



Parks and reserves of Yanchep and Neerabup

management plan 76

2012



Department of
Environment and Conservation



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Commission
WESTERN AUSTRALIA

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Front cover images

Main – Stalactites at Yanchep National Park
Photo – Peter Nicholas

Top left – Wangi-mia

Top right – Koala (*Phascolarctos cinereus*)

Header photo – Cave detail, Yanchep National Park.
Photos – DEC

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- representatives of the Western Australian Speleological Group and the Australian Speleological Federation who provided advice during preparation of the draft plan
- all individuals and organisations who prepared submissions on the draft management plan.



Yanchep rose. Photo – DEC

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Introduction and management context

1. Overview

This management plan, prepared by the Department of Environment and Conservation (DEC, or the department) on behalf of the Conservation Commission of Western Australia (the Conservation Commission), covers Yanchep and Neerabup national parks, Neerabup Nature Reserve and any areas added to these reserves over the life of this management plan (see Map 2).

The area provides an array of nature-based recreation, cultural and tourism opportunities enjoyed by the local community and by visitors from further afield. Yanchep National Park is one of WA's most popular parks, with around 276,000 visitors in 2010–11. It is particularly recognised for its caves, wetlands and remnant vegetation, including tuart and banksia woodlands, which provide important habitat for a range of native fauna, including threatened species.

Significant management pressures on the values of the area include drying climate conditions and declining groundwater levels, inappropriate fire regimes, environmental weeds and feral animals.

The effects of an increasingly urbanised landscape, persistent declines in rainfall and ongoing groundwater abstraction pose considerable pressure on the ecology of the planning area. Management actions are therefore additionally aimed at assessing and minimising the effects of continuing declines in rainfall and groundwater levels on tuart and banksia woodlands, freshwater wetland systems (such as Loch McNess), and groundwater dependent ecosystems within Yanchep National Park and Neerabup Nature Reserve. See Department of Water (www.water.wa.gov.au/Understanding+water/Groundwater/Gnangara+Mound/default.aspx) for further information on the Gnangara groundwater system.

In addition, the development of urban infrastructure surrounding the planning area has led to incremental habitat fragmentation. Other pressures associated with urbanisation include feral animals, environmental weeds, unauthorised access and the risk of bushfire. Population growth in the area therefore needs to be linked with opportunities for community education and stewardship.

2. Regional context

The management plan area (planning area) is in the north-west of the Perth metropolitan area, within the local government area of the City of Wanneroo. It comprises relatively large remnants of bushland, which are highly valued within the increasingly urban landscape of the Perth northern suburbs.

The reserves of the planning area provide the local community with opportunities for nature-based recreation and tourism. The combination of uncommon features such as caves, opportunities to learn about Noongar culture, historic buildings and urban bushland add to the diversity of recreational opportunities available in the broader region. Yanchep National Park, in particular, is a significant drawcard for interstate and international visitors as well as locals. Other regional recreational opportunities include restaurants, wineries, a botanic garden, golf courses, regional parks and the coast.

Map 1 shows the planning area in relation to other department-managed conservation reserves in the vicinity and sites of regionally significant bushland identified through *Bush Forever* (Government of Western Australia 2000). Yanchep National Park and proposed additions form the majority of *Bush Forever* sites 288 and 381, and Neerabup National Park and Neerabup Nature Reserve comprise most of *Bush Forever* site 384.

Implementation of the across-government initiative known as the *Gnangara Sustainability Strategy*¹ will strengthen ecological linkages between the planning area and other bushland remnants in the region. This strategy includes a range of recommendations aimed at more effective land and water management in the context of persistent significant declines in rainfall and groundwater levels. The *Gnangara Groundwater Areas Allocation Plan* (DoW 2009) aims to optimise water availability by setting limits and rules for water abstraction from the Gnangara Mound.

East of the planning area, the land use is predominantly State forest (mainly pine plantation) and rural or semi-rural. Along the coast to the west of the planning area, land use is dominated by urban development. The north-west sector of the metropolitan area has recorded consistent population growth, and projections indicate continued growth to at least 2031 (WAPC 2005).

Major industries in the region include construction, manufacturing, horticulture and retail trade. A small industrial area to the east of Neerabup National Park and Neerabup Nature Reserve provides for a wide range of industrial activities.

3. Management plan area and tenure

Management plan area

The management plan area (shown on Map 2) includes three existing conservation reserves, and the proposed conservation reserve additions described in *Tenure* (see below). The three existing class A conservation reserves are Yanchep National Park (2,877 hectares), Neerabup National Park (937 hectares) and Neerabup Nature Reserve (132 hectares). All are vested in the Conservation Commission. Proposed additions to the planning area also include lands that are currently vested in the Conservation Commission (see Map 2). Other proposed conservation reserve additions for the planning area will be covered by this management plan once vested in the Conservation Commission.

Tenure

Proposed additions or excisions to Yanchep and Neerabup national parks are shown on Map 2 and described below. Further opportunities to add areas of high conservation value to the existing reserves will be considered as they arise over the life of the plan. For example, opportunities may arise to purchase adjacent freehold land of conservation value², provide protection for ecological linkages, or incorporate redundant road reserves of conservation value into the existing reserves.

Areas added to the existing reserves over the life of the plan will be managed in accordance with this plan.

Additions to Yanchep National Park

There have been long-standing recommendations for part of State Forest 65, referred to as 'Ridges' for the purposes of this plan, to be added to Yanchep National Park (Department of Conservation and Environment 1983; Department of Conservation and Land Management 1989; Conservation Commission of Western Australia 2004).

The Ridges area contains significant conservation values including:

- species and communities restricted to limestone ridges (including threatened species and communities)
- species and communities that are not represented or not well represented within the conservation reserve system

¹ The *Gnangara Sustainability Strategy – draft for public comment* was released in July 2009 (Government of Western Australia 2009) – the final document is pending. (www.water.wa.gov.au/sites/gss/gss.html)

² For example, freehold land near the south-east boundary of Yanchep National Park, which has caves on it and may support subterranean fauna of conservation significance.

- occurrence of jarrah near the northern limits of its range (a small area of jarrah woodland occurs in Yanchep National Park)
- important ecological value (Brown *et al.* 2009)
- a seasonal wetland.

Mining leases M70/140 and M70/142 occur within the Ridges area and have been excluded from the proposed addition to Yanchep National Park at this stage. However, because the lease areas contain some of the best remaining examples of threatened limestone vegetation, it is recommended that they should be included in the national park if mining does not proceed. Other mining and petroleum tenements also apply to the Ridges area. Where there are competing land uses, proposals for conservation reserve creation may be referred to the state government for a final decision.

Other possible future additions to Yanchep National Park include several small parcels of freehold land that lie between the existing park boundary and the proposed freeway corridor, which are surplus to freeway requirements.

Potential excisions from Yanchep National Park

The proposed alignment for extending the Mitchell Freeway intersects Yanchep National Park. Government may approve excision of this land from the park for the freeway extension during the life of this plan. The proposed freeway alignment will isolate about 52 hectares (see Map 2) from the rest of the park. The area has significant conservation values.

Additions to Neerabup National Park

Crown reserves 13713, 25252 and 25253 and some parcels of freehold land are proposed to be added to Neerabup National Park to compensate for land that has been excised for the existing Mitchell Freeway and railway extension. Other parcels of freehold land are proposed to be added to Neerabup National Park as a result of a number of Metropolitan Region Scheme amendments. Some of these areas are currently being managed by the department on behalf of the Western Australian Planning Commission under section 16 of the CALM Act. Crown reserve 25252 will require resolution of historical site contamination issues before it can be incorporated into the national park.

Hall Road, contained within unallocated Crown land intersecting the park, is no longer required for road purposes and therefore about 1.65 hectares is proposed to be added to the park.

Excisions from Neerabup National Park

A part of Hester Avenue that intersects Neerabup National Park deviates from the dedicated road reserve. About 0.54 hectares of land on which that section of road has been constructed is proposed to be excised from the park.

This and three other areas to be excised from Neerabup National Park are shown on Map 2. The two areas on the western boundary near the northern end of the park are to be excised because they are no longer viable conservation reserves given their very small size. The larger triangular area near the southern end of the park is to be excised as it was rezoned to 'Urban Deferred' by Metropolitan Region Scheme amendment. The remaining portion of Neerabup National Park on the western side of the transportation corridor will remain within the conservation reserve system and will be managed in association with *Bush Forever* sites 323 and 322 (see Map 1 for location of these *Bush Forever* sites).

³ The area that would be isolated provides habitat for threatened species and is a Quindalup-Spearwood dune transition area of which there is little in the conservation reserve system.

⁴ Lot 14 on Diagram 41749 and Lot 9022 on Diagram 38409.

⁵ Some of which are currently managed by the department under section 16 of the CALM Act (Lot 12 on Plan 9605, Lots 801 and 802 on Diagram 64058, Lot 2 on Diagram 32306, Lot 66 on Diagram 96541) and others that are currently private freehold (i.e. Lots 11 and 12 on Plan 9605, Lot 1 on Diagram 32306).

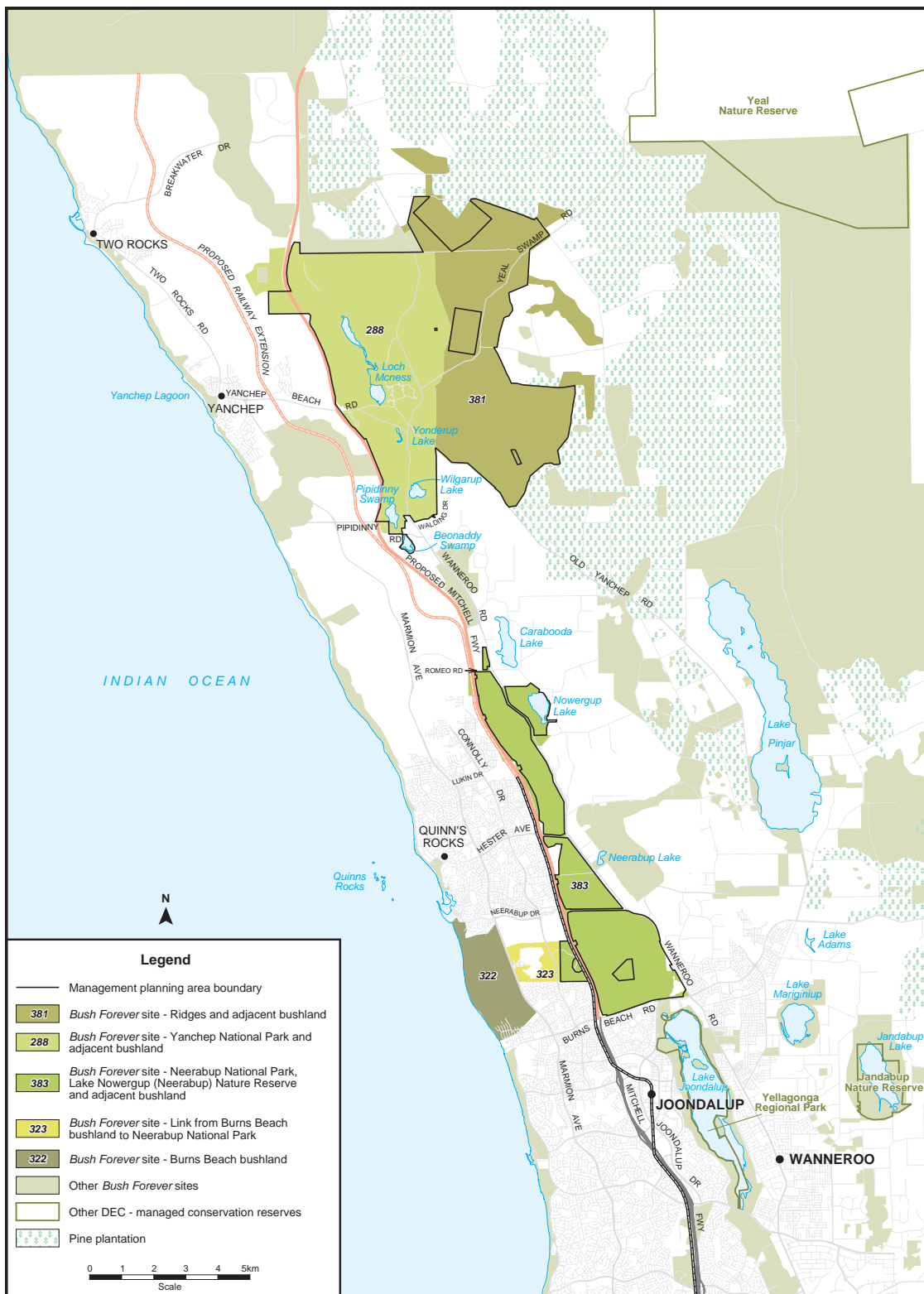
Desired outcome

The planning area is protected by the most appropriate tenure, class and purpose.

