



Ord River and Parry Lagoons Nature Reserves

2010

Draft Management Plan



Department of
Environment and Conservation



 Conservation
Commission
WESTERN AUSTRALIA

ORD RIVER AND PARRY LAGOONS NATURE RESERVES

Management Plan

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Department of Environment and Conservation

Conservation Commission of Western Australia

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Assistance was provided by Daryl Moncrieff, Troy Sinclair, Scott Goodson, Allan Thomson and David Grosse.

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Front cover images:

Main image: Boardwalk at Marlgu Billabong. Photo by DEC.

Other images: Frog; Telegraph Hill interpretive sign. Photos by DEC.

INVITATION TO COMMENT

This draft management plan gives you the opportunity to provide information, express your opinion, suggest alternatives and have your say on how Ord River and Parry Lagoons nature reserves and proposed additions will be managed over the next 10 years.

What to consider

In making your submission, it is important to understand that legislation and policy impose certain obligations on the Department of Environment and Conservation to manage lands and waters vested with the Conservation Commission of Western Australia and that there may be little room to manage some issues outside of these constraints and responsibilities. Nevertheless, it is important to hear from the public about the management of these issues. There are also some issues which may have a number of management options over the life of the plan, or where the Department has developed a proposal and wants to gauge public opinion about management.

The Department and the Conservation Commission would particularly like to seek feedback on strategies and key performance indicators mentioned through various sections of the draft management plan.

How to make effective comments

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

To ensure your submission is as effective as possible please:

- be clear and concise
- list your points according to the subject sections and page numbers in the plan
- describe briefly each subject or issue you wish to discuss
- say whether you agree or disagree with any or all of the outcomes or actions within each subject or just those of specific interest to you—clearly state the reason behind your opinion and provide supportive information where possible
- suggest alternatives to deal with issues on which you disagree.

Where to send your comments

Submissions are welcome for two months after the release date of the draft management plan and can be made online at: <http://www.dec.wa.gov.au> or by writing to:

**Planning Coordinator
Ord River and Parry Lagoons Nature Reserves Draft Management Plan
Department of Environment and Conservation
Locked Bag 104
BENTLEY DELIVERY CENTRE WA 6983**

Alternatively, submissions can be sent to: planning@dec.wa.gov.au

How your comments will be considered

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

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

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

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INTRODUCTION

1. OVERVIEW

The planning area is located in the East Kimberley region in north Western Australia, within the Victoria-Bonaparte bioregion. The Victoria-Bonaparte bioregion covers more than 70,000 square kilometres and spans the Western Australian (WA) and Northern Territory borders with more than 70 per cent of the bioregion within the Northern Territory. The Ord River catchment covers more than 64,000 square kilometres and also spans the border of the two jurisdictions, although it lies predominantly within Western Australia. The 650 kilometre long Ord River starts near Halls Creek and drains into the Cambridge Gulf. The planning area lies within the greater Kununurra Planning Region within the Shire of Wyndham East Kimberley. The western boundary is about 15 kilometres east of the town of Wyndham. The eastern boundary is about 47 kilometres north west of the town of Kununurra (see Map 1).

The Ord River and Parry Lagoons nature reserves are two existing reserves to eventually be co-managed under the Joint Management Initiative by the department and Yawoorroong Miriuwung Gajerrong Yirrgeb Noong Dawang Aboriginal Corporation, through the Yoorrooyang Dawang Regional Park Council (see Management Arrangements with Aboriginal People). As specified in the Ord Final Agreement, co-management is dependent on resources being available, including staffing and funding. The Department of Environment and Conservation (DEC, the department) and the Conservation Commission of WA (Conservation Commission) are interested in pursuing joint management arrangements for the planning area with the Balangarra people of the Wyndham area.

The Ord River Nature Reserve includes the spectacular False Mouths of the Ord, featuring vast areas of mudflats, mangrove communities and a maze of tidal creeks. Of the 18 species of mangrove found in Western Australia, 16 have been recorded within the reserve. It is also important because of the presence of mangrove-dependent bird species not found elsewhere in WA. Additionally, lands within the planning area are considered important habitat for the saltwater crocodile.

The seasonal wetlands south of the Ord River are fresh and sometimes fringed by low shrubs or trees, which are surrounded by a flat, grass covered plain. The mud flats along the river and the eastern side of Cambridge Gulf support patches of saline grassland and samphire. They are incised by numerous creeks and channels, along which are extensive stands of mangroves. Mangroves also grow along the Ord River and the seaward side of the mudflats.

A major characteristic of Parry Lagoons Nature Reserve is the presence of many waterbird species, often in great numbers. It also includes a variety of important habitats such as freshwater springs, components of rainforest, grasslands, woodland, rugged sandstone and floodplain. This diversity of habitat supports a rich faunal assemblage.

The planning area, in conjunction with the lower Ord River waterway, forms the Ord River Floodplain Ramsar site (see Map 1). Listed in 1990 as a Wetland of International Importance, the wetland meets seven of the nine qualifying criteria (Hale 2008).

2. MANAGEMENT PLAN AREA

This management plan covers the following reserves vested with the Conservation Commission and managed by the department (Map 1). Both have the purpose 'conservation of flora and fauna'.

- ❖ Ord River Nature Reserve (Reserve 31967, other than class A) covers an area of 79,842 hectares.
- ❖ Parry Lagoons Nature Reserve (Reserve 42155, other than class A) covers an area of 36,111 hectares.

Neither of the reserves is covered by an existing management plan.

The Ord River and Parry Lagoons nature reserves are proposed to be changed to 'class A' nature reserves. Consideration may also be given to changing Parry Lagoons Nature Reserve to a national park.

The department has interest in other land as proposed conservation reserves, including:

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- ❖ Adolphus Island (8,156 hectares)
- ❖ Cape Domett (4,218 hectares)
- ❖ unallocated Crown land adjacent to the eastern boundary of Ord River Nature Reserve, extending from high water mark to 40 metres above high water mark (1,212 hectares), where the pastoral boundary commences
- ❖ unallocated Crown land between Parry Lagoons Nature Reserve and associated islands, and the Ord River.

It is intended that the proposed reserve additions listed will come under the management plan once the change in land tenure and purpose occurs and the reserves are vested with the Conservation Commission. Other additions not listed will be managed to be consistent with this management plan, or if necessary the plan will be amended to apply to them.

Any reserve additions, or changes in the classification of existing reserves or the category of land, will be subject to usual government consideration and determination.

Desired outcome

Protect the values of the planning area.

Strategies

1. Change Ord River and Parry Lagoons nature reserves to 'class A' nature reserves, subject to usual Government consideration and determination.
2. Consider changing Parry Lagoons Nature Reserve to a national park.
3. Manage any proposed reserve additions within the planning area that become vested in the Conservation Commission in accordance with this management plan.
4. Incorporate other adjoining land into the nature reserves, if identified as having high conservation significance, and subject to usual government consideration and determination.

3. KEY VALUES AND THREATS

Key values

- ❖ Extensive representation of mudflat and tidal waterway systems at the False Mouths of the Ord, within the Victoria Bonaparte subregion of the Interim Biogeographic Regionalisation of Australia.
- ❖ An extensive and diverse mangrove community consisting of 16 of the 18 species of mangrove known to occur in Western Australia.
- ❖ A mangrove habitat that supports a number of species of birds restricted to mangrove forests.
- ❖ Important habitat and breeding site for the saltwater crocodile.
- ❖ Wetland areas that regularly support more than 20,000 waterbirds at a time.
- ❖ Habitats that support critical life stages of annually migrating bird species, act as seasonal drought refuge areas for large numbers of waterbirds, and provide for breeding of 16 species of wetland dependent birds.
- ❖ Sites important for nursery, breeding and feeding for at least 50 fish species, and a migratory route between marine and freshwater habitats for 15 species of fish.
- ❖ Cultural sites of significance for Aboriginal and non-Aboriginal people.
- ❖ Recreation and tourism activities, particularly bird watching, fishing and boating.

