townsite NR, Helms	UCL Esp. Loc. 1992
	Melaleuca dempta	P3		Fields NR, Neredup NR	UCL Lot 2009, UCL Lot 2010, UCL Esp. Loc. 1992
	Melaleuca eximia	P2		Mt Burdett NR	

Family	Species	Cons. code	Endemic	Existing reserves	Proposed additions
Myrtaceae	*Melaleuca fissurata*	P4		Truslove Townsite NR, Ridley South NR, Kau Rock NR	UCL Esp. Loc. 2000
	Melaleuca similis	P1			Oldfield River Corridor
	Melaleuca viminea subsp. appressa	P2		Mt Burdett NR, Muntz NR	
	Micromyrtus elobata subsp. scopula	P3		Kau Rock NR	UCL west of Cape Arid NP
	Verticordia verticordina	P3	LE, E(ESP)	Cape Le Grand NP, Cape Arid NP	
Orchidaceae	*Caladenia longifimbriata*	P1			Lort River Corridor
	Microtis quadrata	P4			UCL west of Cape Arid NP
	Paracaleana parvula	P2		Helms, Cape Arid NP	UCL west of Cape Arid NP
	Pterostylis sp. *Ongerup* (K.R. Newbey 4874)	P4		Cape Arid NP	
	Rhizanthella gardneri	R(S1) CE		Cheadanup NR	Oldfield River Corridor
	Thelymitra variegata	P3			R28170 East, UCL west of Cape Arid NP
Papilionaceae	*Gastrolobium pycnostachyum*	P2	LE	Cape Arid NP, Mt Dean and Mt Esmond NR	
	Gastrolobium tergiversum	P2	LE, E(MAL)	Cape Arid NP	
	Kennedia beckxiana	P4	LE	Cape Arid NP, Mt Dean and Mt Esmond NR	UCL west of Cape Arid NP
Pittosporaceae	*Bentleya diminuta*	P2	E(MAL)	Cape Arid NP	
Pleurophascaceae	*Pleurophascum occidentale*	P4		Cape Le Grand NP	
Polygalaceae	*Comesperma calcicola*	P3		Helms, Kau Rock NR, Cape Arid NP	
	Comesperma griffinii	P2		Helms	
	Comesperma lanceolatum	P2	E(ESP)		R28170 East
Proteaceae	*Adenanthos ileticos*	P4		NR 33113	
	Banksia epica	P2	LE	Nuytsland NR	
	Banksia prolata subsp. *archeos*	P2	LE, E(MAL)	Cape Arid NP, Cape Arid 5(1)(h)	
	Banksia prolata subsp. *calcicola*	P4	LE, E(ESP)	Stokes NP, Barker Inlet NR, Warrenup Lakes NR	
	Banksia prolata subsp. *prolata*	P3	LE	Cape Le Grand NP, Cape Arid NP, Recherche Archipelago NR	
	Grevillea aneura	P4		Griffiths Nature Reserve	UCL adjacent to Peak Charles NP
	Grevillea baxteri	P4		Speddingup East NR, Cape Arid NP, Nuytsland NR	UCL west of Cape Arid NP
	Isopogon alcicornis	P3		Mt Ridley NR, Mt Burdett NR, Burdett South NR, Muntz NR, Cape Arid NP	UCL Lot 2009, Reserve 2780, UCL Esp. Loc. 1992
	Lambertia echinata subsp. *echinata*	R(S1) CE	LE, E(ESP)	Dalyup NR, Cape Le Grand NP, Coolinup NR	Alexander NR

Family	Species	Cons. code	Endemic	Existing reserves	Proposed additions
Proteaceae	*Persoonia baeckeoides*	P1	LE, E(MAL)		UCL adjacent to Peak Charles NP
	Persoonia brevirhachis	P3		East Naernup NR	
	Persoonia cymbifolia	P3		Mt Burdett NR, Cape Arid National Park	UCL adjacent to Peak Charles NP
	Persoonia scabra	P3		Helms, Cape Le Grand NP	
	Persoonia spathulata	P2			UCL west of Cape Arid NP
Restionaceae	*Lepyrodia fortunata*	P2	LE, E(ESP)	Cape Le Grand NP	
Rhamnaceae	*Pomaderris paniculosa* subsp. *paralia*	P2	LE, E(ESP)	Recherche Archipelago NR	
	Spyridium mucronatum subsp. *multiflorum*	P2		Cape Arid NP	
Rubiaceae	*Galium leptogonium*	P3		Recherche Archipelago NR	
	Opercularia hirsuta	P2		Cape Le Grand NP, Cape Arid NP, Recherche Archipelago NR	
Rutaceae	*Boronia baeckeacea* subsp. *patula*	P1		Mt Burdett NR	
	Boronia clavata	R(S2) EN		Cape Arid NP	
	Boronia coriacea	P2	LE	Cape Arid NP, Nuytsland Nature Reserve	
	Boronia scabra subsp. *attenuata*	P3	LE	Cape Le Grand NP, Cape Arid NP, Recherche Archipelago NR	
	Philotheca apiculata	P2			UCL west of Cape Arid NP
	Rhadinothamnus rudis subsp. *linearis*	P4	LE, E(MAL)	Cape Arid NP	
Sapindaceae	*Dodonaea hexandra*	P1		Cape Arid NP	
Scrophulariaceae	*Gratiola pedunculata*	P2		Cape Arid NP	
	Myoporum turbinatum	P4	LE, E(MAL)	Kau Rock NR, Beaumont NR 32130, Beaumont NR 32783	
	Myoporum velutinum	R(S2) EN	E(ESP)	Nuytsland NR	
Sterculiaceae	*Lasiopetalum maxwellii*	P2	E(ESP)	Cape Le Grand NP, Cape Arid NP	
	Lasiopetalum parvuliflorum	P3		Cape Le Grand NP, Nuytsland NR	UCL Loc. 513
Stylidiaceae	*Stylidium glandulosum*	P3	LE, E(ESP)	Cape Le Grand NP, Recherche Archipelago NR	
	Stylidium pulviniforme	P3			Oldfield River Corridor, UCL adjacent to Peak Charles NP
	Stylidium sejunctum	P3			UCL adjacent to Peak Charles NP
Thymelaeaceae	*Pimelea halophila*	P2		NR 33113	
	Pimelea pelinos	P1	E(MAL)		UCL adjacent to Peak Charles NP

Source: NatureMap Data September 2014, conservation status November 2015

Conservation codes

Wildlife Conservation Act

R Flora declared rare under the Wildlife Conservation Act and in particular:

- **R(S1)CE** Schedule 1 Flora that is likely to become extinct or rare, as critically endangered flora
- **R(S2)EN** Schedule 2 Flora that is likely to become extinct or rare, as endangered flora
- **R(S3)VU** Schedule 3 Flora that is likely to become extinct or rare, as vulnerable flora
- **R(S4)Ex** Schedule 4 Flora that is presumed to be extinct in the wild.

Priority flora:

- **P1** Priority One: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations, but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

- **P2** Priority Two: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations, but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

- **P3** Priority Three: Poorly-known species

Species that are known from several locations, and the species do not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations, but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

- **P4** Priority Four: Rare, Near Threatened and other species in need of monitoring

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

APPENDIX 5. Significant vegetation associations

Beards vegetation associations		Criteria	Pre-1750 extent	Current extent	(proportion of pre-1750 extent)	Pre-1750 extent in conservation reserves	(proportion of pre-1750 extent)	Current extent in existing conservation reserves	(proportion of Pre-1750 extent)	(proportion of current extent)	Current extent In existing reserves in MPA	(proportion of pre-1750 extent)	(proportion of current extent)	Current extent in proposed additions in MPA	(proportion of pre-1750 extent)	(proportion of current extent)	No. of additions with significant veg assoc.	Current extent in MPA	(proportion of pre-1750 extent)	(proportion of current extent)	Total to be formally reserved (proportion ofpre-1750 extent)
No.	Description		(Ha)	(Ha)	(%)	(Ha)	(%)	(Ha)	(%)	(%)	(Ha)	(%)	(%)	(Ha)	(%)	(%)		(Ha)	(%)	(%)	(%)
10	Medium woodland; red mallee group	1	145,676	144,163	99	654	<1	654	<1	<1	654	<1	<1					658	<1	<1	0
16	Low forest; bushy yate (*Eucalyptus cornuta*) & Bald Island marlock (*E. lehmanni*)	4	2,906	1,156	40	2,304	79	1,144	39	99	1,137	39	98					2,327	80	201	39
41	Shrublands; teatree scrub	1	194,251	181,630	94	21,735	11	18,514	10	10	1,584	1	1	302	<1	<1	5	3,499	2	2	10
48	Shrublands; scrub-heath	1	30,814	12,150	39	2,426	8	2,203	7	18	880	3	7					890	3	7	7
125	Bare areas; salt lakes	1	3,485,787	3,146,084	90	244,743	7	187,855	5	6	17,153	<1	1	13,203	<1	<1	25	21,832	1	1	6
221	Succulent steppe; saltbush	1	63,720	59,923	94	3,517	6	3,418	5	6				384	1	1	1	387	1	1	6
413	Shrublands; *Acacia neurophylla* & *A.* species thicket	1, 4	3,474	1,807	52	24	1	24	1	1				796	24	45	1	821	24	45	24
468	Medium woodland; salmon gum & goldfields blackbutt	1	592,022	583,903	99	24,331	4	24,331	4	4	<1	<1	<1					<1	<1	<1	4
482	Medium woodland; merrit & red mallee	1	1,628,465	1,612,811	99	143,836	9	143,834	9	9	5,107	<1	<1	77,375	18	18	6	298,159	18	18	14
486	Mosaic: Medium woodland; salmon gum & red mallee / Shrublands; mallee scrub *Eucalyptus eremophila*	1	436,130	255,973	59	21,208	5	17,161	4	7	5,302	1	2	22,145	13	23	7	67,307	15	26	9
512	Shrublands; mallee scrub, *Eucalyptus eremophila* & Forrest's marlock (*E. forrestianna*)	1, 3	237,886	62,809	26	5,715	2	5,655	2	9	5,645	2	9	13,105	15	57	10	41,445	17	66	8
519	Shrublands; mallee scrub, *Eucalyptus eremophila*	1	2,333,413	1,440,021	62	244,701	10	242,761	10	17	17,836	1	1	24,018	10	16	13	250,922	11	17	11
521	Medium woodland; salmon gum & red mallee	1	122,060	122,060	100	838	1	838	1	1				5,659	5	5	1	6,498	5	5	5

522	Medium woodland; redwood (*Eucalyptus transcontinentalis*) & merrit (*E. floctoniae*)	1	709,715	709,228	100	30,584	4	30,584	4	4				1	<1	<1	1	1,111	<1	<1	4
552	Shrublands; *Casuarina acutivalvus* & *calothamnus* (also melaleuca) thicket on greenstone hills	1	33,909	31,669	93	304	1	302	1	1	277	1	1	494	1	2	2	774	2	2	2
925	Shrublands; mallee scrub, red mallee	1	5,153	3,804	74	94	2	91	2	2	91	2	2	871	71	96	1	3,747	73	98	19
929	Low forest; moort (*Eucalytpus platypus*)	1	10,735	7,894	74	213	2	208	2	3	189	2	2	371	4	5	5	576	5	7	5
931	Medium woodland; yate	1	31,742	14,726	46	2,396	8	2,029	6	14	161	1	1	862	3	6	2	1,034	3	7	9
934	Shrublands; mallee scrub, *Eucalyptus nutans*	1	9,282	4,259	46	1,089	12	1,080	12	25	99	1	2					101	1	2	12
936	Medium woodland; salmon gum	1	698,752	676,737	97	15,671	2	15,398	2	2				11,992	4	4	1	25,179	4	4	4
1413	Shrublands; acacia, casuarina & melaleuca thicket	1	1,679,917	1,286,968	77	192,608	11	192,481	11	15	992	<1	<1	3,627	<1	<1	1	7,280	<1	1	12
2048	Shrublands; scrub-heath in the Mallee Region	1	322,220	160,966	50	24,970	8	24,646	8	15				527	<1	<1	2	527	<1	<1	8
4801	Shrublands; heath with scattered *Nuytsia floribunda* on sandplain	1, 3	58,196	6,494	11	1,934	3	1,932	3	30	1,931	3	30	296	1	5	3	2,251	4	35	4
5048	Shrublands; banksia and lambertia scrub-heath in the Esperance Plains Region	1, 2, 4	31,789	1,181	4	391	1	377	1	32	377	1	32					392	1	33	1
6048	Shrublands; banksia scrub-heath on sandplain in the Esperance Plains Region	1, 3	114,135	16,296	14	1,101	1	1,021	1	6	4,029	4	25	473	<1	3	7	5,273	5	32	1
			12,982,150	10,544,712		2,228,908		918,542			63,444			176,501	5	6		900,209			
		25		3	4		24				18			19			19				

Based on June 2015 data

Summary

Number of vegetation associations in planning area	41
Number of vegetation associations in existing reserves	33
Number of vegetation associations in proposed reserves	33
Number of significant vegetation associations	25
Criteria 1 Poorly reserved (proportion of pre-1750 extent column)	24
Criteria 2 and 3 Extensively cleared (proportion of pre-1750 extent column)	4
Criteria 4 Limited extent (current extent column)	3
Number of additions with significant vegetation associations	54
Number of significant vegetation associations within proposed additions	19

Criteria

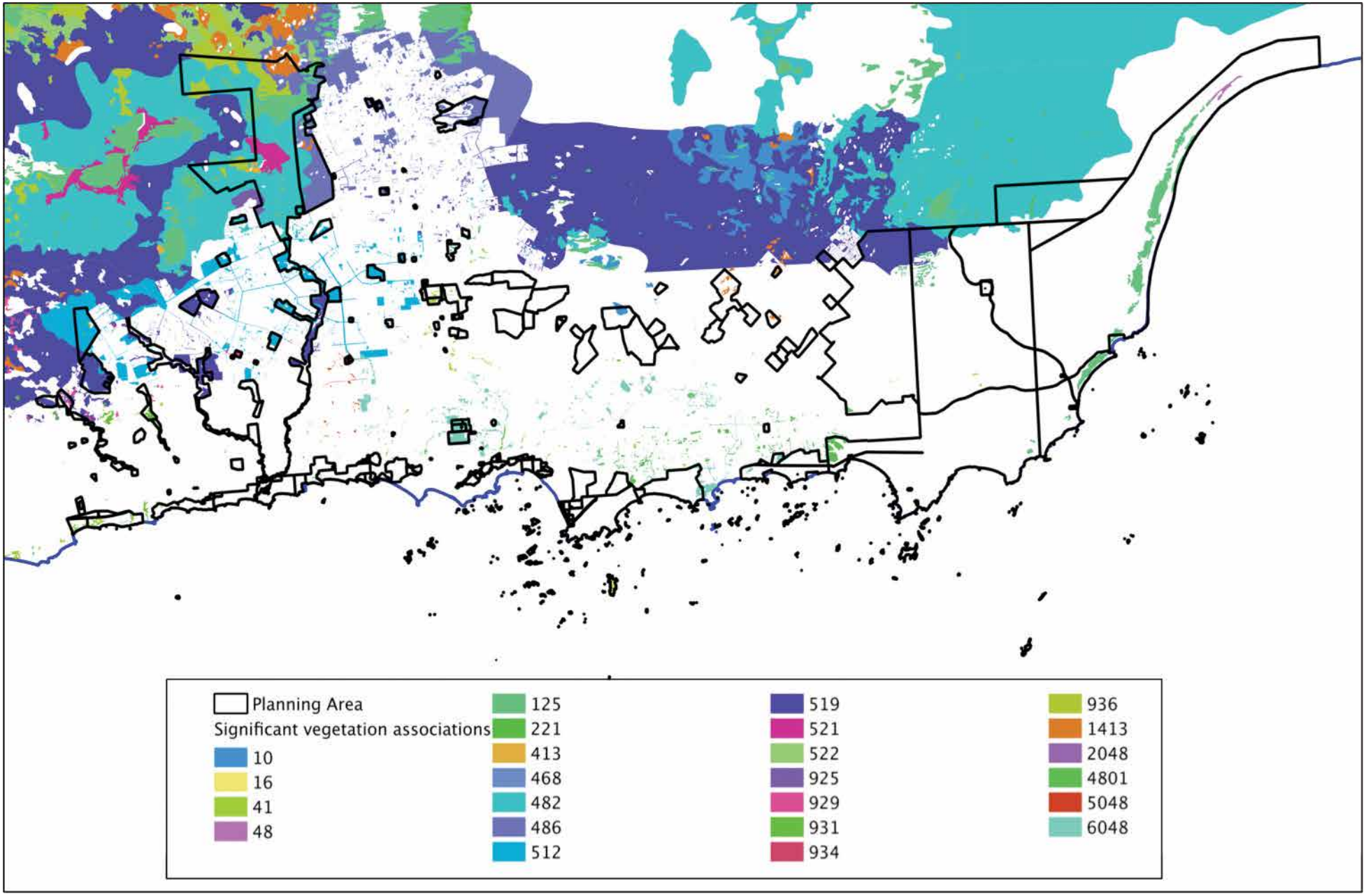
1 Poorly reserved <15% of pre-1750 extent in conservation reserve system.

2 Extensively cleared <10% of pre-1750 extent remaining and can therefore be considered endangered.

3 Extensively cleared <30% of pre-1750 extent remaining is the threshold level below which species loss appears to accelerate exponentially at an ecosystem level and can therefore be considered vulnerable.

4 Limited current extent <2,000ha remaining.

Significant vegetation associations in the planning area (June 2015)



Note: There may be significant vegetation associations outside the planning area, but only those within the planning area have been considered.

APPENDIX 6. Native fauna

Below is a list of native fauna (vertebrates only) within the planning area compiled from NatureMap (data September 2014) as well from other sources (surveys and sightings) as per the reference list below.

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Mammals (32)											
New Zealand fur-seal	*Arctocephalus forsteri*	SP(S5)OS		CITES	2	1	2			5	NM, Other
Australian fur-seal	*Arctocephalus pusillus*			CITES	1					1	Other
Subantartic fur-seal	*Arctocephalus tropicalis*	T(S3)VU	VU	CITES	1		1			2	Other
Woylie (brush-tailed bettong)	*Bettongia penicillata ogilbyi*	T(S1)CR	EN		1		1			2	Other
Mundarda (western pygmy possum)	*Cercartetus concinnus*				2	2			2	6	NM, Other
Gould's wattled bat	*Chalinolobus gouldii*				2					2	NM, Other
Chuditch (western quoll)	*Dasyurus geoffroii*	T(S3)VU	VU		2				1	3	NM, Other
Leopard seal	*Hydrourga leptonyx*				1					1	Other
Quenda (southern brown bandicoot)	*Isoodon obesulus fusciventer*	P5			2	1	1			4	NM, Other
Crab-eater seal	*Lobodon carcinophaga*					1				1	NM, Other
Tammar wallaby	*Macropus eugenii derbianus*	P5			1		1			2	NM, Other
Western grey kangaroo	*Macropus fuliginosus*				3	2	1		2	8	NM, Other
Kwoora (Western brush wallaby)	*Macropus irma*	P4			3	2				5	NM, Other
Southern elephant seal	*Mirounga leonina*		VU	CITES	1					1	Other
Australian sea-lion	*Neophoca cinerea*	T(S3)VU	VU		3	2	2			7	NM, Other
Mitchell's hopping mouse	*Notomys mitchelli*	En			1	1				2	NM, Other
Greater long-eared bat	*Nyctophilus major*	P4				1				1	NM, Other
Recherche rock-wallaby	*Petrogale lateralis hacketti*	T(S3)VU	VU		1		1		1	3	NM, Other
Black-flanked rock-wallaby	*Petrogale lateralis lateralis*	T(S2)EN	VU		1		1			2	NM, Other
Ashy grey mouse	*Pseudomys albocinereus*	En			2	2	1			5	NM, Other
Bush rat	*Rattus fuscipes*	En			3	4	2	1	1	11	NM, Other
Southern bush rat	*Rattus fuscipes fuscipes*	En			1		1			2	Other
Fat-tailed dunnart	*Sminthopsis crassicandata*				1	1			1	3	NM, Other
Little long-tailed dunnart	*Sminthopsis dolichura*								1	1	NM
Gilbert's dunnart	*Sminthopsis gilberti*					1				1	NM