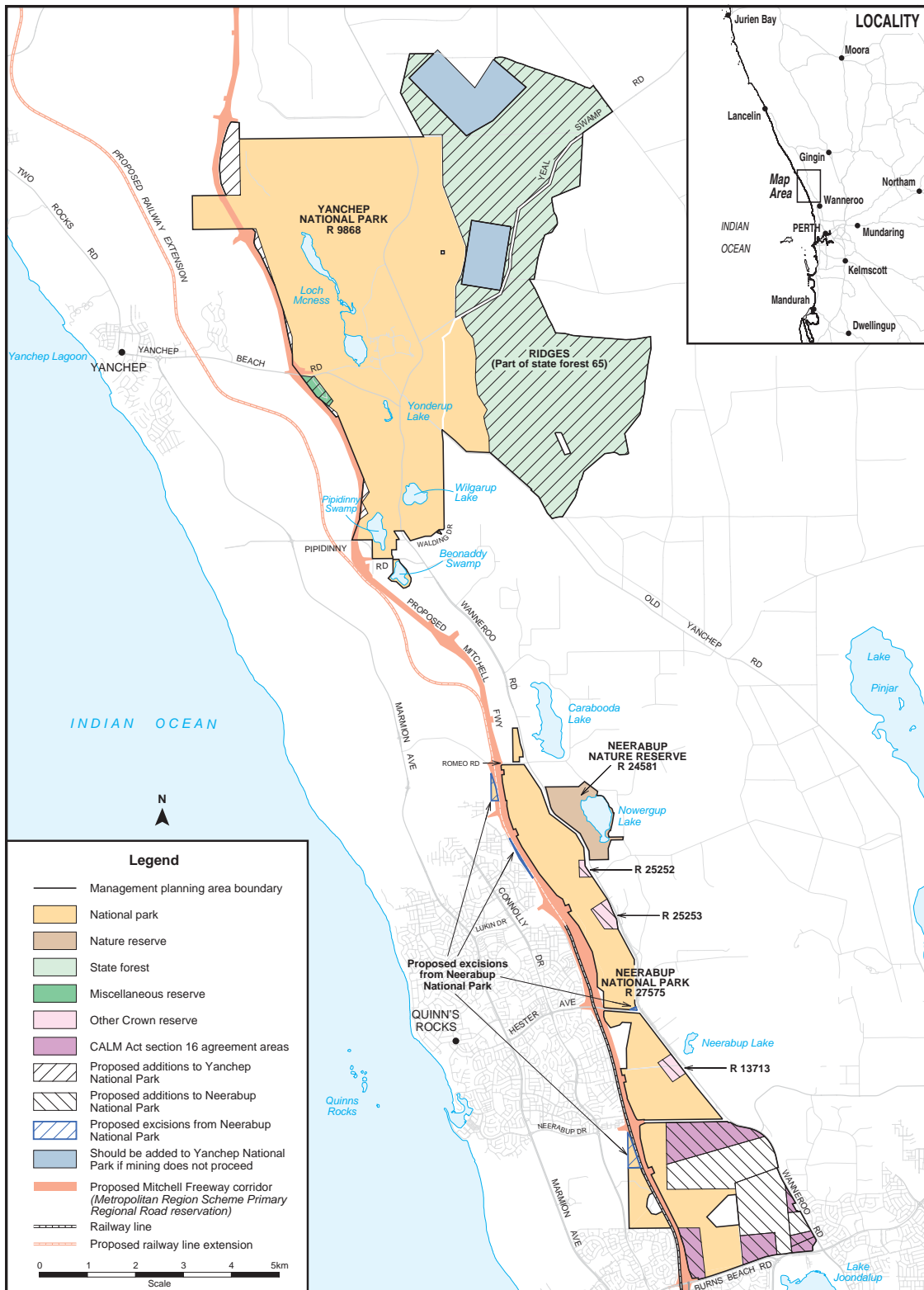
Management actions

1. Progress and implement longstanding recommendations for additions to the conservation reserve system as described above.
2. Identify adjacent areas of regionally significant bushland that will also strengthen ecological linkages for acquisition and reservation under the CALM Act.

Map 1 The planning area and *Bush Forever* sites



Map 2 Tenure of the management planning area



4. Key values and threats

Natural values

- Unique cave and other karst features of biological, scientific and cultural importance.
- Freshwater wetland systems (including Loch McNess, which has been identified as a wetland of national importance⁶) support a diversity of native flora, fauna and communities (including resident and migratory birds) that are dependent on the wetlands.
- Diverse and relatively undisturbed remnant vegetation, occurring on the largely cleared Swan Coastal Plain, contributing to a relatively large and contiguous wildlife corridor.
- A diversity of native fauna and habitats including habitat important for the protection of species and ecological communities of conservation significance (threatened species, for example).
- Unique and threatened fauna including relictual endemic species.



Endangered Carnaby's cockatoo. Photo – DEC



Purple swamphen (*Porphyrio porphyrio*).
Photo – Nicole Pragnell

Cultural and recreational values

- Several Aboriginal heritage sites of mythological, ceremonial or other significance, including a migratory route historically used by Aboriginal groups.
- Clusters of historic buildings that are now rare and depict a popular recreational setting of the 1930s.
- Attractive outdoor settings that offer opportunities for a range of recreation and tourism activities.
- An array of natural and cultural heritage values within easy access of populous urban centres, which provides valuable opportunities for environmental education.
- Opportunities to establish tourism businesses based on the unique natural and cultural values and the provision of high quality facilities.

Threats

- Drying climate conditions.
- Abstraction of water and surrounding land uses impacting on availability and quality of groundwater in the planning area.
- Inappropriate fire regimes.
- Introduction of diseases, environmental weeds and feral animals.

⁶ Included in the *Directory of Important Wetlands in Australia* (Environment Australia 2001) because it meets three of the six criteria for national importance.



Vegetation at Neerabup National Park showing the effects of drought and other environmental stresses. Photos – DEC

5. Legislative and policy framework

National parks, conservation parks and nature reserves in Western Australia are vested in the Conservation Commission and managed by the department under the *Conservation and Land Management Act 1984* (CALM Act). This management plan has been prepared by the department on behalf of the Conservation Commission in accordance with Part 5, Division 1 of the CALM Act.

The department is required to comply with legislation, departmental and government policy and national or international agreements in its day-to-day management of the planning area. Legislation administered by DEC is listed on the State Law Publisher's internet site (www.slp.wa.gov.au/legislation/agency.nsf/dec_menu.htmlx). Departmental policies are available for viewing at the department's internet site (www.dec.wa.gov.au). Strategies within this management plan will focus on additional management guidance that specifically applies to the planning area.

6. Management directions and implementation

Vision

Yanchep and Neerabup parks and reserves are important biodiversity assets of the Perth metropolitan area on the Swan Coastal Plain, where natural values such as tuart and banksia woodlands; wetlands; caves and karst features; and threatened flora, fauna and ecological communities are conserved.

This historic landscape, known as 'Perth's natural and cultural meeting place', will be recognised for its great aesthetic appeal and a recreational legacy that is unique among national parks of today, and for its special importance to Noongar Aboriginal people. A unique collection of 1930s buildings and activities such as viewing koalas and visiting caves will remind visitors of our early 20th century heritage, which was a driving force in establishing this area as a healthy recreational oasis within the Perth metropolitan area.

People will gain enjoyment from the natural, cultural and social environment of the reserves. Visitors will be provided with a range of nature-based recreation, education and interpretation opportunities. The reserves will be managed in partnership with the community through volunteers and clubs using the area, and this will boost conservation efforts and resources available for the protection of the environment.

This vision reflects the key values of the area and the importance of sustainably managing those values, and was developed with community input.

Performance assessment and monitoring

It is not feasible to monitor and measure all aspects of management given resource limitations and technical impediments. Key performance indicators included throughout this plan highlight key aspects of management for monitoring and assessment purposes. The Conservation Commission will measure the success of this plan in accordance with section 19(1)(g)(iii) of the CALM Act by using selected key performance indicators and other mechanisms as appropriate.

Providing suitable evidence of implementation of this management plan is essential. If necessary, information may be obtained from work carried out by the department to cover gaps in baseline data. The following are examples of evidence that may be used for assessment purposes:

- photographs, mapping or other imagery which shows spatial and temporal changes
- checklists
- on-ground surveys
- incident investigation reports or records
- other written documents or forms.

Desired outcome

The department has developed systems and processes to provide evidence of plan implementation.

Management action

1. Define baseline position as described for key performance indicators in this plan.
2. Establish and maintain a portfolio of evidence to prove this management plan has been successfully implemented.

Administration and implementation

For administrative purposes, the department is structured into nine regional centres that are further divided into districts. The planning area is in the Swan Coastal District of the Swan Region. The day-to-day implementation of the management plan is the responsibility of the Swan Coastal District Manager and the Park Manager of Yanchep National Park.

Term of the plan

This management plan will guide management of the Conservation Commission vested areas within the planning area for a period of 10 years from the date of gazettal or until it is replaced with a new plan. During this time, amendments to the final management plan are allowed under section 61 of the CALM Act.



Neerabup National Park.
Photo – DEC



Yanchep National Park, park entry.
Photo – DEC

Managing the natural environment

7. Physical environment

Geomorphology and soils

The planning area lies predominantly within the Spearwood and Quindalup dune systems. Wetlands in the planning area occur where the watertable and inter-dunal depressions intersect.

Caves

An extensive belt of karst⁷ characterised by hundreds of caves, runs in a north-west to south-east direction through Yanchep National Park, and beyond into Carabooda and Wanneroo. This belt of karst represents the line along which groundwater from the Gngangara Mound makes initial contact with the base of the Tamala limestone. As the groundwater becomes charged with calcium during its westward movement the cave density decreases steadily, and consequently few caves have been documented from a large western

strip of the park (Lex Bastian pers. comm. 9 May 2010). There are 580 caves recorded in the Tamala limestone within and adjacent to Yanchep National Park (L. Bastian pers. comm. 9 May 2010). Further survey and mapping may reveal more caves. The caves at Yanchep are unique in that most other caves in aeolian calcarenite are fed from swamplands rather than groundwater (Finlayson and Hamilton-Smith 2003).

Caves within Yanchep National Park have been subject to vandalism, accidental damage and littering, which impacts on the aesthetic values and potentially introduces pollutants into the cave system. The Quaternary limestone in which the caves occur is not well cemented, and chamber and passage collapses are a common characteristic (Finlayson and Hamilton-Smith 2003). Load-bearing capacity varies in dynamic karst landscapes depending on the degree and nature of cementation. Therefore, specialised geotechnical assessments are required before undertaking construction or using heavy machinery in the vicinity of caves.



Crystal Cave at Yanchep National Park.
Photo – DEC

⁷ Term used to describe landscapes that are commonly characterised by closed depressions, subterranean drainage and caves. Karst landscapes are driven by the hydrological cycle and formed principally by solution of the rock, most commonly limestone (as is the case in the planning area).

Acid sulfate soils

Peaty wetland soils of the planning area are prone to the creation of acid sulfate soils, which can cause acidification of wetlands on disturbance or exposure to air. The distribution of acid-producing sediments and their potential to pollute the groundwater resource at high-risk sites need detailed investigation (McHugh and Bourke 2008). The coastal limestone soils of wetlands within the planning area have a naturally high alkalinity which buffer acidity to some extent, but the buffering capacity is not well understood.

Desired outcome

The integrity of the geomorphological processes and values is maintained.

Objective

To protect the caves from damage due to unauthorised human activities.

Management actions

1. Undertake, and maintain a record of, specialised assessments (for example, geotechnical) before any construction to prevent damage to caves and to minimise safety hazards.
2. Maintain detailed mapping and inventory⁸ of caves in the planning area to facilitate conservation, assist with performance assessment, and minimise safety hazards.
3. Manage access to caves, including use of appropriately designed gates (for example, to take account of native fauna movements), to deter unauthorised access and protect cave values as necessary.
4. Provide opportunities for speleological and karst conservation interest group involvement in karst conservation and management.
5. Prevent disturbance of areas that have the potential for acid sulfate soil development wherever possible and, where disturbance is unavoidable, identify and employ risk mitigation measures as necessary to limit environmental impacts.

Key performance indicator

Performance measure	Target	Reporting requirements
The extent of physical damage to caves that is directly attributable to unauthorised human activity	No new irreversible damage from baseline state to be defined during 2012	Every five years

⁸ This must include information which would enable changes in key values to be evaluated for performance assessment purposes (for example, photographic series, condition reports, vandalism incident reports).

Hydrogeology

The planning area lies over the shallower margins of the largest groundwater mound within the superficial aquifer—the Gnangara Mound. A detailed description of the aquifers underlying the planning area can be found in *Hydrogeology and Groundwater Resources of the Perth Region, WA* (Davidson 1995). Aspects of the planning area’s wetland hydrology (including subterranean cave wetlands) are discussed in *Biodiversity Values and Threatening Processes of the Gnangara Groundwater System* (eds. Wilson and Valentine 2009). The Department of Water (DoW) has also recently conducted a shallow groundwater systems investigation involving some of the wetlands in the planning area, which has helped to improve understanding of changes to the local hydrogeology (DoW 2011).

There are several groundwater-dependent ecosystems⁹ in the planning area including wetland and cave ecosystems. All of the wetlands are to some extent hydraulically connected to the Gnangara Mound and have been affected by declining groundwater levels (see *Altered hydrological regimes* in Section 9 of this plan).



The effects of the declining groundwater levels in the cave systems at Yanchep National Park.
Photo – DEC and Peter Nicholas/DEC

Desired outcome

The department works with agencies that have water resource and land-use planning responsibilities to conserve and protect the quality and quantity of water supporting groundwater dependent ecosystems.

Management actions

1. Implement the strategies described in the *Altered hydrological regimes* section to minimise the impacts of declining groundwater levels on planning area ecosystems.
2. Use the best available measures to avoid contamination or overuse of water (for example, non-leaching toilets and low water usage appliances or fittings).

8. Biological environment

Native plants and plant communities

Vegetation and floristics of the planning area are described in Beard (1979), Hedde *et al.* (1980), Keighery *et al.* (1996), Trudgen (1996) Government of Western Australia (2000), and Keighery (2003).

More recently, the vegetation of groundwater dependent ecosystems within the planning area has been studied as part of the Gnangara Mound monitoring program (www.water.wa.gov.au/PublicationStore/first/100974.pdf). This monitoring has revealed signs of long-term decline in the vigour and distribution of some wetland and terrestrial (for example, phreatophytic banksia) species in response to declining

⁹ Groundwater-dependent ecosystems are a complex community of organisms where groundwater is a key element required for consumptive use, biophysical processes or as habitat (Sinclair Knight Merz 2001).

groundwater levels (DoW 2008). Declining groundwater levels and other threatening processes impacting on plant communities are discussed in Section 9.

The additions of land to the conservation reserve system described in this plan include areas that support threatened ecological communities and vegetation types that are not well represented in the existing planning area reserves or in the conservation reserve system in general.

Flora species of conservation significance recorded in the planning area include:

- three threatened flora species specially protected under the *Wildlife Conservation Act 1950* (Wildlife Conservation Act)—Cape tinsel lily (*Calectasia cyanea*), the grand spider orchid (*Caladenia huegelii*) and the Wabbling Hill or Yanchep mallee (*Eucalyptus argutifolia*)¹⁰
- threatened flora communities (see *Threatened ecological communities* in this section of the plan)
- one priority 1 and five priority 2 flora/fungi species. These are species of which there are few populations, and are under consideration for declaration as rare flora, but require more survey to accurately determine their status. Several priority 3, 4 and 5 species are also recorded from the planning area
- four lichen species (*Lecania sylvestris*; *L. turicensis*; *Placynthium nigrum*; and *Rinodina bischoffii*) that may be endemic to Yanchep National Park. *P. nigrum* is a priority 3 species and the other three are priority 2
- three species disjunct from their other populations—*Leucopogon striatus*, slender myoporum (*Myoporum caprarioides*) (Hearn *et al.* 2003) and Chinese brake (*Pteris vittata*) (Government of Western Australia 2000)
- five relictual¹¹ plant species—black kangaroo paw (*Macropidia fuliginosa*), *Quinetia urvillei*, *Leptoceras menziesii*, Christmas tree (*Nuytsia floribunda*) and *Pteris vittata*
- range end species—the planning area includes a number of plant species that are at or near the southern end of their known range, including *Baekkea robusta*, *Jacksonia calcicola*, *Persoonia comata*, tangling melaleuca (*Melaleuca cardiophylla*) (Government of Western Australia 2000), *Conostylis pauciflora* subsp. *euryrhipis*, and Yanchep rose (*Diplolaena angustifolia*) (Gibson *et al.* 1994)
- tuart—extensive stands of tuart (*Eucalyptus gomphocephala*) are found in Yanchep and Neerabup national parks. The *Tuart Atlas* (Government of Western Australia 2003) outlines the importance of the parks for tuart forest conservation in the context of the Swan Coastal Plain where remaining tuart stands are in decline. Research findings of the Tuart Response Group indicate that there may be a range of complex interrelated factors contributing to tuart decline (for example, climate variability, hydrological factors, altered fire regimes, altered nutrient cycles, increased understorey competition, insect attack and fungal pathogens). Some tuart tree root mats in the caves of Yanchep National Park provide a food source and habitat for threatened aquatic invertebrates. Tuart trees associated with threatened ecological communities, particularly those that support or with the potential to support aquatic root mat communities, and trees within the *Melaleuca huegelii*–*Melaleuca acerosa* shrublands on limestone ridges are of particular importance for monitoring and protection.