Key threats

- ❖ Climate change.
- ❖ Modification of hydrological regimes.
- ❖ Pollution (e.g. by nutrients, fertilisers, herbicides, insecticides).
- ❖ Inappropriate fire regimes.
- ❖ Inappropriate recreational use.
- ❖ Introduction of environmental weeds, introduced or problem animals and diseases.

4. MANAGEMENT DIRECTIONS

The vision for Parry Lagoons Nature Reserve and Ord River Nature Reserve is:

To be recognised by the community for its international significance as a wetland providing for migratory and local waders, waterbirds and shorebirds, and as a place where natural, cultural and aesthetic values are appreciated and protected. Natural systems and processes will continue to function, and habitats will be managed in partnership with traditional owners and the community to maintain and improve the area's Ramsar and other natural values.

This management plan will be consistent with Australia's obligations under the Ramsar Convention on Wetlands and promote the management of the Ord River Floodplain Ramsar site in accordance with the Australian Ramsar management principles. In addition, the plan will focus on protecting and enhancing values of the planning area.

5. ECOLOGICAL CHARACTER

The planning area, in conjunction with the lower Ord River waterway, forms the Ord River Floodplain Ramsar site (see Map 1). Listed in 1990 as a Wetland of International Importance under the Convention on Wetlands, the Ramsar site originally met four of the six qualifying criteria.

At the time of listing, the site had already been subject to significant hydrological alteration because of the construction of Kununurra Diversion Dam in 1963 and the Argyle Dam in 1973 for water regulation and development as a part of the Ord River Irrigation Area Stage 1. Although further hydrological alteration occurred with the lifting of the Argyle Dam wall in 1995 for hydro power generation, the ecological characteristics of the Ramsar site must be maintained as they were when originally listed in 1990.

Following refinements in 2005 and 2006 to the original qualifying criteria, plus the collection of additional data for the site, the Ord River Floodplain Ramsar site has been reviewed to meet the following seven of the nine qualifying criteria (Hale 2008):

- Criteria 1. The site represents the best example of wetlands associated with a floodplain and estuary of a tropical river system in the Kimberley region of Western Australia. In addition, the False Mouths of the Ord contain the most extensive mudflat and tidal waterway complex in WA, and the wetland grasslands at Parry Lagoons are the most extensive vegetation community of this type in WA (CALM 1998).
- Criteria 2. The freshwater sawfish (*Pristis microdon*), the green sawfish (*Pristis zijsron*) and the Australian painted snipe (*Rostratula australis*), all recorded within the site, are listed as vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The site is also one of only two known habitats in Western Australia for the nationally endangered northern river shark (*Glypis sp. c*) (Thorburn and Morgan 2004).
- Criteria 3. The site contains an extensive and diverse mangrove community containing 16 of the 18 species of mangrove known to occur in WA. These mangroves are important habitat for a number of species of birds restricted to mangrove forests in WA. This includes a population of black butcherbird (*Cracticus quoyi*) that breeds in the area, which is the only population of its kind in WA (Johnstone 1990).
- Criteria 4. The site supports:
- The critical life stage of migration: annual use by large numbers of many species of migratory animals (birds and fish).
 - The critical life stage of drought refuge: seasonal influx of large numbers of waterbirds from dried out wetlands in surrounding areas, and periodic massive influx from wider regions during drought.
 - The critical life stage of breeding: 14 species of wetland dependent birds, saltwater and freshwater crocodiles and an unknown number of fish.
- Criteria 5. Surveys conducted at Parry Lagoons in the 1980s regularly recorded more than 20,000 birds in this portion of the Ramsar site alone. Much of the area is difficult to survey, but there is sufficient evidence to support the criterion of "regularly supports 20,000 waterbirds".

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- Criteria 6. Surveys from the 1980s indicated that maximum counts for two species exceed the 1 per cent population thresholds (Wetlands International 2006):
- plumed whistling duck (*Dendrocygna eytoni*) – maximum count 15,000 (1 per cent = 10,000)
 - little curlew (*Numenius minutus*) – maximum count 2,500 (1 per cent = 1800).

Based on available habitat, wetland condition and threats – which are probably unchanged since the 1980s – threshold-meeting numbers of these two species can be expected to still occur in the Ramsar site. In addition, it is likely that several other waterbird species would meet this criteria if comprehensive surveys were conducted at appropriate times of year.

- Criteria 8. The site is important as a nursery and/or breeding and/or feeding ground for at least 50 species of fish and a migratory route for 15 species that are known to be diadromous.

The Ramsar Information Sheet for this site can be accessed via the Australian Wetlands Database on the web page of the relevant Commonwealth department at:

<http://www.environment.gov.au/water/publications/environmental/wetlands/database/index.html>

MANAGEMENT PURPOSE

6. LEGISLATIVE FRAMEWORK

The department is responsible for administration of the *Conservation and Land Management Act 1984* (CALM Act), which provides for the management of lands and waters vested with the Conservation Commission of Western Australia, and the *Wildlife Conservation Act 1950* (Wildlife Conservation Act), which provides for specific protection of native flora and fauna on all state lands and waters. Other State and Commonwealth legislation also (i) affects the department's activities, (ii) confers specific powers on the department, or (iii) involves other authorities or agencies in activities in the planning area, which may be referred to throughout this plan.

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

- ❖ Convention on Wetlands
- ❖ China-Australia Migratory Bird Agreement
- ❖ Japan-Australia Migratory Bird Agreement
- ❖ Republic of Korea-Australia Migratory Bird Agreement
- ❖ The Bonn Convention.

The Ord Final Agreement is an agreement between the State of Western Australia and the Miriuwung and Gajerrong people resolving native title over traditional lands. The creation of the Joint Management Initiative is an outcome of the Ord Final Agreement (State Solicitor's Office 2006) where formal processes have been established to provide consultation with Aboriginal people and their interaction in management and management planning.

7. MANAGEMENT ARRANGEMENTS WITH ABORIGINAL PEOPLE

There is strong interest by Aboriginal people to be involved in the management of conservation estate and to strengthen cultural ties to the land. Working together with Aboriginal people to care for the land will be beneficial to the preservation of natural and cultural heritage, as well as enriching cross-cultural awareness.

The department and the Conservation Commission acknowledge the aspirations of Aboriginal people to obtain native title over their traditional lands and waters under the provisions of the Commonwealth's *Native Title Act 1993* (Native Title Act).

Portions of the Ord River and Parry Lagoons nature reserves are traditional lands for the Balangarra people of the Wyndham area and the Miriuwung Gajerrong people of the Kununurra area.

The Ord Final Agreement resulted in the identification of six areas surrounding Kununurra becoming Aboriginal freehold land and leased back to the State for conservation purposes. These areas are to be managed jointly and include:

- ❖ Proposed Mijing Conservation Park
- ❖ Proposed Jemandi-Winingim Conservation Park
- ❖ Proposed Goomiyig Conservation Park
- ❖ Proposed Barrberrm Conservation Park
- ❖ Proposed Darram Conservation Park
- ❖ Proposed Ngamoowalem Conservation Park.

Mijing and Ngamoowalem are adjacent to Ord River and Parry Lagoons nature reserves (see Map 2).

The Ord River and Parry Lagoons nature reserves are two of four existing reserves to be co-managed under the Joint Management Initiative by the department and Yawoorroong Miriuwung Gajerrong Yirrgab Noong Dawang Aboriginal Corporation, through the Yoorrooyang Dawang Regional Park Council. The other two existing reserves are Mirima National Park and Point Springs Nature Reserve. As specified in the Ord Final Agreement, co-management is dependent on resources being available, including staffing and funding. Before conducting

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any works on their country that is within the planning area, and regardless of native title having been resolved over their country, consultation will remain consistent with the Native Title Act.

The department and the Conservation Commission are interested in pursuing joint management arrangements for the planning area with the Balangarra people.