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
White-tailed dunnart	*Sminthopsis granulipes*	En							1	1	NM, Other
Grey-bellied dunnart	*Sminthopsis griseoventer* (includes prev. subsp *griseoventer*)	En			3	1				4	NM, Other
Common dunnart	*Sminthopsis murina*				1					1	Other
Short-beaked echinda	*Tachyglossus aculeatus*				3	3				6	NM, Other
White-striped mastiff bat	*Tadarida australis* (prev. *Nyctinomus australis*)				2	1				3	Other
Noolbenger (honey possum)	*Tarsipes rostratus* (prev. *T. spencerae*)	En			3	7		1	2	13	NM, Other
Southern forest bat	*Vespadelus regulus*					1				1	NM, Other
Birds (271)											
Spiny-cheeked honeyeater	*Acanthagenys rufogularis*				3	3			1	7	NM, Other
Inland thornbill (broad-tailed)	*Acanthiza apicalis*				3	12			8	23	NM, Other
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*				3	9		1	10	23	NM, Other
Chestnut-rumped thornbill	*Acanthiza uropygialis*					1				1	NM
Western spinebill	*Acanthorhynchus superciliosus*	RE			3	6		1	9	19	NM, Other
Collared sparrowhawk	*Accipiter cirrocephalus*				2	1	1		2	6	NM, Other
Brown goshawk	*Accipiter fasciatus*				3	2	2		1	8	NM, Other
Australian reed warbler	*Acrocephalus australis* (syn. *A. stentoreus*)		Mar		2	2			4	8	NM, Other
Australian owlet-nightjar	*Aegotheles cristatus*				2	2			2	6	NM, Other
Striated grasswren	*Amytornis striatus*							1		1	NM, Other
Chestnut teal	*Anas castanea*				3	8		2	4	17	NM, Other
Grey teal	*Anas gracilis* (prev. *gibberifrons*)				3	9		1	5	18	NM, Other
Mallard	*Anas platyrhynchos*					1				1	NM
Australasian shoveller	*Anas rhynchotis*				2	8			4	14	NM, Other
Pacific black duck	*Anas superciliosa*				3	8		2	10	23	NM, Other
Darter	*Anhinga melanogaster*				3	7		1	3	14	NM, Other
Magpie goose	*Anseranas semipalmata*				1					1	Other
Red wattlebird	*Anthochaera carunculata*				3	14	1	1	23	42	NM, Other
Little wattlebird	*Anthochaera chrysoptera*				3	1			1	5	Other
Western wattlebird	*Anthochaera lunulata*				3	13		1	15	32	NM, Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Australian pilpit	*Anthus australis*						1			1	NM, Other
Richard's pipit	*Anthus novaeseelandiae*				3	5			5	13	NM, Other
Southern whiteface	*Aphelocephala leucopsis*	RE							1	1	NM
Fork tailed swift	*Apus pacificus*		Mig, Mar	J, C, R	2	1				3	NM, Other
Wedge-tailed eagle	*Aquila audax*				3	9		1	6	19	NM, Other
Great egret	*Ardea alba* (prev. *Egretta alba* syn. *Egretta modesta*)		Mig, Mar	J	3	6		1	4	14	NM, Other
Little egret	*Ardea garzetta* (syn. *Egretta garzetta*)		Mar		1	2				3	NM, Other
Cattle egret	*Ardea ibis* (syn. *Bubulcus ibis*)		Mig, Mar	J		2				2	NM, Other
White faced heron	*Ardea novaehollandiae* (prev. *Egretta novaehollandiae*)				3	9		2	13	27	NM, Other
White-necked heron (prev. Pacific heron)	*Ardea pacifica*				2	3		1	3	9	NM, Other
Australian bustard	*Ardeotis australis*	P4			3	1			2	6	NM, Other
Ruddy turnstone	*Arenaria interpres*		Mig, Mar	MS, J, C, R, BC	1	5	1		2	9	NM, Other
Black-faced woodswallow	*Artamus cinereus*				1	3			2	6	NM, Other
Dusky woodswallow	*Artamus cyanopterus*				3	5			7	15	NM, Other
Masked woodswallow	*Artamus personatus*				2				1	3	NM, Other
Hardhead	*Aythya australis*				1	6			1	8	NM, Other
Musk duck	*Biziura lobata*				3	7			6	16	NM, Other
Australasian bittern	*Botaurus poiciloptilus*	T(S2)EN			2	1			2	5	NM, Other
Galah	*Cacatua roseicapilla* (prev. *Eolophus roseicapillus*)					3			3	6	NM, Other
Fan-tailed cuckoo	*Cacomantis flabelliformis* (prev. *Cuculus phyrrophanus, Cuculus flabelliformis*)				3	4	1	1	6	15	NM, Other
Fan-tailed cuckoo	*Cacomantis flabelliformis flabelliformis*						1			1	NM, Other
Pallid cuckoo	*Cacomantis pallidus* (prev. *Cuculus pallidus*)				1	2			1	4	NM, Other
Rufous field wren	*Calamanthus campestris*				2	4	1		2	9	NM, Other
Sharp-tailed sandpiper	*Calidris acuminata*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	1	6		1	5	13	NM, Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Sanderling	*Calidris alba*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	3	5			5	13	NM, Other
Dunlin	*Calidris alpina*	SP(S5)IA	Mig, Mar	C, R	1					1	Other
Red knot	*Calidris canutus*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC		4				4	Other
Red knot	*Calidris canutus rogersi*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC		1				1	NM, Other
Curlew sandpiper	*Calidris ferruginea*	T(S3)VU, SP(S5)IA	Mig, Mar	MS, J, C, R, BC		6		1	7	14	NM, Other
Pectoral sandpiper	*Calidris melanotos*	SP(S5)IA	Mig, Mar	MS, J, R, BC		3			1	4	NM, Other
Red-necked stint	*Calidris ruficollis*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	3	8	1	1	8	21	NM, Other
Long-toed stint	*Calidris subminuta*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC		2			1	3	Other
Great knot	*Calidris tenuirostris*	T(S3)VU, SP(S5)IA	Mig, Mar	MS, J, C, R, BC	2	3			1	6	NM, Other
Baudin's cockatoo	*Calyptorhynchus baudinii*	T(S2)EN, En	VU		1				1	2	NM
Carnaby's cockatoo	*Calyptorhynchus latirostris*	T(S2)EN, En	EN		3	10		1	9	23	NM, Other
Recherche Cape Barren goose	*Cereopsis novaehollandiae grisea*	T(S3)VU, En	VU, Mar		3	3	2		1	9	Other
Double-banded plover	*Charadrius bicinctus*	SP(S5)IA	Mig, Mar	MS, BC	2	1			1	4	NM, Other
Large (greater) sand plover	*Charadrius leschenaultii*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	1	3			2	6	Other
Black-fronted (plover) dotterel	*Charadrius melanops* (syn. *Elseyornis melanops*)				1	6		1	7	15	NM, Other
Lesser sand plover	*Charadrius mongolus*	T(S2)EN, SP(S5)IA	Mig, Mar	J, C, R, BC		1				1	Other
Hooded plover	*Charadrius rubricollis* (syn. *Thinornis rubricollis tregellasi* and *Charadrius cucullatus*)	P4	Mar		3	10		1	11	25	NM, Other
Red-capped plover	*Charadrius ruficapillus*		Mar		3	8	1	1	11	24	NM, Other
Maned (Australian wood) duck	*Chenonetta jubata*				1	5			4	10	NM, Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
White-backed swallow	*Cheramoeca leucosternum*				3					3	Other
White-winged black tern	*Chlidonias leucopterus* (syn. *Sterna leucopterus*)	SP(S5)IA	Mig, Mar	J, C, R		2				2	Other
Horsefields bronze-cuckoo	*Chrysococcyx basalis* (prev. *Chalcites basalis*)				3	6		1	6	16	NM, Other
Shining bronze-cuckoo	*Chrysococcyx lucidus plagosus*					1				1	NM, Other
Black-eared cuckoo	*Chrysococcyx osculans*		Mar		1				2	3	NM
Brown songlark	*Cincloramphus cruralis*				2	1			2	5	NM, Other
Rufous songlark	*Cincloramphus mathewsi*								1	1	NM
Chestnut quail-thrush	*Cinclosoma castanotus* (prev. *C. castanotum*)				2					2	NM, Other
Swamp (marsh) harrier	*Circus approximans* (prev. *C. aeruginosus*)		Mar		3	8	2		2	15	NM, Other
Spotted harrier	*Circus assimilus*				3				1	4	NM, Other
Banded stilt	*Cladorhynchus leucocephalus*				2	7			6	15	NM, Other
Rufous treecreeper	*Climacteris rufa*				1	1			1	3	NM, Other
Grey shrike-thrush	*Colluricincla harmonica*				2	6	1		6	15	NM, Other
Black-faced cuckoo-shrike	*Coracina novaehollandiae*				3	7		1	10	21	NM, Other
Little crow	*Corvus bennetti*				3				1	4	NM, Other
Australian raven	*Corvus coronoides*				3	12	2	1	19	37	NM, Other
Australian raven	*Corvus coronoides perplexus*						1			1	NM, Other
Stubble quail	*Coturnix pectoralis* (prev. *C. novaezelandiae*)				1	1			2	4	NM, Other
Brown quail	*Coturnix ypsilophora*				1	1	2			4	NM, Other
Brown quail	*Coturnix ypsilophora australis*						1			1	NM, Other
Pied butcherbird	*Cracticus nigrogularis*				1	1			3	5	NM, Other
Australian magpie	*Cracticus tibicen dorsalis* (syn. *Gymnorhina tibicen dorsalis*)				3	11		1	19	34	NM, Other
Grey butcherbird	*Cracticus torquatus*				3	15		1	16	35	NM, Other
Black swan	*Cygnus atratus*				3	8		1	10	22	NM, Other
Varied sittella	*Daphoenositta chrysoptera*				1	2			2	5	NM
Cape petrel	*Daption capense*				1		1			2	Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Mistletoebird	*Dicaeum hirundinaceum*				1				1	2	NM, Other
Grey-headed albatross	*Diomedea chrysostoma* (syn. *Thalassarche chrysostoma*)	SP(S5)IA	EN, Mig, Mar	BC	1					1	Other
Wandering albatross	*Diomedea exulans*	T(S3)VU, SP(S5)IA	VU, Mig, Mar	J, BC	2					2	Other
Black-browed albatross	*Diomedea melanophris* (syn. *Thalassarche melanophris*)	SP(S5)IA	VU, Mig, Mar	BC	2					2	NM, Other
Emu	*Dromaius novaehollandiae*				3	6			6	15	NM, Other
Southern scrub-robin	*Drymodes brunneopygia*				2	4			6	12	NM, Other
Eastern reef egret	*Egretta sacra* (prev. *Ardea sacra*)		Mar		3	2	1			6	NM, Other
Black-shouldered kite	*Elanus caeruleus* (syn E. *axillaris*, prev. *E. notatus*)				3	3			5	11	NM, Other
Western yellow robin	*Eopsaltria australis griseogularis*				2	1				3	NM, Other
White-fronted chat	*Ephthianura albifrons*				3	6			3	12	NM, Other
Red-kneed dotterel	*Erythrogonys cinctus*				2	3			2	7	NM, Other
Beach stone curlew	*Esacus. neglectus* (prev. *E. magnirostris*)		Mar		1	1				2	NM
Rockhopper penguin	*Eudyptes chrysocome*				1					1	Other
Fiordland penguin	*Eudyptes pachyrhynchus*				1					1	Other
Little penguin	*Eudyptula minor*				2		3			5	NM, Other
Little penguin	*Eudyptula minor novaehollandiae*						1			1	NM, Other
Spotted nightjar	*Eurostopodus argus* (prev. *E. guttatus*, *Caprimulgus guttatus*)				3	3				6	NM, Other
Brown falcon	*Falco berigora*				3	3	1		5	12	NM, Other
Nankeen (Australian) kestral	*Falco cenchroides*				3	8	2	1	5	19	NM, Other
Nankeen (Australian) kestral	*Falco cenchroides cenchroides*						1			1	NM, Other
Grey falcon	*Falco hypoleucos*	T(S3)VU			1				1	2	Other
Australian hobby (little falcon)	*Falco longipennis*				3	4			4	11	NM, Other
Peregrine falcon	*Falco peregrinus*	SP(S5)OS			3	1	1		2	7	NM, Other
Peregrine falcon	*Falco peregrinus macropus*	SP(S5)OS					1		1	2	NM, Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Black falcon	*Falco subniger*					1				1	Other
Eurasian coot	*Fulica atra*				2	8			4	14	NM, Other
Black-tailed native hen	*Gallinulla ventralis* (syn. *Tribonyx ventralis*)				2	4			2	8	NM, Other
Banded land (buff-banded) rail	*Galliralius philippensis* (prev. *Rallus philippensis*)				1					1	NM, Other
Singing honeyeater	*Gavicalis virescens* (prev. *Lichenostomus virescens* and *Meliphaga virescens*)				3	4	2		3	12	NM, Other
Western gerygone	*Gerygone fusca*					1			1	2	NM
Purple-crowned lorikeet	*Glossopsitta porphyrocephala*				3	5		1	8	17	NM, Other
Australian magpie-lark (mud lark)	*Grallina cyanoleuca*				3	11			12	26	NM, Other
Sooty oystercatcher	*Haematopus fuliginosus fuliginosus*						1			1	NM, Other
Pied oystercatcher	*Haematopus longirostris*				3	2	2		3	10	NM, Other
White-bellied sea eagle	*Haliaeetus leucogaster*		Mar		3	7	3	1	2	16	NM, Other
Whistling kite	*Haliastur sphenurus*				2	4			2	8	NM, Other
Square-tailed kite	*Hamirostra isura* (prev. *Lophoictinia isura*)				2				1	3	NM, Other
Black-breasted buzzard	*Hamirostra melanosternon*				1					1	Other
Black-winged stilt	*Himantopus himantopus*		Mar		1	7		1	6	15	NM, Other
Spine-tailed swift (white-throated needletail)	*Hirundapus caudacutus caudacutus*	SP(S5)IA	Mig, Mar	J, C, R	1					1	Other
Fairy martin	*Hirundo ariel* (prev. *Cecropis ariel*)				1					1	Other
Welcome swallow	*Hirundo neoxena*				3	10	2	1	13	29	NM, Other
Tree martin	*Hirundo nigricans* (prev. *Cecropis nigricans* and *Petrochelidon nigricans*)				3	8	1	1	8	21	NM, Other
Shy heathwren	*Hylacola cauta* (prev. *Calamanthus cautus*)				2	1			1	4	NM
Little bittern	*Ixobrychus minutus dubius*	P4			1	1			1	3	NM, Other
White winged triller	*Lalage sueurii*				1	4			4	9	NM, Other
Kelp gull	*Larus dominicanus*				1					1	Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Silver gull	*Larus novaehollandiae* (prev. *Chroicocephalus novaehollandiae*)		Mar		3	8	3	1	5	20	NM, Other
Silver gull	*Larus novaehollandiae novaehollandiae*		Mar		1	1	1			3	NM, Other
Pacific gull	*Larus pacificus*				3	4	2	2	5	16	NM, Other
Pacific gull	*Larus pacificus georgii*				1		1		1	3	NM, Other
Malleefowl	*Leipoa ocellata*	T(S3)VU	VU		1				1	2	NM, Other
Purple-gaped honeyeater	*Lichenostomus cratitius*				2	3			5	10	NM, Other
White-eared honeyeater	*Lichenostomus leucotis*				3	4			4	11	NM, Other
Brown honeyeater	*Lichmera indistincta*				3	15		1	16	35	NM, Other
Broad-billed sandpiper	*Limicola falcinellus*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC		1				1	Other
Bar-tailed godwit	*Limosa lapponica*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	1	4			2	7	NM, Other
Black-tailed godwit	*Limosa limosa*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC		2				2	Other
(Northern) Giant petrel	*Macronectes halli*	SP(S5)IA	VU, Mig, Mar	BC	2					2	NM, Other
Pink eared duck	*Malacorhynchus membranaceus*				2	7			1	10	NM, Other
White-winged fairy wren	*Malarus leucopterus leuconotus*				1					1	Other
Blue-breasted fairy wren	*Malarus pulcherrimus*				2	3			6	11	NM, Other
Splendid wren	*Malarus splendens*				1				1	2	NM
Yellow-throated miner	*Manorina flavigula*				3	10		1	16	30	NM, Other
Little grassbird	*Megalurus gramineus*				1				2	3	NM
Brown-headed honeyeater	*Melithreptus brevirostris*				3	2	1		6	12	NM, Other
Western white-naped honeyeater	*Melithreptus chloropsis*				1					1	Other
White-naped honeyeater	*Melithreptus lunatus*				3	3			3	9	NM, Other
Rainbow bee-eater	*Merops ornatus*	SP(S5)IA	Mig, Mar	J	2	2			2	6	NM, Other
Jacky winter	*Microeca fascinans* (syn. *leucophaea*)				1	1			1	3	NM, Other
Black kite	*Milvus migrans*				1				1	2	NM, Other
Restless flycatcher	*Myiagra inequieta*				2	7			5	14	NM, Other

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Elegant parrot	*Neophema elegans*				3	2			2	7	NM, Other
Rock parrot	*Neophema petrophila*				3	2	3			8	NM, Other
Scarlet chested parrot	*Neophema splendida*				1					1	NM, Other
Southern boobook	*Ninox novaeseelandiae*				2	2			1	5	NM, Other
Eastern curlew	*Numenius madagascariensis*	T(S3)VU, SP(S5)IA	CR, Mig, Mar	MS, J, C, R, BC	1	2			2	5	NM, Other
Whimbrel	*Numenius phaeopus*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	1	2				3	NM, Other
Nankeen night (rufous) heron	*Nycticorax calendonicus hilli*		Mar		2	3			2	7	NM, Other
Cockatiel	*Nymphicus hollandicus*				1				1	2	NM, Other
White-faced storm petrel	*Oceanites marinus dulciae* (syn. *Pelagodroma marina dulciae*)				1		2			3	NM, Other
Crested pigeon	*Ocyphaps lophotes*				3	10			14	27	NM, Other
Crested bellbird	*Oreoica gutturalis*	P4			1				3	4	NM, Other
Golden whistler	*Pachycephala pectoralis*				3	7	2	1	7	20	NM, Other
Golden whistler	*Pachycephala pectoralis fuliginosa*						2			2	NM, Other
Rufous whistler	*Pachycephala rufiventris*				2				1	3	NM
Slender-billed prion	*Pachyptila belcheri*				1					1	Other
Osprey	*Pandion haliaetus cristatus* (prev. *Pandion cristatus*)	SP(S5)IA	Mig, Mar	BC	2	1	2		2	7	NM, Other
Spotted pardalote	*Pardalotus punctatus*				2	8	2		5	17	NM, Other
Yellow-rumped pardalote	*Pardalotus punctatus xanthopyge* (syn. *P. xanthopygus* tentatively conspecific with *P. punctatus*)				3	2				5	NM, Other
Striated pardalote	*Pardalotus striatus*				2	5			4	11	NM, Other
Striated pardalote	*Pardalotus striatus westraliensis*				1	1				2	NM, Other
Australian pelican	*Pelecanus conspicillatus*		Mar		2	7		1	4	14	NM, Other
Inland (Australian) dotterel	*Peltohyas australis* (syn. *Charadrius australis*)				1					1	Other
Hooded robin	*Petroica cucullata* (syn. *Melanodryas cucullata*)				2	1			1	4	Other
Red-capped robin	*Petroica goodenovii*				2					2	Other

Common name	Scientific name	Cons code			Planning area						
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Scarlet robin	*Petroica multicolor* (syn. *P. boodang*)	RE			2	1			1	4	NM, Other
Western ground parrot	*Pezoporus flaviventris* (prev. *P. wallicus flaviventris*)	T(S1)CR	CR		2	2			2	6	NM, Other
Great cormorant	*Phalacrocorax carbo*				3	6	2		3	14	NM, Other
Great cormorant	*Phalacrocorax carbo novaehollandiae*					2		1		3	Other
Black-faced cormorant	*Phalacrocorax fuscescens*				3	2	2		1	8	NM, Other
Little pied cormorant	*Phalacrocorax melanoleucos* (syn. *Microcarbo melanoleucos*)				3	8	2	1	6	20	NM, Other
Little black cormorant	*Phalacrocorax sulcirostris*				3	7		1	4	15	NM, Other
Pied cormorant	*Phalacrocorax varius*				3	6	1		3	13	NM, Other
Common bronzewing	*Phaps chalcoptera*				3	11	1	1	8	24	NM, Other
Brush bronzewing	*Phaps elegans*				3	2	2		5	12	NM, Other
Ruff	*Philomachus pugnax*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC		1				1	Other
Tawny-crowned honeyeater	*Phylidonyris melanops* (prev. *Glyciphila melanops*)				3	9		1	8	21	NM, Other
White-cheeked honeyeater	*Phylidonyris nigra*				3	3			3	9	NM, Other
New Holland honeyeater	*Phylidonyris novaehollandiae*				3	15	2	1	16	37	NM, Other
Yellow-billed spoonbill	*Platalea flavipes*				2	8			2	12	NM, Other
Royal spoonbill	*Platalea regia*				1	1				2	NM
Western rosella	*Platycercus icterotis xanthogenys*	P4				2				2	NM, Other
Red-capped parrot	*Platycercus spurius* (prev. *Purpureicephalus spurius*)				2	5			9	16	NM, Other
Australian ringneck (ring-necked parrot)	*Platycercus zonarius* (syn. *Barnardius zonarius*)				3	7			8	18	NM, Other
Port Lincoln ringneck (twenty eight)	*Platycercus zonarius zonarius* (syn. *Barnardius zonarius zonarius*)				1	1			1	3	Other
Glossy ibis	*Plegadis falcinellus*	SP(S5)IA	Mig, Mar	C, BC		2				2	NM, Other
Lesser golden plover	*Pluvialis dominica*		Mar			1			1	2	Other

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Pacific golden plover	*Pluvialis fulva*	SP(S5)IA	Mig, Mar	J, C, R, BC	1	1			1	3	NM, Other
Grey plover	*Pluvialis squatarola*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	1	2			3	6	NM, Other
Tawny frogmouth	*Podargus strigoides*				3	1			1	5	NM, Other
Great crested grebe	*Podiceps cristatus*				2	6			1	9	NM, Other
Hoary headed grebe	*Poliocephalus poliocephalus*				3	9		1	6	19	NM, Other
Regent parrot	*Polytelis anthopeplus*				1	2			1	4	NM, Other
Regent parrot	*Polytelis anthopeplus westralis*					1				1	NM, Other
White browed babbler	*Pomatostomus superciliosus*				1	2			1	4	NM, Other
White browed babbler	*Pomatostomus superciliosus ashbyi*	P4				1				1	NM, Other
Purple swamphen	*Porphyrio porphyrio*				2	2			3	7	NM, Other
Australian spotted crake	*Porzana fluminea*				1	1				2	NM, Other
Spotless crake	*Porzana tabuenis*		Mar		2	3			3	8	NM, Other
Mulga parrot	*Psephotus varius* (prev. *Platycercus varius*)				1				1	2	NM, Other
Great winged petrel	*Pterodroma macroptera*				2		1			3	NM, Other
Soft plummaged petrel	*Pterodroma mollis*				1					1	Other
Yellow-plumed honeyeater	*Ptiltula ornatus* (prev. *Lichenostomus ornatus*)				2	2			4	8	NM, Other
Little shearwater	*Puffinus assimilis*				2		1			3	NM, Other
Fleshy-footed shearwater	*Puffinus carneipes* (prev. *Ardenna carneipes*)	T(S3)VU, SP(S5)IA	Mig, Mar	J, R	3		2			5	NM, Other
Short-tailed shearwater	*Puffinus tenuirostris* (prev. *Ardenna tenuirostris*)	SP(S5)IA	Mig, Mar	J, R	3		1			4	NM, Other
White-fronted honeyeater	*Purnella albifrons* (prev. *Phylidonyris albifrons*)				2	1			1	4	NM, Other
Redthroat	*Pyrrholaemus brunneus* (prev. *Sericornis brunneus*)				1	1			1	3	NM, Other
Red-necked avocet	*Recurvirostra novaehollandiae*		Mar		3	8			6	17	NM, Other
Grey fantail	*Rhipidura fuliginosa* (prev. *R. albiscapa*)				3	7		1	6	17	NM, Other
Willie wagtail	*Rhipidura leucophrys*				3	9		1	20	33	NM, Other

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White-browed scrub-wren	*Sericornis frontalis*				3	12	2	1	11	29	NM, Other
White-browed scrub-wren	*Sericornis frontalis maculatus* (prev. *S. maculatus*)				1	1	1			3	NM, Other
Weebill	*Smicrornis brevirostris*				3	8	1		10	22	NM, Other
Red-eared firetail	*Stagonopleura oculata* (prev. *Emblema oculata*)	En, RE			3	3	2		2	10	NM, Other
Crested tern	*Sterna bergii* (prev. *Thalasseus bergii*)		Mar		3	5	3		6	17	NM, Other
Caspian tern	*Sterna caspia* (prev. *Hydroprogne caspia*)	SP(S5)IA	Mig, Mar	J	3	6	3	1	4	17	NM, Other
Whiskered tern	*Sterna hybrida* (prev. *Chlidonias hybridus*)		Mar		1	4		1	2	8	NM, Other
Fairy tern	*Sterna nereis nereis* (syn. *Sternula nereis*)	T(S3)VU	VU, Mar		3	5	1		2	11	NM, Other
Gull-billed tern	*Sterna nilotica*	SP(S5)IA	Mig, Mar	C		3				3	Other
Freckled duck	*Stictonetta naevosa*				1	4				5	NM, Other
Southern emu-wren	*Stipituris malachurus*				2	3			2	7	NM, Other
Southern emu-wren	*Stipituris malachurus westernensis*					1				1	NM, Other
Grey currawong	*Strepera versicolor*				3	6			9	18	NM, Other
Australian gannet	*Sula serrator* (syn. *Morus serrator*)		Mar		3	3	1			7	NM, Other
Australasian grebe	*Tachybaptus novaehollandiae* (prev. *Podiceps novaehollandiae*)				3	5			4	12	NM, Other
Australian shelduck (mountain duck)	*Tadorna tadornoides*				3	10		2	12	27	NM, Other
Zebra finch	*Taeniopygia guttata* (syn. *Poephila guttata*)				1					1	Other
Atlantic yellow-nosed albatross	*Thalassarche chlororhynchos* (prev. *Diomedea chlororhynchos*)	T(S3)VU, SP(S5)IA	Mig, Mar	BC	2		1			3	NM, Other
Grey headed albatross	*Thalassarche chrysostoma*	T(S3)VU, SP(S5)IA	Mig, Mar	BC	1					1	NM
Australian white ibis	*Threskiornis molucca*		Mar		1	7		1	2	11	NM, Other
Straw necked ibis	*Threskiornis spinicollis*		Mar		1	5			3	9	NM, Other
Sacred kingfisher	*Todiramphus sanctus* (prev. *Halcyon sanctus*)		Mar		3	4	2		6	15	NM, Other
Sacred kingfisher	*Todiramphus sanctus sanctus*		Mar			1				1	NM, Other

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Grey-tailed tattler	*Tringa brevipes* (syn. *Heteroscelus brevipes*)		Mig, Mar	MS, J, C, R, BC	2	2			1	5	NM, Other
Terek sandpiper	*Tringa cinerea* (prev. *Xenus cinereus)*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC		1				1	Other
Wood sandpiper	*Tringa glareola*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC		5			2	6	NM, Other
Common sandpiper	*Tringa hypoleucos* (prev. *Actitis hypoleucos*)		Mig, Mar	MS, J, C, R, BC	3	5	1	1	3	13	NM, Other
Common greenshank	*Tringa nebularia*	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	2	9		1	5	17	NM, Other
Marsh sandpiper	*Tringa stagnatilis* (prev. *stagnatus*)	SP(S5)IA	Mig, Mar	MS, J, C, R, BC	1	2				3	Other
Painted button-quail	*Turnix varia* (prev. *T. varius*)				2					2	NM, Other
Little button-quail	*Turnix velox*				1					1	Other
Barn owl	*Tyto alba* (prev. *T. javanica*)				3		2			5	NM, Other
Masked lapwing	*Vanellus miles*					3			2	5	NM, Other
Banded lapwing (plover)	*Vanellus tricolor*				1	3			4	8	NM, Other
Silvereye	*Zosterops lateralis gouldi* (prev. *Zosterops lateralis, Zosterops gouldi*)				3	14	2	1	20	40	NM, Other
Reptiles (78)											
Southern death adder	*Acanthophis antarcticus*	P3			1		1			2	NM, Other
New Holland skink (Western tree-lined skink, south west cool skink)	*Acritoscincus trilineatus* (prev. *A. trilineatum, Leiolopisma trilineatum*, syn. *Bassiana trilineata*)	En, RE			3	6	1	1	3	14	NM, Other
Jacky lizard	*Amphibolurus muricatus* (prev. Gemmatophora muricata)						1			1	Other
Mallee tree dragon	*Amphibolurus norrisi* (prev. *Gemmatophora norrisi*)				1	1	1			3	NM, Other
South-western sandplain worm lizard	*Aprasia repens*	RE			1	2	1		2	6	NM, Other
Lined worm lizard	*Aprasia striolata*	RE				1				1	NM

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Lined worm lizard	*Aprasia striolata glauerti*	RE			2					2	Other
Marbled gecko	*Christinus marmoratus* (prev. *Phyllodactylus marmoratus alexanderi, Phyllodactylus marmoratus marmoratus*)				3	5	2	1	3	14	NM, Other
Clawless gecko	*Crenadactylus ocellatus ocellatus*	RE			1					1	NM, Other
Buchanan's snake eyed skink	*Cryptoblepharus buchananii*								1	1	NM
Cream-striped fence skink	*Cryptoblepharus pulcher* (prev. *C.virgatus)*				2					2	Other
Cream-striped fence skink	*Cryptoblepharus pulcher clarus* (prev. *C.virgatus clarus*)				2		2		2	6	NM, Other
Western heath dragon	*Ctenophorus adelaidensis* (syn. *Rankinia adelaidensis*)	En, RE			2	1			1	4	NM, Other
Western heath dragon	*Ctenophorus adelaidensis chapmani* (syn. *Rankinia adelaidensis chapmani, Tympanocryptis adelaidensis chapmani*)				2					2	Other
Eastern heath dragon	*Ctenophorus chapmani*				1	1			2	4	NM
Bicycle dragon	*Ctenophorus cristatus*								1	1	NM
Spotted military dragon	*Ctenophorus maculatus* (prev. *Amphibolurus maculatus*)				1	1				2	Other
Spotted military dragon	*Ctenophorus maculatus dualis* (prev. *Amphibolurus maculatus dualis)*					1				1	NM, Other
Spotted military dragon	*Ctenophorus maculatus griseus* (prev. *Amphibolurus maculatus griseus*)					2			1	3	NM, Other
Ornate crevice dragon	*Ctenophorus ornatus* (prev. *Amphibolurus orbatus*)	RE			1		1		2	4	NM, Other
Salt pan dragon	*Ctenophorus salinarum*				1	1			1	3	NM, Other
Chain-striped skink	*Ctenotus catenifer*	En, RE			3	2		1		6	NM, Other
Jewelled south-west ctenotus	*Ctenotus gemmula*	En, RE			3	2				5	NM, Other

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South-western odd striped skink	*Ctenotus impar*	En, RE			2	3		1	3	9	NM, Other
Red-legged skink	*Ctenotus labillardieri* (prev. *Lygosoma labillardiere*)	En, RE			3	5	2			10	NM, Other
Barred wedgesnout ctenotus	*Ctenotus schomburgkii*					2			1	3	NM, Other
Slender blue tongue	*Cyclodomorphus melanops elongatus*								1	1	NM
Marbled-faced delma	*Delma australis*				3	3			2	8	NM, Other
Fraser's scale-footed (legless) lizard	*Delma fraseri fraseri*	RE			2	4		1	1	8	NM, Other
South coast gecko	*Diplodactylus calcicolus*				0	2			2	4	NM
Western stone gecko	*Diplodactylus granariensis*				1					1	Other
Wheatbelt stone gecko	*Diplodactylus granariensis granariensis*								1	1	NM
Masters' snake	*Drysdalia masterii* (syn. *Notechis mastersii*)				2	2				4	NM, Other
Bardick	*Echiopsis curta* (syn. *Notechis curtus*)				3	1			1	5	NM, Other
King's skink	*Egernia kingii* (prev. *Egernia nitida*)	En, RE			3	1	2		4	10	NM, Other
Smith's (South-west crevice) skink	*Egernia napoleonis*				2	1	2			5	NM, Other
Bright crevice skink	*Egernia richardi* (prev. *carinata*)				1	1				2	NM, Other
Western crowned snake	*Elapognathus coronatus* (prev. *Notechis coronatus*)				3	2	1	1	1	8	NM, Other
Variegated tree dtella	*Gehyra variegata*					1			1	2	NM, Other
Southwestern earless skink	*Hemiergis initialis*					1			1	2	NM, Other
Southwestern earless skink	*Hemiergis initialis initialis*								1	1	NM
Burrowing (earless) (four-toed mulch) skink	*Hemiergis peronii peronii* (prev. *Lygosoma quadridigitatum*)				3	6	2		5	16	NM, Other
Bynoe's gecko	*Heteronotia binoei*				1				1	2	NM, Other
Baynes' slider	*Lerista baynesi*	RE (western)				1				1	NM, Other