Desired outcome

Native plants and plant communities are conserved.

Objective

To maintain flora of conservation significance (for example, threatened, priority 1 or 2, endemic, disjunct and relictual species).

¹⁰ The Yanchep mallee is recorded from proposed additions to Yanchep National Park and proposed additions to Neerabup National Park.

¹¹ Species considered to be relictual because they are within a taxonomic group that has only one species, or because they are primitive within the taxonomic group.

Management actions

1. Maintain a spatial inventory of plant species and communities of conservation significance and implement strategies to minimise the impacts of threatening activities and processes on these (for example, drying climate conditions, introduced plants and animals, inappropriate fire regimes, clearing for urban and other development).
2. Implement fire management plans that maintain ecosystem structure and function.
3. Implement monitoring and recovery actions for threatened species and communities (in accordance with recovery plans where they exist¹²).

Key performance indicator

Performance measure	Target	Reporting requirements
The persistence and status of threatened, priority or otherwise significant flora species or communities	Continued persistence and no decline in the conservation status from baseline to be defined in 2012	Every five years, or as per recovery plans if applicable

Native animals and habitats

The planning area provides diverse Swan Coastal Plain habitats for a wide variety of native fauna in the region. This is particularly valuable given the extensive loss or degradation of faunal habitat that occurs as a result of urban and other development, and the interplay of a range of threatening processes. Addressing the factors contributing to habitat loss or degradation is a critical aspect of conserving faunal diversity.

Species of conservation significance include:

- four species that are rare or likely to become extinct and that have been declared as specially protected under the Wildlife Conservation Act—the graceful sun moth (*Synemon gratiosa*), the chuditch (*Dasyurus geoffroii*), Carnaby's cockatoo (*Calyptorhynchus latirostris*), and the Crystal Cave crangonyctoid (*Hurleya* sp. WAM 642-97). All except the latter are also protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- the fork-tailed swift (*Apus pacificus*), red-necked stint (*Calidris ruficollis*), and rainbow bee-eater (*Merops ornatus*)—migratory birds listed under an international agreement and therefore declared under the Wildlife Conservation Act and protected under the EPBC Act
- other fauna specially protected under the Wildlife Conservation Act—the carpet python (*Morelia spilota imbricata*)
- endemic and relictual aquatic invertebrates including Gondwanan relicts.

Carnaby's cockatoo usually breeds in the northern Wheatbelt areas and then moves west to forage in at major food sources on the northern Swan Coastal Plain during the non-breeding season (Johnstone and Kirkby c. 2010). However, the habitat used for breeding by Carnaby's cockatoo has shifted considerably southwards and westwards in recent times. Tuart forests of the Swan Coastal Plain appear now to form part of its breeding habitat and this species has been recorded breeding at Yanchep National Park (Johnstone *et al.* 2003, Johnstone and Kirkby c. 2010). On the Swan Coastal Plain, most nests are in tuart (Johnstone and Kirkby c. 2010).

¹² Currently there are recovery plans for *Calectasia cyanea* (DEC 2009a) and *Caladenia huegelii* (DEC 2009b).



Carnaby's cockatoo.
Photo – DEC



Yanchep National Park is home to a large kangaroo population. Photo – DEC

Mammalian surveys have been conducted in Yanchep National Park. Other parts of the planning area have not been the subject of detailed surveys (Burbidge 2003). Some synthesis of previous work and additional surveys recently undertaken as part of the *Gnangara Sustainability Strategy is detailed in Biodiversity Values and Threatening Processes of the Gnangara Groundwater System* (eds. Wilson and Valentine 2009).

Mammals recorded from the planning area include the western grey kangaroo (*Macropus fuliginosus*) and the western brush wallaby (*Macropus irma*), three species of possum, six species of bat, three carnivorous marsupials, two species of native rat and one native mouse (Burbidge 2003). Other native fauna recorded from the planning area includes 14 bird species, 44 reptile species¹³, eight frog species, and two fish species (Burbidge 2003). There has not been a comprehensive survey of the terrestrial invertebrate fauna of the planning area, and readily available knowledge of terrestrial invertebrates in the region is very limited (Durrant 2009).

The aquatic invertebrate fauna of groundwater-dependent ecosystems (including cave streams and tuart root mat communities) has been regularly studied through DoW's Gnangara Mound environmental monitoring program (www.water.wa.gov.au/PublicationStore/first/100974.pdf). The findings of this monitoring and other work on aquatic invertebrates are described by Sommer *et al.* (2008). Work by Tang and Knott (2008a, 2008b) involving Yanchep cave invertebrates has identified a number of aquatic species new to science, including two species (*Eucyclops* n. sp. and *Ameiridae* n. gen. & n. sp.) that may qualify for listing under the EPBC Act and special protection under the Wildlife Conservation Act. Aquatic invertebrates of the aquatic root mat community are already listed under the EPBC Act, and the Crystal Cave crangonyctoid are also specially protected under the Wildlife Conservation Act (English *et al.* 2003 describe these threatened invertebrates/communities and recovery actions). In addition to the Yanchep Caves, Loch McNess, Lake Yonderup, and Lake Nowergup have been identified as being significant for aquatic invertebrate endemism and/or richness (Wilson and Valentine 2009). The terrestrial subterranean invertebrate fauna of the Yanchep caves has not been as well studied as the aquatic invertebrates.

Desired outcome

Native fauna and faunal habitat values are conserved.

¹³ Including three species which may be endemic to the Swan Coastal Plan: *Delma concinna* subsp. *concinna*; *Hemiergis quadrilineata* and *Neelaps calonotos*.

Management actions

1. Maintain fauna habitats, including artificially supplying water where necessary for aquatic subterranean fauna within Crystal Cave and Car Park caves, in an attempt to sustain the diversity of subterranean fauna (as known in 2010), for as long as it is proving effective and feasible.
2. Prepare annual reports on the status and quality of important habitat (for example, cave stream water quality and quantity, tuart tree root mat condition) for threatened aquatic subterranean fauna.
3. Implement strategies to minimise the impacts of threatening processes (for example, drying climate conditions and altered hydrological regimes, introduced plants and animals, inappropriate fire regimes, clearing for urban and other development) on native fauna.
4. Implement monitoring and recovery actions for threatened species and communities (in accordance with recovery plans where they exist¹⁴), in liaison with other agencies such as DoW.
5. Promote maintenance or establishment of ecological linkages that improve habitat connectivity between the planning area and other bushland remnants.
6. Document and monitor nests and breeding behaviour at any known or potential Carnaby's cockatoo breeding sites within the planning area where this can be done without causing significant disturbance.

Threatened ecological communities

The department maintains a database of threatened ecological communities that have been endorsed by the Minister for Environment. Three communities from the planning area are on that database: the aquatic root mat community of caves of the Swan Coastal Plain; woodlands over sedgeland in Holocene dune swales of the Swan Coastal Plain (SCP19b); and, *Melaleuca huegelii*–*Melaleuca systema* shrublands on limestone ridges (SCP26a).¹⁵ The department also maintains a database of priority ecological communities. Three communities from the planning area are on that database because more research is required to confirm their conservation status and whether there is a need for declaration as a threatened ecological community.

The threatened ecological communities and recovery actions for them are described in recovery plans by English *et al.* (2002), English *et al.* (2003) and Luu and English (2005). A recovery team has been identified for each community.

A cave water supplementation system is in place in an attempt to retain the root mat community *in situ*. Other measures to protect the tuart trees supporting the community (for example, from destructive fires, disease) are also required.

Securing formal conservation tenure (for example, national park) for the Ridges area and Reserve 25253 will improve protection of *Melaleuca huegelii*–*Melaleuca systema* shrublands on limestone ridges.

Desired outcome

Threatened ecological communities are conserved and their vulnerability to threatening processes is decreased.

Objective

To maintain the occurrences and species diversity of all currently known threatened and priority ecological communities.

¹⁴ Recovery plans or interim recovery plans currently exist for *Dasyurus geoffroii*, (Orell and Morris 1994), *Calyptorhynchus latirostris* (Cale 2003) and the *Crystal Cave crangonyctoid* (English *et al.* 2003).

¹⁵ The first two are currently categorised as critically endangered and the latter as endangered.

Management actions

1. Record annual changes in the extent, condition and key threats of threatened and priority ecological communities.
2. Implement monitoring and recovery actions for threatened and priority communities and liaise with other agencies such as DoW regarding water monitoring as required.
3. Liaise with government agencies with responsibilities for managing water resources and land-use planning to ensure ongoing attention to water availability for groundwater dependent ecosystems.
4. Maintain water supplementation to support the aquatic root mat community of the Swan Coastal Plain and take action to protect tuart trees supporting the community, as guided by the recovery team.
5. Install exclusion devices (for example, fences) if required to protect threatened flora communities from grazing activity or to discourage unauthorised access.
6. Ensure recovery teams are consulted regarding proposed operations with the potential to have an adverse impact on threatened ecological communities.
7. Continue efforts to secure conservation purpose and tenure for the Ridges area and Reserve 25253.

Key performance indicator

Performance measure	Target	Reporting requirements
The persistence and status of threatened ecological communities	Continued persistence and no decline in the conservation status from baseline to be defined in 2012	Every five years, or as per recovery plan if applicable

9. Protection of the natural environment

Altered hydrological regimes

Groundwater levels of the Gnangara Mound have fallen significantly since the 1970s and at a much faster rate since the 1990s, with the principal cause of decline being attributed to drying climate conditions (Government of Western Australia 2009). This aquifer supports several groundwater dependent ecosystems within the planning area including wetland and cave ecosystems, as well as terrestrial vegetation with varying degrees of groundwater dependency (Froend *et al.* 2004; DoW 2008).

DoW is responsible for managing the water resources of the Gnangara Mound and for monitoring the ecological condition of associated groundwater dependent ecosystems. A monitoring program being implemented by DoW includes monitoring of wetland vegetation, macroinvertebrates and water quality at all wetlands within the planning area except for Beonaddy Swamp and the seasonal wetland within the Ridges area. In addition, DoW monitors invertebrates and water quality in several caves in Yanchep National Park. Monitoring of the planning area wetlands has revealed a significant decline in water level at all the monitored sites and a range of associated issues including:

- death or decline in the health of wetland vegetation
- drying of organic sediments and an increase in associated wetland acidification and fire risks
- decline in aquatic invertebrate species richness
- terrestrialisation—replacement of wetland species with those more typical of uplands
- increased occurrence of exotic plant species such as the introduced bulrush *Typha orientalis*
- deterioration in water quality (for example, increases in salinity and nutrient concentrations).

Not all of these changes are evident at every wetland, and the extent to which each wetland has been affected varies. These issues and the wetland-specific monitoring results are explained in detail in the *Review of Ministerial Conditions on the Groundwater Resources of the Gnangara Mound* (DoW 2008) and/or in various ecological condition monitoring reports referred to throughout that document. Further information about Gnangara Mound monitoring is available from the DoW internet site (www.water.wa.gov.au/PublicationStore/first/95812.pdf).

During the summer of 2010/2011 more widespread impacts of drought became plainly evident with sudden death and stress affecting upland species of bushland across the Swan Coastal Plain, including some patches of the planning area.

The decline in groundwater level threatens the persistence of a range of water dependent fauna species (for example, threatened aquatic invertebrates, native fish, some frogs, long-necked turtle, waterbirds, rakali or native water rat, and quenda) (eds. Wilson and Valentine 2009). The more permanent deeper wetlands, such as Lake Yonderup, provide increasingly important fauna refuge, especially during summer. Decline in the abundance or range of several fauna species with high or very high groundwater dependence are likely. Other species less directly dependent on groundwater may also be affected if declining levels markedly affect the vegetation upon which these species rely (eds. Wilson and Valentine 2009).

Artificial water supplementation systems have been installed in a number of caves, and water levels at Lake Nowergup are artificially maintained in an attempt to sustain the ecosystem values under most immediate and significant threat from declining groundwater levels. Despite these efforts, water levels have continued to decline (DoW 2008). Artificial water maintenance of Lake Nowergup is the responsibility of DoW, and DEC is responsible for the water supplementation to the caves. The water maintenance program at Lake Nowergup has had some positive impacts on fringing vegetation (although some fringing wetland trees are still being affected) and may be preventing even more dramatic declines in macroinvertebrate family richness (DoW 2008). It is also limiting the extent of oxidation of acid sulfate soils. The most recent ecological monitoring results for the caves have shown that despite water supplementation, invertebrate abundance and diversity is low and there is no evidence of recovery in the aquatic fauna (Knott and Storey 2009). There has, however, been some improvement in the condition of the tree root mats. Artificial water maintenance and supplementation measures will be evaluated on an ongoing basis as part of an adaptive management response to continuing declines in groundwater levels.

In response to declining groundwater levels, DoW has led development of the *Gnangara Sustainability Strategy – draft for public comment* (Government of Western Australia 2009), a multi-agency project that identifies land and water management strategies that take climate trends, water supply demand and land-use impacts into account. DoW has also produced the *Gnangara Groundwater Areas Allocation Plan* (DoW 2009) that aims to optimise water availability by setting limits and conditions for water abstraction from the Gnangara Mound. Nevertheless, dry climate conditions are predicted to continue over the life of this plan, and despite implementation of these initiatives it has been predicted that under such circumstances water levels of the planning area wetlands would, at best, maintain similar water levels to the present day (Government of Western Australia 2009).¹⁶ In addition to working with DoW to address the impacts of declining groundwater levels on ecosystems within the planning area, measures to minimise the effects of other threatening processes are required to maintain ecosystem resilience and recovery potential.