Desired outcome

Traditional owner involvement in management of the planning area.

Strategies

1. Commit to the Joint Management Initiative in collaboration with Yawoorroong Miriuwung Gajerrong Yirrgeb Noong Dawang Aboriginal Corporation.
2. Foster relations with other traditional owners who speak for country.
3. Ensure consultation with and approval from traditional owners who speak for country, for any amendments to land tenure that may occur over land for which they speak.
4. Work with traditional owners to promote their participation in commercial activities.
5. Ensure consultation with and approval from traditional owners who speak for country, for any research activities that may occur on land for which they speak.
6. Refer development and resource use proposals to traditional owners who speak for country.

8. PERFORMANCE ASSESSMENT

It is not efficient to measure all aspects of management given resource and technical impediments — consequently, indicators target key components of the plan. The specific ‘limits of acceptable change’ for the Ord River Floodplain Ramsar site identified by Hale (2008) have been incorporated into this management plan, and appropriate key performance indicators identified. The Conservation Commission will measure the success of this plan in accordance with s.19(1)(g)(iii) of the CALM Act by using key performance indicators and other mechanisms as appropriate.

9. ADMINISTRATION

The day-to-day implementation of the final management plan will be the responsibility of the department’s East Kimberley District, which coordinates the operational management of parks and reserves in the planning area. The planning area lies within the Kimberley Region.

10. TERM OF PLAN

The management plan will guide management of the planning area for a period of 10 years from the date the final management plan is gazetted. During this time, amendments to the final management plan are allowed under s.61 of the CALM Act. If an amendment is necessary, the proposed changes will be released for public comment. At the end of the 10 year period, the management plan may be reviewed and a new management plan prepared. In the event that the plan is not reviewed and replaced by the end of the 10-year period, this plan will remain in force.

MANAGING THE NATURAL ENVIRONMENT

11. PHYSICAL ENVIRONMENT

Climate

The planning area has a semi-arid, monsoonal climate with a prolonged dry season from May to September. Data collected from Wyndham meteorological site show the average annual rainfall varies across the planning area, from 900 millimetres to 1200 millimetres. Evaporation rates far exceed rainfall the majority of the year, with an average annual evaporation rate of 2800 millimetres. Wet season average maximum temperatures vary between 36°C and 40°C and minimum temperatures between 25°C and 27°C. During the dry season average maximum temperatures are slightly cooler between 31°C and 36°C and minimum temperatures between 16°C and 22°C (Bureau of Meteorology 2009).

For the planning area, implementing the actions incorporated into this plan to create reserves, control pest animals and weeds and manage fire will help improve the resilience of species and ecosystems and hence decrease their vulnerability to climate change. A landscape approach that links large, contiguous habitats or that enable maintenance of ecological process, especially those across a range of environmental gradients, provide the optimal approach for species and ecological processes to respond to changing climatic conditions.

Geology, landforms and soils

The Carpentarian land system comprises the majority of the planning area to the north, characterised by Quaternary alluvia geological material forming the estuarine-deltaic mangrove plains, and an isolated pocket of the Cockatoo land system (Permian, Lower Carboniferous, Upper Devonian and Ordovician-Cambrian geological material of sandstone, calcareous sandstone, calcareous conglomerate and minor limestone). The majority of the southern parts of the planning area are characterised by the Pinkerton and Ivanhoe land systems, interspersed with smaller areas of the Cockburn, Angallari and Frayne land systems. Adelaidean and Carpentarian geological material and Quaternary alluvia form the majority of this area, interspersed with lower Proterozoic and lower Cambrian material (Stewart *et al* 1970).

Geology and geomorphology influence catchment hydrology by affecting the development of aquifers, seepage points, discharge zones and drainage patterns. The planning area spans across the Cambridge Gulf Lowlands subregion of the Ord-Victoria geomorphic unit and into the Kimberley Plateau geomorphic unit to the south.

The damming of the Ord River is considered to have dramatically changed the sedimentation process with anecdotal evidence indicating that parts of the river have become shallower because of the lack of scouring by floodwaters (Wolanski *et al* 2004). Sediment deposition now dominate the entire length of the Ord River and False Mouths of the Ord creating extensive mud flats and dendritic streams, which are important in terms of mangrove communities, invertebrate populations and the waterbirds that feed on them. Broad sandy or gravelly spits and bars occur along upstream reaches while unstable mud bars and islands become common toward the mouth.

Hydrology

Hydrological influences are the primary driver of wetland ecology (Mitsch and Gosselink 2000) and are the principal constraint on the distribution and productivity of wetlands (Mendelssohn and Batzer 2006). Inundation is influenced by surface water, groundwater and tidal regime, and is crucial for wetland plant ecology (Hale 2008). In addition, fauna respond to hydrology directly, such as hydrological cues for breeding or migration, and indirectly via vegetation distribution.

Parry Lagoons contains seasonally inundated floodplains and permanent or near permanent water bodies, which are inundated via surface water flow from the Ord River or Parry Creek. Inundation is at its greatest extent and depth during March - April at the end of the wet season. The low relief claypans and marshes are typically less than one metre deep, and dry out by June - July. The deeper waterholes, however, are permanent or near permanent.

Parry Creek is a seasonally flowing creek running through upland environments, and an alluvial floodplain complex. The expansive floodplain provides an array of seasonal and permanent freshwater wetlands that are important feeding and breeding habitat for migratory shorebirds, waterbirds and juvenile fish populations when flooded, and refuge for resident aquatic flora and fauna during the dry season.

Similarly the floodplains contain vegetation communities that typically require seasonal inundation, but also periods of dry where air can fill soil pore spaces. Without the wet–dry cycles, these vegetation communities, together with the fauna they support, could not exist.

Ground water is generally considered to flow from the Carlton and Mantinea flats proposed irrigation areas into the Ord River near the upstream limit of the planning area (O’Boy *et al.* 2001). During high tides it is possible that the flow of groundwater could be reversed with saline water flowing back under the plains. Work is under way to determine baseline groundwater data in the local area.

The tidal regime is important for maintaining a number of habitats and vegetation communities within the system. Variation in inundation of the banks of the dendritic creeks of the Ord River Nature Reserve provides for a range of habitats for different mangrove species and results in a distinct zonation. Tidal cycles may also provide cues for invertebrate breeding, such as banana prawns, and influence productivity. These macro-tides are important for maintaining nutrient cycling processes within the planning area by facilitating the export of nutrients from the catchment to the Indian Ocean.

Little is known of the hydrological regime influencing the planning area, nor the quality of surface and groundwater within the planning area to sustain the ecological character of the planning area.

Desired outcome

Maintain hydrological regimes occurring at the time of Ramsar listing in 1990.

Strategies

1. Provide input into environmental water allocations for Ord River.
2. Increase knowledge of hydrological requirements of the Ord River to maintain ecological values.
3. Work cooperatively with State and Commonwealth government authorities to maintain Ramsar values.

12. BIOLOGICAL ENVIRONMENT

Native plants and plant communities

The planning area supports a diverse assemblage of native plants and their communities. More than 300 terrestrial and wetland dependent species of plants have been recorded, including three priority flora species. A wide variety of plant communities have been identified, including mangrove and saltmarsh, wetland grasslands and sedges, riparian woodland, and aquatic vegetation (Hale 2008).

Mangrove and saltmarsh: the planning area contains 16 of the 18 species of mangrove found in WA (Johnstone 1990; Semeniuk and Semeniuk 2000). Five species of halophytic saltmarsh have been described in association with the mangrove communities. These include: *Tecticornia* spp., *Batis argillicola*, *Salsola tragus*, *Sesuvium portulacastrum*, *Sporobolus virginicus* and *Suaeda* sp. (Thom *et al.* 1975).