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South-western orange-tailed slider	*Lerista distinguenda*				3	3		1	2	9	NM, Other
Southern four-toed skink	*Lerista dorsalis* (includes part previously *L. frosti)*				1	1	1		1	4	NM, Other
Slippery (South Coast five-toed) skink	*Lerista microtis intermedia*	En			3	3	1		1	8	NM, Other
Southern robust slider	*Lerista picturata*					1			1	2	NM, Other
Bull-headed skink	*Liopholis multiscutata* (prev. *Egernia bos*, *E. multiscutata*, *E. multiscutata bos*)				2	1	2		1	6	NM, Other
Main's ground gecko	*Lucasium maini*								1	1	Other
Common dwarf skink	*Menetia greyii*				3	2			1	6	NM, Other
Thorny devil	*Moloch horridus*				0	1			1	2	NM
Carpet python	*Morelia spilota imbricata*				3	1	1			5	NM, Other
Woodland morethia skink	*Morethia butleri*								1	1	NM
Dark litter (Southern pale-flecked) skink	*Morethia obscura*				3	8	2	1	2	16	NM, Other
Tiger snake	*Notechis scutatus*				3	5			2	10	NM, Other
Tiger snake	*Notechis scutatus occidentalis*				1	1				2	Other
Black-backed (Mitchell's short-tailed) snake	*Parasuta nigriceps* (prev. *Rhinoplocephalus nigriceps*)				1	1			1	3	NM, Other
Gould's hooded snake	*Parasuta gouldii*								1	1	NM
Lake Cronin snake	*Paroplocephalus atriceps*	P3							1	1	NM
	Phyllodactylus sp. 'Cape Le Grand'	P2			1					1	Other
Dwarf bearded dragon	*Pogona minor* (prev. *Amphibolurus minor*)				3	2				5	NM, Other
Dwarf bearded dragon	*Pogona minor minor* (prev. *Amphibolurus minor minor*)				2				1	3	NM, Other
Bight coast skink	*Pseudemoia baudini*					1				1	NM, Other
Dugite	*Pseudonaja affinis affinis*				3	5			3	11	NM, Other
Recherche (pygmy) dugite	*Pseudonaja affinis tanneri*	T(S3)VU, LE					1			1	NM, Other
Gwardar (Western brown snake)	*Pseudonaja nuchalis*				1					1	Other
Common scaly-foot	*Pygopus lepidopodus*				3	2		1	1	7	NM, Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Southern blind snake	*Ramphotyphlops australis* (syn. *Typhlina australis*)				2	1			2	5	NM, Other
Prong-snouted blind snake	*Ramphotyphlops bituberculatus*				1					1	NM, Other
Southern spiny-tailed gecko	*Strophurus intermedius*	RE (western)			1					1	Other
Western (soft) spiny-tailed gecko	*Strophurus spinigerus*	RE			1	2		1		4	NM, Other
Western (soft) spiny-tailed gecko	*Strophurus spinigerus inornatus* (prev. *Diplodactylus spinigerus inornatus*)				3	1		1		5	NM, Other
Western blue tongue lizard	*Tiliqua occipitalis*				3	2				5	NM, Other
Bobtail	*Tiliqua rugosa rugosa*				3	2	1		2	8	NM, Other
Thick tailed (barking) gecko	*Underwoodisaurus milii* (prev. *Phyllurus milii*, *Gymnodactylus milii*, syn. *Nephrurus milii*)				2	2	2			6	NM, Other
Southern heath monitor	*Varanus rosenbergi* (prev. *V. gouldii rosenbergi*)				3	1	1		1	6	NM, Other
Amphibians (16)											
Quacking frog (Tschudi's froglet)	*Crinia georgiana*	En, RE			2	3	1	1		7	NM, Other
Glauert's frog (Clicking frog)	*Crinia glauerti*	D, En, RE			0	1	1	1		3	NM, Other
Bleating froglet	*Crinia pseudinsignifera*	En, RE			3	2		1		6	NM, Other
South coast froglet	*Crinia subinsignifera* (prev. *Ranidella subinsignifera*)	En, RE			3					3	NM, Other
Western spotted frog	*Heleioporus albopunctatus*	En, RE			1	1				2	NM, Other
Moaning frog	*Heleioporus eyrei*	En, RE			3			1		4	NM, Other
Sand frog	*Heleioporus psammophilus*	En, RE						1		1	NM, Other
Banjo (sand) frog	*Limnodynastes dorsalis*	En, RE			3	6		1	3	13	NM, Other
Slender tree (striped-burrowing) frog	*Litoria adelaidensis*	En, RE			3	2			1	6	NM, Other
Spotted-thigh frog	*Litoria cyclorhyncha* (prev. *L. cyclorhychus*)	En, RE			3	5	1	1	1	11	NM, Other
Turtle frog	*Myobatrachus gouldii*	En, RE				1				1	Other
White-footed trilling frog	*Neobatrachus albipes*	En, RE			2	2		1	1	6	NM, Other
Kunapalari frog	*Neobatrachus kunapalari*	RE			1	4			2	7	NM, Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Humming frog	*Neobatrachus pelobatoides*	RE			2	2		1		5	NM, Other
Gunther's (crawling) toadlet	*Pseudophryne guentheri*	En, RE			2	1		1		4	NM, Other
Western toadlet	*Pseudophryne occidentalis*	RE			1	1				2	NM, Other
Fish (25)											
Black bream	*Acanthopagrus butcheri* (prev. *Mylio butcheri*)					1		1	3	5	NM, Other
Yellow-eye mullet	*Aldrichetta forsteri*								1	1	Other
Herring	*Arripis georgianus*								1	1	Other
Elongate hardyhead	*Atherinosoma elongata*								2	2	Other
	Atherinosoma wallacei								2	2	NM
Nightfish	*Bostockia porosa*				1					1	NM
Estuary cobbler	*Cnidoglanis macrocephalus*								1	1	Other
Anchovy	*Engraulis australis*								2	2	Other
Angelfish	*Enoplosus armatus*								1	1	Other
Longfinned goby	*Favonigobius lateralis*								1	1	Other
Common jollytail	*Galaxias maculatus*								1	1	Other
Southern sea garfish	*Hyporhamphus melanochir* (prev. *Hemiamphus melanochir*)								1	1	Other
Velvet leatherjacket	*Meuschenia scaber* (prev. *Navodon australis*)								1	1	Other
Sea mullet	*Mugil cephalus*								1	1	Other
Queen snapper	*Nemadactylus valenciennesi* (prev. *N. carponotatus*)								1	1	Other
Shore prawn	*Palaeomentes australis* (prev. *Leander litoreus*)								1	1	Other
Sandy flathead	*Platycephalus bassensis*								1	1	Other
Southern blue-spotted flathead	*Platycephalus speculator*								1	1	Other
Tailor	*Pomatomus saltatrix*								1	1	Other
Silver trevally	*Pseudocaranx dentex* (prev. *Usacaranx georgianus*)								1	1	Other
Bluespot gobi (Swan River gobi)	*Pseudogobius olorum* (prev. *Ellogobius olorum*)				1	2			4	7	NM, Other

Common name	Scientific name	Cons code			Planning area						
		WA	EPBC	International conventions	NPs	NRs (mainland)	NRs (islands)	Other existing reserves	Proposed additions	TOTAL	Ref
Tarwhine	*Rhabdosargus sarba*								1	1	Other
Samsonfish	*Seriola hippos*								1	1	Other
School whiting	*Sillago bassensis*								1	1	Other
Weeping toado	*Torquigener pleurogramma* (prev. *Sphaeroides pleurogramma*)								1	1	Other

Conservation status November 2015

Conservation codes

Wildlife Conservation Act

T Threatened fauna declared likely to become extinct, or rare, or otherwise in need of **SP** special protection under the Wildlife Conservation Act, in particular:

- **T(S1)CE** Schedule 1 Fauna that is rare or likely to become extinct, as critically endangered fauna
- **T(S2)EN** Schedule 2 Fauna that is rare or likely to become extinct, as endangered fauna
- **T(S3)VU** Schedule 3 Fauna that is rare or likely to become extinct, as vulnerable fauna
- **T(S4)Ex** Schedule 4 Fauna that is presumed to be extinct
- **SP(S5)IA** Migratory birds protected under an international agreement
- **SP(S6)CD** Fauna that is of special conservation need being species dependent on ongoing conservation intervention
- **SP(S5)OS** Fauna that is in need of special protection, otherwise than for the reasons mentioned.

Priority fauna:

- **P1** Priority One: Taxa with few, poorly known populations on threatened lands
- **P2** Priority Two: Taxa with few, poorly known populations on conservation lands
- **P3** Priority Three: Taxa with several, poorly known populations, some on conservation lands
- **P4** Priority Four: Taxa in need of monitoring (not considered threatened or in need of special protection but could be if present circumstances change)
- **P5** Priority Five: Taxa in need of monitoring (subject to a conservation program, the cessation of which would result in the species becoming threatened within 5 years).

D Disjunct, **En** Endemic, **LE** Locally Endemic, **RE** Range End.

EPBC

Under the Environment Protection and Biodiversity Conservation Act:

- **CR** Critically Endangered
- **EN** Endangered
- **VU** Vulnerable
- **CD** Conservation Dependent
- **Mig** Migratory
- **Mar** Marine

International Conventions

J Jamba, **C** Camba, **R** ROKAMBA, **BC** Bonn Convention, **CITES** CITES Convention

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APPENDIX 7. Lake Gore wetlands and Esperance Lakes waterbirds

Family	Common name	Scientific name	Lake Gore Ramsar	Lake Gore NR	Other Gore wetlands	Lake Quaillilup 5(1)(h)	Carbul, Gidon and Kubitch lakes UCL	Lake Warden System Ramsar	Lake Warden NR	Woody Lake NR	Mullet Lake NR	Pink Lake
Cormorants												
Anhingidae	Darter	*Anhinga melanogaster*	Y	✔	Y	✔		Y	✔	✔	✔	
Phalacrocoracidae	Great cormorant	*Phalacrocorax carbo*	Y	✔				Y		✔	✔	
	Great cormorant	*Phalacrocorax carbo novaehollandiae*			Y	✔		Y		✔		
	Little pied cormorant	*Phalacrocorax melanoleucos* (syn. *Microcarbo melanoleucos*)	Y	✔	Y	✔		Y	✔	✔	✔	
	Little black cormorant	*Phalacrocorax sulcirostris*	Y	✔	Y	✔		Y	✔	✔	✔	
	Pied cormorant	*Phalacrocorax varius*	Y	✔				Y	✔	✔		
Crakes and hens												
Rallidae	Eurasian coot	*Fulica atra*	Y	✔				Y	✔	✔	✔	
	Black-tailed native hen	*Gallinulla ventralis* (syn. *Tribonyx ventralis*)	Y	✔				Y		✔	✔	
	Purple swamphen	*Porphyrio porphyrio*						Y		✔		
	Australian spotted crake	*Porzana fluminea*						Y			✔	
	Spotless crake	*Porzana tabuenis*	Y	✔				Y		✔		
Ducks and geese												
Anatidae	Chestnut teal	*Anas castanea*	Y	✔	Y	✔		Y	✔	✔	✔	
	Grey teal	*Anas gracilis* (prev. *gibberifrons*)	Y	✔	Y	✔		Y	✔	✔	✔	
	Mallard	*Anas platyrhynchos*						Y	✔			
	Australasian shoveller	*Anas rhynchotis*	Y	✔				Y	✔	✔	✔	
	Pacific black duck	*Anas superciliosa*	Y	✔	Y	✔		Y	✔	✔	✔	
	Hardhead	*Aythya australis*	Y	✔				Y	✔	✔	✔	
	Musk duck	*Biziura lobata*	Y	✔				Y	✔	✔	✔	
	Recherche Cape Barren goose	*Cereopsis novaehollandiae grisea*						Y		✔	✔	Y
	Maned (Australian wood) duck	*Chenonetta jubata*	Y	✔				Y	✔	✔	✔	
	Black swan	*Cygnus atratus*	Y	✔	Y		✔	Y	✔	✔	✔	Y
	Pink eared duck	*Malacorhynchus membranaceus*	Y	✔				Y	✔	✔	✔	
	Blue billed duck	*Oxyura australis*	Y	✔				Y	✔	✔	✔	
	Freckled duck	*Stictonetta naevosa*	Y	✔				Y		✔	✔	
	Australian shelduck (mountain duck)	*Tadorna tadornoides*	Y	✔	Y	✔	✔	Y	✔	✔	✔	Y

Family	Common name	Scientific name	Lake Gore Ramsar	Lake Gore NR	Other Gore wetlands	Lake Quaillilup 5(1)(h)	Carbul, Gidon and Kubitch lakes UCL	Lake Warden System Ramsar	Lake Warden NR	Woody Lake NR	Mullet Lake NR	Pink Lake
Grebes												
Podicipedidae	Great crested grebe	*Podiceps cristatus*	Y	✔				Y	✔	✔	✔	
	Hoary headed grebe	*Poliocephalus poliocephalus*	Y	✔	Y	✔		Y	✔	✔	✔	Y
	Australasian grebe	*Tachybaptus novaehollandiae* (prev. *Podiceps novaehollandiae*)	Y	✔				Y	✔	✔	✔	
Herons, egrets, ibises and spoonbills												
Ardeidae	Great egret	*Ardea alba* (prev. *Egretta alba* syn. *Egretta modesta*)	Y	✔	Y	✔		Y	✔	✔	✔	
	Little egret	*Ardea garzetta* (syn. *Egretta garzetta*)						Y		✔	✔	
	Cattle egret	*Ardea ibis* (syn. *Bubulcus ibis*)						Y		✔	✔	
	White faced heron	*Ardea novaehollandiae* (prev. *Egretta novaehollandiae*)	Y	✔	Y	✔		Y	✔	✔	✔	Y
	White-necked heron (prev. Pacific heron)	*Ardea pacifica*	Y	✔				Y		✔		
	Eastern reef egret	*Egretta sacra* (prev. *Ardea sacra*)						Y	✔			
	Nankeen night (rufous) heron	*Nycticorax calendonicus hilli*						Y		✔		
Threskiornithidae	Yellow-billed spoonbill	*Platalea flavipes*	Y	✔				Y	✔	✔	✔	
	Royal spoonbill	*Platalea regia*						Y		✔		
	Glossy ibis	*Plegadis falcinellus*						Y		✔		
	Australian white ibis	*Threskiornis molucca*	Y	✔	Y	✔		Y	✔	✔	✔	
	Straw necked ibis	*Threskiornis spinicollis*	Y	✔	Y		✔	Y	✔	✔	✔	
Kingfishers												
Halcyonidae	Sacred kingfisher	*Todiramphus sanctus* (prev. *Halcyon sanctus*)						Y	✔	✔		Y
	Sacred kingfisher	*Todiramphus sanctus sanctus*						Y	✔			
Pelicans												
Pelecanoididae	Australian pelican	*Pelecanus conspicillatus*	Y	✔	Y	✔	✔	Y	✔	✔	✔	
Raptors												
Accipitridae	Swamp (marsh) harrier	*Circus approximans* (prev. *C. aeruginosus*)	Y	✔				Y	✔	✔	✔	
	White-bellied sea eagle	*Haliaeetus leucogaster*	Y	✔	Y	✔		Y	✔	✔		
Reed warblers												
Sylviidae	Australian reed warbler	*Acrocephalus australis* (syn. *A. stentoreus)*						Y	✔	✔		

Family	Common name	Scientific name	Lake Gore Ramsar	Lake Gore NR	Other Gore wetlands	Lake Quaillilup 5(1)(h)	Carbul, Gidon and Kubitch lakes UCL	Lake Warden System Ramsar	Lake Warden NR	Woody Lake NR	Mullet Lake NR	Pink Lake
Seabirds												
Laridae	Silver gull	*Larus novaehollandiae* (prev. *Chroicocephalus novaehollandiae*)	Y	✔	Y	✔		Y	✔	✔	✔	Y
	Silver gull	*Larus novaehollandiae novaehollandiae*						Y			✔	
	Pacific gull	*Larus pacificus*			Y	✔		Y	✔			Y
	Crested tern	*Sterna bergii* (prev. *Thalasseus bergii*)						Y	✔	✔		Y
	Caspian tern	*Sterna caspia* (prev. *Hydroprogne caspia*)	Y	✔	Y	✔	✔	Y	✔	✔		
	Fairy tern	*Sterna nereis nereis* (syn. *Sternula nereis*)	Y	✔				Y	✔	✔	✔	
	Gull-billed tern	*Sterna nilotica*						Y	✔	✔	✔	
Sternidae	White-winged black tern	*Chlidonias leucopterus* (syn. *Sterna leucopterus*)						Y		✔	✔	
	Whiskered tern	*Sterna hybrida* (prev. *Chlidonias hybridus*)	Y	✔	Y	✔		Y	✔	✔	✔	Y
Sulidae	Australian gannet	*Sula serrator* (syn. *Morus serrator*)						Y	✔			
Shorebirds												
Burhinidae	Beach stone curlew	*Esacus neglectus* (prev. *E. magnirostris*)						Y			✔	
Charadriidae	Large (greater) sand plover	*Charadrius leschenaultii*	Y	✔				Y		✔		Y
	Black-fronted (plover) dotterel	*Charadrius melanops* (syn. *Elseyornis melanops*)			Y	✔		Y	✔	✔		
	Lesser sand plover	*Charadrius mongolus*						Y			✔	
	Hooded plover	*Charadrius rubricollis* (syn. *Thinornis rubricollis tregellasi* and *Charadrius cucullatus*)	Y	✔	Y		✔	Y	✔	✔	✔	Y
	Red-capped plover	*Charadrius ruficapillus*	Y	✔	Y		✔	Y	✔	✔	✔	Y
	Red-kneed dotterel	*Erythrogonys cinctus*	Y	✔				Y		✔		
	Lesser golden plover	*Pluvialis dominica*	Y	✔								
	Grey plover	*Pluvialis squatarola*						Y			✔	
	Masked lapwing	*Vanellus miles*	Y	✔				Y		✔	✔	
	Banded lapwing (plover)	*Vanellus tricolor*	Y	✔				Y		✔		
Haematopodidae	Sooty oystercatcher	*Haematopus fuliginosus*	Y	✔				Y	✔			

Family	Common name	Scientific name	Lake Gore Ramsar	Lake Gore NR	Other Gore wetlands	Lake Quallilup 5(1)(h)	Carbul, Gidon and Kubitch lakes UCL	Lake Warden System Ramsar	Lake Warden NR	Woody Lake NR	Mullet Lake NR	Pink Lake
Recurvirostridae	Banded stilt	*Cladorhynchus leucocephalus*	Y	✔	Y		✔	Y	✔	✔	✔	Y
	Black-winged stilt	*Himantopus himantopus*	Y	✔	Y	✔		Y	✔	✔	✔	
	Red-necked avocet	*Recurvirostra novaehollandiae*	Y	✔				Y	✔	✔	✔	Y
Scolopacidae	Ruddy turnstone	*Arenaria interpres*	Y	✔				Y	✔		✔	Y
	Sharp-tailed sandpiper	*Calidris acuminata*	Y	✔	Y	✔		Y	✔		✔	Y
	Sanderling	*Calidris alba*	Y	✔				Y			✔	Y
	Red knot	*Calidris canutus*	Y	✔				Y	✔	✔	✔	
	Curlew sandpiper	*Calidris ferruginea*	Y	✔	Y		✔	Y	✔	✔	✔	Y
	Pectoral sandpiper	*Calidris melanotos*	Y	✔				Y	✔			
	Red-necked stint	*Calidris ruficollis*	Y	✔	Y		✔	Y	✔	✔	✔	Y
	Long-toed stint	*Calidris subminuta*	Y	✔				Y	✔			
	Great knot	*Calidris tenuirostris*	Y	✔				Y	✔		✔	Y
	Broad-billed sandpiper	*Limicola falcinellus*						Y	✔			
	Bar-tailed godwit	*Limosa lapponica*						Y	✔		✔	
	Black-tailed godwit	*Limosa limosa*	Y	✔				Y			✔	
	Eastern curlew	*Numenius madagascariensis*						Y	✔			
	Whimbrel	*Numenius phaeopus*						Y		✔		
	Grey-tailed tattler	*Tringa brevipes* (syn. *Heteroscelus brevipes*)						Y	✔			
	Terek sandpiper	*Tringa cinerea* (prev. *Xenus cinereus)*						Y			✔	
	Wood sandpiper	*Tringa glareola*	Y	✔				Y	✔	✔	✔	
	Common sandpiper	*Tringa hypoleucos* (prev. *Actitis hypoleucos*)	Y	✔	Y	✔		Y		✔	✔	
	Common greenshank	*Tringa nebularia*	Y	✔	Y	✔	✔	Y	✔	✔	✔	
	Marsh sandpiper	*Tringa stagnatilis* (prev. *stagnatus*)						Y		✔	✔	
			60	60	30	23	11	90	61	67	61	21

APPENDIX 8. 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 (data 2015).

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 two[93] 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 ecosystem 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

[93] 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 ecosystem component/process	
Hydrology	• 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
Water quality (physico-chemical)	• Salinity concentrations saline to hypersaline • 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) • 60 species of waterbird recorded • 30 waterbirds listed under the EPBC Act: 30 marine, 16 migratory species listed under international migratory agreements CAMBA (13), JAMBA (16), ROKAMBA (14) and Bonn Convention (14) • 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) • Notable species: threatened fairy tern (Vulnerable under Schedule 3 of the Wildlife Conservation Act)
Fish	• Western trout minnow, bluespot gobi (*Pseudogobius olorum*) 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 (*Leptatherina wallacei*) and the bluespot gobi have been recorded in the lower Dalyup River where it terminates at Lake Gore
Aquatic invertebrates	• Low richness due to high salinities • Species composition has been variable
Vegetation	• Lake Gore has fringing vegetation consisting of Melaleuca cuticularis • High water mark of Lake Gore consists of *Schoenus brevifolius* and *Gahnia trifida*, samphire species (*Suaeda australis* and *Sarcocornia quinqueflora)* and the grass species *Sporobolus virginicus* and herb *Samolus repens* • *Melaleuca cuticularis* is replaced by *Acacia* 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) updated

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 – Wetland habitats*). 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 been 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. 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 being reached. This ultimately aids in ensuring that a change in ecological character does not occur. Where known, management triggers from Annex 1 of DEC (2009b) are included below.

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	Baseline must be identified before limits can be set New hydrological regime – no further increase in surface water inputs into Lake Gore	Not specified
Fresh and saline water inputs from 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	Baseline must be identified before limits 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 16.2 to 17.03m 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 **(Trigger: 0 out of every 3 years)** At all other times the depth of Lake Gore should not exceed 16.6m AHD **(Trigger: 16.0m 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 **(Trigger: 16.6m AHD)**	3 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 **(Trigger: >60ppt for more than 2 consecutive years)**	Every 2 years

Baseline condition	Limits of acceptable change	Reporting
pH for September and November 6.8 to 9.8	The minimum pH must not fall below 6.5 and the maximum pH must not be greater than 11 **(Trigger: minimum 7.0 and maximum 10)** Waterbirds have been recorded at average pH values between 6.3 to 8.7 (min. 1.9 and max. 11.5)	Not specified
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 **(Trigger: 0.30mg/L chlorophyll a)**	Not specified
Waterbird diversity		
>1% of the South-west Australian population of the Australian shelduck	>1% in at least 4 out of 5 years **(Trigger: 1 out of 2 years)**	Every 2 years
>1% of the South-west Australian population of the chestnut teal	>1% in at least 2 out of 5 years **(Trigger: 1 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 **(Trigger: 1 out of 3 years)**	Every 3 years
>1% of the Australian population of the banded stilt	>1% in at least 1 out of 5 years **(Trigger: 1 out of 3 years)**	Every 3 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 **(Trigger: 1 out of 2 years)**	Every 2 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 Coxiella sp. (likely to be C. exposita) 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 *Coxiella* sp. should occur	Every 3 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 3 years

Source: DEC (2009b)

APPENDIX 9. 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) including the great knot and curlew sandpiper (both threatened). Twenty-nine migratory waterbird species recognised under the international migratory bird agreements CAMBA (25 species), JAMBA (27 species), ROKAMBA (24 species) and Bonn Convention (24 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 ecosystem component/process	
Climate Geomorphology	• Refer to Appendix 8 • 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
Water quality (physico-chemical)	• Salinity concentrations are saline to hypersaline depending on the wetland • Alkaline pH • Nutrient enriched

Critical ecosystem component/process	
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	• 90 species of waterbird recorded • 53 EPBC Act listed species, 53 are listed as marine species and 29 species are listed as migratory and are included under the international migratory bird agreements CAMBA (25), JAMBA (27), ROKAMBA (24) and the Bonn Convention (24) • 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 great knot, curlew sandpiper, fairy tern and the Cape Barren goose (all threatened under the Wildlife Conservation Act and Vulnerable under the EPBC Act)
Fish	• Bluespot 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) updated

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 – Wetland habitats*). 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)* change, 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. 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 being reached. This ultimately aids in ensuring that a change in ecological character does not occur. Where known, management triggers from Annex 1 of DEC (2009c) are included below.

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 **(Trigger: 1 out of 2 years)** 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) **(Trigger: 1m other than during extreme flooding events)** New hydrological regime interim limit – water depth to remain below 2.5m **(Trigger: 2.0m)**	Every 2 years
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 **(Trigger: 1 out of 2 years)** At all other times depth should not exceed 1.6m (other than during extreme storm events) **(Trigger: 1.3m other than during extreme flooding events)** New hydrological regime interim limit – water depth to remain below 1.7m **(Trigger: 1.5m other than during extreme flooding events)**	Every 2 years
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 **(Trigger: 0 years out of 2)** At all other times depth of Station Lake should not exceed 0.8m (other than during extreme storm events) **(Trigger: 0.5m other than during extreme flooding events)** New hydrological regime interim limit – **(Trigger: 0.7m)**	Every 2 years
Water quality		
Salinity at Lake Warden has ranged from ~ 15ppt to 369ppt Waterbirds have been recorded at a range of <2ppt to >35ppt	Lake Warden median summer salinities 100ppt	Not specified
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 **(Trigger: Windabout Lake 20ppt, Woody Lake 10ppt, Lake Wheatfield 10ppt)**	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 **(Trigger: Station 100ppt, Mullet Lake 50ppt, Ewans Lake 15ppt)**	Not specified

Baseline condition	Limits of acceptable change	Reporting
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 **(Trigger: Minimum pH 7 and maximum pH 10)**	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
Waterbird diversity		
>1% of the South-west Australian population of the chestnut teal	>1% in at least 2 out of 3 years **(Trigger: 1 out of 2 years)**	Every 2 years
>1% of the Western Australian population of the hooded plover	>1% in at least 2 out of 5 years **(Trigger: 1 out of 3 years)**	Every 3 years
89 species of waterbirds, 29 listed under the EPBC Act as 'migratory'	All 29 listed as 'migratory' recorded over a 2-year period **(Trigger: <50% recorded over 1 year)**	Annually
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 Molluscs *Coxiella* spp. have been recorded and are an important food source for the hooded plover	Insufficient information at this time, although no changes in *Coxiella* spp. should occur	Not specified

Source: DEC (2009c)

APPENDIX 10. Weeds

Environmental Weed Strategy Rating

High	Priority for control and/or research
Moderate	Control or research efforts should be directed to it if funds are available in addition to reasonably high level of monitoring
Mild	Monitoring and control where appropriate
Low	Low level of monitoring

Based on *Environmental Weed Strategy for Western Australia* (CALM 1999)

Regional Assessment Rating

VH	Very High (objective is eradication)
H	High (objective is eradication or control to reduce)
M	Medium (objective is control to reduce or containment)
L	Low (objective is containment at key sites only)
N	Negligible (no action to be undertaken but may include monitoring only)
FAR	Further assessment required

Examples of management actions that may be considered for each ranking:

A	No action (the weed species ranking is so low as to not warrant any investment in regional strategic management actions)
B	Monitor only (aims to detect any significant changes in the species' weed risk or management ability)
C	Improve general weed management (aims to minimise weed impact and maintain the overall biodiversity, social, cultural and economic values in the region through improved general weed management)
D	Protect priority sites (aims to prevent spread of weed species to key sites/assets of high biodiversity, social, cultural or economic value)
E	Targeted control to reduce infestations at priority sites (may include bio-control) (aims to significantly reduce the impact of a weed species on key sites/assets of high biodiversity, social, cultural or economic value through targeted management)
F	Contain regional spread (aims to prevent the ongoing spread of the weed species in the region)
G	Reduce regional infestations (may include bio-control) (aims to significantly reduce the extent of the weed species in the region)
H	Regional eradication (aims to remove the weed species from the region)
I	Statewide eradication (aims to remove the weed species from the state)

Based on *An Integrated Approach to Weed Management on DPaW-managed Lands in WA* (DPaW 2013a)

Weeds in the planning area (157)