Desired outcome

The department works with agencies that have water resource and land-use planning responsibilities to minimise the impacts of declining groundwater levels on groundwater dependent ecosystems.

¹⁶ These predictions are based on regional scale models and further finer scale assessment would be required to confirm impacts on individual ecosystems (Government of Western Australia 2009).

Management actions

1. Liaise with the government agencies with responsibilities for managing water resources and land-use planning as required to restore and maintain Ecological Water Requirements.¹⁷
2. Implement strategies of the *Gnangara Sustainability Strategy* for which DEC is responsible.
3. Liaise with the government agencies with responsibilities for managing water resource to adapt management strategies as required and feasible in the light of wetland and cave monitoring results or other new information.
4. Manage threatening processes to promote species resilience and resistance to groundwater decline (for example, inappropriate fire regimes, introduced plants and animals).
5. Maintain a record of evidence of the department's interaction with external parties (for example, government agencies with responsibilities for managing water resources or for land-use planning) to minimise the impacts of declining groundwater levels on groundwater dependent ecosystems.

Environmental weeds

Weed species recorded from the planning area include two Weeds of National Significance—bridal creeper (*Asparagus asparagoides*) and gorse (*Ulex europaeus*)—14 species declared under the *Agriculture and Related Resources Protection Act 1976* (ARRP Act)¹⁸, and 16 species rated in the *Swan Region Species-led Invasive Plant Prioritization Process* (DEC 2009c) as having a high impact on biodiversity (these are listed in Appendix 1).

Many non-indigenous trees were deliberately planted in Yanchep National Park during the 1930s for their ornamental values and are now also valued as part of the area's historic heritage. Non-indigenous trees have also been planted to provide a food source for Yanchep National Park's koalas. Non-indigenous trees that are not required as koala feed trees or are not of aesthetic or cultural value, and have the potential to be invasive, should be progressively replaced with indigenous species. Main Roads WA and/or the City of Wanneroo will be consulted regarding any proposed removal of large non-indigenous trees that have been planted along roads they manage.



Bridal creeper infestation.
Photo – DEC



Koala feeding on eucalypt leaves at Yanchep National Park.
Photo – DEC

Desired outcome

Minimal impacts of environmental weeds on key values.

¹⁷ The water regimes needed to sustain the ecological values of groundwater dependent ecosystems at a low level of risk. EWR may be expressed in parameters such as water quantity and quality.

¹⁸ The ARRP Act and its instruments will be replaced by the *Biosecurity and Agriculture Management Act 2007* once fully proclaimed. This may have altered management requirements for declared plants and animals.

Objective

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

1. new introductions of environmental weed species
2. expansion of existing weed species.

Management actions

1. Develop and implement a weed control plan, which:
 - a. identifies weed control priorities and maps those identified as a high priority for control (for example, Weeds of National Significance, species declared under the ARR Act and species significantly impacting on threatened species or communities or on areas otherwise of high conservation value)
 - b. includes measures to limit opportunities for the introduction and establishment of new weeds that have potential to significantly impact on key values
 - c. includes measures for monitoring, evaluating and documenting weed control effectiveness
 - d. is consistent with and complementary to regional weed management approaches.
2. Ensure hygiene management plans are prepared and implemented for developments, redevelopments or other significant disturbances (such as roadworks or facility construction).
3. Progressively remove non-indigenous trees that are not serving any specific and useful aesthetic, koala feed or cultural value purpose, and which have the potential to become environmental weeds, and replace with species indigenous to the local area as appropriate.

Key performance indicator

Performance measure	Target	Reporting requirements
The number and extent of environmental weed species identified as a high priority for control	Decrease from baseline status to be defined in 2012	Every five years

Introduced animals

A large number of introduced animals occur in the planning area and eradication or even control of all of these is not feasible. The control of introduced animals requires a planned and prioritised approach. Priorities for action includes species declared under the ARR Act (see footnote 17) and introduced animals significantly impacting on threatened species and communities, or on important habitats.

Introduced animals currently presenting the most significant threats to the values of the planning area include:

- yabbies (*Cherax destructor*), which present a threat to the Yanchep aquatic root mat community and the Crystal cave crangonyctoid (English *et al.* 2003)
- introduced fish species such as mosquito fish (*Gambusia holbrooki*) and carp (*Cyprinus carpio*), which impact on native fish species and degrade wetland habitats—populations of native freshwater fish are increasingly important within Gngangara Mound wetlands (Sommer *et al.* 2008)
- introduced stygofauna—the introduction of stygofauna from other groundwater areas could result in genetic dilution of extant cave stream populations (Knott and Storey 2004) and therefore water supplementation systems need to be designed to avoid this problem.

- foxes—fox activity in Yanchep National Park was quantified in August 2008 through a feral sand pad survey. The results showed significantly higher fox activity compared with other sites in WA which were surveyed using the same methodology (Reaveley 2009).
- cats—are particularly associated with recreation areas in Yanchep National Park
- rabbits—numbers correspond with the periodic impact of *Myxomatosis* and *Calicivirus*, which, together with fire events, has temporarily reduced populations.

Control measures for a small population of feral goats in the Ridges area appear to have been effective in eradicating these from the planning area. Control measures will be re-implemented should goats re-invade this area.

Desired outcome

Minimal impacts of introduced animals on key values.

Management actions

1. Develop and implement an introduced animal control plan, which:
 - a. identifies control priorities (for example, species declared under the ARR Act and species significantly impacting on threatened species or communities, or on areas of high conservation value)
 - b. includes measures to limit opportunities for the introduction and establishment of new feral animal populations with the potential to significantly impact on key values
 - c. includes measures for monitoring, evaluating and documenting control effectiveness
 - d. is consistent with and complementary to regional feral animal management approaches.
2. Use fencing or other exclusion control measures to protect high conservation areas (for example, threatened ecological communities) from impacts of introduced animals if necessary.
3. Continue to investigate fox and cat activity and control options in the planning area.

Diseases

Plant diseases

Known plant diseases currently requiring management in the planning area include:

- dieback (*Phytophthora cinnamomi*)—the planning area is within a zone vulnerable to the establishment and persistence of *P. cinnamomi*, and it has been recorded at several locations. *Phytophthora multivora*, a newly described species, may also present a significant potential threat to tuart and a range of other flora species present in the planning area (Scott *et al.* 2009, Burgess *et al.* 2009). *P. multivora* appears to be strongly associated with tuart decline and proliferates on calcareous soils which are often considered to be less vulnerable to *P. cinnamomi* (Scott *et al.* 2009)
- rusts—the gall rust *Uromycladium tepperianum* has affected some *Acacia* species
- *Armillaria* root rot (or honey fungus) *Armillaria luteobubalina*— occurs in Yanchep National Park, particularly areas east of Loch McNess.

Animal diseases

Known animal diseases currently presenting the most significant threat to fauna of the planning area include:

- *Chlamydia*—Yanchep National Park’s koala populations are susceptible to this disease but have been free of it for a number of years
- *Chytridiomycosis*, which is an infectious disease caused by the amphibian chytrid fungus *Batrachochytrium dendrobatidis*—while the infection has been reported in many South West frog species, four species of frogs occurring in the planning area¹⁹ are infected more frequently than most other species (Aplin and Kirkpatrick 2000). Populations of these frogs should be monitored to detect any significant decline in numbers.

Desired outcome

No significant spread of new or existing plant and animal diseases.

Management actions

1. Develop and implement a disease control plan that:
 - a. identifies monitoring and control priorities based on diseases significantly impacting (or potentially impacting) on threatened species or communities or on areas of high conservation value
 - b. includes measures for monitoring, evaluating and documenting control effectiveness.
2. Ensure hygiene management plans are prepared and implemented for developments, redevelopments or other significant disturbances (such as roadworks or facility construction).
3. Rehabilitate treated disease areas where feasible.

Fire

The department’s management of fire is guided by *Policy Statement No. 19 – Fire Management Policy* (DEC 2007), which includes a number of scientific principles that underpin fire management. The Conservation Commission of Western Australia *Position Statement No. 1 – Fire Management* (Conservation Commission 2011) also provides guidance on fire management.

Species and communities vary in their response to fire. While many species are resilient to a range of fire regimes, others may have very specific fire regime requirements (for example, some wetland species, flora that has relatively long juvenile periods, and fauna that prefers medium to late successional stages of vegetation). The fire response of native biota is also affected by the extent of fire and the interplay of fire and other ecological disturbances. Some habitats have very specific fire regime requirements. For example, there are significant fire issues associated with the drying of peat soils—peat fires can be extremely difficult to extinguish, they can burn for long periods of time, and they can result in considerable ecological impact, both from fire control activities as well as the fire itself (Loomes *et al.* 2003). Karst and cave environments may also require special fire management consideration because alterations to surface-subsurface interrelationships can change air, water, nutrient and sediment inputs to subterranean ecosystems. Karst landscapes also have implications for fire suppression operations (for example, the safety of firefighters and the type of machinery that can be used). The department is developing fire management guidelines for habitats with specific fire regime requirements.

Because there are gaps in current knowledge, management for biodiversity conservation will focus on the creation and maintenance of a spatial and temporal diversity of functional habitats across the landscape. This will promote as much resilience as possible for ecosystems in the face of disturbance and

¹⁹ The motorbike frog, slender tree frog, moaning frog and the western banjo frog.

the impact of a drying climate. Within this mosaic the needs of individual threatened species, threatened ecological communities and significant habitats that require specific fire regimes will be considered and accommodated. As information on the vital attributes of species increases and their fire regime requirements are identified, this knowledge will be incorporated into fire planning and operations.

Fire poses a significant risk to the safety of firefighters, visitors, neighbours and local communities as well as a range of community assets, and must be managed in a planned way to reduce the potential severity of bushfire. Identifying fire vulnerable community assets within the planning area, and determining the risk, likelihood and consequences of bushfire impact on those assets, will help with managing and prioritising the risk mitigation strategies for bushfires. In the light of bushfire threat analyses, the department implements a range of bushfire mitigation strategies including:

- prescribed burning and mechanical fuel management, to reduce the consequence of unplanned fire events on life and property, by maintaining a reduced fuel level and an effective fire response capacity (for example, to manage fire risks around the main recreation area of Yanchep National Park or near densely populated urban areas)
- maintaining a strategic protection system (for example, strategic fire breaks) to minimise the extent of bushfire runs
- maintaining access for fire management purposes
- maintaining fire response capability and implementing fire suppression strategies as required
- educating and communicating with the community
- liaison with other bodies with fire management responsibilities as required (for example, the Fire and Emergency Services Authority of WA, local government authorities and local fire brigades).



The effects of a bushfire that went through Yanchep National Park in January 2005. Photos – Alison Pritchard

Desired outcome

Fire management that conserves biodiversity and natural values and protects life and community assets.

Objective

Fire management that results in:

1. protection of human life and community assets
2. maintenance of habitat diversity and the persistence of biota and habitats that are dependent upon fire regimes.

Management actions

1. Strategic use of fire in accordance with the relevant legislation, departmental policies, adopted principles/guidelines and the best available knowledge.
2. Maintain a diversity of post-fire (seral) stages and use fire management guidelines or other best available knowledge to determine the appropriate fire regime for biota and habitats that are dependent upon fire regimes.
3. Implement an asset protection plan.
4. Maintain a protection and fire management access system, and implement incident response plans as required.
5. Monitor and record the impacts of fire on key values and on areas that may require specific fire regimes (for example, peat soils, cave and karst areas, threatened and priority ecological communities).
6. Liaise with relevant fire management agencies/groups and communicate with the community regarding fire management issues as required.

Key performance indicators

Performance measure	Target	Reporting requirements
The extent of fire diversity measured by the diversity and scale of post-fire fuel ages	A mosaic of post-fire fuel ages (time since fire) with a modal grain size of 250 hectares ²⁰	Annually
The extent to which fire management guidelines for significant habitats requiring specific fire regimes are addressed in burn objectives	Burn objectives are met for significant habitats requiring specific fire regimes	Every five years

Habitat loss and fragmentation

The parks and reserves of the planning area are isolated remnants of natural bushland within a highly modified landscape and are increasingly important flora and fauna refuges. The development of public infrastructure and utilities to service urban and other development have led to some habitat loss and fragmentation. In addition to direct losses from vegetation clearing, fire and disease, habitat fragmentation can impact on wide-ranging species, reduce genetic diversity and increase the susceptibility of ecosystems to weed infestation, introduction of pest animals and inappropriate fire regimes.

Development proposals with the potential to impact on the planning area may require consideration over the life of this plan. Extension of the freeway along the western boundary of Yanchep and Neerabup national parks is one example. The proposed freeway corridor may impact on some areas of transition between the Quindalup and Spearwood dune systems within Yanchep National Park. Areas of transition between geomorphic systems can have a relatively high biodiversity, supporting species and communities of the bordering areas, as well as others restricted to the transition zone. The values of this area are not comprehensively known and therefore a biological survey would be required to adequately assess the environmental impacts of building a road through the area.

²⁰ That is, grain size is mostly in the order of 250 hectares.

Desired outcome

Minimal impacts of public infrastructure and other developments on key values.

Management actions

1. Evaluate and provide information or advice to relevant agencies regarding planning and development proposals as required to prevent or minimise any associated impacts (and cumulative development impacts) on the key values of the planning area.



The reserves are important bushland remnants in a highly modified landscape. Neerabup National Park. Photo – DEC

Managing cultural heritage

10. Aboriginal cultural heritage

The reserves, and in particular associated wetlands, played an important role in the seasonal²¹ migrations that were part of traditional Aboriginal society before the arrival of Europeans (O'Connor *et al.* 1989). Wetlands are of special cultural significance to Aboriginal people. Traditionally, Yuat people would migrate south from the Moore River and Noongar people would migrate north from the Swan River to Loch McNess (known as Lake Wagardu) to meet, hold ceremonies and rituals, and to obtain food and water (O'Connor *et al.* 1989).

The department recognises that the ability to care for country and to undertake a range of activities for customary purposes is a critical part of Aboriginal culture. Legislation and policy changes are currently being progressed to enable conservation estate to be used for such purposes.

Providing visitors with information on Aboriginal history and culture through interpretative and educational materials and activities can enhance visitor appreciation and understanding of Aboriginal cultural heritage, and promote culturally appropriate behaviour.



Yanchep National Park wangi-mia. Photo – DEC

Desired outcome

Protect and conserve the value of the land to the culture and heritage of Aboriginal persons. Aboriginal people have the opportunity to care for country and engage in activities for customary purposes.