Wetland grasslands and sedges: the floodplain of Parry Lagoons Nature Reserve is dominated by grassland communities, characterised by annual grasses Australian wild rice (*Oryza australiense*) and beetle grass (*Diplachne parviflora*). The annual wetland shrubs sesbania pea (*Sesbania cannabina*) and budda pea (*Aeschynomene indica*) can form extensive tall thickets across the floodplain following periods of major inundation. Some of the most frequently inundated southern basins support dense beds of sedge dominated by *Eleocharis brassii* (CALM 1998).

Riparian woodland: the floodplain of Parry Lagoons Nature Reserve contains extensive woodland communities that are periodically inundated by floodwaters. Common canopy species include river red gum (*Eucalyptus camaldulensis*), northern salmon gum (*Eucalyptus bigalerita*), Darwin box (*Eucalyptus tectifera*) and guttapercha tree (*Excoecaria parvifolia*).

Aquatic vegetation: the permanent wetlands within the Ramsar site contain a diverse aquatic flora community that provide habitat and forage for a range of waterbirds during the wet and dry seasons.

Inundation directly affects the plant communities associated with Parry Lagoons Nature Reserve. True freshwater aquatic plants are generally confined to the permanent waterholes within Parry Lagoons. These species are adapted to permanent inundation with mechanisms for coping with anaerobic soils and are reliant on the presence of surface water for survival.

Desired outcome

Conserve indigenous plants and plant communities.

Strategies

1. Maintain vegetation diversity by reducing threatening processes, such as inappropriate fire regimes, altered hydrological regimes and high densities of introduced animals, such as cattle.
2. Work cooperatively with State and Commonwealth government authorities to maintain Ramsar values.

Native animals and habitats

The planning area supports critical life stages of annual migration for bird species and provides seasonal drought refuge for a variety of bird species. The planning area contains 105 waterbird, 16 wetland dependent bird, 21 mangal-restricted forest bird, 37 mammal, 17 bat, 87 aquatic invertebrate and potentially more than 50 fish species. Two new conservation areas, Mijing and Ngamoowalem, are located adjacent to the planning area and provide contiguous, protected habitat for native animals and therefore provide for improved cross-boundary management.

Many fauna species of conservation significance are found within the planning area and local vicinity, including species specially protected as threatened fauna pursuant to the Wildlife Conservation Act. Notable species of conservation significance include:

- ❖ three threatened species with rank endangered – Gouldian finch (*Erythrura gouldiae*), crested shrike-tit (*Falcunculus frontatus whitei*) and northern quoll (*Dasyurus hallucatus*)
- ❖ three threatened species with rank vulnerable – flatback turtle (*Natator depressus*), Australian painted snipe (*Rostratula benghalensis australis*) and red goshawk (*Erythrotriorchus radiatus*)
- ❖ four identified department priority species – flock bronzewing (*Phaps histrionica*), bush stonecurlew (*Burhinus grallarius*), eastern curlew (*Numenius madagascariensis*) and water rat (rakali) (*Hydromys chrysogaster*)
- ❖ two species that are otherwise specially protected under section 14(2)(ba) of the Wildlife Conservation Act – saltwater crocodile (*Crocodylus porosus*) and freshwater crocodile (*Crocodylus johnstoni*)
- ❖ 32 migratory waterbird species listed under international agreements
- ❖ 19 marine bird species listed under the EPBC Act.

The number of waterbirds recorded breeding is almost certainly incomplete given the limited published bird records, the extensive and diverse nesting habitat from wooded swamps to open marshes with plenty of dense cover, combined with extreme difficulty for access during times of greatest habitat and food resources in the wet season. It is likely that this species list and the abundance values will change with monitoring.

The planning area provides important nursery, breeding and feeding sites for fish, ranging from freshwater, estuarine and marine environments. This allows for feeding and breeding migration between all three habitats. It is predicted that the area could support more than 50 species of fish; however, fish populations have received little research attention.

Valuable crocodile breeding habitat is found east of the Ord River Nature Reserve. A 40 metre wide strip of unallocated Crown land is located adjacent to the inland side of the Ord River Nature Reserve boundary from high water mark to 40 metres above high water mark. Extending the boundary of the nature reserve to be 40 metres above high water mark will incorporate this area of unallocated Crown land into the reserve and provide additional protection to crocodile breeding areas.

Adolphus Island was surveyed in 2008 and 2009 as part of the Kimberley Islands Biological Survey. Northern quolls (*Dasyurus hallucatus*) were trapped at two Adolphus Island survey sites (T. Handasyde *pers. comm.*). The only other confirmed records of northern quolls in the east Kimberley are a 1908 WA Museum specimen from the planning area and a recent sighting (confirmed by photograph, T. Sinclair) from neighbouring El Questro Station. The proposed addition of Adolphus Island to the planning area will provide protection for the island population of northern quolls in the short term, although cane toads will pose a potential threat to their continued survival.

A large flatback turtle (*Natator depressus*) rookery is located beyond the northern boundary of the planning area at Cape Domett. Although limited research has been conducted on the species in this area, this is thought to be among the largest of all known flatback nesting populations, with an estimated yearly population in the order of several thousand turtles (Whiting *et al.* 2008). As this species is protected under the Wildlife Conservation Act, it is recommended Cape Domett be incorporated into the Ord River Nature Reserve.

Desired outcome

Conserve specially protected and other native fauna.

Strategies

1. Support the preparation and implementation of recovery plans for any threatened fauna species.
2. Protect native fauna from introduced and problem animals through appropriate control regimes where necessary.
3. Work cooperatively with State and Commonwealth government authorities to maintain Ramsar values.

13. PROTECTION OF THE NATURAL ENVIRONMENT

Environmental weeds

Weeds displace indigenous plants, particularly on disturbed sites, by competing with them for light, nutrients and water. Other impacts include the prevention of seedling recruitment, changes to soil nutrients, and changes to the abundance of indigenous fauna. They can also have a significant adverse impact on other conservation values by altering animal habitats, harbouring pests and diseases, and increasing fire hazard by changing fire regimes.

Parkinsonia (*Parkinsonia aculeata*), a Weed of National Significance, noogoora burr (*Xanthium occidentale*) and bellyache bush (*Jatropha gossypifolia*), weeds of potential national significance, persist within Parry Lagoons Nature Reserve; however, management efforts by the department to date have controlled the spread of the weeds. The Department of Agriculture and Food WA maintains a noogoora burr quarantine zone within the planning area. Other weeds that are found upstream of the planning area, and thereby pose a threat to the planning area, include salvinia (*Salvinia molesta*), rubber vine (*Cryptostegia grandiflora* and *Cryptostegia madagascariensis*) and *Mimosa pigra*, all Weeds of National Significance. With the development of horticultural crops in Ord Stage 2, the potential for invasion by *Moringa oleifera* and other crop species will increase.

Weeds of National Significance and weeds of potential national significance are current priorities for control.

Weed species within the planning area are recognised as a significant problem. The *Environmental Weed Strategy for Western Australia* (CALM 1999a) provides an integrated approach to weed management and rates environmental weeds as high, moderate, mild and low according to their potential invasiveness, distribution and environmental impacts. The department is undertaking regional weed prioritisation processes, with the Kimberley region due to undertake this in 2010. The outcomes will provide the basis for identifying control actions, with the highest rated species and species that pose a threat to conservation values within the reserve, being the focus for weed management.

Desired outcome

Prevent loss of native species and decline in plant communities from weed invasion.

Strategies

1. Consistent with regional weed prioritisation, prepare a weed control program based upon invasiveness, existing and potential impacts, current and potential distribution and feasibility of control.
2. Support the Australian Quarantine and Inspection Service to monitor the occurrence of, and potentially control the spread of, alien weed species.