Species	Common name	Reserve	Regional assessment	Local management
High (12)				
*Asparagus asparagoides**	Bridal creeper	Lake Shaster NR, Stokes NP, Moir Homestead, Lake Gore NR, Helms, Cape Arid NP, Nuytsland NR, Recherche Archipelago NR	L (D)	Control
Bromus diandrus	Great brome	Lake Gore NR, Lake Mortijinup NR, Cape Le Grand NP, Woody Island NR, Recherche Archipelago NR	N (B)	Monitor
Carrichtera annua	Wards weed	Nuytsland NR[2]	L (B,C)	Control
Ehrharta calycina	Perennial Veldt grass	Lake Gore NR, Woody Lake NR, Cape Le Grand NP	L (D)	Monitor
Eragrostis curvula	African love grass	Stokes NP[2]	L (B,C)	Control/monitor
Euphorbia terracina[#]	Geraldton carnation weed	Stokes NP, Moir Homestead, Cape Arid NP, Thomas River[1,2]	H (G,H,I)	Control/monitor
Lagurus ovatus	Hares tail grass	Lake Mortijinup NR, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Leptospermum laevigatum	Victorian tea tree	Stokes NP, Warrenup Lakes NR, Lake Gore NR, UCL Esp. Loc. 2010, Cape Le Grand NP	M (D,E,F)	Control, if possible eradicate
Lycium ferocissimum[*]	African box-thorn	Stokes NP, Moir Homestead, Woody Island NR, Recherche Archipelago NR	M (D,E,F)	Control, if possible eradicate
*Malva arborea (*prev. *M. dendromorpha)*	Tree mallow	Helms	ALERT	Monitor
Pelargonium capitatum	Rose pelargonium	Stokes NP, Moir Homestead, Woody Lake NR, Cape Le Grand NP	L (B,C)	Control
Watsonia meriana var. *bulbillifera*	Bungle lily watsonia	Dalyup NR	M (D,E,F)	Control
Moderate (68)				
Aira carophyllea	Silvery hair grass	Lake Shaster NR, Oldfield river corridor, East Naernup NR, Lake Gore NR, Beaumont NR, UCL Loc 513, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Monitor
Aira cupaniana	Silvery hair grass	Helms, Cape Le Grand NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Monitor
Anthoxanthum odoratum	Sweet vernal grass	Speddingup NR	L (B,C)	Monitor
Arctotheca calendula	Cape weed	Dalyup NR, Helms, Cape Le Grand NP, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	N (B)	Monitor

Species	Common name	Reserve	Regional assessment	Local management
Arctotheca populifolia	Dune arctotheca	Cape Arid NP, Recherche Archipelago NR	N (B)	Monitor
Avena barbata	Bearded oat	Munglinup NR, Mullet Lake NR, Cape Le Grand NP, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	N (B)	Monitor
Avena fatua	Wild oat	Woody Island NR, Recherche Archipelago NR[5]	N (B)	Monitor
Briza maxima	Blowfly grass	Lake Gore NR, Helms	N (B)	Monitor
Briza minor	Shivery grass	Oldfield River, East Naernup NR, Lake Gore NR, Woody Lake NR, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	N (B)	Monitor
Bromus rubens	Red brome	Lake Gore NR, Kau Rock NR	N (B)	Control/monitor
Bupleurum semicompositum	Hares ear	Cape Arid NP	FAR	Further assessment required
Cakile maritima	Sea rocket	Stokes NP, Cape Le Grand NP, Cape Arid NP, Recherche Archipelago NR	N (B)	Monitor
Carduus pycnocephalus	Slender thistle	Cape Arid NP	L (D)	Control/monitor
Centaurea melitensis	Maltese cockspur	Cape Arid NP	L (D)	Control/monitor
Centaurium erythraea	Common centaury	Helms, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Monitor
Cirsium vulgare	Slender or spear thistle	Stokes NP, Cape Arid NP, Recherche Archipelago NR	L (D)	Control/monitor
Crassula natans	Crassula	Cape Arid NP, Nuytsland NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Crassula natans var. *minus*	Crassula	Helms, Recherche Archipelago NR	L (B,C)	Monitor
Cynodon dactylon	Couch	Cape Arid NP, Woody Island NR	L (B,C)	Monitor
Cyperus congestus	Dense flat-sedge	Beaumont NR	L (B,C,D)	Monitor
Cyperus tenellus	Tiny flatsedge	Helms	L (B,C)	Monitor
Ehrharta longiflora	Annual veldtgrass	Oldfield River, Stokes NP, Lake Gore NR, Dalyup NR, Cape Le Grand NP, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Monitor
Erodium cicutarium	Common storksbill	Woody Island NR[5]	N (B)	Monitor
Eucalyptus cladocalyx	Sugar gum	Moir Homestead[2]	L (B,C,D)	Control/monitor
Euphorbia paralias	Sea spurge	Stokes NP, Cape Le Grand NP, Cape Arid NP, Recherche Archipelago NR	L (B,C)	No action

Species	Common name	Reserve	Regional assessment	Local management
Euphorbia peplus	Petty spurge	Oldfield River, Cape Arid NP, Woody Island NR	L (B,C)	Monitor
Ficus carica	Fig	Moir Homestead[2]	Deleted	No action
Galium murale	Slender bedstraw	East Naernup NR, Helms, Cape Arid NP, Woody Island NR	L (B,C)	Monitor
Gomphocarpus fruticosus^	Narrowleaf cottonbush	Helms	ALERT	Control/monitor
*Helichrysum luteoalbum (*prev. *Pseudognaphalium luteoalbum)*	Jersey cudweed	Oldfield River, East Naernup NR, UCL Esp Loc 1992, Cape Le Grand NP, Cape Arid NP, Recherche Archipelago NR	Deleted	Further assessment required
Heliophila pusilla	-	Helms[4]	FAR	Further assessment required
Hordeum glaucum	Northern barley grass	Cape Arid NP	N (B)	Monitor
Hordeum leporinum	Barley grass	Cape Arid NP, Woody Island NR, Recherche Archipelago NR	N (B)	Monitor
Hordeum marinum	Sea barley	Lake Gore NR	N (B)	Monitor
Hypochaeris glabra	Smooth cat's ear or flat weed	Lake Shaster NR, Oldfield River, East Naernup NR, UCL adj Peak Charles, Lake Gore NR, Lake Mortijinup NR, Swan Lagoon NR, Helms, Shark Lake NR, Mt Ney NR, UCL Loc 513, Alexander NR, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Monitor
Isolepis marginata	Coarse club rush	Lake Shaster NR, Helms, Cape Le Grand NP, Mt Ney NR, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	Deleted	Negligible
Juncus bufonius	Toad rush	Lake Gore NR, Helms, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (D)	Control/monitor
Juncus capitatus	Capitate rush	Cape Arid NP	L (D)	Control/monitor
Lactuca serriola	Prickly lettuce	Recherche Archipelago NR[5]	FAR	Further assessment required
Lolium rigidum	Wimmera ryegrass	Cape Arid NP, Woody Island NR, Recherche Archipelago NR	N (B)	Monitor
*Lysimachia arvensis (*prev. *Anagallis arvensis, Anagallis arvensis var.arvensis* and *Anagallis arvensis* var.*caerulea)*	Pimpernel	Lake Gore NR, Swan Lagoon NR, Helms, Cape Le Grand NP, Cape Arid NP, Nuytsland NR, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Melilotus indicus	Hexham scent King Island melilot	Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor

Species	Common name	Reserve	Regional assessment	Local management
Parentucellia latifolia	Common bartsia	Cape Arid NP,	N (B)	Monitor
Pentameris airoides	False hairgrass	East Naernup NR, UCL adj Peak Charles NP, Swan Lagoon NR, Beaumont NR	L (B,C)	Control/monitor
Pinus pinaster	Maritime pine	Cheadanup NR, Helms, Shark Lake NR, Bebenornin NR[2]	L (C)	Eradicate/ harvest
Polypogon monspeliensis	Annual beardgrass	Oldfield River, Lake Gore NR, Lake Mortijinup NR, Helms, Woody Lake NR, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Rostraria cristata	Mediterranean hairgrass	Truslove Townsite NR, Beaumont NR, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Rostraria pumila	Roughtail	Swan Lagoon NR, Mt Burdett NR	ALERT	Control/monitor
Rubus laudatus^	Blackberry	Woody Lake NR, Freehold Lot 826	L (B,C)	Eradicate/ monitor
Solanum nigrum	Blackberry nightshade	Cape Le Grand NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Sonchus asper	Rough sowthistle	Munglinup NR, Mullet Lake NR, UCL adj Cape Arid NP, Cape Arid NP, Recherche Archipelago NR	L (B,C)	Control/monitor
Sonchus oleraceus	Common sowthistle	Lake Shaster NR, East Naernup NR, UCL adj Peak Charles NP, Lake Gore NR, Helms, Woody Lake NR, Cape Le Grand NP, Beaumont NR, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Spergularia rubra	Sand spurry	Truslove Townsite NR, Woody Island NR, Recherche Archipelago NR	N (B)	Control/monitor
Trifolium arvense var.*arvense*	Hares foot clover	Cape Arid NP	N (B)	Monitor
Trifolium campestre	Hop clover	Lake Gore NR, Cape Arid NP, Woody Island NR	N (B)	Monitor
Trifolium campestre var.campestre	Hop clover	Cape Arid NP	N (B)	Monitor
Trifolium cernuum	Drooping flower clover	Woody Island NR	N (B)	Monitor
Trifolium glomeratum	Ball clover cluster clover	Cape Arid NP, Woody Island NR	N (B)	Monitor
Trifolium subterraneum	Subterranean clover	Cape Arid NP[1]	L (B,C)	Monitor
Ursinia anthemoides	Ursinia	R26915, Lake Gore NR, Swan Lagoon NR	L (B,C)	Control/monitor
Ursinia anthemoides subsp. Anthemoides	-	R26915	L (B,C)	Monitor

Species	Common name	Reserve	Regional assessment	Local management
Vellereophyton dealbatum	White cudweed	Young River, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	N (B)	Control/monitor
Vulpia bromoides	Squirrel tail fescue	Recherche Archipelago NR[5]	N (B)	Monitor
Vulpia fasciculata (prev. *V. membranacea)*	Dune fescue	Cape Le Grand NP, Recherche Archipelago NR	N (B)	Monitor
Vulpia myuros	Rat's tail fescue	Cape Arid NP, Woody Island NR, Recherche Archipelago NR	N (B)	Monitor
Vulpia myuros forma megalura	Fox tail fescue	Mt Ney NR	N (B)	Monitor
Vulpia myuros forma myuros	Rat's tail fescue	Cape Le Grand NP, Recherche Archipelago NR[1,5]	L (B,C)	Monitor
Wahlenbergia capensis	Cape bluebell	Helms[4]	L (B,C)	Control/monitor
Mild (14)				
Dittrichia graveolens	Stinkwort	Cape Le Grand NP, Cape Arid NP	L (B,C)	Control/monitor
Hedypnois rhagadioloides	Cretan weed	Cape Arid NP	M (D,E,F,G)	Control
Juncus microcephalus	-	R28170(east)	M (D,E,F)	Control/monitor
Medicago polymorpha	Burr medic	Woody Island NR, Recherche Archipelago NR[5]	L (B,C)	Monitor
Nicotiana glauca	Tree tobacco	Cape Arid NP	L (B,C,D)	Monitor
Ornithopus compressus	Yellow serradella	Woody Lake NR, Cape Le Grand NP	N (B)	Monitor
Parapholis incurva	Coast barbgrass	Munglinup NR, Lake Gore NR, Truslove Townsite NR, Helms, UCL Esp Loc 1992, Mullet Lake NR, Cape Le Grand NP, Beaumont NR, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (C)	Control/monitor
Poa annua	Annual winter grass	Cape Arid NP, Woody Island NR	L (C)	Control/monitor
Rumex crispus	Curled dock	Lake Gore NR, Woody Island NR	N (B)	Monitor
Sherardia arvensis	Field madder	Cape Arid NP	L (B,C,D)	Control/monitor
Sisymbrium irio	London rocket	Cape Arid NP	L (C)	Control/monitor
Solanum laciniatum	Kangaroo apple	Lake Mortijinup NR, Cape Arid NP	L (B,C)	Control/monitor
Spergularia diandra	Lesser sand spurry	UCL adj Peak Charles NP, R26915, UCL Esp Loc 1992, Beaumont NR	L (B,C)	Control/monitor
Urtica urens	Stinging nettle or small nettle	Nuytsland NR, Woody Island NR	L (B,C,D)	Control/monitor

Species	Common name	Reserve	Regional assessment	Local management
Low (38)				
Acacia pycnantha	Golden wattle	East Naernup NR, Dalyup NR, Helms[2,4]	M (D,E,F)	Eradicate
Aira elegantissima (prev. *A. elegans)*	Elegant hair grass	Cape Arid NP	L (B,C)	Monitor
Aira praecox	Early hair grass	Woody Island NR	L (B,C)	Control/monitor
Ammophila arenaria	Marram grass	Cape Le Grand NP[1]	L (C)	Control/monitor
Ammophila arenaria subsp. arenaria	Marram grass	Cape Le Grand NP[1]	L (C)	Control/monitor
Bromus hordeaceus	Soft brome	Lake Gore NR, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	N (B)	Monitor
Bromus madritensis	Madrid brome	Cape Arid NP	N (B)	Monitor
Carpobrotus aequilaterus	Angular pigface	Recherche Archipelago NR	L (B,C,D)	Control/monitor
Carthamus lanatus^	Saffron thistle	Cape Le Grand NP, Cape Arid NP	L (D)	Control/monitor
Centaurium tenuiflorum	Branched centaury	Cape Le Grand NP, Cape Arid NP	L (B,C)	Control/monitor
Cerastium glomeratum	Chickweed	Lake Mortijinup NR, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Chenopodium glaucum	Glaucous goosefoot	Oldfield River, Lake Mortijinup NR, Cape Arid NP	N (B)	Monitor
Chenopodium murale	Nettleleaf goosefoot or green flat hen	Woody Island NR, Recherche Archipelago NR[1,5]	N (B)	Monitor
Chloris virgata	Feathertop Rhodes grass	Munglinup NR, Mullet Lake NR	FAR	Further assessment required
Cicendia filiformis	Slender cicendia	Helms	FAR	Further assessment required
Conium maculatum#	Hemlock	Cape Arid NP	Deleted	Further assessment required
Conyza bonariensis	Flaxleaf fleabane	Roberts Swamp, Recherche Archipelago NR	L (B,C)	Control/monitor
Corrigiola litoralis	Strapwort	Recherche Archipelago NR[1,5]	L (B,C)	Control/monitor
Cotula bipinnata	Ferny cotula	Woody Island NR, Recherche Archipelago NR	FAR	Further assessment required
Cotula coronopifolia	Waterbuttons	Helms, Woody Lake NR, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Eucalyptus globulus	Tasmanian blue gum	Moir Homestead[2]	L (B,C,D)	Control/monitor

Species	Common name	Reserve	Regional assessment	Local management
Fumaria bastardii	Bastards fumitory	Cape Arid NP	Not on list	Further assessment required
Galium aparine	Goosegrass	Recherche Archipelago NR[5]	ALERT	Monitor
Helianthus annuus	Sunflower	Lake Warden NR	Deleted	Monitor
Lolium perenne	Perennial rye grass	Cape Arid NP[1]	N (B)	Monitor
Lycopersicon esculentum	-	Recherche Archipelago NR[5]	ALERT	Monitor
Malva parviflora	Marshmallow	Woody Island NR[5]	FAR	Further assessment required
Oenothera stricta subsp. stricta	Evening primrose	Cape Le Grand NP, Cape Arid NP	FAR	Further assessment required
Oxalis corniculata	Yellow wood sorrel	Recherche Archipelago NR[1,5]	N (B)	Monitor
Polycarpon tetraphyllum	Four-leaf allseed	Lake Gore NR, Cape Le Grand NP, Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (C)	Control/monitor
Ricinus communis	Castor oil plant	Moir Homestead, Nuytsland NR[1,2]	N (A,B)	Monitor
Sagina apetala	Annual pearlwort	Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Silene gallica	Catchfly	Woody Island NR[5]	L (C)	Control/monitor
Silene gallica var. *gallica*	French catchfly	Woody Island NR [1,5]	L (C)	Control/monitor
Stellaria media	Chickweed	Lake Mortijinup NR, Recherche Archipelago NR	L (B,C)	Monitor
Trifolium striatum	Knotted clover	Munglinup NR, Mullet Lake NR	N (B)	Monitor
Trifolium tomentosum	Woolly clover	Woody Island NR[5]	N (B)	Monitor
Vulpia muralis	Wall fescue	Stokes NP, NR33113, Woody Island NR	N (B)	Monitor
Unrated (13)				
Apium graveolens	Wild celery	Recherche Archipelago NR	Not on list	Monitor
Avellinia michelii	Avellinia	Lake Mortijinup NR, Cape Le Grand NP, Beaumont NR, Cape Arid NP	Deleted	Monitor
Campylopus introflexus	(moss)	Cape Le Grand NP, Mt Burdett NR, Cape Arid NP	Not on list	Monitor
Catapodium rigidum (prev *Desmazeria rigida)*	Rigid fescue	Cape Arid NP, Woody Island NR, Recherche Archipelago NR	L (B,C)	Control/monitor
Disa bracteata	South African weed orchid	Recherche Archipelago NR[5]	L (B,C)	Control/monitor

Species	Common name	Reserve	Regional assessment	Local management
Dischisma arenarium	-	Lake Mortijinup NR, Cape Le Grand NP, Recherche Archipelago NR	L (B,C)	Control/monitor
Freesia leichtlinii	Freesia	Cape Le Grand NP[2]	L (D)	Control
Hypochaeris radicata	Flat weed	Helms	L (B,C)	Control/monitor
Lolium loliaceum	Stiff ryegrass	Woody Island NR, Recherche Archipelago NR[5]	Deleted	Control/monitor
Panicum hillmanii	Hillman's panicgrass	Cape Arid NP	Not on list	Control/monitor
Spergularia marina	Lesser sea spurry	Helms, Woody Island NR	FAR	Further assessment required
Stellaria pallida	Lesser chickweed	Woody Island NR[1,5]	L (B,C)	Control/monitor
Symphyotrichum squamatum (syn. *subulatum)*	Bushy Starwort	Woody Lake NR	FAR	Further assessment required
Not listed (6)				
Chamaecytisus proliferus	Tagasaste	Stokes NP[2]	L (B,C,D)	Control/monitor
Conyza sumatrensis	Tall fleabane	Oldfield River, Stokes NP, Cape Arid NP	L (B,C)	Control/monitor
Freesia alba x *leichtlinii*	Freesia	Cape Le Grand NP	ALERT	Control
Hornungia procumbens	-	Beaumont NR, Recherche Archipelago NR	L (D)	Control/monitor
Lepidium didymum	Wart cress	Cape Arid NP	L (C)	Control/monitor
Moraea flaccida^	One-leafed cape tulip	Lake Shaster NR, Woody Lake NR	L (B,C,D)	Control/monitor
Not listed - Ornamental (2)				
Eucalyptus gomphocephala	Tuart	Lake Shaster NR, Moir Homestead, Cape Le Grand NP[2]	N (A,B)	Monitor
Ficus macrophylla	Moreton Bay fig	Moir Homestead[2]	Not on list	Monitor
TBA (4)				
Atriplex prostrata	Hastate orache	Helms, Woody Lake NR	FAR	Monitor
Cucumis myriocarpus	Prickly paddy melon	Helms	L (C)	Control/monitor
Echium plantagineum^	Paterson's curse	Lake Shaster NR[2]	Not on list	Eradicate
Morus alba	English mulberry	Moir Homestead[2]	L (B,C,D)	Monitor

* Also a Weed of National Significance as identified in Australian Weeds Committee (2012) Weeds of National Significance 2012. Department of Agriculture, Fisheries and Forestry, Canberra, ACT.

^ Also declared weed species listed under the *Biosecurity and Agriculture Management Act 2007*.

+ Records from NatureMap (September 2014 data) as well as from [1]WA herbarium, [2]district records and observations, [3]CALM (1986c), [4]TEC/PEC flora lists and [5]Lohr and Keighery (2014).

Additional weeds adjacent to the planning area^(41)

Species	Common name	Reserve	Regional assessment	Local management
High (2)				
Hyparrhenia hirta	Tambookie grass	Near Munglinup River, Helms, R14112, Shark Lake NR	M (D,E,F)	Control/monitor
Romulea rosea	Guildford grass	Near Mullet Lake NR	L (B,C)	Negligible
Moderate (5)				
Lythrum hyssopifolia	Lesser loosestrife	Near Truslove Townsite NR	L (B,C)	Control/monitor
Oenothera drummondii	Beach evening primrose	Near Lake Warden NR, Woody Lake NR	L (B,C,D)	Control/monitor
Orobanche minor	Lesser broomrape	Near Woody Lake NR	L (B,C)	Control/monitor
Paspalum dilatatum	Dallisbrass	Near R28170 (west)	L (C)	Further assessment required
Sisymbrium orientale	Indian hedge mustard	Near R14112, Woody Lake NR	N (B)	Control/monitor
Stenotaphrum secundatum	Buffalo grass	Near Nuytsland NR	L (B,C)	Negligible
Mild (3)				
Asphodelus fistulosus	Wild onion	Near Woody Lake NR	N (B)	Negligible
Medicago minima	Small burr medic	Near UCL south of Alexander NR, Nuytsland NR	FAR	Control/monitor
Raphanus raphanistrum	Wild radish	Near Lort River	N (B)	Negligible
Low (22)				
Acaena echinata	Sheeps burr	Near Lort River corridor R31761	N (A,B)	Further assessment required
Agave americana	Century plant	Near Truslove North NR, Nuytsland NR	Deleted	Negligible
Amaranthus albus	Tumbleweed	Near Pink Lake, Shark Lake NR	Deleted	Further assessment required
Amaranthus retroflexus	Redroot amaranthus	Near Shark Lake NR	N (B)	Further assessment required
Avena sativa	Common oat	Near Munglinup NR	N (B)	Further assessment required
Bromus catharticus	Prairie grass	Near Woody Lake NR, Mullet Lake NR	Not on list	Control/monitor
Centaurea calcitrapa	Star thistle	Near Dalyup NR	L (B,C)	Control/monitor
Crassula alata	-	Near Woody Lake NR	L (B,C,D)	Control/monitor
Cyperus laevigatus	-	Near Pink Lake	L (B,C,D)	Control/monitor
Dactylis glomerata	Cocksfoot	Near R28170(west)	FAR	Control/monitor

Species	Common name	Reserve	Regional assessment	Local management
Diplotaxis tenuifolia	Sand rocket	Near Helms, Pink Lake, R22422	L (B,C,D)	Further assessment required
Dipogon lignosus	Dolichos pea	Near Nuytsland NR	L(D)	Control/monitor
Eragrostis cilianensis	Stinkgrass	Near Dalyup NR	ALERT	Control/monitor
Erodium moschatum	Musky crowfoot	Near UCL Lot 105	L (C)	Negligible
Heliotropium europaeum^	Common heliotrope	Near NR33113	M (D,E,F,G)	Further assessment required
Lepidium africanum	Rubble peppercress	Near R28170(west)	Deleted	Control/monitor
Monopsis debilis	-	Near Cape Le Grand NP	N (A,B)	Control/monitor
Papaver hybridum	Rough poppy	Near R14112	L (B,C,D)	Negligible
Pinus pinea	-	Near UCL adj Cape Arid NP	Deleted	Negligible
Phragmites australis	Common reed	Near R4181	Deleted	Further assessment required
Plantago coronopus	Buckshorn plantain	Near UCL Esp Loc 1992	L (B,C,D)	Control/monitor
Polygonum aviculare	Wireweed	Near Dalyup NR	N (B)	Further assessment required
Rapistrum rugosum	Turnip weed	Near Lake Warden NR, Woody Lake NR	N (A,B)	Further assessment required
Sisymbrium officinale	Hedge mustard	Near R14112, Woody Lake NR	Deleted	Further assessment required
Sparaxis pillansii	Harlequin flower	Near Shark Lake NR	Deleted	Control/monitor
Trifolium fragiferum	Strawberry clover	Near Woody Lake NR	N (B)	Negligible
TBA (2)				
Camelina sativa	False flax	Near Dalyup NR	Deleted	Further assessment required
Opuntia stricta	Common prickly pear	Near NR8102	L (B,C,D)	Control/monitor
Not listed (2)				
Amaranthus muricatus	-	Near Shark Lake NR	Not on list	Control/monitor
Melaleuca armillaris subsp. *armillaris*	Bracelet honey myrtle	Near Cape Le Grand NP	ALERT	Further assessment required

^ Within a 2km radius of the planning area. It is possible that these species may already occur within the planning area but have not been recorded as yet.

All records from NatureMap (Sept 2014 data).

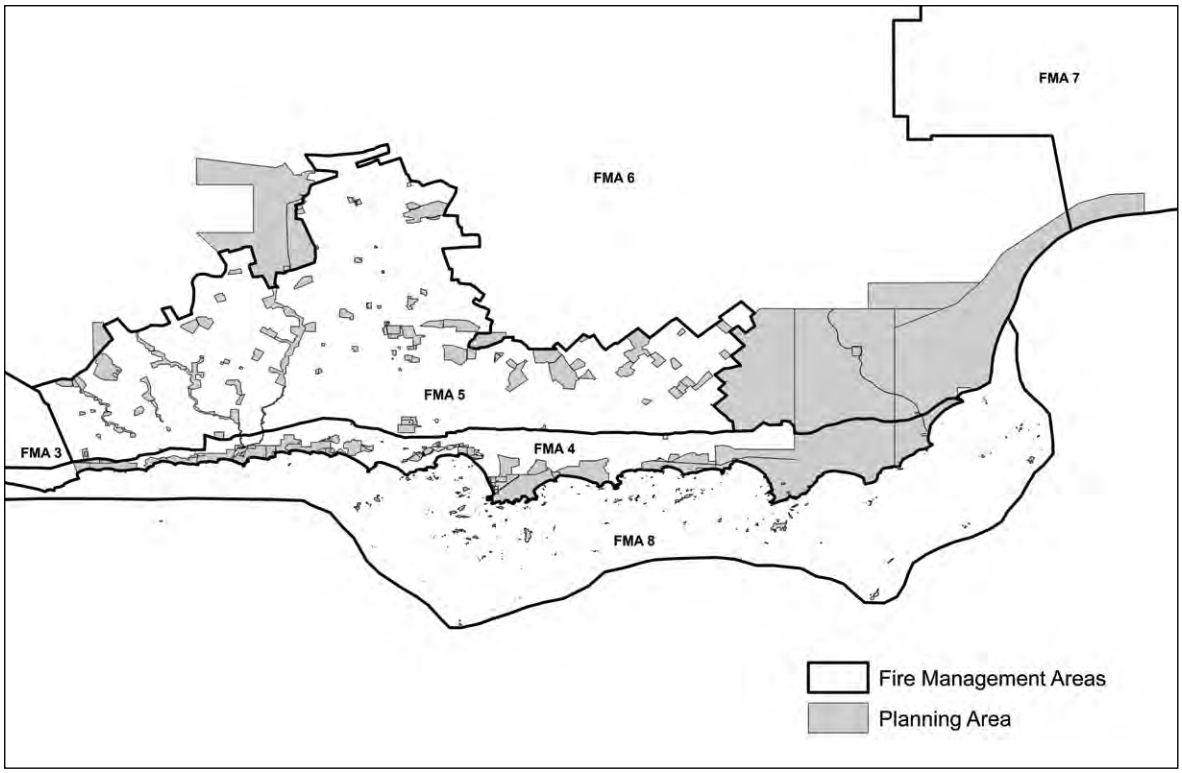
APPENDIX 11. Summary of fire management by fire management area and vegetation type

Vegetation type and indicator species	Fire management outcome	Prescribed fire regime	Bushfire response
Fire Management Area 4 – 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 to 2 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 Area 5 – 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 to 2 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 to 2 juvenile periods of key indicator species (excluding low fuel buffers)	Minimise bushfire size, appropriate to capability, resource availability, current commitments and adjoining property and assets Attempt to exclude bushfire where possible
Fire Management Area 6 – Woodland/Mallee (part in planning 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 and Nuytsland Nature Reserve)	Protect from bushfire	No planned fire	Minimise bushfire size, appropriate to potential impacts, capability and current commitments
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

Vegetation type and indicator species	Fire management outcome	Prescribed fire regime	Bushfire response
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
Fire Management Area 7 – Pastoral Nullarbor (part in planning area)			
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 (Nuytsland Nature Reserve)	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 to 2 juvenile periods of key indicator species	Minimise bushfire size, appropriate to potential impacts, capability and current commitments
Fire Management Area 8 – 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 self extinguish

Source: DEC (2007c) modified to reflect new FMA boundaries (DPaW in prep.)