²¹ 'Seasonal' in this case meaning the six Noongar seasons.

Objective

Protect Aboriginal heritage sites.

Management actions

1. Enhance understanding of the value of the planning area to the culture and heritage of Aboriginal persons.
2. Ensure that the values of the land to the culture and heritage of Aboriginal people inform and guide management actions.
3. Protect and maintain cultural heritage according to relevant legislation and policies.
4. Provide for traditional custodians to ‘care for country’ and undertake activities for customary purposes consistent with relevant legislation and policies.
5. Work with Aboriginal people to provide culturally appropriate information and interpretation on Aboriginal cultural heritage to promote awareness, appreciation and understanding.
6. Ensure that Aboriginal people have a primary and active role in conservation and communication of their heritage.

Key performance indicator

Performance measure	Target	Reporting requirements
Known or identifiable Aboriginal heritage sites	No disturbance without formal approval and consultation during the life of this plan	Every five years

11. Other Australian cultural heritage

The cultural heritage significance of several sites within the planning area has been formally recognised by registration on federal, state and municipal registers of heritage buildings and places. These sites include historic buildings, remnants of army bunkers, lime kilns, and sheep dips.

The *McNess Recreation Area – Yanchep National Park Non-Indigenous Cultural Heritage Conservation Plan* (Hocking Planning and Architecture *et al.* 2003) considered the heritage significance of historic buildings in Yanchep National Park and their relationship to the landscape in which they are situated. It provides some guidance for maintaining or enhancing elements of heritage significance.



The lakes at Loch McNess (1930s–1950s).

Desired outcome

Other Australian cultural heritage is conserved.

Objective

Protect historic buildings and other known heritage sites.

Management actions

1. Protect and maintain cultural heritage according to relevant legislation and policies.
2. Manage places of cultural heritage significance with guidance from relevant heritage conservation plans.
3. Ensure that any leases containing cultural heritage assets specify heritage conservation requirements (for example, as specified in relevant heritage conservation plans).
4. Provide interpretation of historic cultural heritage to visitors.

Key performance indicator

Performance measure	Target	Reporting requirements
Known or identifiable other Australian heritage sites	No disturbance to heritage listed places without formal approval and consultation during the life of this plan	Every five years

Managing visitor use

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

Visitation to Yanchep National Park is recorded via the entry station and use of road counters. Over the past five years (2006–2011) an average of 239,000 people visited the park per annum, which indicates that it is one of the most highly visited national parks in the region and among the most heavily visited reserves in the state. Information on the numbers of visitors to Neerabup National Park and Neerabup Nature Reserve is not formally recorded at this stage.

12. Visitor management settings

Visitor management settings are used to ensure recreation areas are not incrementally developed, without prior consideration being given to the impact proposed development or uses would have on the diversity of recreational opportunities. Visitor management settings for the planning area are presented in Map 3 and descriptions of recreational development and management appropriate for each of the settings are outlined in Appendix 2. Map 3 shows a 'highly modified' setting for a significant proportion of the planning area. The reasons for this are the urban context of the reserves, the long-linear shape of Neerabup National Park and the impacts these have on the provision of recreation at the more remote end of the recreation opportunity spectrum. This management plan distinguishes between the level of recreation development and use that is considered appropriate for the McNess Recreation Area of Yanchep National Park and other parts of the planning area.

Desired outcome

Visitors are provided with a range of nature-based recreation settings.

Objective

To maintain or increase visitors' satisfaction with the recreation opportunities, facilities and services available.

Management actions

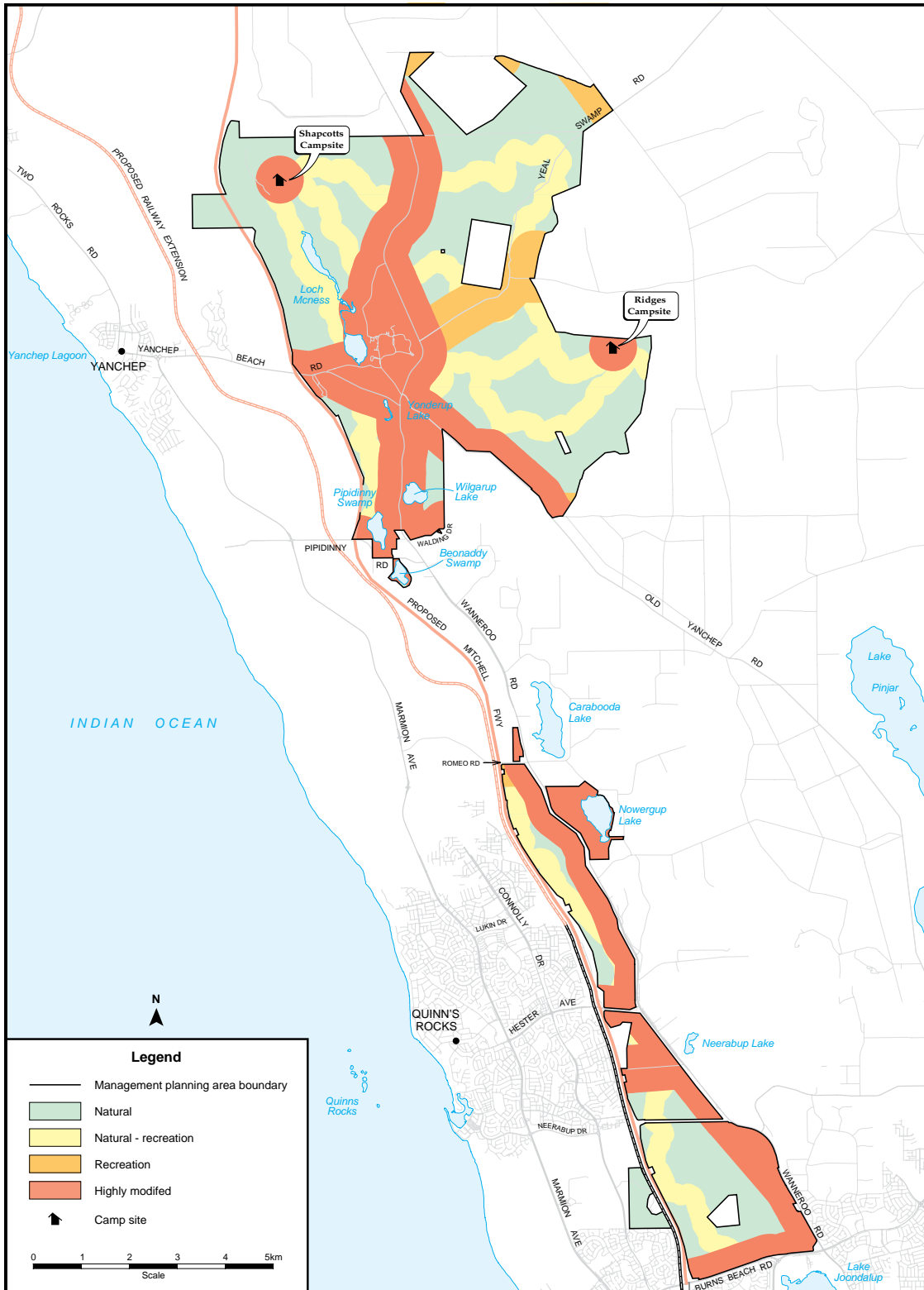
1. Provide for recreation and tourism development and visitor use that is consistent with the visitor management settings shown on Map 3.
2. Refer any proposed recreational development that has not been considered within this plan, and/or which would be inconsistent with the relevant visitor management setting, to the Conservation Commission.

Key performance indicator

Performance measure	Target	Reporting requirements
Level of visitor satisfaction with recreational facilities and services	Remains stable or increases from levels as defined in 2012	Every five years

Map 3

Visitor management settings



13. Visitor access

Public vehicle access within the planning area is shown on Map 4 (and in Figure 1 for the McNess Recreation Area). Wanneroo Road, Yanchep Beach Road, Old Yanchep Road and a small part of Yeal Swamp Road which traverse the planning area are currently within reserves vested in the Conservation Commission, but are managed by Main Roads Western Australia or the City of Wanneroo. These road areas should be excised and road reserves created. Road reserves without constructed roads that are no longer needed should be incorporated into the conservation reserve system.

The access roads connecting the entry station at Yanchep National Park with Wanneroo Road and Yanchep Beach Road are in poor condition with narrow sections and overhanging trees causing poor lines of sight. Since neither road provides an ideal route into the park, and given that in the future most visitors will be arriving from the west via Marmion Avenue and the new freeway, a review of access routes into the park may be necessary during the life of this plan.

Main Roads WA plans to upgrade Wanneroo Road where it passes through Yanchep National Park to cater for increasing traffic and provide a more direct route to Lancelin. This proposal has significant implications for management of the reserve and a full assessment of impacts and mitigation measures will be undertaken once a specific proposal is presented.

Unauthorised access associated with prohibited activities (for example, rubbish or vehicle dumping, unauthorised collection of firewood or wildflowers, cave access, and off-road recreational vehicle use) is an ongoing management issue, and one which is likely to increase given urban growth in the vicinity of the planning area.

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

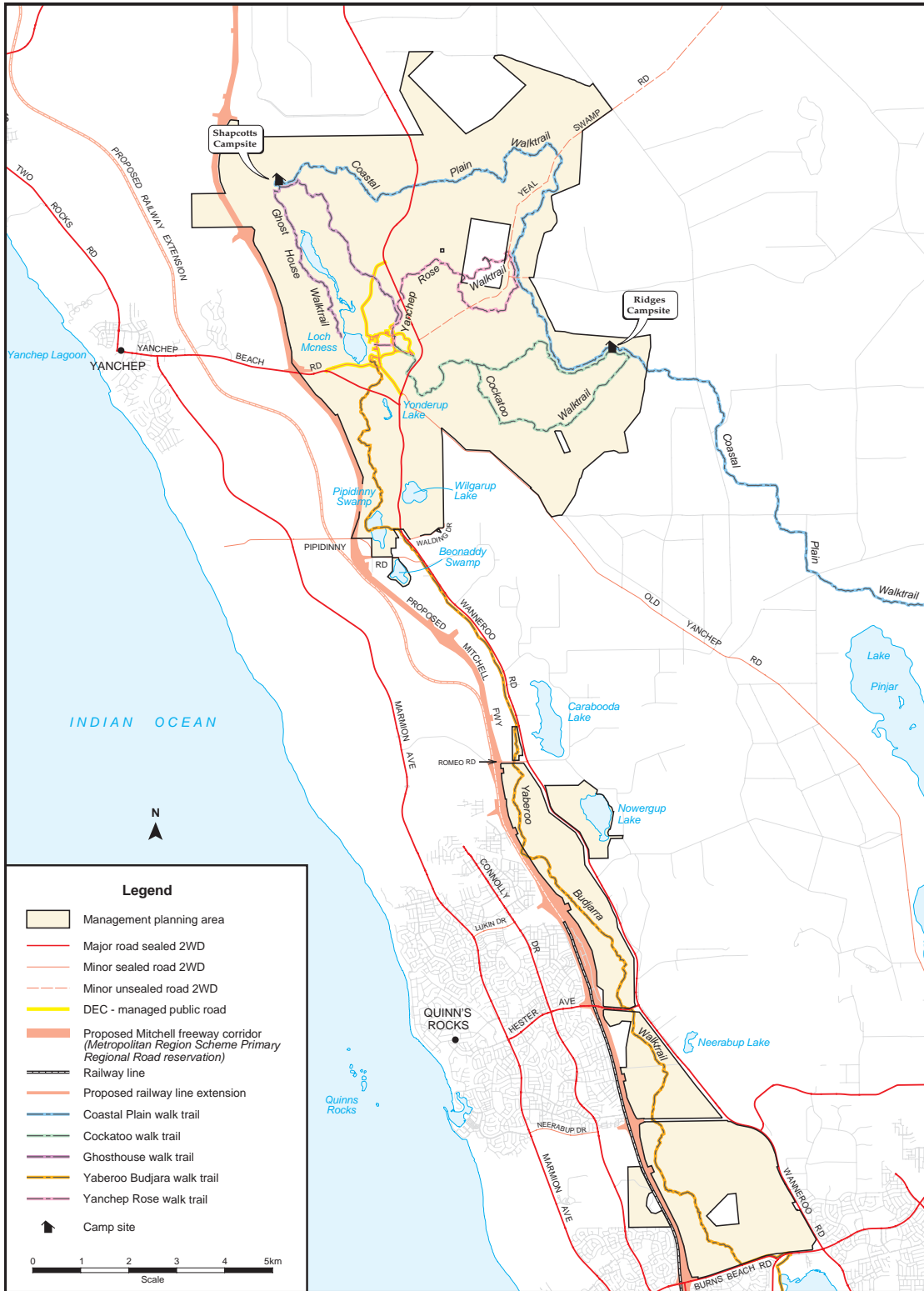
Desired outcome

To provide safe, effective access that facilitates visitor appreciation of the key values of the planning area without having significant adverse impacts on those values.

Management actions

1. Ensure public roads servicing the planning area are brought under the control of, and managed by, the appropriate authority.
2. Evaluate and provide advice to relevant agencies as required for road planning and development proposals, including road management activities that have the potential to impact on the key values of the planning area.
3. Review access routes into Yanchep National Park as required (for example, if visitors are predominantly accessing the park from the west).
4. Upgrade department-managed access roads into Yanchep National Park as required in light of the outcomes from management action 3, or as otherwise required (subject to adequate mitigation of impacts on key values).
5. Continue to implement necessary measures (for example, interagency cooperative management programs, fencing and gate installation, issuing of infringement notices, education) as necessary to deter unauthorised access and illegal activities.

Map 4 Public access



14. Visitor activities and use

Day-use—McNess Recreation Area

The McNess Recreation Area within Yanchep National Park is the primary day-use area in the planning area. Upgrades and new site developments are proposed for parts of the McNess Recreation Area to provide complementary alternatives to those already provided within the most heavily used lakeside area. The proposals for various precincts of the McNess Recreation Area (see Figure 1) are summarised in Table 1.

Desired outcome

To provide a range of day-use opportunities to enhance the enjoyment of visitors and their appreciation of key values.

Management actions

1. Implement development proposals in McNess Recreation Area as indicated in Table 1 (subject to evaluation and mitigation of any associated adverse impacts on key values) to address contemporary management issues.
2. Consult the Conservation Commission regarding recreation development proposals not considered in Table 1 as necessary.
3. Monitor visitor numbers, use patterns and satisfaction levels to improve understanding and inform future management.