Introduced and other problem animals

Problem animals are those species that have the potential to cause serious impact on natural systems through direct effects such as predation, habitat destruction, competition for food and territory, introduction of disease and through environmental degradation, such as overgrazing. Problem animals can be either native species that are impacting on natural or agricultural values, or feral animals that are introduced species that have become established as wild or naturalised populations. The most significant introduced species within the planning area is cattle (*Bos taurus*). Cane toads (*Bufo marinus*) are expected to enter the planning area by 2011. Little is known

of the impact from feral honey bees, cats and feral pigs; however, the potential for invasion remains. The Judas Donkey Program, run by the Department of Agriculture and Food WA and partially funded by the department, has successfully eradicated donkey populations in the local area.

Desired outcome

Prevent impacts of problem animals on the values of the planning area.

Strategies

1. Consistent with regional prioritisation for introduced and problem animals, prepare a control program based upon existing and potential impacts, current and potential distribution, feasibility of control and capacity for long term monitoring.
2. Assist adjoining land owners to ensure boundary fences are adequate to exclude cattle, where practicable.
3. Support the Australian Quarantine and Inspection Service and Department of Agriculture and Food WA to monitor the occurrence of, and potentially control the spread of, alien fauna.

Altered hydrological regimes

Kununurra Diversion Dam was constructed in 1963 and Argyle Dam constructed in 1973 to enable water regulation and development for the Ord River Irrigation Area (ORIA) Stage 1. Further hydrological alteration occurred with the lifting of the Argyle Dam wall in 1995 for hydro power generation.

With the river now dammed at two points upstream, the flood frequency and extent and sediment deposition characteristics have changed markedly. The Argyle Dam is highly effective at constraining wet season flood peaks and trapping sediment loads from the majority of the catchment. Combined with this is a significant reduction of intense rainfall events since the construction of the dams (Rodgers and Ruprecht unpublished). Once a river with only seasonal flow, the Ord's flow is now perennial because of constant discharge from the Kununurra Diversion Dam and flood events are less frequent and for shorter periods.

Since the construction of the Argyle Dam, the wet season flood peaks and sediment pulses in the lower Ord River are almost certainly determined more by flooding from the Dunham River and sediment being deposited downstream from the Dunham River and upstream from the Cambridge Gulf. It is likely that the alignment of the main stream channel of the lower Ord River is more stable than in past times, though shallower and wider. The floodplain of the lower Ord River is a complex network of intermittent and occasionally permanent streams. The major sources of fresh water directly into the floodplain are from the Ord River itself, Parry Creek and the major tributaries of the False Mouths of the Ord; Emu, Tanmurra and Station creeks.

Hydrological modelling of the Ord River was performed pre- and post-dam construction. Before dam construction, at a 10 per cent annual exceedence probability, numerous flood breakouts occurred from the main Ord River channel, including flooding of a significant portion of the Parry Lagoons and Mantinea Flats areas. Flooding at this time was strongly influenced by river flows (Rodgers and Ruprecht unpublished).

After dam construction, at a 10 per cent annual exceedence probability, major flooding at Mantinea Flats is significantly reduced and only a small to moderate area in the vicinity of Parry Lagoons experiences flooding. Therefore, as a result of the dam construction and reduction in intense rainfall events, flooding at Parry Lagoons is now more strongly influenced by the combination of tidal regimes and river flows (Rodgers and Ruprecht unpublished).

The *Ord River Water Management Plan* (Department of Water 2007) has set environmental flow conditions for water discharge from Lake Kununurra Diversion Dam to maintain the current environmental condition of the Ord River. It is unclear if these flow conditions reflect the flow of the Ord River, and therefore the ecological character, between the time of Ramsar listing in 1990 and raising of the Argyle Dam wall in 1995 (see section 3 *Ecological Character*).

Development of ORIA Stage 2 is estimated to have a relatively small effect on the modelled flood flows experienced by the Ord River, particularly in comparison to the changes to modelled flood flows as a result of the construction of the two dams (Rodgers and Ruprecht unpublished).

Disease

No plant or animal diseases have been located within the planning area. The Australian Quarantine and Inspection Service monitors migratory birds within the planning area to detect any occurrence of avian bird flu.

Fire

Fire management is a major issue in the region. The occurrence of large, end of dry season fires has led to changes in the structure and composition of vegetation communities and the distribution and abundance of fauna species, such as the decline in population numbers experienced by the Gouldian finch. Values at risk include:

- ❖ the lives of visitors to the planning area
- ❖ people involved in fire management activities
- ❖ native flora and fauna communities
- ❖ adjoining lands.

The department has prepared the *Kimberley Regional Fire Management Plan* (DEC 2008) for the implementation of a prescribed burning program focused on early dry season burning and the creation of mosaics. Prescribed burning is primarily undertaken along the Great Northern Highway adjacent to the western boundary of Parry Lagoons Nature Reserve. The use of incendiaries dropped from the air and hand burning will continue.

The preparation and implementation of a prescribed burning program is required for the planning area, based on the following principles from the *Kimberley Regional Fire Management Plan*:

- ❖ wet season burning of areas immediately adjacent to wetlands
- ❖ early dry season linear buffers no closer than 3kilometres to wetland burnt patches
- ❖ low intensity burning of woodlands to maintain adequate, low fuel mosaic
- ❖ liaison with traditional owners to build fire management capacity to assist in the removal of fuels around cultural assets and living areas and implement the prescribed burning program.

Pre- and post-suppression work within the planning area is the responsibility of the department and would include rehabilitation of any fire lines that are constructed as part of suppression efforts.

Desired outcomes

Protect biodiversity, people and property within the planning area.
Maintain cultural responsibilities.

Strategy

1. Prepare and implement a prescribed burning program in accordance with the Kimberley Regional Fire Management Plan which considers the knowledge and responsibilities of traditional owners.

Key performance indicator

Performance measure	Target	Reporting requirement
Loss of life or property from fire.	No loss of life or property from fire.	5 yearly.
Biodiversity.	No reduction in biodiversity from fire.	5 yearly.

MANAGING OUR CULTURAL HERITAGE

14. ABORIGINAL HERITAGE

The conservation of Aboriginal heritage is important in maintaining the identity, health and well being of Aboriginal people. In Western Australia, the *Aboriginal Heritage Act 1972* (Aboriginal Heritage Act) protects places and objects customarily used by, or traditional to, the original inhabitants of Australia. A register of such places and objects is maintained under the Act; however, all sites are protected regardless of whether they have been entered on the register.

Aboriginal heritage within the planning area is diverse, consisting of numerous rock art sites, burial sites and mythological sites, including the Ord River. Management must ensure that Aboriginal sites are protected from damage, and that obligations are fulfilled according to the Aboriginal Heritage Act before any planning or public works occur.

The Conservation Commission and the department acknowledge the aspirations of Indigenous people to obtain native title over their traditional lands and waters under the Native Title Act. The Kimberley Land Council is the representative Indigenous body appointed under Native Title Act for the planning area. Existing reserves in the planning area have been created under the *Land Act 1933*, the *Land Administration Act 1977* or the CALM Act. These reserves were vested before 23 December 1996, thereby extinguishing native title rights in the vesting process (Ward High Court Decision August 2002). Although this is the case, the department will continue to follow the requirements of the Native Title Act and advise native title claimants and representative bodies before major public works are undertaken. The department will continue to recognise the interests of Indigenous people and their desire to continue cultural activities and customs in the planning area.

Irrespective of whether native title has been determined, Aboriginal people still have the right of access for sustenance, maintenance and protection of important places and paintings, and the inheritance of native title rights. Activities that can be undertaken include free movement, fishing, ceremonies, visiting and protecting important places.

Under section 100 of the CALM Act, the department's Director General may grant leases to traditional owners on department-managed lands on such terms and conditions as he sees fit, with the approval of the Minister for Environment. As a negotiated outcome of the *Ord Final Agreement* (State Solicitor's Office 2006), the Goose Hill Aboriginal Living Area within the planning area will be excised and given freehold status.

Desired outcomes

Protect Aboriginal cultural heritage.

Traditional owners living and camping on their traditional lands.