Fire Management Areas in the planning area



Source: (DPaW in prep.)

APPENDIX 12. Visitor management settings criteria

Visitor management settings in the planning area

	Visitor management setting class				
	Wilderness*	**Natural**	**Natural -recreation**	**Recreation**	**Highly modified**
Principal purposes	Conservation, low level recreation	Conservation, low level recreation	Conservation, low to medium level recreation	Conservation, medium level recreation, education and interpretation	High level recreation, education and interpretation, conservation, multiple-use
Description	Natural areas with minimal evidence of modern human activity. Large, remote areas (8,000ha in temperate areas)	Natural areas with minimal evidence of modern human activity. No size criteria	Predominantly natural areas, with some disturbance and modern human activity apparent at specific sites	Mostly natural areas, but with disturbance and modern human activity apparent at some sites	Concentrated areas of modified environment but with natural or rural background. Human activity conspicuous
Access Access standards and type of transport used for visitors, resource users and protected area managers	Vehicles: mechanised access in emergency situations or essential management operations only Walking: via natural routes formed principally by human use (AS Walking Track class 6 only) Boat: non-motorised only Horse: no horses allowed Aircraft: no airstrips allowed and landing of non-fixed wing aircraft is allowed for emergency and essential research purposes only. Fixed wing aircraft must fly above 2,000 feet and non-fixed wing above 1,500 feet	Vehicles: mechanised access in emergency situations or essential management operations only Walking: via natural routes formed to a minimum standard (AS Walking Track class 4 to 5) Boat: non-motorised only Horse: no horses allowed Aircraft: no airstrips allowed and landing of non-fixed and fixed wing aircraft allowed for emergency and essential research purposes only	Vehicles: mechanical access on 4WD tracks. Cycle type 4 trails Walking: formed walk trails (AS Walking Track class 2 to 5) Boat: non-motorised, and limited motor boat only in designated areas Horse: commercial horseriding access in designated areas (n/a in planning area) Aircraft: natural earth airstrip allowed	Vehicles: mechanical access on 2WD unsealed tracks. Cycle type 2 and 3 trails Walking: well-built walking trails with direction signs (AS Walking Track class 2 to 4) Boat: non-motorised, and motor boats only in designated areas Horse: designated bridal trails possible (n/a in planning area) Aircraft: unsealed airstrip allowed	Vehicles: mechanical access on 2WD sealed tracks. Cycle type 1 trail Walking: Well-built, signposted walking trails (AS Walking Track class 1 and 2) Boat: non-motorised, and motor boats only in designated areas Horse: designated bridal trails possible (n/a in planning area) Aircraft: sealed airstrip allowed
Site modification Extent, type and design of infrastructure, facilities, amenities and the style of accommodation provided	No site modification and no facilities or structures except for reasons of visitor safety, resource protection and/ or management operations. Camping sites are not defined (wild camping)	No site modification and no facilities or structures except for reasons of visitor safety, resource protection and/or management operations. Trail markers may be used. Camping sites are not defined (wild camping). Day use sites not defined	Minor modification of specific sites. Basic facilities such as toilets may be provided in specific locations. 'Low' recreation sites and beach camping may be provided	Modification of specific sites. Low-key facilities such as simple car parks, toilets, shelters and picnic areas may be present. 'Medium' or 'Low' recreation sites or beach camping may be provided	Modified site, with often a range of facilities. Accommodation facilities, picnic areas, visitor centres and lookouts may be present. 'High' and 'Medium' recreation sites may be provided
Commercial uses	Commercial recreation and tourism operations not allowed	Commercial tourism licences allowed, but may consider regulating numbers (e.g. E Class Licence) Leases not allowed	Commercial tourism licences allowed with a focus on nature-based/cultural activities Leases allowed	Commercial tourism licences allowed with a focus on nature-based/cultural and adventure activities Leases allowed	Commercial tourism licences allowed with a focus on nature-based/cultural and adventure activities Leases allowed

	Visitor management setting class				
	Wilderness*	**Natural**	**Natural -recreation**	**Recreation**	**Highly modified**
Probable social interaction Density of users and degree of social interaction and opportunities for solitude	Interaction between users is minimal, with usually less than two other groups encountered during a day, and no other groups within sight or sound at camp sites. Maximum group size of about six to eight people	Little interaction between users, with usually less than about four to six other groups encountered during a day, and usually no more than about two other groups within sight or sound at camp sites. Group size approximately 8-12 people	Moderate interaction between users, with encounters with several other groups likely along access routes and at camp sites. Group size approximately 12-15 people	High level of contact and interaction with other users on roads and in camping and picnic areas, moderate interaction on walking tracks. Groups of more than 15 people may be expected, depending on location	High level of contact and frequent interaction with many other groups. Groups may exceed 20 people
Probable recreation experiences	Opportunities for isolation, independence, closeness to nature, tranquillity and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge	Opportunities for isolation, independence, closeness to nature, tranquillity and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge	Opportunities for closeness to nature, tranquillity and self-reliance through the application of outdoor skills in an environment that offers a moderate degree of challenge	Opportunities include closeness to nature and nature appreciation. Moderate levels of social contact and some opportunity to experience tranquillity	Opportunities for nature appreciation, and for social interaction. Facilities often support presentation of nature or access to nature-based opportunities in nearby areas
Degree of self-reliance Level of support services provided	Visitors must be totally self-reliant as support services are inappropriate and are not provided. Commercial tourism and recreation operators not allowed	Visitors must be totally self-reliant, as support services are inappropriate and are minimal or non-existent	Visitors must be largely self-reliant as basic support services are provided in specific locations only	Self-reliance requirements are generally low where facilities are provided, but outdoor skills will be important in areas away from roads and tracks	Low level of self-reliance due to high level of support services and facilities present
Style of visitor management Level of on-site management, site constraints and regulations	On-site visitor management is very low with controls primarily off site. All interpretation is off-site. No trail information in brochures. Boundary signage only. Very infrequent ranger presence	On-site regimentation is low with controls primarily off site. Generally boundary signs only. Infrequent ranger presence	Low on-site regimentation. Walking trails and camp sites may be defined. Most interpretation is off-site. Along trails and at trail camping sites there may be basic markers and signage with minimal management messages. Infrequent ranger presence	Moderate on-site regimentation, including some signs and barriers. Facilities may be common and clustered. Track signs may include interpretation. Brochures and track guides often available. May be frequent ranger presence	A high degree of on-site visitor management, including the use of physical barriers to constrain movement of pedestrians and vehicles/boats. Well-developed structures. There may be considerable interpretive signage, materials or activities. Frequent ranger presence likely

* Refer to *Policy No. 62 Identification and Management of Wilderness and Surrounding Areas* (CALM 2004b)

APPENDIX 13. Camping area and day use definitions

Recreation site hierarchy

	Recreation site categories			Other areas	
	High	Medium	Low	No facilities, vehicles[3]	No facilities, no vehicles[4]
General facilities					
Vehicle access to area	Yes – 2WD	Yes	Optional	Optional	No
Long vehicle turning & parking[1]	Yes	Optional	No	No	No
Water provided	Optional	Optional	Optional	No	No
Toilets	Yes	Preferred	Optional	No	No
Cooking – Gas/Electric BBQs	Preferred	Acceptable	Optional	No	No
Cooking – Wood BBQs/Fire rings	No[5]	No[5]	Mt Ragged only	No	No
Tables	Yes	Yes	Optional	No	No
Shelters	Preferred	Optional	No	No	No
Rubbish collection	Acceptable	Optional	No	No	No
Visitor information	Yes	Optional	Optional	No	No
Overnight stays specific					
Camping sites defined	Yes	Yes	Optional	No	No
Resident manager	Optional	Optional	No	No	No
Campground host (peak)	Optional	Optional	No	No	No
Powered sites	Optional	No	No	No	No
Showers	Optional	Optional	No	No	No
Cooking – fuel stoves only	Optional	Optional	Optional	Preferred	Yes
Fires allowed in container (where/when ground fires permitted)	No	No	No	No[5]	No
Camping area numbers[2]	20+ sites 100+ people	6 – 20 sites 21 – 100 people	1 – 5 sites 1 – 20 people	Preferred <4 vehicles, 20 people	One group of <10 people
Accommodation • Basic shelter (eg 3-sided) • Semi-permanent structure (eg safari tent) • Other (e.g. permanent structures)	Optional Optional Yes	Optional Optional No	No No No	No No No	No No No
Day use specific					
Car parking	Yes – 2WD	Yes	Optional	NA	NA
Kiosk/shop	Optional	Optional	No	NA	NA
Visitor centre	Optional	No	No	NA	NA
Site numbers	Up to 200 vehicles or 800 people	Up to 30 vehicles or 120 people	Up to 20 vehicles or 80 people		

1 – Long vehicles include coaches, buses, caravans, campervans and motor homes
2 – To preserve the visitor management setting, the maximum number of people ideally should not be exceeded; as a site reaches the threshold limits, a review should be conducted to confirm future intent of site.
3 – Could include beach or bush camping.
4 – Often referred to as 'wild' or remote camping
5 – Not allowed in this planning area

Legend

Yes = facility or service should be provided.
Preferred = facility should be provided; this option is preferred but not only valid option; local conditions will determine the best option.
Optional = facility or service may be provided, but is not essential.
Acceptable = facility may be provided but there may be a better option; local conditions will determine best option.
No = facility or service will not be provided.

Recreation site definitions and classification guidelines

High (major) recreation site

High recreation sites are primary recreation nodes catering for a broad range of visitors with facilities and interpretation hubs. Most visitors entering the park/reserve will be directed to these sites, considered to be the main attractions within the park/reserve. High recreation sites are provided in the 'highly modified' visitor management setting only.

Recreation experience	Generally the recreation experience has opportunities for nature appreciation, a chance to discover a specific feature or experience, and chances for solitude and social interaction in a natural environment with a higher level of access to facilities.
Modifications and development	The site is developed and has parking areas and facilities.
	The local landscape and features are evident although changes have occurred to the vegetation or landform, such as clearings, formed tracks, buildings and other structures. Some levelling of the site may have been undertaken to create developed areas.
Visitation and interaction	The site has a high level of visitation from the local population and visitors to the area.
	Choice in the level of social interaction between staying to oneself or one's group, however contact with other people will likely be unavoidable.
Services	Degree of self-reliance within a day use setting is low. Needs such as, shelter and toilets are catered for, providing for a high level of comfort and safety to visitors.
Management presence	A high degree of management presence at the site by authority or representative such as ranger patrols.
Interpretation	Moderate to high levels of the natural, cultural and historical interpretation including interpretation displays, brochures, interpretation tracks, guided activity program or access to information through ranger or expert contact.
Recreation experience	Generally the recreation experience has opportunities for active activity, solitude, independence, closeness to nature, tranquillity in a natural environment, but has access to basic facilities where possible.
Modifications and development	Site is modified with car parking areas and site access, additional facilities may be provided based on visitation.
	The local landscape and features are dominant although there have been some changes to the vegetation or land form, such as clearings and formed tracks.
Visitation and interaction	The site has a moderate level of seasonal visitation from the local population and visitors to the area.
	Choice in the level of social interaction between staying to oneself or groups however contact with other visitors is to be expected.
Services	Moderate degree of self-reliance for essential needs. Some facilities including shelter provided possibility of providing toilet facilities.

Management presence	Some degree of management presence such as ranger patrols at the site depending on site conditions.
Interpretation	Moderate levels of natural, cultural and historical interpretation, which may include interpretation displays and interpretation tracks.

Medium recreation site

Medium recreation sites provide for moderate to low intensity recreation set in mostly natural landscapes. These sites are considered to be secondary sites and offer unique experiences within the park/reserve. They may be provided in either the 'highly modified' or 'recreation' visitor management settings, with the possible level of development varying according to the setting.

Recreation experience	Generally the recreation experience has opportunities for active activity, solitude, independence, closeness to nature, tranquillity in a natural environment, but has access to basic facilities where possible.
Modifications and development	Site is modified with car parking areas and site access, additional facilities may be provided based on visitation.
	The local landscape and features are dominant although there have been some changes to the vegetation or land form, such as clearings and formed tracks.
Visitation and interaction	The site has a moderate level of seasonal visitation from the local population and visitors to the area.
	Choice in the level of social interaction between staying to oneself or groups however contact with other visitors is to be expected.
Services	Moderate degree of self-reliance for essential needs. Some facilities including shelter provided possibility of providing toilet facilities.
Management presence	Some degree of management presence such as ranger patrols at the site depending on site conditions.
Interpretation	Moderate levels of natural, cultural and historical interpretation, which may include interpretation displays, interpretation tracks.

Low (minor) recreation site

Low recreation sites have minimal development and facilities catering specifically for a purpose. They may generally be provided in the 'recreation' and 'natural-recreation' visitor management settings.

Recreation experience	Generally the recreation experience has opportunities for solitude, independence, closeness to nature and tranquillity in a natural environment.
Modifications and development	Some site modification to provide car parking areas and access. Site is dominated by the local landscape and features without major changes to the landform or features.
	Little facilities apart from essential site infrastructure such as car parking, signage and trails.
Visitation and interaction	Experiences a low to moderate level of visitation, visitors are predominantly local. Some likelihood of interaction between users, although the emphasis would be on socialising with own group.
Services	High degree of self-reliance for essential needs such as the provision of shelter and toilet facilities.
Management presence	Some degree of management presence such as ranger patrols at the site depending on site conditions.
Interpretation	No to low levels of natural, cultural and historical interpretation apart from essential information for identification of sites and visitor risk issues. Specific interest site signage for niche user groups may be present.

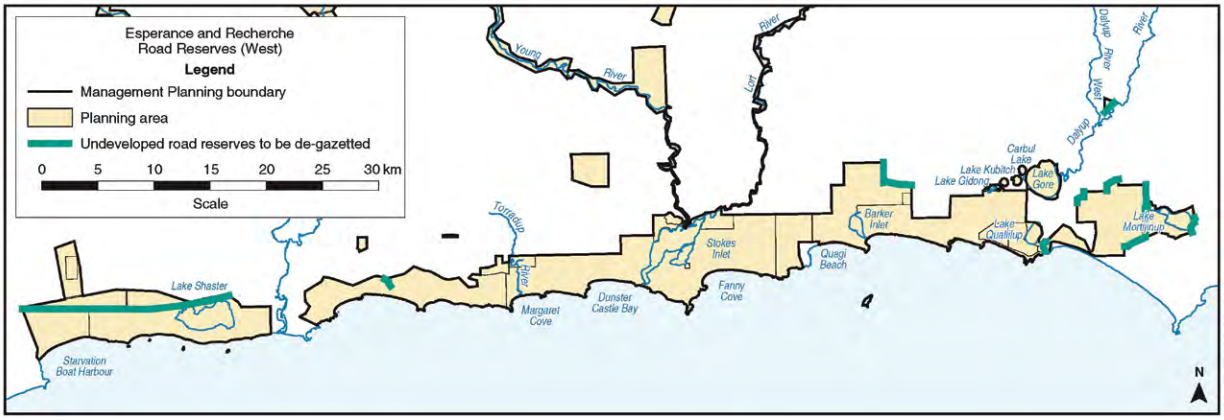
No facilities, vehicles camping (beach camping)

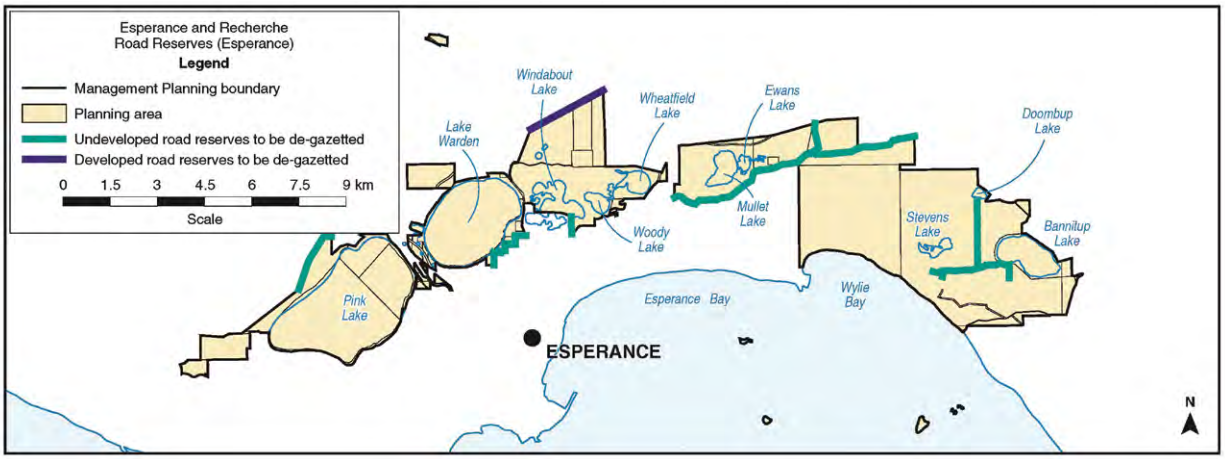
These areas are by four-wheel drive vehicles and/or by foot and no facilities are provided. These areas include either beach camping (or bush camping in remote bush areas). Camping may occur at any time in this area provided it is safe to do so. Generally camping will only be allowed as an overnight stay. Campfires will not be allowed (plan specific condition). Camping groups will be limited to four vehicles. For beach camping, camping will not be allowed in the primary dune area or within 2km of a formal camping area. Camping may be provided in the visitor management settings where vehicles are allowed.

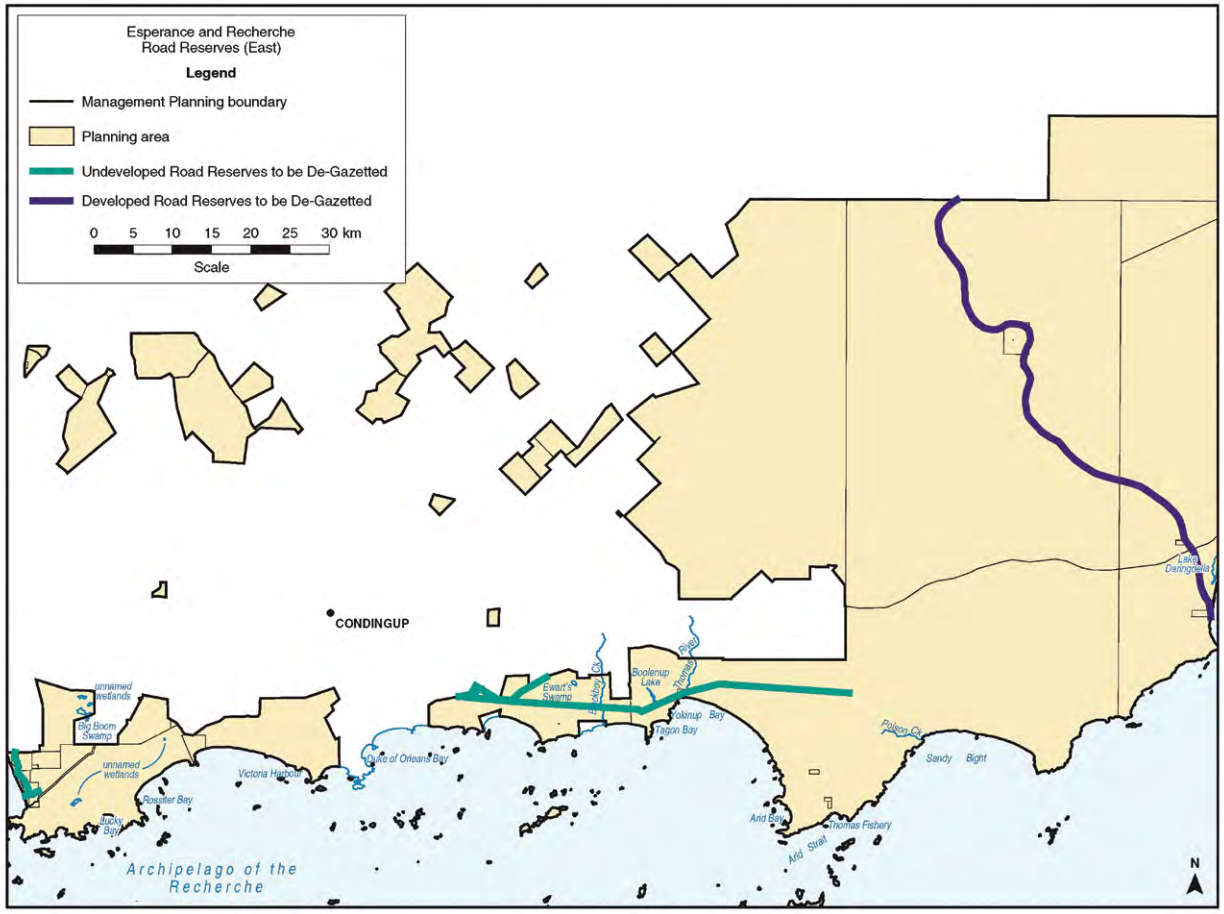
No facilities, no vehicles camping ('wild' camping)

These areas are accessed by foot. They are referred to as 'wild' or 'remote' camping. No sites will be defined and minimum impact camping techniques will be practiced at all times. Camping group sizes generally will be limited to 10 people. Campfires will not be allowed. Camping will generally occur in the more natural visitor management settings.

APPENDIX 14. Road reserves to be cancelled (preliminary)







APPENDIX 15. Commercial beekeeping site assessment

Criteria and approach for assessing commercial beekeeping sites within the planning area

	Suitable	Suitable but Conditional	Highly Constrained
Approach			
	Maintain or increase numbers of apiary sites in these areas. Standard permit conditions would apply	Maintain or increase numbers of apiary sites in these areas. Additional permit conditions would apply such as increased hygiene control and seasonal, site location and access restrictions. Research and monitoring at these sites may be required	Close, and relocate where possible, any current apiary sites in these areas. Prevent any new apiary sites in these areas
Environmental criteria			
1. Threatened and other conservation significant flora within a 2km radius[1]	No rare, Priority 1 or 2 flora present that are visited by honey bees	Rare, Priority 1 or 2 flora present that are visited by honey bees and impacts are seasonal or undetermined[2]	Rare, Priority 1 or 2 flora present that are visited by honey bees and impact is predicted to be year-round[2]
	No Priority 3 or 4, endemic, disjunct or relictual flora present that are visited by honey bees	Rare, Priority 1 or 2 flora present that are visited by honey bees but no predicted impact[3] Priority 3 or 4, endemic, disjunct or relictual flora that are visited by honey bees present[4]	-
2. Significant communities within a 2km radius	No threatened ecological communities (TECs) or priority ecological communities (PECs)	TEC or Priority 1 or 2 PEC present and impacts are seasona[l2] TEC or Priority 1 or 2 PEC present but no predicted impact[3] Priority 3 or 4 PEC present and flora is visited by honey bees[4]	A TEC or Priority 1 or 2 PEC present and impact is predicted to be year-round[2]
3. Threatened fauna and other significant habitats (i.e. habitats for fauna adversely impacted by honey bees) within a 2km radius	No old growth forest or other known habitat of hollow nesting threatened fauna present	Old growth forest or other known habitat of hollow nesting threatened fauna is present[5]	
	No threatened, Priority 1 or 2 pollen or nectar feeding birds or mammals present	Threatened, Priority 1 or 2 pollen or nectar feeding birds or mammals present that are seasonally impacted[2]	Threatened, Priority 1 or 2 pollen or nectar feeding birds or mammals present and impact is predicted to be year-round[2]
	No fauna watering points at fauna breeding centres and re-introduction sites present	-	Fauna watering point at fauna breeding centres and re-introduction sites present[6]
	No other significant habitats or communities present	Other significant habitats or communities are present that are seasonally impacted[7]	Other significant habitats or communities are present that are impacted year-round
Management criteria			
1. Previous use	A conservation reserve that has authorised historic use of commercial beekeeping	-	A conservation reserve that has no authorised historic use of commercial beekeeping

	Suitable	Suitable but Conditional	Highly Constrained
2. Access	Public or suitable management vehicle only access is available	-	There is no public or suitable management vehicle only access or current access is being closed
	No gazetted wilderness present	'Candidate' wilderness only	Gazetted wilderness or wilderness proposed to be gazetted present
3. Recreation sites or dwellings within a 500m radius	No built accommodation/ camping/day use site present	-	Built accommodation/ camping/day use site present
4. Tracks and trails within a 200m radius	No walk trail present (Class 1 or 2)	Walk trail (Class 1 or 2) present but only used infrequently, or proposed walk trail (Class 1 or 2)	Walk trail (Class 1 or 2) present and used frequently
5. Disease control[8]	Low risk of *P. cinnamomi* spread	*P. cinnamomi* present or area identified as protectable from *P. cinnamomi* spread but there is an existing site Disease present or vegetation identified as being susceptible to disease and there is a risk of spread from existing apiary activities	Area identified as protectable from *P. cinnamomi* spread and there are no existing sites Disease present, or vegetation identified as susceptible to disease and there are no existing sites
6. Apiary sites within 3km radius	No other apiary sites present		Apiary site present
7. Feral honey bee management within 2km	-	Feral honey bee control program in place[9]	
8. Weed management within a 2km radius	No high or moderate weeds present that are considered to have an increased seedset due to honey bees	High or moderate rated weeds that are considered to have an increased seed set due to honey bees but flower seasonally[10]	High or moderate rated weeds that are considered to have an increased seed set due to honey bees and flower year-round
9. Other management concerns	No impact on departmental operations or the requirements of other authorities controlling Crown land or Government reserves	An impact on departmental operations or the requirements of other authorities controlling Crown land or Government reserves that can be managed	An impact on departmental operations or the requirements of other authorities controlling Crown land or Government reserves that can not be managed

Notes

[1] This process has been based on where there is spatial data for threatened and other conservation significant flora. A list is available for the threatened and other conservation significant flora within the planning area (and buffer), which has been assessed as being impacted by honey bees. This apiary assessment should be adaptive through the life of the plan and the best data incorporated, for example if during an application for a new site or during a review of an existing site, any new locations of these identified species are found, then this data should be incorporated and the assessment should be rerun for the site.

[2] Impacts are seasonal or undetermined (see Guidance for Additional Conditions – A). Where impacts are predicted to be year-round, the area will be considered to be highly constrained.

[3] Visited by honey bees, but no predicted impact. These flora and communities are still of high conservation significance and a precautionary approach is warranted (see Guidance for Additional Conditions – B).

[4] As with note 3 above, priority 3 or 4, endemic, disjunct and relictual flora are of conservation significance and a precautionary approach is warranted. In addition, although populations of these species may be widespread and impacts on these populations may not threaten the existence of the species, there still may be some populations that should be afforded higher protection (e.g. the population may be (1) at the species' range end, (2) the largest viable population or (3) genetically significant) (see Guidance for Additional Conditions – C).

[5] If there is a current apiary site and there are feral honey bees present, then use can continue year-round. However, old growth forest and other significant habitats for hollow nesting fauna will be targeted for feral honey bee control (see Guidance for Additional Conditions – D). For new sites within old growth forest see Guidance for Additional Conditions – E.

[6] Native fauna breeding centres and fauna re-introduction sites often have watering points. Commercial beekeeping in the vicinity may disturb the animals from drinking.

[7] No other significant habitat or community likely to be impacted by honey bees has been identified during the planning process however, they may be identified during the life of this management plan. Other significant habitats may be identified due to either:

- new research/information
- changes in threat status of fauna
- changes in resource availability – for example, directly after a fire, when competition between species such as honey possums and honey bees would be at its highest.

[8] Standard disease control conditions will apply. The soil dryness index may be used to restrict vehicle access to the sites. There should be no new sites established in areas that are either:

- protectable from *P. cinnamomi*
- designated Disease Risk Areas
- in vegetation associations identified as susceptible to disease.