Figure 1
Precincts in the McNess Recreation Area

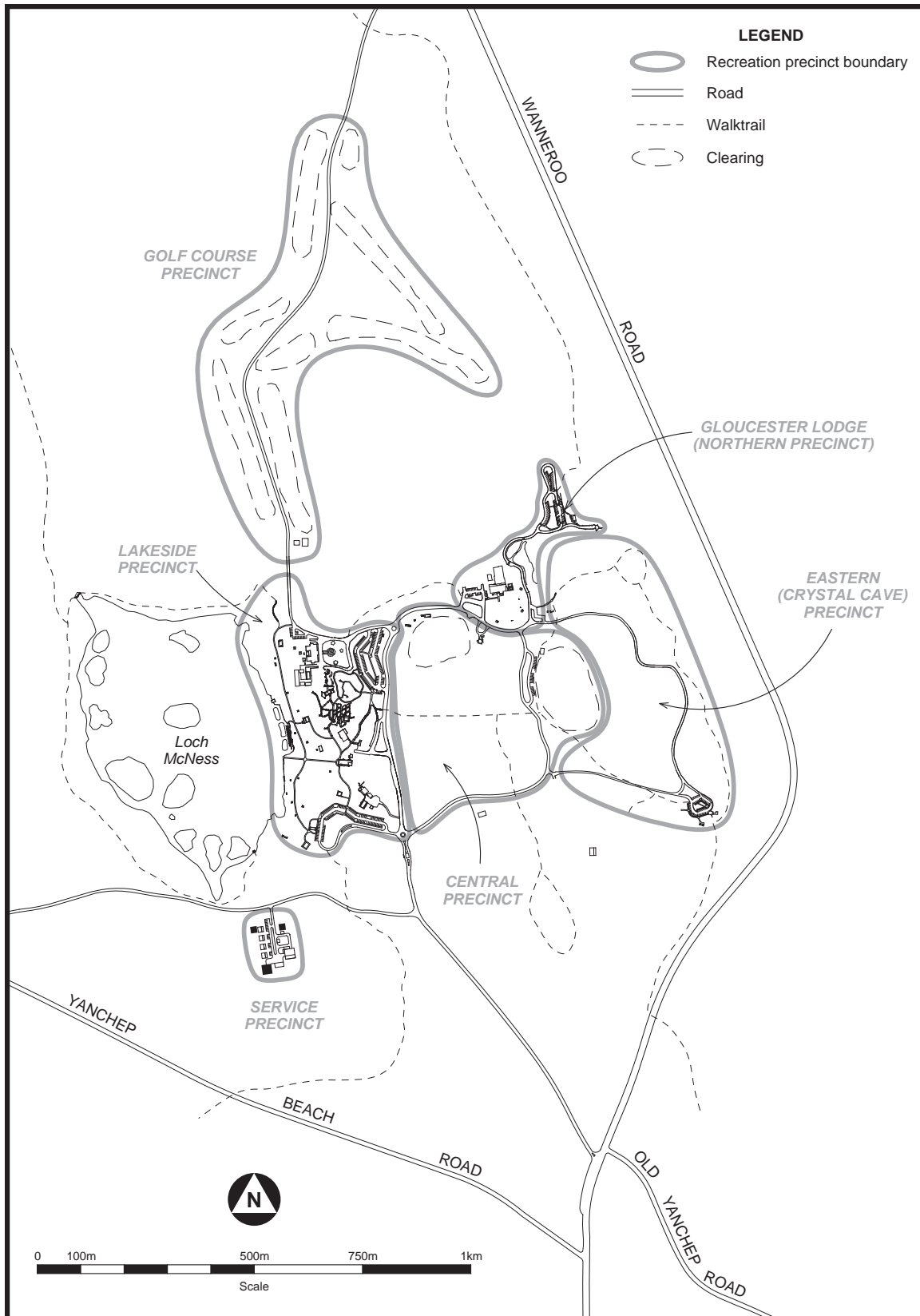


Table 1 McNess Recreation Area proposals

Precinct management objectives and proposals	
<p>All precincts</p>	<ul style="list-style-type: none"> • Provide universal visitor access wherever possible. • Progressively upgrade, replace or remove toilet facilities as required. • Provide facilities and services as necessary to facilitate comprehensive and integrated interpretation of natural, cultural and historic features. • Continue to maintain and upgrade signage as necessary. • Undertake modifications as appropriate to improve visitor 'sense of arrival' and orientation. • Undertake works as necessary for conservation of historic buildings.
<p>Lakeside Precinct</p> <p>Objective:</p> <p>To maintain existing facilities and develop facilities that will disperse crowds on the lakefront.</p>	<ul style="list-style-type: none"> • Develop and implement an ongoing tree replacement program and provide shade alternatives as appropriate to combat the impacts of cockatoo damage to shade trees. • Implement measures to maintain or enhance the aesthetics of the historic buildings as appropriate (for example, restore or establish gardens to complement buildings). • Remove the current park-staff office building if no longer required, or use plantings or other appropriate landscaping to screen this building. • Disperse visitor pressures on the lake front by providing additional picnic areas in other areas of the McNess Recreation Area.
<p>Gloucester Lodge (Northern Precinct)</p> <p>Objective:</p> <p>To attract more visitors to the precinct by improving facilities, or adding to existing facilities, and services.</p>	<ul style="list-style-type: none"> • Develop Gloucester Lodge as necessary and appropriate for heritage conservation compatible use. • Develop and implement plans for increasing visitor use and improve facilities and services. • Investigate options for development of a children's playground area in this or other precinct of the McNess Recreation Area as resources permit.
<p>Eastern (Crystal Cave) Precinct</p> <p>Objective:</p> <p>To improve existing facilities to enhance visitors experience while ensuring ecological values are protected.</p>	<ul style="list-style-type: none"> • Upgrade the entrance to Crystal Cave to improve aesthetics and functionality. • Upgrade the publicly accessible areas inside Crystal Cave (for example, improving lighting, walkways and handrails). • Maintain Cabaret Cave facilities to support its use as a function centre as required and appropriate.

Precinct management objectives and proposals	
<p>Golf Course Precinct</p> <p>Objective:</p> <p>To maintain the existing use of the precinct until such time that it is required for alternative uses or rehabilitated for conservation purposes.</p>	<ul style="list-style-type: none"> Review options for use of the golf course area as required.
<p>Central Precinct</p> <p>Objective:</p> <p>To maintain or improve the condition of the indigenous vegetation and utilise the area as picnic space and/or sports ground.</p>	<ul style="list-style-type: none"> Retain one oval as large open space. Investigate alternative landscape solutions for Henry White or Bull Banksia ovals and/or reduce the area by revegetating with indigenous flora. Upgrade existing picnic areas as appropriate or necessary. Consider options for adventure/sports recreational activity development, and implement where appropriate.
<p>Service Precinct</p> <p>Objective:</p> <p>To maintain a separate service precinct to support management of the park.</p>	<ul style="list-style-type: none"> Implement planting or other landscaping to screen the service area from public view.

Golf

The golf course in Yanchep National Park has been in use since 1962 and has historical and social values attached to it.

The golf club house grounds are under lease to the Yanchep Golf Club until 2013. At present, the cost of managing the golf course exceeds the revenue generated from its use. Options for use of the golf course area will be reviewed by the department as required.

Desired outcome

The opportunity to play golf at Yanchep National Park is continued on a cost recovery basis in accordance with appropriate environmental protection measures.

Management actions

- Review options for use of the golf course area as required.
- Include conditions regarding sustainable water use and other environmental protection measures (for example, management of fertiliser or herbicide run-off) in future golf course lease conditions as required.

Caving

Yanchep National Park has the only caves in the metropolitan region that are open to visitors. Cave access is managed in accordance with the department's Cave Management Classification System (DEC 2006) and specific group size and frequency limits that have been identified for each cave that is open to visitors. Caving requires careful management to ensure the caves and the biota they support are not adversely impacted by the activity. Monitoring for potential impacts such as sediment erosion or compaction, significant alterations to cave atmosphere (for example, carbon dioxide levels or temperature), speleothem damage and lampenflora spread are required. Above ground, damage to vegetation can occur in the absence of defined access routes to and between the caves that are used for caving.

Caving is one of the more high-risk recreational activities in which visitors to the planning area can engage. A range of measures is employed to minimise the safety risks. All cave tours are undertaken by suitably trained and experienced guides.

Crystal Cave is the only daily guided tour cave for visitors to Yanchep National Park. There is some (albeit limited) potential that another cave could be opened as a tour cave to broaden visitor's experience and appreciation of the area's caves and other karst values. More investigation of the options is required because some caves have cultural heritage or other constraints limiting their suitability for such use.

Caves within Yanchep National Park have been subject to vandalism, accidental damage and littering, which impacts on the aesthetic values and potentially introduces pollutants into the cave system.

Desired outcome

Opportunities for caving (for recreational, scientific and training purposes), which are compatible with protection of the caves and associated values, are maintained.

Objective

To:

1. control lampenflora spread in Crystal Cave
2. prevent adverse visitation-related impacts on caves.



Guided cave tour at Yanchep National Park. Photo – DEC

Management actions

1. Continue to classify and manage caves in accordance with the Cave Management Classification System, or any other substitute management arrangements identified in consultation with karst management and/or other relevant specialists.
2. Ensure that all visits to caves are subject to prior authorisation either by payment of a fee on entry or by registration of the visit.
3. Close caves as necessary once group size or frequency limits are reached, or if there are unacceptable impacts on cave values.
4. Document and implement a cave visitation impact monitoring program and take action to address issues as required.
5. Use subtle trail markers to guide cave access and minimise damage to vegetation as required.
6. Assess safety risks (for example, undertaking geotechnical inspections, evaluating carbon dioxide levels) in caves open to visitation as required and take action as necessary to minimise risks.
7. Promote appropriate caving code of conduct and ensure that all cave tours are conducted by suitably trained and experienced guides.
8. Assess options for an additional tour cave if cultural heritage or other constraints can be resolved.

Key performance indicators

Performance measure	Target	Reporting requirements
Presence of lampenflora in Crystal Cave	Decrease, or no increase from condition defined in 2012	Every five years
Visitation related adverse impacts on caves ²²	No increase from condition defined in 2012	Annually

Wildlife viewing and interaction

Opportunities to view animals such as kangaroos, birds and koalas are a popular attraction, particularly at Yanchep National Park, which receives the highest visitation in the planning area.

Koalas were first introduced into Yanchep National Park during the 1930s. The koala colony continues to be maintained at the park because it is an expected and popular part of the tourist experience at Yanchep.



Koala sanctuary at Yanchep National Park. Photo – DEC



Kangaroo population. Photo – DEC

²² This key performance indicator will encompass a series of locality specific measures (for example, erosion, compaction, speleothem breakage, cave atmosphere) to be identified in consultation with speleologists or karst management experts.

Desired outcome

Opportunities are provided for sustainable wildlife viewing and interaction that is consistent with the protection of key values.

Management actions

1. Continue to facilitate opportunities for wildlife viewing and interaction as appropriate.
2. Ensure visitors to the planning area have access to information that will enhance wildlife viewing and interaction activities and promote appropriate behaviour that minimises disturbance of wildlife.

Recreational boating

Hiring rowboats and/or taking the Wagardu Boat Tour on Loch McNess have been popular activities with visitors to Yanchep National Park. However, because of significant decline in water level in Loch McNess over a number of years, the boat tour was stopped in 2008. Rowboats are currently able to be used for several weeks a year when the water level is sufficient to support this activity.

Desired outcome

Opportunities are provided for visitors to enjoy boat-based activities on Loch McNess when water levels are adequate.

Management actions

1. Continue hiring rowboats for use on Loch McNess as water levels allow provided that any associated environmental impacts can be effectively mitigated.

Bushwalking and cycling

A range of short and long-distance walks featuring natural and cultural points of interest are available in the planning area (long distance walk trails are shown on Map 4). These are well used and use is likely to increase as the population of surrounding suburbs grows. It is anticipated that the existing walk trail network will be sufficient to meet needs over the life of the plan, although additions or modifications to the network of trails within the McNess Recreation Area of Yanchep National Park may be required. There is scope to improve the recreational experience on other walk trails in the planning area. It may be feasible to expand some trails to accommodate dual use, although this will be considered if they can be designed and managed to simultaneously provide for the safety and enjoyment of all user groups.

Bicycles can be used on all public roads, although special approvals may be required from the department and relevant road management agencies for specific events. There may be potential for widening some of the existing sealed roads within the planning area to accommodate cycle paths.

Currently, all existing walk trails in the planning area are restricted to walkers and are not available for use by cyclists. Similar to the demand for walk trails, demand for cycling opportunities (including off-road cycling) in the planning area is likely to increase as the surrounding areas become more populated. Proposals for cycle trails may be developed and implemented over the life of the plan should sufficient demand arise and resources permit. Cycle trails that provide links to or complement other trails in the region are preferable to development of circuits limited to the planning area.

Desired outcomes

- A range of bushwalking opportunities that do not have significant adverse impacts on key values are provided.
- Recreational cycling opportunities that do not have significant adverse impacts on key values are provided.

Management actions

1. Maintain and enhance the network of walk trails that are in use.
2. Maintain a self-registration system for users of long distance trails.
3. Provide visitor information to minimise safety risks and promote appropriate code of conduct.
4. Liaise with other landholders regarding trail management issues as required (for example, with the City of Wanneroo regarding the Yaberoo Budjara Heritage Trail).
5. Liaise with relevant road management agencies regarding potential widening of sealed roads within the planning area to accommodate cycle paths, and also explore the feasibility of widening roads that are managed by the department for this purpose.
6. Investigate (and implement where feasible) options for the development of dual-use trails and/or dedicated cycle trail/s (including off-road trails), which preferably link to or complement other trails in the region.

Overnight stays

Visitors to Yanchep National Park have opportunities to stay in built accommodation in the park, predominantly at the historic Yanchep Inn, although small groups can also be accommodated at Gloucester Lodge. Both sites are managed by a commercial operator under lease arrangements. The use of Yanchep Inn and Gloucester Lodge for accommodation purposes is compatible with heritage conservation objectives.

Two small walk-in camp sites are provided for walkers using the Coastal Plain Walk Trail. Some camping (for example, by school groups and scout groups) occurs in conjunction with the current lease for Gloucester Lodge.

There is a small but regular demand for additional opportunities for visitors to camp within Yanchep National Park. In addition, demand is increasing for the development of caravanning and camping areas in conservation reserves as many areas traditionally used for this purpose have been replaced with alternative accommodation or other land-use (Economics and Industry Standing Committee 2009). The development of a campground and caravan facilities within Yanchep National Park, where there are licensed premises operating within the recreation area, presents a number of issues. Provided these issues can be addressed, and impacts on natural resources are manageable, there is a significant need for nature-based caravanning and camping opportunities, and the establishment of a campground and/or caravan park may be considered over the life of this plan.