Strategies

1. Work with traditional owners who speak for country, to protect heritage sites within the planning area.
2. Notify relevant native title claimants and authorities when proposing to undertake public works in registered heritage sites.
3. Ensure management activities, visitor activities and threatening processes, such as altered fire regimes and introduced plants and animals and altered hydrological regimes, do not adversely impact Aboriginal cultural heritage.
4. Ensure the recommendations and outcomes of the Ord Final Agreement in respect to Aboriginal Living Areas are implemented.

Key performance indicator

Performance measure	Target	Reporting requirement
Loss of Aboriginal cultural heritage sites.	No loss of Aboriginal cultural heritage sites.	5 yearly.

15. NON-ABORIGINAL HERITAGE

The graziers of the East Kimberley were preceded by early exploration of the area by Alexander Forrest in 1897 and the privately funded expeditions of Patsy Durack in 1882 and WJ O'Donnell in 1883. Parry Creek was named after E Parry, a syndicate member of the Cambridge Downs Pastoral company, which financed O'Donnell's exploration of the area. The lagoons subsequently took their name from Parry Creek which feeds them (CALM 1999b).

The non-Aboriginal heritage within the planning area includes European and Chinese history. The following structures found within the planning area are listed on the Shire of Wyndham-East Kimberley *Municipal Heritage Inventory* (1997):

- ❖ Chinese Gardens Parry Creek – the Chinese Gardens at Parry Creek are tangible evidence of the early Chinese impact on early settlement in the Wyndham locality. They provided fresh fruit and vegetables to Wyndham and the goldfields in Halls Creek from 1889 to 1890.
- ❖ Chimooly Dam – the fenced area was used to hold cattle destined for the meatworks at Wyndham and the dam used to water the cattle. It was also part of the original cattle route into Wyndham.
- ❖ Old Telegraph Station – much of the foundations of the old telegraph station are still evident. Built in 1914 inland from Wyndham because of the Bastion Hill blocking reception, it was used for intelligence communications during the First World War and played a crucial part in the sinking of the German raider *Emden*. Used later to communicate with merchant ships for safety, the station was decommissioned in 1924.
- ❖ Curtin's Cowboys – a series of camps near Parry Lagoons used by the 550 volunteers of the North Australian Observer Unit, otherwise known as the Knackerroos, formed in response to the Japanese raids in the north of Australia and disbanded in 1945.

A number of other features within the planning area were identified as holding heritage significance (Nayton 1998), in particular the cobblestone remnants of Old Halls Creek Road. The department will work collaboratively with the Shire to ensure the *Municipal Heritage Inventory* is updated to include all sites of significance within the planning area.

Desired outcome

Protect non-Aboriginal cultural heritage.

Strategy

1. Ensure management activities, visitor activities and threatening processes, such as fire and introduced plants and animals, do not adversely impact cultural heritage.

Key performance indicator

Performance measure	Target	Reporting requirement
Loss of non-Aboriginal cultural heritage sites.	No loss of non-Aboriginal cultural heritage sites because of management activities.	5 yearly.

MANAGING VISITOR USE

16. VISITOR OPPORTUNITIES AND PLANNING

The Kimberley is known locally and abroad for its rugged beauty and remoteness, attracting increasing numbers of visitors each year. The planning area is a relatively undisturbed natural environment with the potential to offer visitors remote day use or four-wheel-driving experiences. Parry Lagoons Nature Reserve is one of four department parks within the Kimberley Region to have experienced a steady increase in visitor numbers since 2001 (DEC in prep.).

Visitor planning

Planning for visitor use is required in order to manage issues of visitor risk, environmental impacts, social benefit, equity, public demand and potential economic benefit. Recreational activities will continue to be generally low-key within the planning area.

The provision of consistent and accurate information by internal and external providers is important in protecting values of the planning area and achieving effective communication. The department provides a variety of information on the planning area (e.g. facilities, activities and access) through a variety of means (e.g. signage, printed materials, website and staff). Telegraph Hill and the bird hide at Marlgu Billabong are the main interpretive sites in the planning area.

Possible future developments include:

- ❖ stopping points and lookouts at significant natural features or cultural and historical sites along four-wheel drive routes
- ❖ commercial tourism operations
- ❖ short walktrails from roadside lay-bys to provide access to features and views over the surrounding landscape.

Low impact activities and those that facilitate enjoyment, appreciation and understanding of the natural and cultural environment will be encouraged within the planning area.

Desired outcome

Facilitate visitor enjoyment, appreciation and understanding of the values of the planning area.

Strategy

1. Provide a range of opportunities for visitors, and ensure they are consistent with the purpose of the reserves, pose no adverse impacts on the environment or unreasonably interfere with public use.

Visitor safety

In addition to a genuine concern for visitor welfare, the department has a legal responsibility to consider the personal safety of visitors to the planning area. Factors that contribute to visitor risk in the planning area include:

- ❖ facility maintenance
- ❖ climate (eg. dehydration and sun exposure)
- ❖ hazardous terrain (eg. slipping and tripping on uneven ground)
- ❖ remoteness (eg. hard to access by emergency services and often lacking digital mobile phone network coverage)
- ❖ bushfire
- ❖ cyclones
- ❖ dangerous wildlife (eg. snakes, crocodiles).

Many of these risks are addressed through attention to personal safety, appropriate maintenance of facilities by department staff, appropriate risk warning through brochures, promotional material and signage. Risk assessments involve the identification of hazards, assessment of the risks posed by these hazards, implementation of risk mitigation measures and ongoing monitoring. As part of the program, all designated recreation sites are routinely audited to identify visitor risks.

In the event of an incident, the coordination of search, rescue or recovery operations is the responsibility of the Western Australian Police Service, with the department providing support as requested. However, where these occur on lands managed by the department, and in an area as remote as the planning area, it is often the department that organises the initial response.

Desired outcome

Minimal risks to visitors and encouragement of appropriate visitor behaviour.

Strategy

1. Develop a visitor risk management plan in accordance with department policy, that identifies and assesses the risks associated with all recreation sites and monitors and regularly reviews visitor risk.

Information, education and interpretation

The planning area provides a valuable opportunity for improving community awareness about wetland ecosystems and the values of Ramsar listed wetlands. An effective information, education and interpretation program is vital to achieving the vision and objectives of maintaining, enhancing and communicating the values of the planning area.

Educational facilities are only located within Parry Lagoons Nature Reserve and are limited to Telegraph Hill, Marlgu Billabong and information bays at access points. Signage at Telegraph Hill explains the history of the area and a walking trail provides botanical and historical details. Information bays depict life in the area for early settlers and Aboriginal people and detail any projects under way in the reserve. Given the importance of Marlgu Billabong as waterbird habitat, the bird hide and boardwalk are invaluable to visitors. It is a high priority to upgrade the signs and information for the purpose of public education and interpretation to assist in achieving conservation objectives. Programs and activities aimed at increasing public education on the values of the planning area will be supported by the department.

A number of publications and brochures are available on the area. It is a high priority to review and edit the information they contain before being reprinted.

The department's website also provides a valuable means of distributing information on the significant values of the planning area.

The characteristic water-holding ability of the planning area increases the potential for visitors to be exposed to mosquitoes that have a high possibility of carrying Ross River virus. As mosquitoes are an essential part of the reserve's ecosystem and mosquito control has the potential to jeopardise natural values, the department and the Conservation Commission will not take measures to reduce mosquito numbers. Instead, increasing visitor awareness may help reduce the incidence of infection.

Desired outcome

Increase community awareness, understanding and appreciation of the values of the planning area in order to foster support for its protection and effective management.

Strategies

1. Provide information to visitors, volunteers, commercial operators and the tourism industry on:
 - ❖ day-use opportunities
 - ❖ the values and management issues within the planning area such as its importance for migratory waterbirds, visitor safety, permitted activities and regulations
 - ❖ cultural heritage to promote visitor awareness, appreciation and understanding
 - ❖ potentially hazardous areas and activities in order to modify visitor behaviour accordingly.
2. Update existing signage and brochures and install new signs at all access points, including information on Aboriginal cultural interpretation.
3. Incorporate the promotion of the values of the planning area into future commercial lease agreements at major interpretive sites.
4. Increase community awareness of the need to keep domestic animals out of the planning area.