[9] There may need to be seasonal restrictions (see Guidance for Additional Conditions – D) when a feral honey bee control program is in place.

[10] High or moderate weeds are a high priority for the department to control (see Guidance for Additional Conditions – F).

Assessment of current beekeeping sites within the planning area

Beekeeping sites within the planning area were assessed against the environmental and management criteria# and categorised as suitable, suitable but conditional or highly constrained. The table below shows the result of the assessment and indicates criteria that require additional conditions. Some of these additional conditions have been included as guidance and should be seen as a minimum set.

Site no.	Current status^	Environmental criteria								Management criteria							Additional conditions
		Rare and Priority 1, 2 flora visited			Other conservation flora visited	TEC and Priority 1, 2 PEC			Priority 3, 4 PEC	Wilderness		Recreation sites	Class 1 or 2 walk trail	Disease risk	Weed management		
		Impact year round	Impact seasonal	No predicted impact		Impact year round	Impact seasonal	No predicted impact		Candidate	Gazetted				Impact seasonal	Impact year round	
Suitable (17, 6 current, 11 vacant)																	
1189	V																
1587	V																
1588	V																
5932	C																
5936	V																
5961	C																
5962	C																
6061	V																
6062	V																
6063	V																
6064	V																
6088	V																
6090	V																
6091	V																
6282	C																
6283	C																
6350	C																
Suitable but conditional (13, 10 current, 3 vacant)																	
1018	C				X												C
1019	C				X												C
1020	C				X												C
1021	C		X(Nov-Dec)		X												A(Nov-Dec), C
1022	C				X												C
1629	C			X(*Aotus prosacris*, *Cyathostemon* sp. Jyndabinbin Rocks)													B, C
5434	V				X												C
5935	V				X												C

Site no.	Current status^	Environmental criteria								Management criteria							Additional conditions
		Rare and Priority 1, 2 flora visited			Other conservation flora visited	TEC and Priority 1, 2 PEC			Priority 3, 4 PEC	Wilderness		Recreation sites	Class 1 or 2 walk trail	Disease risk	Weed management		
		Impact year round	Impact seasonal	No predicted impact		Impact year round	Impact seasonal	No predicted impact		Candidate	Gazetted				Impact seasonal	Impact year round	
5960	C		X(May, Sep-Dec)		X												A(May, Sep-Dec), C
5977	C		X(Aug-Sep)	X(*Aotus* sp. Dundas, *Drosera salina*)	X												A(Aug-Sep), B, C
5978	C		X(Aug-Sep)	X(*Drosera salina*, *Cyathostemon* sp. Esperance)	X												A(Aug-Sep), B, C
5983	C				X												C
6087	V		X(May)		X												A(May), C
Highly constrained (44, 27 current, 17 vacant)																	
3994	C					X											
3996	V					X											
3997	C				X	X											
4647	C				X	X								X			
4741	C					X											
4742	C				X	X											
4850	V		X(May-Jun)		X	X										X	
5155	V			X(Astartea eobalta)		X											
5176	C		X(Sep-Nov)		X	X											
5283	V					X											
5419	C	X(*Eremophila glabra* subsp. Scaddan)	X(Aug-Nov)		X	X											
5453	V		X(Sep-Oct)		X	X										X	
5501	C		X(Aug-Nov)		X	X										X	
5502	C				X	X											
5523	V					X											
5524	V					X											
5556	V		X(Oct-Jun)		X	X										X	
5560	V					X											
5566	V		X(Nov)			X											
5567	V				X	X											
5579	V				X	X								X			
5590	V					X											
5591	V					X											
5602	C					X											
5603	C					X											

Site no.	Current status^	Environmental criteria								Management criteria							Additional conditions
		Rare and Priority 1, 2 flora visited			Other conservation flora visited	TEC and Priority 1, 2 PEC			Priority 3, 4 PEC	Wilderness		Recreation sites	Class 1 or 2 walk trail	Disease risk	Weed management		
		Impact year round	Impact seasonal	No predicted impact		Impact year round	Impact seasonal	No predicted impact		Candidate	Gazetted				Impact seasonal	Impact year round	
5605	C			X(*Anigozanthos bicolor* subsp. *minor*)		X								X		X	
5606	C					X											
5607	C					X										X	
5608	C					X											
5609	C				X	X											
5610	C					X											
5611	C					X											
5612	C					X											
5613	C				X	X											
5614	C				X	X											
5753	C					X											
5947	C	X(*Eucalyptus dielsii* x *platypus*)	X(Sep-Nov)		X	X											
5963	C				X											X	
6077	V															X	
6089	V	X(*Eutaxia andocada*)															
6092	V															X	
6332	C					X											
6334	C					X											
6335	C					X											
Sites within 2km of planning area* (21, 15 current, 6 vacant)																	
No conditions from this planning process (9, 7 current, 2 vacant)																	
1016	C																
1017	C																
1023	C																
1025	C																
5433	V																
5584	V																
5981	C																
5982	C																
6351	C					X+											+TEC is within 2km of planning area

Site no.	Current status^	Environmental criteria								Management criteria							Additional conditions
		Rare and Priority 1, 2 flora visited			Other conservation flora visited	TEC and Priority 1, 2 PEC			Priority 3, 4 PEC	Wilderness		Recreation sites	Class 1 or 2 walk trail	Disease risk	Weed management		
		Impact year round	Impact seasonal	No predicted impact		Impact year round	Impact seasonal	No predicted impact		Candidate	Gazetted				Impact seasonal	Impact year round	
Suitable but conditional (3, 2 current, 1 vacant)																	
4643	C				X												C
5615	V		X(Aug-Sep)														A(Aug-Sep)
5828	C		X(Oct)	X(*Aotus* sp. Dundas)	X												A(Oct), B, C
Highly constrained (9, 6 current, 3 vacant)																	
77	C				X	X											
78	C					X											
3995	V				X	X											
5452	V				X												
5465	C					X											
5933	V	X(*Dampiera orchardii*)			X	X											
5934	C				X	X											
5958	C	X(*Eutaxia andocada*)	X(Aug-Sep)														
5959	C	X(*Eutaxia andocada*)	X(May, Sep-Dec)		X	X+											+TEC is within 2km of planning area

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.
^C Current, V Vacant
*Sites within 2km of the planning area have been classified as 'no conditions from this planning process', 'suitable but constrained' or 'highly constrained'. Only values within the planning area, and 2km surrounding the planning area were used in the assessment so it cannot be fully determined if the sites are 'suitable'. 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 area in order to protect values of the planning area.

Guidance for additional conditions

A. 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.

B. These flora and communities are still of high conservation significance and a precautionary approach is warranted. Placement (at least 100m 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, weeds and other disturbances. If unacceptable impacts are shown or observed later, then treatment will be the same as A.

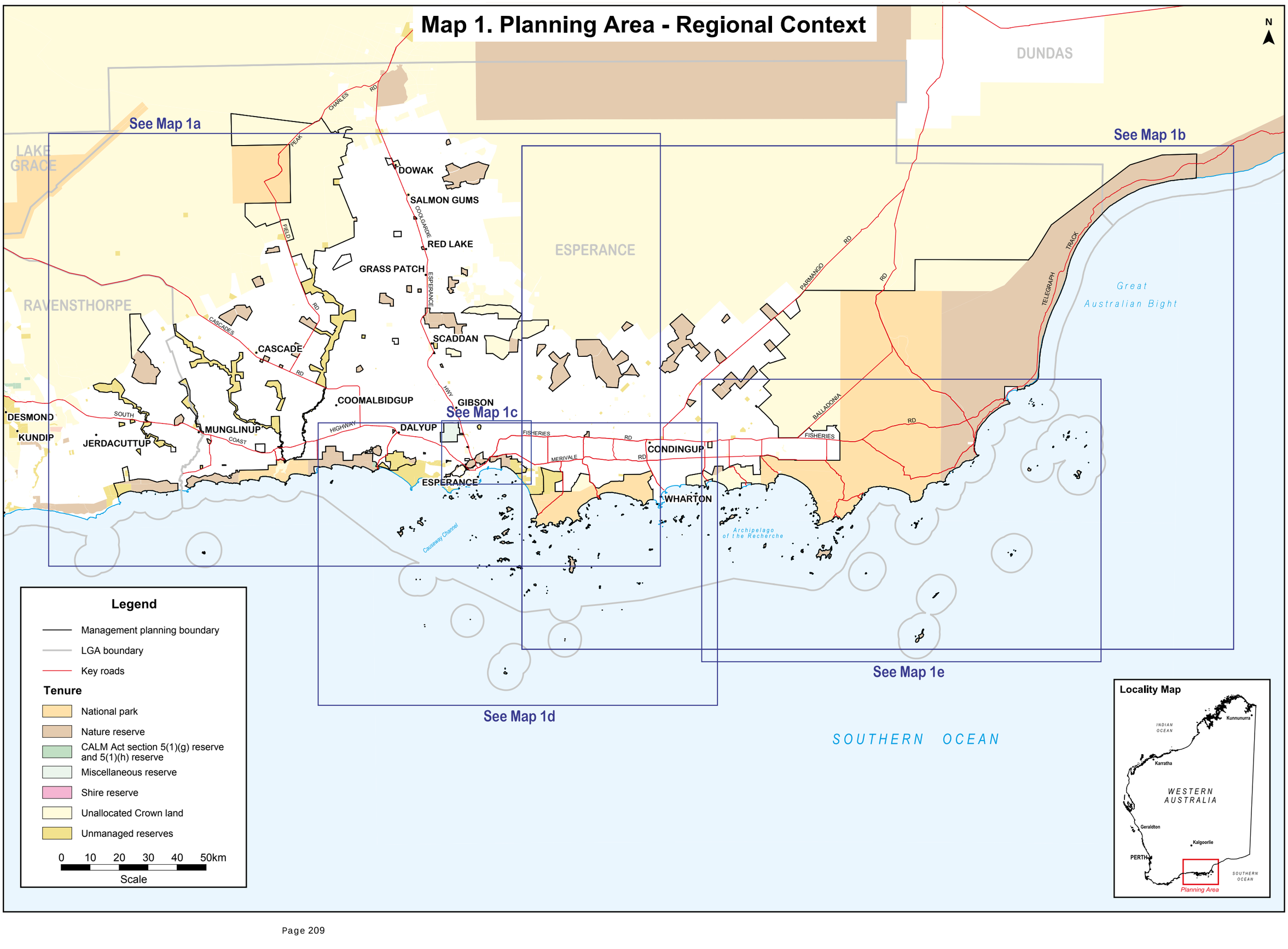
C. These flora and communities are still of high conservation significance and a precautionary approach is warranted. There may be a need to review populations within the planning area to determine whether these populations are significant to the conservation of the species (e.g. the population may be (1) at the species' range-end, (2) the largest viable population or (3) genetically significant). If deemed significant then treatment will be the same as A.

D. When a feral honey bee program is in place, then use of the site will be restricted during periods when the queen may swarm, such as spring or a suitable method to restrict the queen should be implemented.

E. For new sites in old growth forest where there are no feral honey bees present, a condition may be that if during the period of the permit, feral honey bee hives are located within 2km of the site, the site will be temporarily restricted until the feral honey bees are controlled.

F. Seasonal restriction based on flowering period of environmental weed however, only until the environmental weed has been successfully eradicated.

Map 1. Planning Area - Regional Context



Legend

- Management planning boundary
- LGA boundary
- Key roads

Tenure

- National park
- Nature reserve
- CALM Act section 5(1)(g) reserve and 5(1)(h) reserve
- Miscellaneous reserve
- Shire reserve
- Unallocated Crown land
- Unmanaged reserves

0 10 20 30 40 50km

Scale

Locality Map

Map 1a. Planning Area - West

Legend

- Management Planning boundary
- Key roads
- Hydrography

Tenure

- National park
- Nature reserve
- CALM Act section 5(1)(g) reserve and 5(1)(h) reserve
- Miscellaneous reserve
- Shire reserve
- Conservation estate outside of planning area
- Proposed additions*
- Proposed national park
- Proposed nature reserve
- Proposed conservation park
- Proposed CALM Act section 5(1)(h) reserve

0 5 10 15 20 25km

Scale

*Note: All proposed additions are either unvested Crown reserve, unallocated Crown land, freehold or shire reserve.

FRANK HANN NP R 27023
PEAK CHARLES NP R 36004
Peak Charles
PEAK CHARLES RD
Pansy Lake
Lake Shaape
Lake Tay
Three Star Lake
Lake Mends
Lake Dundas
R 33501
R 21360
UCL
DOWAK NR R 36608
COOLGARDIE
R 33113
SALMON GUMS
R 43221
R 8102
Lot 225
Lot 264
Red Lake
Style Rock
R 43949
ROBERTS SWAMP SHIRE RESERVE R 26912
R 2786
Roberts Swamp
RED LAKE TOWNSITE NR R 29680
RIDLEY NORTH NR R 28300
FIELD RD
Pyramid Lake
R 35659
GRASS PATCH
ESPERANCE
SWAN LAGOON NR R 8019
Swan Lagoon
Jeffrey Lagoon
Doust Swamp
RIDLEY SOUTH NR R 27768
Mt Ridley
R 31739
GRIFFITHS NR R 30583
JEFFREY LAGOON NR R 3042
TRUSLOVE NORTH NR R 16801
Esp Loc 2000
BISHOPS NR R 29012
UCL
Esp Loc 1999
Esp Loc 1996
R 26913
RD
CASCADES
R 31749
UCL
KENDALL ROAD NR R 28846
TRUSLOVE TOWNSITE NR R 27985
Truslove Lagoon
R 14112
Lot 532
Heart Echo Lake
R 2780
FIELDS NR 31742
R 31751
CHEADANUP NATURE RESERVE R 31754
R 31750
CASCADE
R 26915
Esp Loc 2009
UCL
SCADDAN
Bostock Swamp
Esp Loc 2010
R 31313
Esp Loc 1992
SPEDDINGUP EAST NR R 25958
MOUNT RIDLEY NR R 27386
BURDETT NR R 27385
MOUNT BURDETT NR R 27384
Witteenoom Hills
Mt Burdett
MOUNT NEY NR R 32782
Kau Rock
Mt Ney
KAU ROCK NR R 32776
KAU ROCK NR R 32780
R 31745
CASCADE NR R 31744
CASCADE NR R 31743
RD
SPEDDINGUP WEST NR R 36183
R 31764
R 31762
R 31761
Native Dog Swamp
Young River
Cascade Creek
Oldfield River
Munglinup River
Dalyup River
Dalyup River West
HWY
HELMS FORESTRY RESERVE R 23527
GIBSON
SHARK LAKE NR R 31197
R 14563
Benje Benjenup Lake
R 29713
R 29715
R 30869
EAST NAERNUP NR R 31755
R 31756
R 31757
R 29447
R 29446
MUNGLINUP NR R 26410
MUNGLINUP
R 31762
R 31761
DALYUP NR R 19628
Lot 2199 & road reserve
Lot 3001
Wheatfield Lake
Mullet Lake
Windabout Lake
MULLET LAKE NR R 23825
Ewans Lake
Stevens Lake
Doombup Lake
R 28170
COOLINUP NR R 27354
FISHERIES RD
TYRELL RD
JIMS OVEN RD
MERIVALE RD
CONDINGUP
Condingup Peak
ORLEANS BAY RD
R 29448
R 7352
R 31758
FUSS
SOUTH COAST HWY
R 31765
R 31763
BARKER INLET NR R 27888
FARRELLS RD
LAKE GORE NR R 32419
Carbul Lake
Lake Kubilch
Lake Gidong
Lake Gore
MURRAY RD
LAKE MORTIJINUP NR R 35557
R 24953
R 14209
PINK LAKE NR R 24511
Lake Mortijinup
Lake Quallilup
Lake Cubinup
Torradup River
STOKES INLET RD
SPRINGDALE NR R 28168
R 25376
SPRINGDALE RD
UCL
R 18030
Lake Shaster
R 7580
Swan Hill
Starvation Boat Harbour
UCL (proposed NR)
LAKE SHASTER NR R 32339
Margaret Cove
Dunster Castle Bay
Stokes Inlet
Fanny Cove
MOIR HOMESTEAD R 32601
STOKES NP R 32590
Quagi Beach
Barker Inlet
Red Is
LAKE QUALLILUP 5(1)(h) RESERVE R 50792
WARRENUP LAKES NR R 26885
R 30672
BUTTY HARBOUR RESERVE R 24486
Butty Head
R 4182
UCL
ESPERANCE
Canning Is
Observatory Is
Cull Is
WOODY ISLAND NR R 39435
Woody Is
WOODY LAKE NR R 15231
Lot 110
Woody Lake
Wylie Bay
Mt Hannell
unnamed wellands
Bannitup Lake
R 28170
CAPE LE GRAND NP R 44987
Mt Hawes
Esp Loc 2073
DUNN ROCK RD
Big Boom Swamp
UCL
Cheetup Hill
CAPE LE GRAND NP R 22795
Yungarup Hill
unnamed wellands
CAPE LE GRAND RD
Frenchman Peak
Mt Le Grand
Rossiter Bay
Lucky Bay
Mississippi Hill
Dunns Rocks
Victoria Harbour
Cheyne Pt
RECHERCHE ARCHIPELAGO NR R 22796
Archipelago of the Recherche
Cape Le Grand
Sandy Hook Is
Renmark Is
Mondrain Is
Boxer Is
Figure of Eight Is
FIGURE OF EIGHT ISLAND 5(1)(h) RESERVE R 48955
Causeway Channel
CULL ISLAND 5(1)(h) RESERVE R 42379
Investigator Is
INVESTIGATOR ISLAND NR R 36056
SOUTHERN OCEAN
N

Map 1b. Planning Area - East

CAPE ARID 5(1)(h) RESERVE R 44191

CLYDE HILL NR R 38545

BEAUMONT NR R 32783

R 38334

BEAUMONT NR R 32129

R 32131

NIBLICK NR R 38544

NEREDUP NR 32784

MUNTZ NR R 31799

BEAUMONT NR R 32130

BEAUMONT NR R 32128

BEBENORIN NR R 32800

MOUNT NEY NR R 32782

BURDETT NR R 27385

MOUNT BURDETT NR R 27384

KAU ROCK NR R 32776

KAU ROCK NR R 32780

BURDETT NORTH NR R 27387

BURDETT SOUTH NR R 27388

KAU ROCK NR R 32777

KAU ROCK NR R 32779

COOLINUP NR R 27354

CONDINGUP

R 27087

ALEXANDER NR R 27086

THOMAS RIVER R 518

CAPE LE GRAND NP R 44987

CAPE LE GRAND NP R 22795

R 28170

RECHERCHE ARCHIPELAGO NR R 22796

MT DEAN + MT ESMOND NR R 41934

NUYTSLAND NR R 27632

CAPE ARID NP R 24047

UCL

Lot 105

Nullarbor Karst

Scarp

TRACK

Bilbunya Dunes

To Point Culver 3km

Great Australian Bight

Archipelago of the Recherche

SOUTHERN OCEAN

Mt Ridley

Mt Heywood

Kau Rock

Mt Ney

Mt Burdett

Witteroom Hills

Mt Buraminya

Namerlonia Rock

Juranda Rockhole

Kangawane Rockhole

Pine Hill

Ponloon Rocks

Ark Point

Wylie

Junana Rock

Wolgrah Hill

Russell Range

Mt Esmond

Mt Dean

Brook Peak

Tower Peak

Mt Ragged

Scott Rock

Baelmayalina Gnamma Hole

Modyununna Gnamma Hole

Mt Simmons

Gora Hill

Mica Hill

The Pups

The Diamond Hill

Sheoaks Hill

Tooklejenna Rock

Israelite Hill

Point Lorenzen

Israelite Bay

Lake Danngdella

Point Dempster

6 Mile Is

Price Hill

Mt Baring

Hamish Hill

Mt Millard

Carnicup Hill

Point Malcolm

Spindle Is

Daw Is

Bellinger Is

Marlbemup Hill

Mt Pasley

Cape Pasley

Pasley Is

Sandy Bight

Poison Ck

Tagon Bay

Yokinup Bay

Tagon Pt

Pt Jedacorrudup

Mt Arid

Barrier Anchorage

Arid Bay

Cape Arid

Thomas Fishery

Slanley Is

Middle Is

Round Is

Salisbury Is

Cooper Is

North Twin Peak Is

South Twin Peak Is

Draper Is

Mondrain Is

Condingup Peak

Mungliginup Hill

Mungliginup Creek

Eagle Rock

Ewart's Swamp

Hawes Hill

Belinup Hill

Boolenup Lake

Alexander Hill

Alexander Bay

Membinup Beach

Yungaup Hill

Mt Belches

Duke of Orleans Bay

Little Wharton Beach

Hammer Head

Wharton Beach

Victoria Harbour

Cheyne Pt

Dunns Rocks

Rossiter Bay

Frenchman Peak

Mt Le Grand

Cape Le Grand

Lucky Bay

Mississippi Hill

Big Boom Swamp

Cheelup Hill

Mt Hawes

Dalley River

Thomas River

Bonnie Hill

Fowle Hill

Eclipse Hill

Florabel Hill

Niblick Hill

Clyde Hill

Bebenorin Hill

Boyatup Hill

Mt Barang

Mt Beaumont

Parmango Rd

Balladonia Rd

Gora Rd

Russell Range Rd

Point Malcolm Rd

Telegraph Track

Pasley Track

Poison Creek Rd

Fisheries Rd

Merivale Rd

Tyrell Rd

Jams Oven Rd

Dunn Rock Rd

Cape Le Grand Rd

Orleans Bay Rd

Alexander Rd

Exchange Rd

Tagon Rd

Baring Rd

Fisheries Rd

Legend

- Management Planning boundary
- Key roads
- Hydrography
- Karst
- Scarp

Tenure

- National park
- Nature reserve
- CALM Act section 5(1)(g) reserve and 5(1)(h) reserve
- Shire reserve
- Proposed additions*
- Proposed national park
- Proposed nature reserve
- Proposed 5(1)(h) reserve

0 5 10 15 20 25km

Scale

*Note: All proposed additions are either unvested Crown reserve, unallocated Crown land, freehold or shire reserve

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Map 1c. Planning Area - Esperance Lakes

Legend

- Management Planning boundary
- Key roads
- Hydrography
- Railway

Tenure

- Nature reserve
- Miscellaneous reserve
- Shire reserve
- Proposed additions*
- Proposed national park
- Proposed nature reserve
- Proposed 5(1)(h) reserve
- Esperance Townsite

0 1 2 3 4 5km
Scale

*Note: All proposed additions are either unvested Crown reserve, unallocated Crown land, freehold or shire reserve

R 14563
Benje Benjenup Lake
WEST KALGOORLIE
COOLGARDIE - ESPERANCE
ESPERANCE
HELMS FORESTRY RESERVE R 23527
SHARK LAKE NR R 31197
Shark Lake
Lot 2199 & road reserve
Creek
Coramup
RD
Lot 3001
SOUTH COAST
RAILWAY
HWY
FISHERIES
MERIVALE RD
Lake Monjimup
R 24953
R 4181
R 24284
WOODY LAKE NR R 15231
Station Lake
Mullet Lake
Ewans Lake
Wheatfield Lake
Windabout Lake
Woody Lake
Lake Warden
LAKE WARDEN NR R 32257
LAKE WARDEN NR R 33660
LAKE WARDEN NR R 32259
LAKE WARDEN NR R 50098
R 22422
Lot 2029
PINK LAKE NR R 24511
Pink Lake
Lot 566
Lot 560
UCL
Lot 215
Lot 282
Lot 300
Lot 207
Lot 219
Lot 196
Lot 510
Lot 511
Lot 500
Lot 501
Lot 304
Lot 512
Lot 513
MULLET LAKE NR R 23825
R 28170
Doombup Lake
Stevens Lake
Bannilup Lake
Mt Hannett
Wylie Head
Wylie Bay
ELEVEN MILE BEACH RD
HARBOUR
ESPERANCE
SOUTHERN OCEAN
R 4182