Desired outcome

Opportunities are provided for visitors to stay overnight in appropriately designed built accommodation and camp sites.

Management actions

1. Maintain walk-in camp sites in association with long distance walk trails as appropriate.
2. Maintain opportunities for visitors to stay in Yanchep National Park's built accommodation, or to camp in designated areas (for example, in conjunction with Gloucester Lodge activities) unless there are overriding management considerations.

15. Information, education and interpretation

Information at Yanchep National Park is provided in print products, interpretive signage and by direct interaction of staff with visitors. At Neerabup National Park information is primarily communicated through signage and brochures associated with the Yaberoo Budjara Walk Trail.

The current primary interpretive theme for Yanchep National Park is *'From caves to coast, the way of water'* and following on from this are three supporting themes:

- water (for example, wetlands, karst features)
- natural communities (for example, cave communities, banksia woodlands, wetland, tuart ecosystems)
- people (Noongar, early settlers, present and future visitors).

At Neerabup National Park interpretation is focused on the walk trails.

Interpretation planning for the reserves of the planning area is complementary and, where appropriate, integrates with interpretive themes at nearby conservation reserves (for example, Yellagonga Regional Park).

Education programs are targeted at specific user groups to foster greater appreciation and understanding of the area's key values. School groups are regularly involved in projects and activities.



Dwertia Mia Trail, Boomerang Gorge at Yanchep National Park. Yaberoo Budjara Heritage Trail at Neerabup National Park. Photos – DEC

Desired outcome

Increase in community awareness and appreciation of key values, and in support for management activities.

Management actions

1. Prepare and implement a marketing, tourism and recreation plan.
2. Maintain and implement an interpretation and communication plan.
3. Provide information to visitors (and commercial tour operators to provide to their clients) on key conservation values.
4. Support institutions using the planning area for educational purposes.

16. Visitor safety

Some visitors to the planning area deliberately seek out activities because they involve risk. Nevertheless, it is essential to encourage visitors to exercise appropriate behaviour while undertaking recreational activities that involve risk. Caving is one of the more high-risk recreational activities in which visitors to the planning area engage and the department employs a number of measures to minimise these risks. Unauthorised access of caves is also an ongoing issue in the planning area, and has safety risks for those illegally accessing these areas as well as persons who may be involved in any associated cave rescue operations. Some caves are gated to deter unauthorised access where other management measures prove ineffective and the threats or hazards warrant this.

Long distance walk trails can also present particular visitor safety concerns. These include, for example, the hazards of bushfire, severe summer heat, becoming lost or injured, and sinkholes.

Desired outcome

Minimise risk to visitor safety while maintaining a range of recreation and tourism opportunities.

Management actions

1. Implement and maintain a visitor risk management plan.
2. Promote application of caving safety codes of conduct or guidelines (for example, Australian Speleological Federation cave safety guidelines, the *Minimal Impact Cave Rescue Code and Caring Code for the Bush as described in Policy Statement No. 18 – Recreation, tourism and visitor services*) as appropriate.
3. Use education, gates and enforcement measures as required to deter unauthorised cave access.
4. Ensure geotechnical monitoring and inspections are conducted as necessary to maximise visitor safety.
5. Maintain a self-registration system for long distance walkers.

17. Commercial tourism operations

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 DEC in providing quality visitor experiences in parks.

Leases

Within the planning area leases are currently issued for:

- the Yanchep Inn and Chawn Mia Tearooms
- Gloucester Lodge
- the golf clubhouse grounds.

The department intends to call for expressions of interest from commercial operators to lease the golf course (see *Golf* in Section 13).

Licences

Currently, licensed commercial tour operator-use of the planning area is predominantly by tour bus operators who incorporate a stop at Yanchep National Park en route to the Pinnacles in Nambung National Park.

Over the life of the plan it may be considered advantageous to license commercial tour operators to conduct guided cave tours. Given the nature of this activity, special training, experience and accreditation requirements will apply. Consultation with the Yanchep Caves Advisory Committee should also be undertaken.

Desired outcome

Commercial tourism activities are compatible with other management objectives, and serve to extend the range of services, facilities and experiences available in the planning area.

Management actions

1. Continue to issue and manage commercial licences and leases that are compatible with the purposes of the reserves and the objectives of this management plan, in accordance with departmental policy.
2. Negotiate and issue a lease for the golf course as required (see *Golf* in Section 13)
3. Ensure that any commercial operators licensed to conduct cave tours are appropriately trained and experienced.

Managing resource use

18. Mineral and petroleum exploration and development

No mining tenements have been granted within the current boundaries of the national parks or nature reserve within the planning area. There are number of approved and pending mining tenements applicable to some of the areas proposed for addition to the conservation reserve system. The number and status of these tenements will change over time (see the Department of Mines and Petroleum's *Tengraph* online database at www.dmp.wa.gov.au). Tenements within proposed additions include a tenement over Crown Reserve 25253, which was one of the areas identified for addition to Neerabup National Park in exchange for excisions required for the freeway and railway extension. A geothermal exploration permit also covers some of the areas proposed for addition to Yanchep National Park and Neerabup National Park.

The Ridges area has very high conservation values and has repeatedly been identified as strategically important for inclusion into the conservation reserve system. Where there are competing land uses, conservation reserve creation proposals may be referred to the state government for a final decision. In such cases, decisions regarding conservation reserve creation are made by the government, taking account of the land-use issues.

An active mining lease (No. M70/7171) that also incorporates a concrete batching plant is situated outside the western boundary of Neerabup National Park between Hester Avenue and Hall Road. Access to the mining operation and batching plant is via a pre-existing management track on the western boundary²³, and is fenced off from the national park. The mining and batching plant operations are subject to environmental conditions.

Desired outcome

The impact of mineral and petroleum exploration and development on the key values is minimised.

Management actions

1. Evaluate and provide information or advice to relevant agencies regarding mining and petroleum exploration and development proposals as required to prevent or minimise any associated impacts (and cumulative impacts) on the key values of the planning area.

19. Water resources

Drying climate conditions, water abstraction and land use have resulted in significant declines in groundwater levels and adversely impacted on groundwater dependent ecosystems within the planning area. These issues and management responses, which are led primarily by DoW, are discussed in Section 9.

DoW manages water abstraction under the *Rights in Water and Irrigation Act 1914* and issues licences for groundwater extraction. Priority 1 and Priority 3 Public Drinking Water Source Areas and a Protection Zone (wellhead) that intersects the planning area are shown on Map 5. More information about these water quality protection measures is available in the *Gnangara Groundwater Area Allocation Plan* (DoW 2009). Land use within these areas is subject to some constraints to avoid (in Priority 1 areas) or manage (in Priority 3 areas) the risk of contamination to the water source.

²³ By way of a miscellaneous licence issued under the *Mining Act 1978*.

DoW has a number of monitoring bores within the planning area, as well as bores that are being used to artificially maintain or supplement water levels for select groundwater dependent ecosystems. Several other bores are used to service buildings/facilities, irrigate lawns and gardens, and for fire management purposes.

There can be potential water contamination risks associated with septic tanks. Toilets in Yanchep National Park are connected to septic tanks because the option to link to reticulated sewerage is not available at this stage. The septic systems are being progressively upgraded to alternative non-leaching systems or connected to the main sewer over the life of the plan to minimise environmental contamination risks.

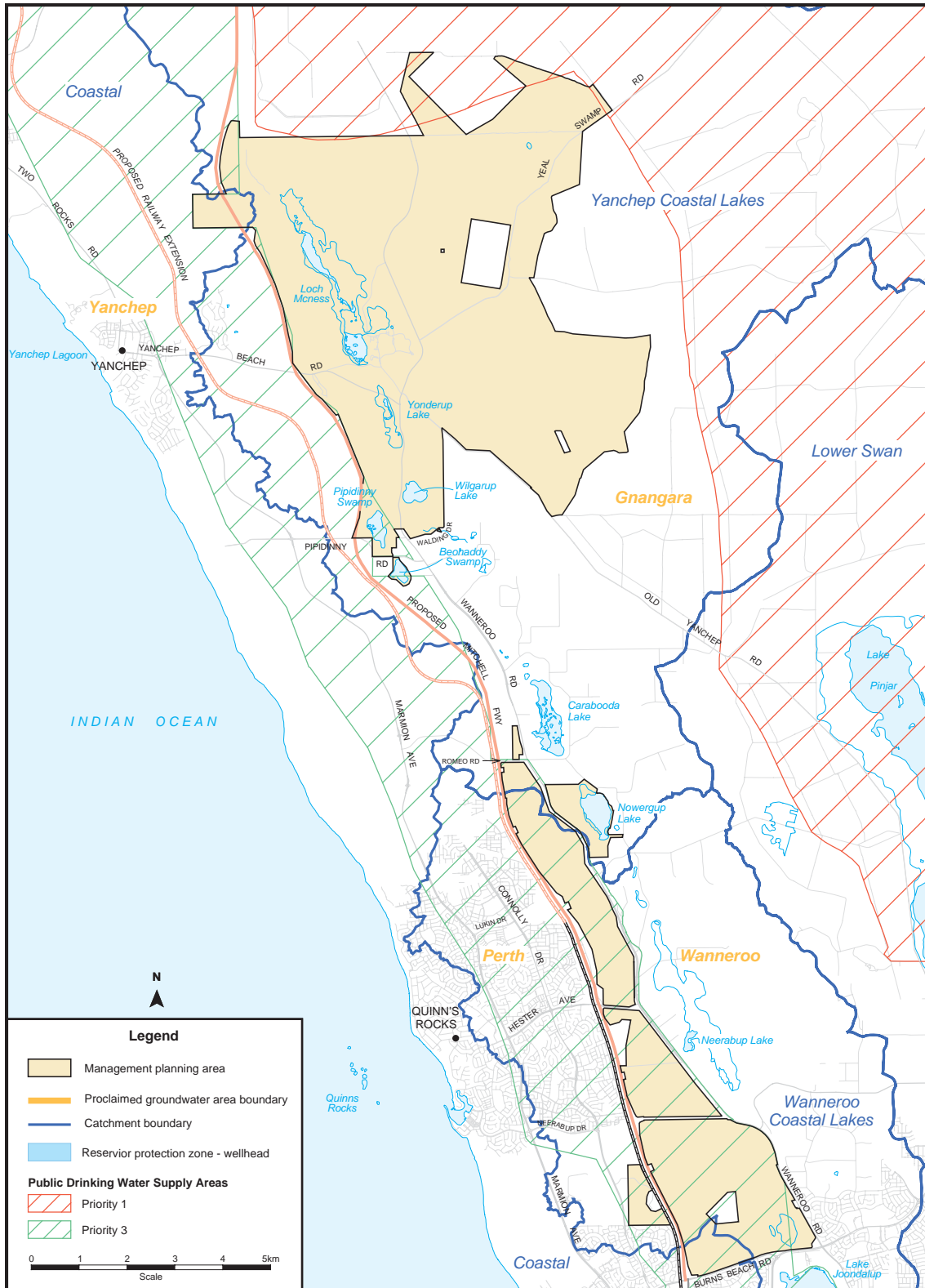
Desired outcome

Water resource use within the planning area does not adversely impact on key values.

Management actions

1. Ensure all water extracted from the planning area is taken and used in an ecologically sustainable manner.
2. Undertake documented audits of water use in the planning area and implement water conservation initiatives to reduce water use.
3. Liaise with the agencies responsible for water resource protection about any recreation site developments proposed for Public Drinking Water Source Areas.
4. Progressively upgrade septic systems to non-leaching systems or connect to reticulated sewerage if the option is available.

Map 5 Water supply areas



20. Beekeeping

There are 11 apiary permits issued for the planning area, eight within Yanchep National Park and three in Neerabup National Park. Given uncertainties about the conditions under which honeybees leave a hive and become feral, the department takes a precautionary approach with regard to beekeeping in conservation reserves. An analysis undertaken during preparation of the draft management plan used a range of environmental and management criteria to categorise parts of the planning area as suitable; suitable but conditional; or highly constrained, for apiary sites. The assessment results are shown in Appendix 3. Three apiary sites were categorised as highly constrained and will be cancelled and relocated to other suitable areas where possible.

Desired outcome

The commercial beekeeping industry is supported where this can be done without compromising the natural and recreational values.

Management actions

1. Manage apiary sites in accordance with relevant departmental policies.
2. Review access to the planning area for beekeeping purposes, if required in light of relevant new knowledge.
3. Liaise with beekeepers and relevant agencies or representative bodies to ensure the most efficient and sustainable use of apiary sites.

Involving the community

The public have been involved in the preparation of this management plan by providing community perspective of the issues within the planning area via written submissions and consultation meetings. In particular, members of the Yanchep National Park Advisory Committee and Yanchep Caves Advisory Committee provided detailed advice regarding management issues.

Ongoing community involvement and support is a significant factor in the successful implementation of this management plan. Community members are encouraged to volunteer to take part in a wide range of activities and projects. In the 2010–11 financial year, more than 7,313 volunteer hours were contributed to management activities within the planning area, providing assistance with activities such as tending to the wildflower garden at Yanchep National Park, rehabilitation, native plant propagation and historic tours. Volunteer programs increase the department's work capabilities and skills base, and also provide a valuable opportunity for improving communication between the department and the community.

Building and maintaining good relations with neighbours is essential to dealing with common boundary issues and achieve many of the management objectives specified in this plan (for example, management objectives for introduced plants and animals and fire management).



Volunteers participating in Keep Australia Beautiful/Adopt-a-Spot program at Yanchep National Park. Photo – DEC

Desired outcome

The community is provided with opportunities to be involved in planning and management of the parks and reserves.

Objective

Volunteer involvement in management continues.

Management actions

1. Continue to provide and promote opportunities for interested community members to be involved in conservation and land management programs.
2. Record volunteer related information (for example, hours, activity) as required for input into the department's volunteer database.
3. Work with neighbours to achieve collaborative and cooperative approaches to dealing with common boundary issues.

Key performance indicator

Performance measure	Target	Reporting requirements
The number of registered volunteers and the number of volunteer hours contributed	Remains stable or increases from 2012 levels	Every five years

Research and monitoring

Research and monitoring are required to effectively implement and measure the success of this management plan. The department has prepared a range of plans that will guide research and monitoring activities undertaken in the planning area including: the *Strategic Plan for Biodiversity Conservation Research 2008–2017*, the *Nature Conservation Service Swan Region Plan 2009–2014*; and a variety of threatened species or community recovery plans. In addition, key performance indicators and some of the strategies that have been included in this management plan will have monitoring and research implications.