17. VISITOR ACCESS

Access within the planning area is provided to allow passive recreational use, as well as for management and emergency vehicles. All roads within the planning area are only adequate for four-wheel-drive vehicles and are impassable during the wet season.

Vehicle access to Parry Lagoons Nature Reserve is via Parry Creek Road, accessed either from the Great Northern Highway in the west or Old Wyndham Road in the east and maintained by the Shire of Wyndham East Kimberley. The Shire is also legally responsible for Parry Creek Road.

There is no formal vehicle access to the Ord River Nature Reserve on the east of the Ord River, as the reserve is bound by Carlton Hill Pastoral Station. Visitation to the area is minor, often via boat from Wyndham to the Cambridge Gulf and False Mouths of the Ord.

It is proposed no new tracks are created by the department for the purpose of public access or management access in the planning area throughout the life of this plan. Informal roads or tracks may be closed to the public as necessary by using signage or natural barriers because of the risk of degradation of natural and cultural values and visitor safety.

Desired outcome

Provide safe and convenient access within the planning area for visitors and management.

Strategies

1. Maintain designated access points to the planning area to facilitate four-wheel drive, walking and bird watching activities.
2. Pending a future increase in visitor numbers, develop defined walking trails if required.

18. VISITOR ACTIVITIES AND USE

Recreational activities that take place within the planning area include bird watching, scenic and wildlife photography, picnicking, fishing, boating, and four-wheel driving.

Traffic counters are not used within the planning area, so visitor numbers are not recorded. This management plan recommends traffic counters are installed at Marlgu Billabong and Telegraph Hill to provide data on the level of visitation to these sites. This will assist in determining future recreational requirements within the planning area.

Day use

Bird watching and nature appreciation

Bird watching is a popular activity within the planning area, particularly at Marlgu Billabong. The Ord River contains a variety of habitats for birds, ranging from deep water popular with diving species such as cormorants, darters and pelicans, to shallow areas that attract waders and shorebird species. Mangrove and saltmarsh habitats, wetland grasslands and sedges, riparian woodlands and aquatic vegetation are all represented. The planning area has large populations of seasonal waterbirds, some of which are threatened. The saltwater and freshwater crocodile are found throughout the planning area.

A bird hide, boardwalk, signs and interpretation panels are located within Parry Lagoons Nature Reserve. Picnicking is common at Crocodile Hole and Marlgu Billabong however the locations are informal and do not provide facilities.

Fishing

Fishing activities are primarily managed under the *Fish Resources Management Act 1994*. In freshwater areas species targeted include barramundi and sooty grunter. In saltwater areas species targeted include threadfin salmon, cod and mulloway. Crabbing for mud crabs is known to occur; however, the extent is not known.

Boating

Boating is a popular activity within the planning area, mainly in motorised boats and generally in conjunction with fishing pursuits. There are no boat ramps within the planning area, with access generally from the boat

ramp at Wyndham town site. An informal boat launching site is located at Tanmurra Creek within the False Mouths of the Ord.

Motorised boating is not permitted in the lagoons within Parry Lagoons Nature Reserve in order to prevent disturbance to bird life and for safety purposes because of the presence of crocodiles. It is recognised that it may be necessary for motorised boats to operate on the lagoons in some circumstances, such as search and rescue operations, scientific research and for inspections by government agencies. In these instances approval of the department's Regional Manager is required.

Overnight stays

Overnight stays and camping are not permitted within the planning area. Tourists wanting to stay within the general area are able to make use of accommodation facilities at Parry Creek Farm, a freehold property within the planning area. Other facilities are located within Wyndham, 50 kilometres north-west, and Kununurra, 100 kilometres east of the planning area along the Great Northern Highway.

Illegal camping is known to occur at Tanmurra Creek within the Ord River Nature Reserve. The location of the camp site is close to mangroves, often infested with sand flies and not managed in respect to rubbish disposal and toilet facilities. Alternative opportunities for camping will be investigated.

Desired outcome

Passive, low impact visitor use of the planning area.

Strategies

1. Encourage visitor use that is consistent with protecting and promoting the values of the planning area.
2. Provide a range of day-use opportunities consistent with department policies as resources permit.
3. Install traffic counters at Marlgu Billabong and Telegraph Hill.
4. Provide management solutions to mitigate visitor impacts.

Domestic animals

Domestic animals are not permitted within nature reserves.

Commercial operations and tourism

Leases are formal agreements that allow exclusive use of land as a means of providing security to protect significant investments. There are no recreation or tourism leases in the planning area. Leases on department-managed land should be assessed against a range of sustainability indicators including design, environmental, cultural and social impacts, safety and risk management, interpretation and education, customer service, marketing and contribution to management.

Licences allow private tour operators conducting commercial tourist activities to access and use department-managed lands, and enable the department to monitor and regulate access and use to ensure values of the planning area are maintained. Commercial tour operators interact with visitors on a regular basis and play a significant role in disseminating information. There are 68 'T' class commercial operators licensed to conduct tours in Parry Lagoons Nature Reserve, the majority being four-wheel drive or safari operations offering bushwalking along with other activities including bird watching. No tour operators hold licenses for the Ord River Nature Reserve.

The highly attractive visual amenity of the planning area is popular for filming ventures. Organisations and individuals planning to undertake commercial filming must obtain a permit from the department before filming.

Desired outcome

Commercial tourism activities that extend the range of services, facilities and experiences available which are compatible with management outcomes.

Strategies

1. Evaluate proposals for licences and commercial tourism leases according to department policies and allow their establishment where appropriate.
2. Ensure all commercial operations operate under a lease, licence or permit agreement with appropriate conditions.

3. Ensure any commercial tourism operations are regularly evaluated to reflect current market trends and that operations remain cost-neutral to the department.
4. Work with the tourism industry and associations regarding any commercial proposal or activity.

MANAGING RESOURCE USE

Resource use refers to consuming natural resources to provide economic and social benefit. This usually requires the determination of sustainable yield or allocation limits to ensure the natural resources are not consumed beyond acceptable means (WA Government 2006). Using the natural resources of the planning area in a sustainable manner is critical to the long term management, conservation and protection of such resources.

19. MINERAL EXPLORATION AND DEVELOPMENT

The Department of Mines and Petroleum (DMP) administers the *Mining Act 1978* (Mining Act) and is responsible for the granting of various tenements including prospecting licences, exploration licences, general purpose leases and mining leases for the exploration and subsequent development of minerals in Western Australia. There are two current and two pending exploration licences and one pending prospecting licence within the planning area and the proposed additions to the planning area.

Extraction of basic raw materials from the planning area by local government authorities for use on road reserve enclaves within the planning area occurs under the *Local Government Act 1955* and with departmental approval. Extraction by private contractors or individuals for use on private easements within conservation estate occurs under the Mining Act. It is preferred that basic raw materials for road construction and recreation developments be obtained from outside the planning area, or from areas that are already disturbed or of lower conservation value. To prevent the unwanted introduction of weeds and disease into the reserves, quarantine measures may be required.

Desired outcome

Minimal impacts from mineral exploration and development, including basic raw material extraction and development activities, on the values of the planning area.

Strategies

1. Refer proposals that may adversely impact upon the planning area to the Environmental Protection Authority (EPA) for consideration of assessment under the *Environmental Protection Act 1986* (EP Act).
2. Refer proposals to the Conservation Commission, in order to provide advice to the Minister for Environment.
3. Ensure access to basic raw materials from within the planning area by local government authorities and private contractors is allowed only when:
 - ❖ the material is to be used within the planning area
 - ❖ extraction complies with the relevant management plan and the purpose, class and tenure of the reserves
 - ❖ extraction complies with existing department and Conservation Commission policies and guidelines.