Map 1d. Planning Area - Recherche Archipelago West

121^20'00"E 121^30'00"E 121^40'00"E 121^50'00"E 122^00'00"E 122^10'00"E 122^20'00"E 122^30'00"E 122^40'00"E

33^50'00"S
34^00'00"S
34^10'00"S
34^20'00"S
34^30'00"S

SOUTH COAST HWY
COOLGARDIE ESPERANCE HWY
FISHERIES RD
MERIVALE RD
CONDINGUP
ESPERANCE
Esperance Bay
Wylie Bay
Pink Lake
Lake Warden
Windabout Lake
Wheatfield Lake
Ewans Lake
Doombup Lake
Woody Lake
Mullet Lake
Stevens Lake
Bannitup Lake
Carbul Lake
Lake Kubitch
Lake Gidong
Lake Gore
Barker Inlet
Lake Quallup
Lake Mormenup
Quagi Beach
Red Is
Butty Head
Canning Is
Observatory Is
Button Rocks
Button Is
Rabbit Is
Charley Is
Cull Is
Lion Is
Black Is
Woody Is
Thomas Is
Gunton Is
Canard Is
unnamed wetlands
Big Boom Swamp
unnamed wetlands
Rossiter Bay
Lucky Bay
Dunns Rocks
Free Is
Kimberley Is
Victoria Harbour
Barely Is
Lorraine Is
Station Is
Broughton Is
Cornwall Is
York Is
Tory Is
Cliff Is
Cape Le Grand
New Is
Roy Is
Rob Is
Ram Is
Cloud Is
Pasco Is
Hope Is
Hastings Is
Finger Is
Mondrain Is
Hugo Is
Beaumont Is
Tizard Is
Mart Is
Wharton Is
Slipper Is
High Is
John Is
Duke of Orleans Bay
Nares Is
Creak Is
Forrest Is
Ben Is
Capps Is
Boxer Is
Seal Rock
Figure of Eight Is
Causeway Channel
Sandy Hook Is
Long Is
Hendy Is
Renmark Is
Frederick Is
Corbett Is
Wilson Is
Davy Is
Hood Is
Howe Is
Mac Kenzie Is
Pearson Is
Draper Is
Little Is
Termination Is
Archipelago of the Recherche
SOUTHERN OCEAN
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Name	Latitude (DMS)	Longitude (DMS)	Area (ha)	Distance to mainland (km)	Tenure
Red Island	33 52 22 S	121 20 56 E	35.07	4320	Recherche Archipelago NR 22796
Unnamed	33 52 29 S	121 20 56 E	0.4528	4780	Recherche Archipelago NR 22796
Unnamed	33 49 29 S	121 25 52 E	0.4221	165	Unnamed nature reserve 26885
Unnamed	33 50 29 S	121 30 03 E	1.119	135	Recherche Archipelago NR 22796
Unnamed	33 50 35 S	121 30 07 E	0.2664	175	Recherche Archipelago NR 22796
Unnamed	33 50 26 S	121 30 18 E	0.1709	55	Recherche Archipelago NR 22796
Unnamed	34 02 34 S	121 36 13 E	2.541	16500	Recherche Archipelago NR 22796
Figure of Eight Island	34 01 42 S	121 36 19 E	245.4	14800	Recherche Archipelago NR 22796
Fur Rock	34 00 51 S	121 38 21 E	7.843	12900	Recherche Archipelago NR 22796
Square Rock	34 01 03 S	121 38 22 E	1.64	13200	Recherche Archipelago NR 22796
Rug Rock	34 01 08 S	121 38 43 E	3.478	13400	Recherche Archipelago NR 22796
Unnamed	34 01 39 S	121 39 08 E	0.7319	14400	Recherche Archipelago NR 22796
Whale Rock	34 01 36 S	121 39 11 E	1.63	14400	Recherche Archipelago NR 22796
Seal Rock	34 01 15 S	121 39 15 E	4.066	13700	Recherche Archipelago NR 22796
Giant Rocks	34 10 19 S	121 40 12 E	3.38	30400	Recherche Archipelago NR 22796
Boxer Island	34 00 04 S	121 40 36 E	166.3	11900	Recherche Archipelago NR 22796
Capps Island (West group)	33 59 20 S	121 40 51 E	40.46	10600	Recherche Archipelago NR 22796
Giant Rocks	34 10 21 S	121 41 06 E	0.576	30600	Recherche Archipelago NR 22796
Waterwitch Rocks	34 19 08 S	121 41 15 E	0.004908	51700	Recherche Archipelago NR 22796
Waterwitch Rocks	34 19 29 S	121 41 19 E	0.0049	52000	Recherche Archipelago NR 22796
Hector Rock	33 59 45 S	121 41 45 E	3.428	11800	Recherche Archipelago NR 22796
Gig Rocks	33 55 31 S	121 45 53 E	0.5342	2490	Recherche Archipelago NR 22796
Unnamed	33 55 11 S	121 46 07 E	1.193	1770	Recherche Archipelago NR 22796
Canning Island	33 55 06 S	121 46 21 E	10.82	1400	Recherche Archipelago NR 22796
Observatory Island	33 55 28 S	121 47 32 E	88.67	1580	Recherche Archipelago NR 22796
Burton Rocks	33 54 39 S	121 48 51 E	1.374	1280	Recherche Archipelago NR 22796
Burton Rocks	33 54 42 S	121 49 02 E	2.521	1400	Recherche Archipelago NR 22796
Swell Rocks	33 55 19 S	121 49 10 E	0.7195	2580	Recherche Archipelago NR 22796
Unnamed	33 53 47 S	121 49 27 E	2.888	220	Recherche Archipelago NR 22796
Unnamed	33 53 51 S	121 49 33 E	0.3229	310	Recherche Archipelago NR 22796
Middle Rock	34 18 28 S	121 50 57 E	0.004914	39600	Recherche Archipelago NR 22796
Taylor Rock	33 54 57 S	121 51 42 E	0.5556	2710	Recherche Archipelago NR 22796
Smith Rock	34 03 26 S	121 51 49 E	2.445	17700	Recherche Archipelago NR 22796
Unnamed	34 02 35 S	121 52 17 E	2.503	16500	Recherche Archipelago NR 22796
Charley Island	33 55 24 S	121 52 32 E	85.88	3720	Recherche Archipelago NR 22796
Unnamed	33 54 57 S	121 52 36 E	1.575	2930	Recherche Archipelago NR 22796
Hendy Island	34 02 56 S	121 53 06 E	3.705	17700	Recherche Archipelago NR 22796
Unnamed	33 55 49 S	121 53 07 E	2.793	4760	Recherche Archipelago NR 22796
Button Island	33 54 14 S	121 53 21 E	5.456	2250	Recherche Archipelago NR 22796
Unnamed	34 08 38 S	121 53 25 E	1.242	24140	Recherche Archipelago NR 22796
Rabbit Island	33 54 55 S	121 53 32 E	13.54	3550	Recherche Archipelago NR 22796
Unnamed	34 08 08 S	121 53 48 E	1.41	23160	Recherche Archipelago NR 22796
Cull Island	33 55 23 S	121 54 08 E	53.32	4540	Recherche Archipelago NR 22796
Bishop Rock	34 08 28 S	121 55 24 E	3.033	21700	Recherche Archipelago NR 22796
Davy Island	34 08 10 S	121 55 59 E	9.71	20800	Recherche Archipelago NR 22796
Unnamed	34 10 48 S	121 56 35 E	3.429	23800	Recherche Archipelago NR 22796
Long Island	34 02 58 S	121 57 43 E	157.7	12800	Recherche Archipelago NR 22796
Low Rock	33 51 18 S	121 57 45 E	2.988	2000	Recherche Archipelago NR 22796
Unnamed	33 51 19 S	121 57 51 E	0.4258	1960	Recherche Archipelago NR 22796
Unnamed	34 07 25 S	121 57 56 E	8.481	17600	Recherche Archipelago NR 22796
Magistrate Rocks	33 55 46 S	121 58 07 E	0.8883	8500	Recherche Archipelago NR 22796
Limpet Rock	33 52 40 S	121 58 10 E	4.047	4200	Recherche Archipelago NR 22796
Unnamed	34 07 18 S	121 58 10 E	4.256	17300	Recherche Archipelago NR 22796
Magistrate Rocks	33 55 44 S	121 58 16 E	1.249	9800	Recherche Archipelago NR 22796
Unnamed	33 58 39 S	121 58 25 E	0.3173	10980	Recherche Archipelago NR 22796
Unnamed	33 58 35 S	121 58 28 E	1.339	10900	Recherche Archipelago NR 22796
Unnamed	33 58 24 S	121 58 29 E	0.6699	10950	Recherche Archipelago NR 22796
Corbett Island	34 07 08 S	121 58 34 E	80.88	16600	Recherche Archipelago NR 22796
Unnamed	34 07 35 S	121 58 44 E	1.689	17000	Recherche Archipelago NR 22796
Unnamed	33 58 10 S	121 58 47 E	0.6507	10330	Recherche Archipelago NR 22796
Unnamed	33 58 55 S	121 58 53 E	0.4596	10160	Recherche Archipelago NR 22796
Steep Rocks	33 55 48 S	121 59 00 E	0.4562	9100	Recherche Archipelago NR 22796
Unnamed	33 59 36 S	121 59 02 E	1.701	9840	Recherche Archipelago NR 22796
Thomas Island	33 58 37 S	121 59 02 E	51.2	10070	Recherche Archipelago NR 22796
Remark Island	34 03 53 S	121 59 04 E	101.7	11950	Recherche Archipelago NR 22796
Unnamed	33 59 40 S	121 59 05 E	0.3456	9790	Recherche Archipelago NR 22796
Unnamed	34 02 42 S	121 59 17 E	0.3224	10600	Recherche Archipelago NR 22796
Little Island	34 27 29 S	121 59 20 E	5.155	50100	Recherche Archipelago NR 22796
Unnamed	34 03 43 S	121 59 25 E	0.6592	11350	Recherche Archipelago NR 22796
Termination Island	34 28 20 S	121 59 26 E	55.74	52000	Recherche Archipelago NR 22796
Black Island	33 55 13 S	121 59 32 E	72.73	7800	Recherche Archipelago NR 22796
Sandy Hook Island	34 02 05 S	121 59 33 E	237.8	9430	Recherche Archipelago NR 22796
Unnamed	34 07 20 S	121 59 39 E	1.196	15800	Recherche Archipelago NR 22796
Gunton Island	33 59 19 S	121 59 40 E	83.36	8920	Recherche Archipelago NR 22796
Unnamed	34 02 25 S	122 00 02 E	0.1078	9310	Recherche Archipelago NR 22796
Unnamed	33 57 41 S	122 00 03 E	0.2562	9050	Recherche Archipelago NR 22796
Unnamed	34 02 23 S	122 00 08 E	0.2895	9130	Recherche Archipelago NR 22796
Wilson Island	34 07 08 S	122 00 10 E	90.45	15170	Recherche Archipelago NR 22796
Frederick Island	34 04 03 S	122 00 20 E	80.12	10400	Recherche Archipelago NR 22796
Unnamed	33 59 10 S	122 00 21 E	0.3846	7890	Recherche Archipelago NR 22796
Unnamed	33 59 06 S	122 00 25 E	0.5729	7820	Recherche Archipelago NR 22796
Unnamed	33 59 02 S	122 00 26 E	0.3297	7790	Recherche Archipelago NR 22796
Unnamed	33 57 18 S	122 00 30 E	0.2331	8320	Recherche Archipelago NR 22796
Woody Island	33 57 44 S	122 00 41 E	195	8090	Nat Res 39435
Unnamed	34 10 08 S	122 00 47 E	5.593	19050	Recherche Archipelago NR 22796
Unnamed	34 09 54 S	122 01 08 E	8.306	18500	Recherche Archipelago NR 22796
Canard Island	33 59 34 S	122 01 14 E	10.93	6420	Recherche Archipelago NR 22796
Unnamed	33 58 46 S	122 01 17 E	0.4014	6630	Recherche Archipelago NR 22796
Howe Island	34 08 58 S	122 01 17 E	43.77	16810	Recherche Archipelago NR 22796
Lion Island	33 52 48 S	122 01 21 E	10.91	2690	Recherche Archipelago NR 22796
Unnamed	34 04 02 S	122 01 25 E	0.5107	9350	Recherche Archipelago NR 22796
Unnamed	34 09 12 S	122 01 43 E	0.5308	16850	Recherche Archipelago NR 22796
Unnamed	33 52 32 S	122 01 59 E	0.3358	1680	Recherche Archipelago NR 22796
Unnamed	33 52 35 S	122 02 03 E	0.6113	1650	Recherche Archipelago NR 22796
Unnamed	33 52 29 S	122 02 08 E	0.3158	1400	Recherche Archipelago NR 22796
Unnamed	33 52 30 S	122 02 12 E	0.2956	1350	Recherche Archipelago NR 22796
Unnamed	34 02 28 S	122 02 54 E	1.056	5700	Recherche Archipelago NR 22796
Hood Island	34 08 35 S	122 02 54 E	96.89	15000	Recherche Archipelago NR 22796
Thistle Rock	33 58 44 S	122 02 58 E	0.775	6460	Recherche Archipelago NR 22796
Unnamed	34 03 33 S	122 03 45 E	0.3856	6380	Recherche Archipelago NR 22796
Unnamed	34 13 53 S	122 03 52 E	4.7	24100	Recherche Archipelago NR 22796
Unnamed	34 13 17 S	122 04 22 E	5.218	22900	Recherche Archipelago NR 22796
Unnamed	34 13 07 S	122 04 31 E	0.2041	22600	Recherche Archipelago NR 22796
Unnamed	34 13 03 S	122 04 33 E	1.437	22400	Recherche Archipelago NR 22796
Libke Island	34 13 00 S	122 05 01 E	16.63	22100	Recherche Archipelago NR 22796
Cliff Island	34 01 07 S	122 05 11 E	16.75	1600	Recherche Archipelago NR 22796
Cloud Island	34 02 43 S	122 05 16 E	23.58	3650	Recherche Archipelago NR 22796
Pasco Island	34 03 55 S	122 06 11 E	44.34	5210	Recherche Archipelago NR 22796
Mackenzie Island	34 11 54 S	122 06 14 E	35.57	20100	Recherche Archipelago NR 22796
Unnamed	34 03 51 S	122 06 29 E	0.3313	5090	Recherche Archipelago NR 22796
Unnamed	34 05 56 S	122 06 38 E	0.2931	8940	Recherche Archipelago NR 22796
Unnamed	34 05 57 S	122 06 46 E	0.2815	8930	Recherche Archipelago NR 22796
Unnamed	34 01 14 S	122 06 49 E	0.2456	210	Recherche Archipelago NR 22796
Hastings Island	34 05 55 S	122 07 03 E	40.29	8980	Recherche Archipelago NR 22796

Name	Latitude (DMS)	Longitude (DMS)	Area (ha)	Distance to mainland (km)	Tenure
Unnamed	34 06 15 S	122 07 16 E	0.1129	9530	Recherche Archipelago NR 22796
Unnamed	34 06 19 S	122 07 18 E	0.2909	9660	Recherche Archipelago NR 22796
Unnamed	34 06 16 S	122 07 19 E	0.5716	9590	Recherche Archipelago NR 22796
Unnamed	34 05 45 S	122 07 23 E	0.1521	8640	Recherche Archipelago NR 22796
Unnamed	34 02 07 S	122 08 08 E	0.121	2250	Recherche Archipelago NR 22796
New Island	34 01 10 S	122 08 29 E	21.45	440	Recherche Archipelago NR 22796
Ram Island	34 01 56 S	122 08 30 E	115.1	1830	Recherche Archipelago NR 22796
Unnamed	34 12 17 S	122 08 50 E	0.431	21000	Recherche Archipelago NR 22796
Unnamed	34 13 30 S	122 08 52 E	2.231	23200	Recherche Archipelago NR 22796
Unnamed	34 13 01 S	122 09 03 E	0.5847	22300	Recherche Archipelago NR 22796
Unnamed	34 02 07 S	122 09 07 E	0.3049	2180	Recherche Archipelago NR 22796
Unnamed	34 01 56 S	122 09 10 E	0.2699	1880	Recherche Archipelago NR 22796
Unnamed	34 05 02 S	122 09 35 E	0.5267	7620	Recherche Archipelago NR 22796
Hope Island	34 04 47 S	122 09 43 E	21.57	7230	Recherche Archipelago NR 22796
Unnamed	34 00 54 S	122 11 34 E	0.2873	105	Recherche Archipelago NR 22796
Unnamed	34 00 53 S	122 11 44 E	0.2033	330	Recherche Archipelago NR 22796
Unnamed	34 01 03 S	122 11 44 E	0.2862	245	Recherche Archipelago NR 22796
Unnamed	34 00 59 S	122 11 45 E	0.5764	325	Recherche Archipelago NR 22796
Black Rock	34 02 48 S	122 12 21 E	0.4322	3420	Recherche Archipelago NR 22796
Unnamed	34 09 02 S	122 12 40 E	0.6279	14850	Recherche Archipelago NR 22796
Unnamed	34 09 10 S	122 12 48 E	0.8429	15120	Recherche Archipelago NR 22796
Unnamed	34 09 08 S	122 13 02 E	2.133	15110	Recherche Archipelago NR 22796
Unnamed	34 07 57 S	122 13 08 E	0.6213	12960	Recherche Archipelago NR 22796
Twin Rocks	34 22 24 S	122 13 10 E	1.824	39600	Recherche Archipelago NR 22796
Twin Rocks	34 22 01 S	122 13 13 E	4.071	38900	Recherche Archipelago NR 22796
Rob Island	34 02 03 S	122 13 56 E	20.19	3340	Recherche Archipelago NR 22796
Unnamed	34 00 49 S	122 14 08 E	6.663	1340	Recherche Archipelago NR 22796
Unnamed	34 06 37 S	122 14 12 E	0.3712	11040	Recherche Archipelago NR 22796
Roy Island	34 01 46 S	122 14 27 E	5.436	2620	Recherche Archipelago NR 22796
Unnamed	34 00 33 S	122 14 32 E	33.25	590	Recherche Archipelago NR 22796
Mondrain Island	34 08 12 S	122 14 41 E	802.8	13820	Recherche Archipelago NR 22796
Unnamed	34 02 09 S	122 15 04 E	0.342	3280	Recherche Archipelago NR 22796
French Reef	34 04 42 S	122 15 47 E	0.004911	9360	Recherche Archipelago NR 22796
Unnamed	33 58 38 S	122 16 22 E	2.385	420	Recherche Archipelago NR 22796
Unnamed	33 59 40 S	122 16 50 E	9.611	320	Recherche Archipelago NR 22796
Unnamed	33 59 48 S	122 16 55 E	0.2506	580	Recherche Archipelago NR 22796
Unnamed	33 59 11 S	122 17 48 E	1.574	1730	Recherche Archipelago NR 22796
Unnamed	33 58 49 S	122 17 49 E	0.5099	2030	Recherche Archipelago NR 22796
Unnamed	33 58 59 S	122 17 49 E	3.429	1890	Recherche Archipelago NR 22796
Tory Islands	34 01 30 S	122 17 50 E	0.3154	3160	Recherche Archipelago NR 22796
Unnamed	33 59 21 S	122 17 56 E	3.967	1910	Recherche Archipelago NR 22796
Tory Islands	34 01 24 S	122 17 57 E	13.2	3100	Recherche Archipelago NR 22796
Unnamed	33 57 44 S	122 18 05 E	11.45	1890	Recherche Archipelago NR 22796
Tory Islands	34 01 10 S	122 18 07 E	1.768	3000	Recherche Archipelago NR 22796
Tory Islands	34 01 10 S	122 18 13 E	0.4511	3130	Recherche Archipelago NR 22796
Unnamed	33 57 57 S	122 18 15 E	0.8887	2360	Recherche Archipelago NR 22796
Unnamed	33 56 56 S	122 18 18 E	0.2471	730	Recherche Archipelago NR 22796
Unnamed	33 59 36 S	122 18 19 E	2.381	2500	Recherche Archipelago NR 22796
Tory Islands	34 01 16 S	122 18 23 E	6.004	3430	Recherche Archipelago NR 22796
Unnamed	33 59 32 S	122 18 27 E	0.1908	2690	Recherche Archipelago NR 22796
Unnamed	33 59 35 S	122 18 27 E	0.2509	2690	Recherche Archipelago NR 22796
Unnamed	33 57 09 S	122 18 28 E	13.59	1200	Recherche Archipelago NR 22796
Tory Islands	34 00 51 S	122 18 29 E	32.33	3200	Recherche Archipelago NR 22796
Hugo Island	34 08 46 S	122 18 57 E	2.585	16400	Recherche Archipelago NR 22796
Unnamed	33 59 05 S	122 20 25 E	1.238	5690	Recherche Archipelago NR 22796
Unnamed	34 07 00 S	122 20 30 E	2.459	14100	Recherche Archipelago NR 22796
Unnamed	34 06 34 S	122 20 31 E	4.451	13400	Recherche Archipelago NR 22796
Finger Island	34 06 16 S	122 20 38 E	11.24	13000	Recherche Archipelago NR 22796
Pearson Islands	34 12 19 S	122 20 49 E	15.93	23500	Recherche Archipelago NR 22796
Pearson Islands	34 12 36 S	122 20 49 E	8.085	24000	Recherche Archipelago NR 22796
Unnamed	34 16 44 S	122 21 17 E	0.00491	31900	Recherche Archipelago NR 22796
Free Island	33 57 20 S	122 24 31 E	13.47	4500	Recherche Archipelago NR 22796
Unnamed	34 16 40 S	122 25 42 E	0.004903	33900	Recherche Archipelago NR 22796
Broughton Island	33 58 54 S	122 25 59 E	16.06	6450	Recherche Archipelago NR 22796
Kimberley Island	33 57 03 S	122 28 03 E	12.32	1850	Recherche Archipelago NR 22796
Unnamed	33 57 13 S	122 28 28 E	2.428	2000	Recherche Archipelago NR 22796
Unnamed	34 11 41 S	122 29 13 E	0.4964	26800	Recherche Archipelago NR 22796
Draper Island	34 11 49 S	122 29 40 E	18.9	27000	Recherche Archipelago NR 22796
Barely Island	33 57 08 S	122 30 07 E	14.23	380	Recherche Archipelago NR 22796
Unnamed	34 11 43 S	122 30 24 E	0.5239	26600	Recherche Archipelago NR 22796
Unnamed	33 57 53 S	122 30 40 E	2.718	1110	Recherche Archipelago NR 22796
Station Island	33 57 41 S	122 31 17 E	39.36	1190	Recherche Archipelago NR 22796
Unnamed	33 56 55 S	122 31 42 E	1.438	410	Recherche Archipelago NR 22796
Unnamed	33 56 49 S	122 31 47 E	0.4518	580	Recherche Archipelago NR 22796
Unnamed	33 56 56 S	122 31 47 E	0.4861	570	Recherche Archipelago NR 22796
Cornwall Island	34 00 18 S	122 32 19 E	19.39	5550	Recherche Archipelago NR 22796
Beaumont Island	34 05 28 S	122 32 21 E	36.24	1460	Recherche Archipelago NR 22796
Lorraine Island	33 57 01 S	122 33 47 E	9.41	360	Recherche Archipelago NR 22796
York Islands	34 00 10 S	122 34 20 E	3.442	4480	Recherche Archipelago NR 22796
York Islands	34 00 35 S	122 34 32 E	10.34	5240	Recherche Archipelago NR 22796
York Islands	34 00 23 S	122 35 10 E	22.05	5050	Recherche Archipelago NR 22796
Nares Island	33 56 02 S	122 35 36 E	5.571	270	Recherche Archipelago NR 22796
Table Island	33 54 52 S	122 35 43 E	N/A	Connected to Mainland	Parkland and Recreation Res 41097
High Island	33 54 51 S	122 35 56 E	N/A	Connected to Mainland	Parkland and Recreation Res 41097
Unnamed	34 03 12 S	122 35 56 E	0.221911	10430	Recherche Archipelago NR 22796
John Island	33 55 17 S	122 36 24 E	2.969	1000	Recherche Archipelago NR 22796
Mart Islands	33 59 46 S	122 37 27 E	2.21	5740	Recherche Archipelago NR 22796
Mart Islands	33 59 30 S	122 37 45 E	2.868	5750	Recherche Archipelago NR 22796
Mart Islands	34 00 09 S	122 37 49 E	32.27	6620	Recherche Archipelago NR 22796
Mart Islands	33 59 20 S	122 38 07 E	1.32	6010	Recherche Archipelago NR 22796
Mart Islands	34 00 04 S	122 38 56 E	33.49	7880	Recherche Archipelago NR 22796
Mart Islands	34 00 22 S	122 39 09 E	7.579	8420	Recherche Archipelago NR 22796
Mart Islands	33 59 44 S	122 39 14 E	13.71	7870	Recherche Archipelago NR 22796
Mart Islands	33 59 32 S	122 39 17 E	1.127	7700	Recherche Archipelago NR 22796
Unnamed	34 02 44 S	122 39 20 E	0.05693	11810	Recherche Archipelago NR 22796
Mart Islands	33 59 22 S	122 39 26 E	23.37	7860	Recherche Archipelago NR 22796
Mart Islands	33 59 10 S	122 39 34 E	2.452	7810	Recherche Archipelago NR 22796
Mart Islands	33 59 27 S	122 39 49 E	0.6289	8410	Recherche Archipelago NR 22796
Unnamed	33 55 22 S	122 40 21 E	3.628	3570	Recherche Archipelago NR 22796
Tizard Island	34 01 05 S	122 40 53 E	6.226	11310	Recherche Archipelago NR 22796
Unnamed	34 00 57 S	122 41 13 E	2.679	11610	Recherche Archipelago NR 22796
Unnamed	33 55 58 S	122 41 19 E	0.6286	4420	Recherche Archipelago NR 22796
Unnamed	33 54 52 S	122 41 24 E	1.191	2370	Recherche Archipelago NR 22796
Forrest Island	33 55 04 S	122 42 30 E	19.02	2660	Recherche Archipelago NR 22796
Unnamed	33 57 06 S	122 42 44 E	2.425	6200	Recherche Archipelago NR 22796
Wharton Island	33 59 31 S	122 42 50 E	18.3	10700	Recherche Archipelago NR 22796
Creak Island	33 56 53 S	122 42 54 E	7.846	5780	Recherche Archipelago NR 22796
Unnamed	33 59 12 S	122 43 03 E	5.88	10000	Recherche Archipelago NR 22796
Unnamed	33 53 51 S	122 43 11 E	3.912	200	Recherche Archipelago NR 22796
Unnamed	33 53 58 S	122 44 18 E	0.7991	400	Recherche Archipelago NR 22796
Unnamed	33 53 53 S	122 44 24 E	1.263	200	Recherche Archipelago NR 22796
Ben Island	33 54 00 S	122 45 08 E	32.56	700	Recherche Archipelago NR 22796
Slipper Island	34 02 45 S	122 45 12 E	5.668	16600	Recherche Archipelago NR 22796
Sail Rock	34 02 45 S	122 45 24 E	0.362	16400	Recherche Archipelago NR 22796

Map 1e. Planning Area - Recherche Archipelago East

122^50'00"E 123^00'00"E 123^10'00"E 123^20'00"E 123^30'00"E 123^40'00"E 123^50'00"E 124^00'00"E 124^10'00"E

33^40'00"S 33^50'00"S 34^00'00"S 34^10'00"S 34^20'00"S

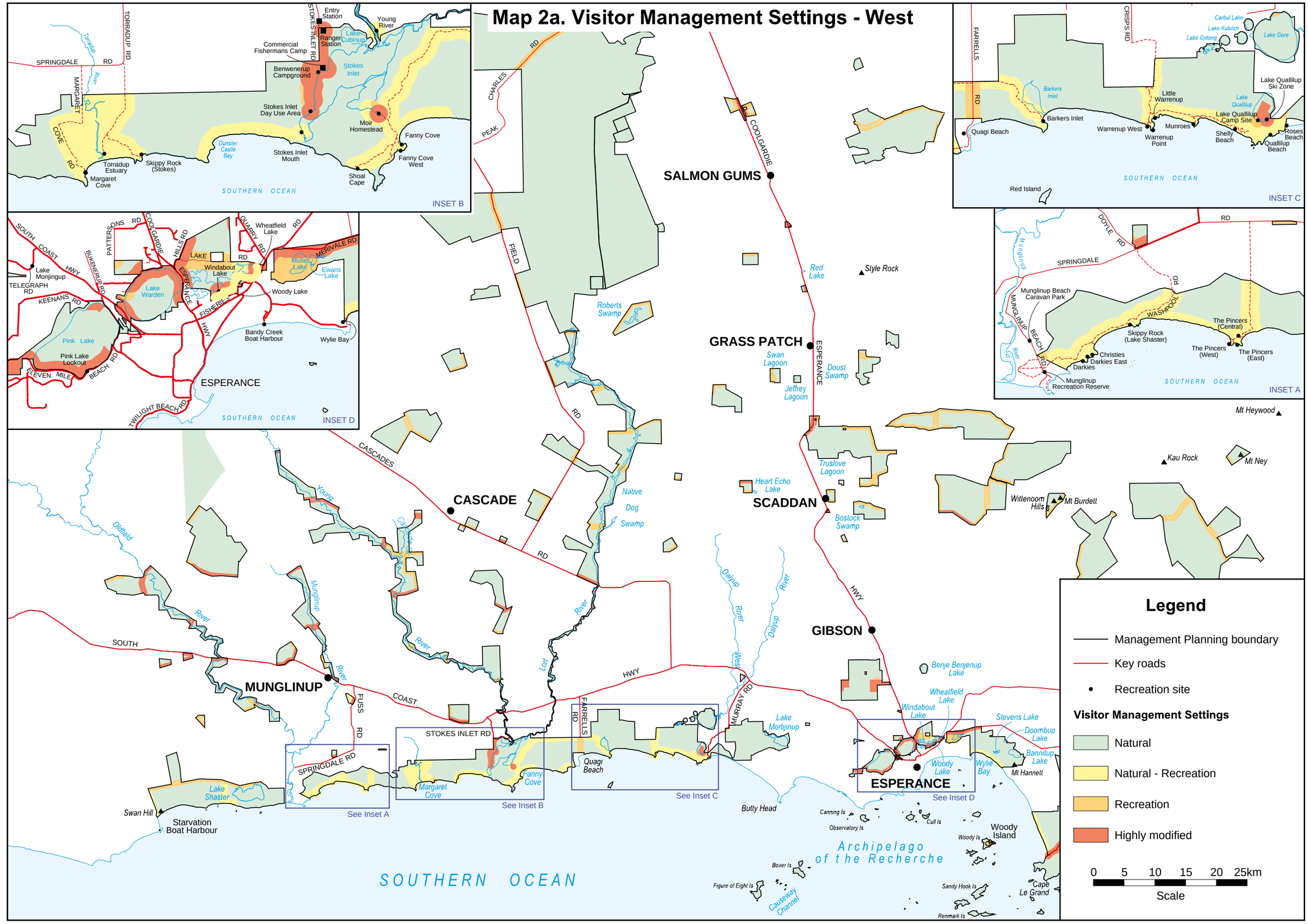
FISHERIES RD
MERIVALE RD
Thomas River
Blackboy Ck
Ewart's Swamp
Boolenup Lake
Yokinup Bay
Tagon Bay
Tagon Pt
Alexander Bay
Ben Is
Taylor Is
Inshore Is
Cave Is
Cap Is
North Twin Peak Is
South Twin Peak Is
Slipper Is
Kermadic Is
Westall Is
Brewis Is
Glennie Is
Manicon Is
Hasler Is
Helby Is
Dailey Is
Goose Is
Russell Rock
Middle Is
Douglas Is
Pt Jedacorrudup
Ruby Is
Barrier Is
Barrier Anchorage
Arid Bay
Cape Arid
Arid Is
Arid Strait
Thomas Fishery
Gulch Is
Stanley Is
Owen Is
MilesIs
George Is
Poison Ck
Sandy Bight
Cape Pasley
Pasley Is
Bellinger Is
Point Malcolm
Lake Daringabella
Israelite Bay
Point Lorenzen
Point Dempster
6 Mile Is
Great Australian Bight
Cranny Is
Pointer Is
Anvil Is
Tadpole Is
Spindle Is
Ford Is
Rodona Is
New Year Is
Daw Is
Archipelago of the Recherche
Round Is
Dome Is
Cooper Is
Salisbury Is
SOUTHERN OCEAN
N