Research and monitoring activities are also currently being undertaken in the planning area by DoW (for example, in association with the Gngangara Mound environmental monitoring program (www.water.wa.gov.au/PublicationStore/first/100974.pdf) and the *Gngangara Sustainability Strategy* and to improve understanding of ecological water requirements and local hydrogeology). This will be continued into the life of this management plan. It is not uncommon for research and monitoring activities to be done by or in collaboration with external organisations or individuals (for example, universities, research centres, volunteers) and this will continue to be encouraged.

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. Undertake research and monitoring in accordance with relevant departmental strategic research and monitoring plans and priorities, and as otherwise required to implement and measure the effectiveness of this management plan.
2. Ensure that outcomes of research and monitoring are documented in readily accessible formats (for example, reports, databases, geographic information systems) and made available to land managers and other end users as appropriate.
3. Encourage external groups and individuals (for example, universities, research centres, volunteers) to carry out research and monitoring projects, particularly where this will directly benefit management of the planning area or the delivery of department strategies.
4. Ensure that research and monitoring activities do not adversely impact on the values of the planning area.



Climate watch flora monitoring at Yanchep National Park.
Photo – DEC



Water monitoring in the cave systems at Yanchep National Park. Photo – DEC

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Personal communications

Lex Bastian – Member of the Yanchep National Park Caves Advisory Committee

Appendices

Appendix 1 Significant weed species

Scientific name	Common name	Weed of National Significance	Declared species ²⁴	High rated weeds in Swan Region plant prioritisation process (DEC 2009c)
<i>Asparagus asparagoides</i>	bridal creeper	Yes	Yes	Yes
<i>Ulex europaeus</i>	gorse	Yes	Yes	
<i>Carthamus lanatus</i>	saffron thistle		Yes	
<i>Cirsium arvense var. arvense</i>	perennial thistle		Yes	
<i>Cynara cardunculus</i>	artichoke thistle		Yes	
<i>Datura stramonium</i>	common thornapple		Yes	
<i>Echium plantagineum</i>	Paterson's curse		Yes	Yes
<i>Galium tricornerutum</i>	three-horned bedstraw		Yes	
<i>Hypericum perforatum</i>	St. Johns wort		Yes	
<i>Moraea flaccida</i>	one-leaf cape tulip		Yes	Yes
<i>Myriophyllum aquaticum</i>	parrots feather (aquatic)		Yes	
<i>Senecio jacobaea</i>	ragwort		Yes	
<i>Silybum marianum</i>	variegated thistle		Yes	
<i>Brassica tournefortii</i>	mediterranean turnip			Yes
<i>Bromus diandrus</i>	great brome			Yes
<i>Cortaderia selloana</i>	pampas grass			Yes
<i>Ehrharta calycina</i>	P. veld grass			Yes
<i>Eragrostis curvula</i>	African lovegrass			Yes
<i>Euphorbia terracina</i>	Geraldton carnation weed			Yes
<i>Freesia alba x leichtlinii</i>	freesia			Yes
<i>Leptospermum laevigatum</i>	Victorian tea tree			Yes
<i>Lupinus cosentinii</i>	sandplain lupin			
<i>Passiflora foetida</i>	passion flower			
<i>Pelargonium capitatum</i>	rose pelargonium			Yes
<i>Sparaxis bulbifera</i>	harlequin flower			Yes
<i>Typha orientalis</i>	bulrush			Yes
<i>Watsonia meriana var. bulbifera</i>	bulbil watsonia			Yes
<i>Zantedeschia aethiopica</i>	arum lily		Yes	Yes

²⁴ Biosecurity and Agriculture Management Act 2007

Appendix 2 Visitor management settings criteria

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 (8,000 ha 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	Vehicles: mechanised access in emergency situations or essential management operations only.	Vehicles: no public access; mechanised access in emergency situations or essential management operations only.	Vehicles: mechanical access on 4WD tracks. Cycle type 4 trails	Vehicles: mechanical access on 2WD unsealed tracks. Cycle type 2 and 3 trails	Vehicles: mechanical access on 2WD sealed tracks. Cycle type 1 trail
Access standards and type of transport used for visitors, resource users and protected area managers	Walking: via natural routes formed principally by human use (AS Walking Track class 6 only)	Walking: via natural routes formed to a minimum standard (AS Walking Track class 4 to 5)	Walking: formed walk trails (AS Walking Track class 2 to 5)	Walking: well-built walking trails with direction signs (AS Walking Track class 2 to 4)	Walking: well-built, signposted walking trails (AS Walking Track class 1 and 2)
	Aircraft: no airstrips permitted	Boat: non-motorised only	Boat: non-motorised and limited motor boat only in designated areas	Boat: non-motorised, and motor boats only in designated areas	Boat: non-motorised, and motor boats only in designated areas
	Horse: no horses permitted	Aircraft: landing of non-fixed wing aircraft is permitted for emergency and essential research purposes only. Fixed wing aircraft must fly above 2,000 feet and non-fixed wing above 1,500 feet	Aircraft: natural earth airstrip permitted	possible Aircraft: unsealed airstrip permitted	Aircraft: sealed airstrip permitted
		Horse: commercial horseriding access in designated areas	Horse: designated bridle trails	Horse: designated bridle trails possible	Horse: designated bridle trails possible

Visitor management setting class					
	Wilderness*	Natural	Natural – recreation	Recreation	Highly modified
<p>Site modification</p> <p>Extent, type and design of infrastructure, amenities and the style of accommodation provided</p>	<p>No site modification and no facilities or structures except for reasons of visitor safety, resource protection and/or management operations. Camp sites are not defined ('wild camping')</p>	<p>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. Camp sites are not defined ('wild camping'). Day-use sites not defined</p>	<p>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</p>	<p>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</p>	<p>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</p>
<p>Commercial uses</p>	<p>Commercial recreation and tourism operations not permitted</p>	<p>Commercial tourism licences permitted, but may consider regulating numbers (e.g. E Class Licence)</p> <p>Leases not permitted</p>	<p>Commercial tourism licences permitted with a focus on nature-based/cultural activities</p> <p>Leases permitted</p>	<p>Commercial tourism licences permitted with a focus on nature-based/cultural and adventure activities</p> <p>Leases permitted</p>	<p>Commercial tourism licences permitted with a focus on nature-based/cultural and adventure activities</p> <p>Leases permitted</p>
<p>Probable social interaction</p> <p>Density of users and degree of social interaction and opportunities for solitude</p>	<p>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 6–8 eight people</p>	<p>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 of about 8–12 people</p>	<p>Moderate interaction between users, with encounters with several other groups likely along access routes and at camp sites. Group size of about 12–15 people</p>	<p>High level of contact and frequent interaction with many other groups. Groups may exceed 20 people</p>	<p>High level of contact and frequent interaction with many other groups. Groups may exceed 20 people</p>
<p>Probable recreation experiences</p>	<p>Opportunities for isolation, independence, closeness to nature, tranquility and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge</p>	<p>Opportunities for isolation, independence, closeness to nature, tranquility and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge</p>	<p>Opportunities for closeness to nature, tranquility and self-reliance through the application of outdoor skills in an environment that offers a moderate degree of challenge</p>	<p>Opportunities include closeness to nature and nature appreciation. Moderate levels of social contact and some opportunity to experience tranquility</p>	<p>Opportunities for nature appreciation, and for social interaction. Facilities often support presentation of nature or access to nature-based opportunities in nearby areas</p>

Visitor management setting class					
	Wilderness*	Natural	Natural – recreation	Recreation	Highly modified
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 permitted	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. A long trails and at trail camp 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 62 – Identification and Management of Wilderness and Surrounding Area

Appendix 3 Commercial apiary sites assessment

Assessment criteria

	Suitable	Suitable, but conditional	Highly constrained
Approach	Maintain or increase numbers of apiary sites in these areas. Standard permit conditions would apply	Maintain of increase numbers of apiary sites in these areas. Additional permit conditions would apply, such as increased hygiene and seasonal, site location and access restrictions. Research and monitoring at these sites may be required	Close, and re-locate where possible, any current apiary sites in these areas. Prevent any new apiary sites in these areas
Environmental criteria			
1. Threatened and other conservation significant flora within a 2km radius	No rare, priority 1 or 2 flora present that are visited by honeybees No priority 3 or 4, endemic, disjunct or relictual flora present that are visited by honeybees	Rare, priority 1 or 2 flora present that are visited by honeybees and impacts are seasonal or undetermined ¹ Rare or priority 1 or 2 flora present that are visited by honeybees but no predicted impact ² Priority 3 or 4, endemic, disjunct or relictual flora that are visited by honeybees present ³	Rare, priority 1 or 2 flora present that are visited by honeybees and impact is predicted to be year round ¹
2. Significant ecological communities within a 2km radius	No threatened ecological communities (TECs)	TEC present and impacts are seasonal ¹ TEC present, but no predicted impact ²	TEC present and impact is predicted to be year round ¹
3. Threatened fauna and other significant habitats (i.e. habitats for fauna adversely impacted by honeybees) within a 2km radius	No old-growth forest or other known habitat of hollow nesting threatened fauna present No fauna watering points at fauna breeding centres and translocation sites present No other significant habitats or communities present	Old growth forest or other known habitat of hollow nesting threatened fauna is present ⁴ Other significant habitats or communities are present that are seasonally impacted ⁶	Fauna watering point at fauna breeding centres and translocation sites present ⁵ Other significant habitats or communities are present that are impacted year round

Management criteria	Suitable	Suitable, but conditional	Highly constrained
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
2. Access	Public or suitable management vehicle only access is available No gazetted wilderness present	'Candidate' wilderness only	There is no public or suitable management vehicle only access or current access is being closed Gazetted wilderness 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 present, but only used infrequently or proposed walk trail (Class 1 or 2)	Walk trail present and used frequently (Class 1 or 2)
5. Disease control	Low risk of <i>Phytophthora cinnamomi</i> spread	<i>P. cinnamomi</i> present or area identified as protectable from <i>P. cinnamomi</i> spread, but there is an existing site ⁷	Area identified as protectable from <i>w</i> spread and there are no existing sites ⁷
6. Apiary sites within a 3km radius	No other apiary sites present		Apiary site present
7. Feral honeybee management within 2km		Feral honeybee control program in place ⁸	
8. Weed management within a 2km radius	No 'high' or 'moderate' rated environmental weeds present that are considered to have an increased seed-set due to honeybees	'High' or 'moderate' rated environmental weeds that are considered to have an increased seed-set due to honeybees, but flower seasonally ⁹	'High' or 'moderate' rated environmental weeds that are considered to have an increased seed-set due to honeybees and flower year round ⁹
9. Other management concerns	No impact on department operations or the requirements of other authorities controlling Crown land or government reserves	An impact on department operations or the requirements of other authorities controlling Crown land or government reserves that can be managed	An impact on department operations or the requirements of other authorities controlling Crown land or government reserves that can not be managed

Apiary sites assessment notes

¹ = Impacts are seasonal or undetermined (see Guidance for Additional Conditions – A). Where impacts are predicted to be year-round, the area will be considered to be highly constrained.

² = Visited by honeybees, but no predicted impact. These flora and TECs are still of high conservation significance and a precautionary approach is warranted (see Guidance for Additional Conditions – B).

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

⁴ = If there is a current apiary site and there are feral honeybees present, then use can continue year-round. However, old-growth forest and other significant habitats for hollow-nesting fauna will be targeted for feral honeybee control (see Guidance for Additional Conditions – D). For new sites within old growth forest see Guidance for Additional Conditions – E.

⁵ = Native fauna breeding centres and fauna translocation sites often have watering points. Commercial beekeeping in the vicinity may disturb the animals from drinking.

⁶ = To be determined through the planning process. (If no specific habitats are identified through the planning process then the following should be inserted for this note “no other significant habitat or community likely to be impacted by honeybees has been identified during the planning process, however they may be identified during the life of this management plan”).

Other significant habitats may be identified due to:

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

⁷ = Standard disease control conditions will apply. The soil dryness index may be used to restrict vehicle access to the sites. There should be no new sites established in areas that are protectable from *P. cinnamomi* (or designated Disease Risk Areas).

⁸ = There may need to be seasonal restrictions (see Guidance for Additional Conditions – D) when a feral honeybee control program is in place.

⁹ = High or moderate rated environmental weeds are a high priority for the department to control (see Guidance for Additional Conditions – F).

Guidance for additional conditions

- A Seasonal restriction based on flowering period of flora. Site must be available for a minimum of one month. Placement and number of hives also may be restricted.
- B Placement (at least 100 metres from populations) and number of hives may be restricted. Monitoring or representative samples for health of adult populations and seedling recruitment or TEC to ensure there is no decline due to apiary management, taking into account factors such as drought, disease, fire, environmental weeds and other disturbances. If unacceptable impacts are shown or observed later, then treatment will be the same as A.
- C There may be a need to review populations within the planning area to determine whether these populations are significant to the conservation of the species. If deemed significant then treatment will be the same as A.
- D When a feral honeybee control program is in place, then use of the site will be restricted during periods when the queen may swarm, such as spring, or a suitable method to restrict the queen should be implemented.
- E For new sites in old-growth forest where there are no feral honeybees present, a condition may be that if during the period of the permit, feral honeybee hives are located within two kilometres of the site, the site will be temporarily restricted until the feral honeybees are controlled.
- F Seasonal restriction is based on the flowering period of environmental weeds but only until the environmental weed has been successfully eradicated.

Apiary sites assessment results

Apiary sites within the planning area were assessed against the environmental and management criteria and categorised as suitable, suitable but conditional or highly constrained. The table below shows the result of the assessment and indicates which sites require special conditions.

Apiary site no.	Environmental criteria assessment						Management criteria assessment					Recommendations/ conditions	
	Rare and priority 1, 2 flora visited			TEC			Rec. sites	Class 1 or 2 walk trail	Weed management		Disease risk		
	Impact year round	Impact seasonal	No predictable impact	Other cons. flora visited	Impact year round	Impact seasonal			No predictable impact	Fauna habitat			Impact seasonal
Suitable													
4837													Standard apiary permit conditions apply
Suitable but conditional													
891		X				X			X				A (Jan, Aug–Nov)
2637		X			X					X			A (Jan, Aug–Nov), B (Jan, Mar–Dec), F (Aug–Jan)
2677						X				X			F (Aug–Dec)
3131		X											A (Dec–Feb)
3626										X			F (Jul–Dec)
4919										X			F (Aug–Dec)
5594										X			F (Aug–Dec)
Highly constrained													
564								X			X		Close site
890						X						X	Close site
4403		X				X						X	Close site