Name	Latitude (DMS)	Longitude (DMS)	Area (ha)	Distance to mainland (km)	Tenure
Ben Island	33 54 00 S	122 45 08 E	32.56	700	Recherche Archipelago NR 22796
Slipper Island	34 02 45 S	122 45 12 E	5.668	16600	Recherche Archipelago NR 22796
Sail Rock	34 02 45 S	122 45 24 E	0.362	16400	Recherche Archipelago NR 22796
Godman Island	33 57 55 S	122 48 11 E	11.52	6380	Recherche Archipelago NR 22796
South Twin Peak Island	34 00 28 S	122 48 13 E	102.9	11000	Recherche Archipelago NR 22796
Unnamed	33 55 24 S	122 48 34 E	4.487	2130	Recherche Archipelago NR 22796
Tunney Island	33 57 44 S	122 48 45 E	28.47	6060	Recherche Archipelago NR 22796
Cave Island	33 58 45 S	122 49 07 E	5.146	7660	Recherche Archipelago NR 22796
Unnamed	33 54 36 S	122 49 10 E	3.965	520	Recherche Archipelago NR 22796
Inshore Island	33 55 01 S	122 49 39 E	24.98	720	Recherche Archipelago NR 22796
Kermadec Rocks	34 05 47 S	122 49 51 E	0.04461	20800	Recherche Archipelago NR 22796
Kermadec Island	34 05 22 S	122 49 59 E	23.18	20000	Recherche Archipelago NR 22796
North Twin Peak Island	33 59 41 S	122 50 13 E	277.2	9300	Recherche Archipelago NR 22796
Hull Island	33 58 07 S	122 50 33 E	32.94	6550	Recherche Archipelago NR 22796
Foam Rocks	34 07 51 S	122 50 43 E	0.2032	24600	Recherche Archipelago NR 22796
Foam Rocks	34 07 53 S	122 50 43 E	0.1712	24700	Recherche Archipelago NR 22796
Gould Island	33 57 57 S	122 51 26 E	16.09	6720	Recherche Archipelago NR 22796
Unnamed	33 57 48 S	122 52 00 E	0.4886	6640	Recherche Archipelago NR 22796
Unnamed	34 00 09 S	122 52 05 E	1.072	10900	Recherche Archipelago NR 22796
Taylor Island	33 55 18 S	122 52 18 E	23.21	2040	Recherche Archipelago NR 22796
Unnamed	33 59 32 S	122 52 21 E	7.218	9810	Recherche Archipelago NR 22796
Unnamed	33 57 55 S	122 53 44 E	3.149	7180	Recherche Archipelago NR 22796
Unnamed	33 58 41 S	122 53 48 E	2.638	8610	Recherche Archipelago NR 22796
Unnamed	33 58 15 S	122 54 01 E	0.5449	7870	Recherche Archipelago NR 22796
Unnamed	33 58 45 S	122 54 01 E	0.9338	8760	Recherche Archipelago NR 22796
Unnamed	33 58 47 S	122 54 05 E	0.2403	8830	Recherche Archipelago NR 22796
Unnamed	33 58 01 S	122 54 17 E	2.853	7620	Recherche Archipelago NR 22796
Cap Island	33 57 42 S	122 56 13 E	4.298	7350	Recherche Archipelago NR 22796
Tagon Reef	33 56 08 S	122 57 03 E	2.316	3860	Recherche Archipelago NR 22796
Westall Island	34 04 51 S	122 57 57 E	68.89	18900	Recherche Archipelago NR 22796
Lichen Island	33 54 13 S	122 58 14 E	6.59	220	Recherche Archipelago NR 22796
Unnamed	33 54 32 S	122 58 21 E	4.342	590	Recherche Archipelago NR 22796
Unnamed	33 54 17 S	122 59 30 E	1.389	1350	Recherche Archipelago NR 22796
Unnamed	33 58 49 S	12253 52 E	0.7942	8790	Recherche Archipelago NR 22796
Unnamed	33 51 50 S	123 00 54 E	1.051	180	Recherche Archipelago NR 22796
Manicom Island	34 06 50 S	123 01 46 E	4.19	15890	Recherche Archipelago NR 22796
Unnamed	34 07 08 S	123 03 52 E	0.6124	14270	Recherche Archipelago NR 22796
Archdeacon Island	34 07 17 S	123 03 58 E	18.31	14420	Recherche Archipelago NR 22796
Hasler Island	34 06 54 S	123 04 08 E	12.8	13700	Recherche Archipelago NR 22796
Brewis Island	34 04 23 S	123 04 09 E	1.684	10020	Recherche Archipelago NR 22796
Unnamed	34 05 35 S	123 06 11 E	0.8595	9950	Recherche Archipelago NR 22796
Glennie Island	34 05 50 S	123 06 14 E	42.25	10200	Recherche Archipelago NR 22796
Unnamed	34 06 04 S	123 06 27 E	0.7952	10510	Recherche Archipelago NR 22796
Ruby Island	33 57 12 S	123 07 10 E	3.342	3020	Recherche Archipelago NR 22796
Dailey Island	34 04 35 S	123 07 32 E	2.594	7290	Recherche Archipelago NR 22796
Unnamed	34 04 38 S	123 07 41 E	0.3954	7280	Recherche Archipelago NR 22796
Barrier Island	33 58 49 S	123 08 14 E	10.71	1000	Recherche Archipelago NR 22796
Douglas Island	34 09 54 S	123 08 23 E	31.13	16600	Recherche Archipelago NR 22796
Unnamed	33 55 55 S	123 08 25 E	3.056	370	Recherche Archipelago NR 22796
Unnamed	34 00 17 S	123 08 42 E	2.655	930	Recherche Archipelago NR 22796
Unnamed	33 56 31 S	123 08 50 E	1.229	350	Recherche Archipelago NR 22796
Skink Island	33 59 15 S	123 08 50 E	10.79	980	Recherche Archipelago NR 22796
Unnamed	33 57 02 S	123 08 53 E	2.105	570	Recherche Archipelago NR 22796
Arid Island	34 01 28 S	123 09 32 E	13	730	Recherche Archipelago NR 22796
Unnamed	34 00 10 S	123 09 34 E	1.396	440	Recherche Archipelago NR 22796
Unnamed	34 00 02 S	123 09 43 E	5.293	390	Recherche Archipelago NR 22796
Russell Rock	34 03 22 S	123 09 47 E	1.019	4250	Recherche Archipelago NR 22796
Goose Island	34 04 59 S	123 10 56 E	56.34	7440	Recherche Archipelago NR 22796
Middle Island	34 06 05 S	123 11 21 E	984.8	9800	Recherche Archipelago NR 22796
Unnamed	34 00 19 S	123 13 06 E	5.477	590	Recherche Archipelago NR 22796
Unnamed	34 03 05 S	123 13 21 E	1.874	5500	Recherche Archipelago NR 22796
Unnamed	34 03 11 S	123 13 22 E	0.5329	5690	Recherche Archipelago NR 22796

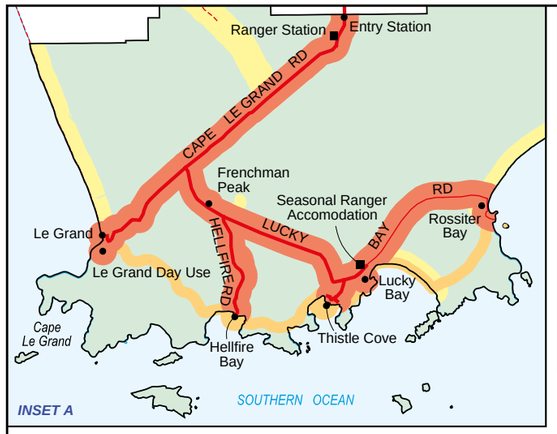
Name	Latitude (DMS)	Longitude (DMS)	Area (ha)	Distance to mainland (km)	Tenure
Unnamed	34 03 17 S	123 13 28 E	2.175	5870	Recherche Archipelago NR 22796
Unnamed	34 03 27 S	123 13 32 E	9.651	6210	Recherche Archipelago NR 22796
Unnamed	34 03 46 S	123 13 34 E	1.981	6820	Recherche Archipelago NR 22796
Miles Island	34 04 05 S	123 13 54 E	45.01	7550	Recherche Archipelago NR 22796
Owen Island	34 02 31 S	123 14 09 E	27.8	4900	Recherche Archipelago NR 22796
Harlequin Island	34 01 50 S	123 14 10 E	10.15	3700	Recherche Archipelago NR 22796
Gulch Island	34 01 35 S	123 14 57 E	78.06	2930	Recherche Archipelago NR 22796
George Island	34 03 08 S	123 15 27 E	6.015	5930	Recherche Archipelago NR 22796
Wickham Island	34 01 17 S	123 17 24 E	41.18	4310	Recherche Archipelago NR 22796
Unnamed	33 55 22 S	123 20 12 E	4.059	440	Recherche Archipelago NR 22796
Unnamed	33 55 15 S	123 20 23 E	0.808	390	Recherche Archipelago NR 22796
Dome Island	34 09 55 S	123 20 38 E	14.48	20600	Recherche Archipelago NR 22796
Unnamed	33 54 11 S	123 25 34 E	3.436	410	Recherche Archipelago NR 22796
Unnamed	34 00 54 S	123 30 49 E	2.983	7860	Recherche Archipelago NR 22796
Unnamed	34 21 44 S	123 31 49 E	0.3192	46700	Recherche Archipelago NR 22796
Pasley Island	34 00 45 S	123 31 50 E	67.9	8020	Recherche Archipelago NR 22796
Unnamed	34 21 38 S	123 31 51 E	1.551	46400	Recherche Archipelago NR 22796
Unnamed	34 00 31 S	123 32 09 E	0.4362	7340	Recherche Archipelago NR 22796
Unnamed	34 00 29 S	123 32 12 E	0.5002	7260	Recherche Archipelago NR 22796
Unnamed	34 00 08 S	123 32 21 E	2.261	6700	Recherche Archipelago NR 22796
Unnamed	34 00 12 S	123 32 35 E	0.5313	6830	Recherche Archipelago NR 22796
Unnamed	34 21 40 S	123 33 02 E	349.9	46600	Recherche Archipelago NR 22796
Unnamed	33 59 45 S	123 33 03 E	2.726	6270	Recherche Archipelago NR 22796
Unnamed	33 59 37 S	123 33 08 E	1.24	6090	Recherche Archipelago NR 22796
Cooper Island (South East Islands)	34 13 58 S	123 36 19 E	56.66	33300	Recherche Archipelago NR 22796
Bellinger Island	33 53 17 S	123 38 16 E	39.62	1110	Recherche Archipelago NR 22796
Unnamed	33 50 59 S	123 39 59 E	1.805	600	Recherche Archipelago NR 22796
Unnamed	33 49 51 S	123 44 00 E	1.635	2020	Recherche Archipelago NR 22796
Unnamed	33 49 08 S	123 44 28 E	6.152	900	Recherche Archipelago NR 22796
Unnamed	33 43 00 S	123 47 51 E	0.5332	2950	Recherche Archipelago NR 22796
Unnamed	34 05 53 S	123 52 31 E	1.684	32900	Recherche Archipelago NR 22796
Round Island	34 06 22 S	123 53 12 E	29.94	34100	Recherche Archipelago NR 22796
Unnamed	34 05 25 S	123 53 47 E	0.6334	33600	Recherche Archipelago NR 22796
Unnamed	34 05 35 S	123 54 06 E	2.951	34200	Recherche Archipelago NR 22796
Unnamed	33 38 04 S	123 56 53 E	0.2073	5310	Recherche Archipelago NR 22796
Unnamed	33 38 07 S	123 56 53 E	0.2242	5420	Recherche Archipelago NR 22796
Unnamed	33 50 20 S	123 57 05 E	80.45	18100	Recherche Archipelago NR 22796
Unnamed	33 37 35 S	123 57 06 E	0.8055	4630	Recherche Archipelago NR 22796
Unnamed	33 37 20 S	123 57 17 E	0.3209	4360	Recherche Archipelago NR 22796
Unnamed	33 37 16 S	123 57 23 E	0.4789	4310	Recherche Archipelago NR 22796
Unnamed	33 37 10 S	123 57 25 E	0.6604	4190	Recherche Archipelago NR 22796
Unnamed	33 37 40 S	123 57 30 E	0.3631	5060	Recherche Archipelago NR 22796
Unnamed	33 38 09 S	123 57 40 E	0.4089	5960	Recherche Archipelago NR 22796
Unnamed	33 37 53 S	123 57 55 E	0.886	5720	Recherche Archipelago NR 22796
Six Mile Island	33 38 26 S	123 57 57 E	11.7	6650	Recherche Archipelago NR 22796
Rodondo Island	33 49 39 S	123 58 54 E	2.506	20600	Recherche Archipelago NR 22796
Unnamed	33 38 11 S	123 59 51 E	1.229	7800	Recherche Archipelago NR 22796
Ford Island (Eastern Group)	33 46 03 S	124 02 23 E	14.43	21200	Recherche Archipelago NR 22796
Cranny Island	33 43 51 S	124 04 40 E	4.381	20700	Recherche Archipelago NR 22796
Unnamed	33 44 12 S	124 04 41 E	0.7187	21200	Recherche Archipelago NR 22796
Whaleback Island	33 44 41 S	124 05 13 E	5.368	22500	Recherche Archipelago NR 22796
Anvil Island	33 44 18 S	124 05 40 E	39.93	22100	Recherche Archipelago NR 22796
Pointer Island	33 43 22 S	124 05 47 E	25.76	21000	Recherche Archipelago NR 22796
Unnamed	33 51 15 S	124 07 11 E	4.117	33000	Recherche Archipelago NR 22796
Unnamed	33 44 29 S	124 07 27 E	1.186	24100	Recherche Archipelago NR 22796
New Year Island	33 51 27 S	124 07 33 E	21	33800	Recherche Archipelago NR 22796
Daw Island	33 50 56 S	124 08 05 E	214.3	34200	Recherche Archipelago NR 22796
Spindle Island	33 45 53 S	124 09 35 E	16.31	28100	Recherche Archipelago NR 22796
Unnamed	33 43 17 S	124 09 46 E	2.5	24700	Recherche Archipelago NR 22796
Unnamed	33 48 57 S	124 10 19 E	1.468	33300	Recherche Archipelago NR 22796
Unnamed	33 58 20 S	128 58 27 E	0.3217	11030	Recherche Archipelago NR 22796

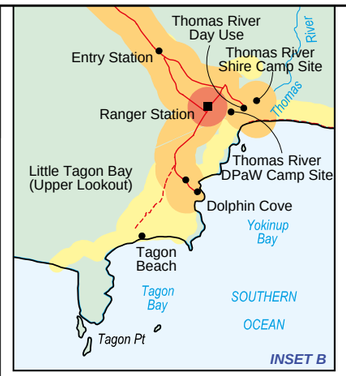
The Recherche Archipelago Nature Reserve has a gazetted legal area of 7145.49ha (March 2015) which is approximately 92ha more than the figures included above which are based on mapped areas.

Map 2a. Visitor Management Settings - West



Map 2b. Visitor Management Settings - East





Mt Buraminya
Juranda Rockhole
Namerlonia Rock
Kangawarie Rockhole
Mt Ridley
Mt Heywood
Mt Beaumont
Kau Rock
Mt Ney
Mt Burdett
Wittenoom Hills
Clyde Hill
Bonnie Hill
Fowlie Hill
Eclipse Hill
Niblick Hill
Florabel Hill
PARMANGO RD
Pine Hill
Junana Rock
Modyununna Gnamma Hole
Mount Ragged
Mt Simmons
Gora Hill
Mica Hill
The Pups
The Diamond Hill
Bebenorin Hill
Boyatup Hill
Price Hill
Mt Baring
Hamish Hill
Mt Millard
Carnicup Hill
Pontoon Rocks
Mt Esmond
Wolgrah Hill
Russell Range
Mt Dean
Brook Peak
Tower Peak
Mt Ragged
Scott Rock
Baelmayalina Gnamma Hole
Ark Point
Wylie Scarp
TELEGRAPH RD
Proposed Wilderness Area
Israelite Hill
Point Lorenzen
Israelite Bay
Lake Daringella
Point Dempster
6 Mile Is
Tooklejenna Rock
Sheoaks Hill
Wattle Camp
Point Culver
To Point Culver 3km
Bilbunya Dunes TRACK
Great Australian Bight
Nuytsland Enclave
Point Malcolm
Spindle Is
Daw Is
Marlbemup Hill
Mt Pasley
Bellinger Is
Cape Pasley
Pasley Is
Poison Creek
Seal Creek
Jorndee Creek
Sandy Bight
Poison Ck
Pt Jedacorrudup
Barrier Anchorage
Cahills Hut (Fishermans Hut)
Arid Bay
Cape Arid
Mt Arid
Thomas Fishery
Stanley Is
Arid Strait
Middle Island
North Twin Peak Is
South Twin Peak Is
Mondrain Is
Archipelago of the Recherche
Draper Is
Cooper Is
Salisbury Is
Round Is
SOUTHERN OCEAN
CONDINGUP
Condingup Peak
Mt Hawes
Mungliginup Hill
Cheetup Hill
Yungarup Hill
Mt Belches
Duke Of Orleans Caravan Park
Duke Of Orleans Bay
Membinup
Alexanders
Alexander Hill
Alexander Bay
Kennedy's Beach
Ewart's Swamp
Hawes Hill
Belinup Hill
See Inset B
See Inset A
Big Boom Swamp
Dunn Rocks
Victoria Harbour
Cheyne Pt
Whartons Beach
Little Wharton Beach
Hammer Head
Frenchman Peak
Mt Le Grand
Mississippi Hill
Ressiter Bay
Lucky Bay
FISHERIES RD
TYRELL RD
JIMS OVEN RD
DUNN ROCK RD
MERIVALE RD
ORLEANS BAY RD
ALEXANDER RD
EXCHANGE RD
TAGON RD
BARING RD
PASLEY RD
POISON CREEK RD
MALCOLM POINT RD
BALLADONIA RD
GORA RD

Legend

- Management Planning boundary
- Key roads
- Recreation site
- Proposed Wilderness Area

Visitor Mangement Settings

- Natural
- Natural - Recreation
- Recreation
- Highly modified

0 5 10 15 20 25km
Scale

N

Map 3a. Visitor Use and Access - West

Legend

- Management Planning boundary
- Planning area
- 2WD sealed road
- 2WD unsealed road
- 4WD unsealed track
- DPaW 2WD sealed road
- DPaW 2WD unsealed road*
- DPaW 4WD unsealed track*
- Walk trail
- Water trail
- Beaches with 4WD access*

** May be subject to temporary closures*

Recreation site hierarchy (as proposed)

- High camping
- Medium camping
- Low camping
- High day use
- Medium day use
- Low day use

0 5 10 15 20 25km
Scale

N

SOUTHERN OCEAN

Archipelago of the Recherche

Causeway Channel

Butty Head

Kau Rock

Mt Heywood

Mt Burdett

Mt Ney

SALMON GUMS

GRASS PATCH

CASCADE

SCADDAN

GIBSON

MUNGLINUP

ESPERANCE

Style Rock

Red Lake

Roberts Swamp

Doust Swamp

Swan Lagoon

Jeffrey Lagoon

Truslove Lagoon

Heart Echo Lake

Bostock Swamp

Native Dog Swamp

Lake Mortijinup

Lake Monjingup

Pink Lake

Lake Warden

Lake Shaster

Ewans Lake

Benje Benjenup Lake

Wheatfield Lake

Windabout Lake

Woody Lake

Water ski area

Trail

Wetland

Keyman

Water

Woody Island

Lookout

Top Walk Trail

Twiggy's Landing

Skinny Dip Bay

Skinny Dip Bay Trail

Shearwater Bay

Woody Island Trail

Torradup River

Stokes Inlet Walk Trail

Entry Station

Ranger Station

Young River

Lake Cuburup

Stokes Inlet

Commercial Fishermans Camp

Benwenerup Campground

Stokes Inlet Day Use Area

Moir Homestead

Moir Homestead Precinct Historical Trail

Stokes Inlet Mouth

Dunster Castle Bay

Fanny Cove

Fanny Cove West

Shoal Cape

Torradup Estuary

Margaret Cove

SkippyRock (Stokes)

Carbul Lake

Lake Kubitch

Lake Gidong

Lake Gore

Barkers Inlet

Little Warrenup

Lake Quallilup

Lake Quallilup Ski Zone

Water ski area

Warrenup West

Warrenup Point

Munroes

Shelly Beach

Roses Beach

Quallilup Beach

Quagi Beach

Red Island

Munglinup Beach Caravan Park

Skippy Rock (Lake Shaster)

The Pincers (Central)

The Pincers (West)

The Pincers (East)

Christies

Darkies East

Darkies

Munglinup Recreation Reserve

Helms Arboretum

Entry Station

Bandy Creek Boat Harbour

Pink Lake Lookout

Wylie Bay

Swan Hill

Shark Hole

Starvation Boat Harbour

Margaret Cove

Fanny Cove

Woody Island

See Inset A

See Inset B

See Inset C

See Inset D

See Inset E

INSET A

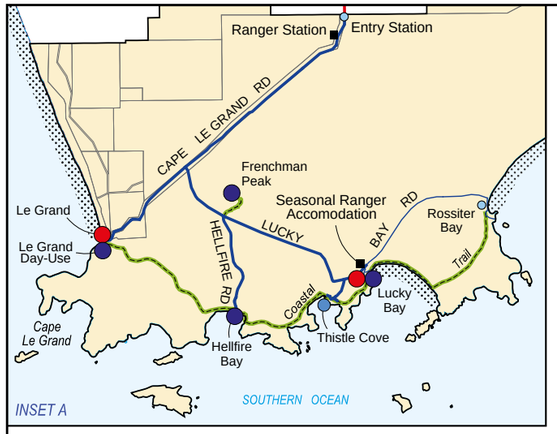
INSET B

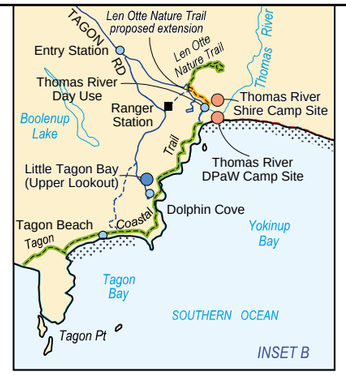
INSET C

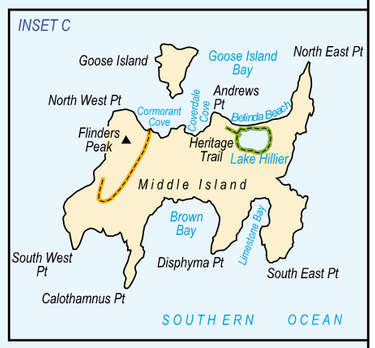
INSET D

INSET E

Map 3b. Visitor Use and Access - East







Mt Ridley
Mt Heywood
Mt Beaumont
Clyde Hill
Bonnie Hill
Fowlie Hill
Eclipse Hill
Florabel Hill
Niblick Hill
Kau Rock
Mt Ney
Mt Burdett
Wittenoom Hills
BURDETT RD
MOUNT KAU ROCK RD
NEY RD
HOWICK RD
GREENS RD
WITTENOOM RD
SCADDAN RD
BACKMANS RD
SAVAGES RD
LANES RD
COOLINUP RD
MEYER RD
ELD RD
KETTLES RD
RIDGELANDS RD
KARL BERG RD
PARMANGO RD
BEAUMONT RD
TWEEDALE RD
MUNTZ RD
HENKES RD
ORLEANS RD
SHAO LU RD
BEBENORIN RD
Bebenorin Hill
Boyatup Hill
CONDINGUP RD
Condingup Peak
FISHERIES RD
TYRELL RD
OVEN RD
JIMS RD
RANCHO RD
MERIVALE RD
SADDLEBACK RD
DUNN ROCK RD
Mt Hawes
Cheetup Hill
Duke Of Orleans Caravan Park
Yungarup Hill
Mt Belches
Dunns Rock
Victoria Harbour
Cheyne Pt
Membinup
Duke Of Orleans Bay
Little Wharton Beach
WHARTON RD
Whartons Beach
Hammer Head
Frenchman Peak
Mt Le Grand
Rossiter Bay
Lucky Bay
Mississippi Hill
See Inset A
ORLEANS BAY RD
DANIELS RD
ALEXANDER RD
EXCHANGE RD
TAGON RD
GREWAR RD
BARING RD
Mungliginup Hill
Ewart's Swamp
Hawes Hill
Belinup Hill
Alexanders
Alexander Hill
Alexander Bay
Kennedy's Beach
See Inset B
Pt Jedacorrudup
Barrier Anchorage
Cahills Hut (Fishermans Hut)
Cape Arid
Arid Bay
Mt Arid
Mt Arid Walk Trail
Thomas Fishery
Arid Strait
Middle Island
See Inset C
North Twin Peak Is
South Twin Peak Is
Archipelago of the Recherche
Mondrain Is
Draper Is
Cooper Is
Salisbury Is
Round Is
Stanley Is
Mt Buraminya
Namerlonia Rock
Juranda Rockhole
BALLADONIA RD
Kangawarie Rockhole
Pine Hill
Pontoon Rocks
Mt Esmond
Mt Dean
Brook Peak
Wolgrah Hill
Russell Range
Junana Rock
Mount Ragged Walk Trail
Modyununna Gnamma Hole
Tower Peak
Mt Ragged
Mt Simmons
Mount Ragged
Scott Rock
Baelmayalina Gnamma Hole
Gora Hill
GORA RD
Mica Hill
The Pups
The Diamond Hill
Sheoaks Hill
Price Hill
Hamish Hill
Mt Baring
Mt Millard
Tookiejenna Rock
Carnicup Hill
PASLEY RD
POISON CREEK RD
Poison Ck
Poison Creek
Sandy Bight
Seal Creek
Jorndee Creek
Marlbemup Hill
Mt Pasley
Cape Pasley
BELLINGER TRACK
Bellinger Is
Ark Point
Wylie Scarp TRACK
TELEGRAPH
Bilbunya Dunes
Point Culver
To Point Culver 3km
Wattle Camp
Great Australian Bight
Israelite Hill
Point Lorenzen
Israelite Bay
Lake Daringdella
Point Dempster
6 Mile Is
MALCOLM PT RD
Nuytsland Enclave
Point Malcolm Beach
Point Malcolm
Spindle Is
Daw Is
SOUTHERN OCEAN

Legend

- Management Planning boundary
- Planning area
- 2WD sealed road
- 2WD unsealed road
- 4WD unsealed track
- DPaW 2WD sealed road
- DPaW 2WD unsealed road*
- DPaW 4WD unsealed track*
- Walk trail
- Proposed walk trail
- Beaches with 4WD access*

** May be subject to temporary closures*

Recreation site hierarchy (as proposed)

- High camping
- Medium camping
- Low camping
- High day use
- Medium day use
- Low day use

0 5 10 15 20 25km

Scale

N