20. WATER RESOURCES

There is no extraction of surface water from the lower reaches of the Ord River adjacent to the planning area. Because of previous reliability issues with Moochalabra Dam during storm events, it was proposed to seek an alternative source of water from the Ord River for the Wyndham town site. This may not eventuate since the Water Corporation has upgraded the dam with a state-of-the-art water purification system. The tidal influence on the Ord River causes salt water intrusion which would result in an unsatisfactory taste of the water. If there is a future need to source water from the Ord River, all infrastructure should be located within Parry Creek Road reserve.

Parry Creek Farm source rainwater for their accommodation facilities.

Drinking water at Goose Hill Aboriginal Living Area is obtained from bores. Historical testing of the water show salinity levels greatly exceed the Australian Drinking Water Guidelines for taste (ANZECC 2000), though residents continue to drink the water.

A tidal power station has been proposed on the lower Ord River, south-east of Panton Island. The proposal is based on the construction of a rock barrage across the Ord River from Mt Connection to Limpit Hill, which is within the Ramsar classified wetland. Such a barrage would permanently halt upstream water movement within

the Ord River and divert all water around the western side of Limpit Hill, within the Ord River Nature Reserve. Although an environmental impact assessment has not been conducted for this proposal, potential issues involved with the proposal include:

- ❖ loss of connectivity between the Ord River and the Cambridge Gulf estuary impacting aquatic animals including saltwater crocodiles, diadromous fish, reptiles, crustaceans and benthic dwellers
- ❖ significant changes to the hydrological regime influencing salinity concentrations, sediment dynamics and nutrient cycling of the Ord River
- ❖ flooding of the Ord River Nature Reserve at Limpit Hill and along upstream banks of the Ord River causing death of and/or stress of mangrove and other vegetation and loss of, or alteration to, saltwater crocodile habitats
- ❖ Inconsistency with the purpose of a nature reserve.

This proposal may have a significant impact on matters of national environmental significance, such as the Ord River Floodplain Ramsar site, threatened species, threatened ecological communities and migratory species listed under the EPBC Act. It should also be referred to the relevant Commonwealth department responsible for the administration of this Act, for approval and possible assessment under the EPBC Act.

Mantina Flats, on the eastern boundary of Parry Lagoons Nature Reserve south of the Ord River, is earmarked for horticultural development during the implementation of ORIA Stage 2 (see Map 2). Potential issues involved with the design and management of Stage 1 and further development of Stage 2 include:

- ❖ direct and indirect impacts on Parry Lagoons Nature Reserve. Portions of the Mantinea Flats area are proposed to extend into the nature reserve. In addition to overall approval from the Minister for Environment under the EP Act, permission from the department and the Conservation Commission would be required if this area was to be considered for development
- ❖ unknown impacts to surface water and groundwater hydrology of the planning area, from land clearing and water abstraction, either from the Ord River or from groundwater sources, and within ORIA Stage 1 and Stage 2
- ❖ unknown impacts of increasing nutrients, pesticides and herbicides to the ecology of the river from ORIA Stage 1 and Stage 2, including bioaccumulation. Of serious concern is the impact from the herbicide atrazine, bioaccumulation of the insecticide endosulfan and bioaccumulation of DDE in reptiles effecting the thickness of eggs resulting from historical use of DDT
- ❖ potential for invasion of weed crop species into the planning area
- ❖ inconsistency with the purpose of a nature reserve.

A proposal to develop a prawn farm north of Wyndham, on the west bank of the Ord River, was tabled with the department and former National Parks and Nature Conservation Authority and referred to the EPA in 1999. Although the proposal did not proceed beyond the scoping phase, potential issues involved with the aquaculture facility include:

- ❖ direct and indirect impacts on Ord River Nature Reserve. Portions of the prawn farm are planned to extend into the Ord River Nature Reserve. In addition to overall approval from the Minister for Environment under the EP Act, permission from the department and the Conservation Commission would be required if this area was to be considered for development
- ❖ unknown impacts to saltwater crocodiles (*Crocodylus porosus*) and other fauna
- ❖ unknown impacts from increased nutrients to the ecology of the river
- ❖ inconsistency with the purpose of a nature reserve.

Desired outcome

Minimal impacts from water resource use on the values of the planning area.

Strategies

1. Issue licences as required under the CALM Act for water extraction from bores and other water sources located within the planning area.
2. Refer proposals that may adversely impact upon the planning area to the EPA for consideration of assessment under the EP Act.
3. Refer proposals to the Conservation Commission, in order to provide advice to the Minister for Environment.

21. PUBLIC UTILITIES AND SERVICES

The provision of new services and infrastructure has the potential to impact on the natural and cultural values of the planning area and depending on their location and type can result in a number of significant management problems. Such impacts may include the clearing of vegetation, introduction of weeds and disease, increased susceptibility to fire, visual impacts and the destruction of important habitats. Under the CALM Act provision of such services must be compatible with the objective of a nature reserve.

To limit management problems such as those referred to above, it is preferable that all utility infrastructure not servicing the planning area itself is accommodated outside of the reserves. For example, Parry Creek Road reserve has been excised from Parry Lagoons Nature Reserve, and from the Ramsar site. This road reserve provides a single infrastructure corridor across the nature reserve, with the expectation that all services for the Mantinea Flats irrigation development will be installed within the road reserve. This would also apply for any future water supply for Wyndham town site from the Ord River.

A Telstra telecommunications radio repeater tower is located within the boundary of Parry Lagoons Nature Reserve. Reserve No 39016 is vested with the Australian Telecommunications Commission for the purpose of 'communications'.

Desired outcome

Minimal impacts from the installation and maintenance of public utilities on the values of the planning area.

Strategies

1. Ensure all new public utilities are accommodated outside of the reserves.
2. Refer proposals that may adversely impact upon the planning area to the EPA for consideration of assessment under the EP Act.
3. Refer proposals to the Conservation Commission in order to provide advice to the Minister for Environment.
4. Where there are no viable alternatives within existing utility corridors, allowances may be given if the proposal:
 - ❖ is consistent with the objective of the reserves of the planning area
 - ❖ does not adversely impact the values of the planning area
 - ❖ does not adversely impact department operations
 - ❖ is consistent with government policy.

22. REHABILITATION

Rehabilitation is the establishment of a stable, self-perpetuating ecosystem following disturbance, consistent with the purpose for which the area is managed. Rehabilitation within the planning area will be implemented following exploration and mining, road works, raw material extraction, track closure, recreational events, recreational site closure, activities associated with fire suppression or intense fires.

DMP apply conditions to mineral tenements which highlight rehabilitation requirements and rehabilitation programs. When applied, the licence holder is required to rehabilitate all disturbed areas, such as drill pads, grid lines, temporary structures, access tracks and mining operations. In cases where other agencies or organisations have been responsible for disturbance within the planning area, it is the department's policy that the organisation is responsible for rehabilitation of these areas to a suitable standard. In such cases, the cost of rehabilitation should also be borne by that organisation.

Natural regeneration of vegetation from seed, through good site and topsoil management where feasible, is preferable to planting of seedlings. Tracks, drill pads, disturbed recreation sites should be ripped where possible and access prevented to allow establishment of surrounding local plant species. Replacement of cleared vegetation and topsoil over the disturbed area is critical to replenish the seed bank within the soil and obtain an adequate rehabilitation outcome.

Desired Outcome

Degraded areas being restored to a condition resembling the natural environment within the local vicinity.

Strategies

1. Coordinate rehabilitation works with weed control, fire management and cattle exclusion to allow natural regeneration wherever possible.
2. Utilise plant stock or seed of local provenance where active rehabilitation is required.

INVOLVING THE COMMUNITY

Various policy statements are used to guide the department in community involvement. A range of communication strategies are used that target different audiences, including: information; interpretation; education; community involvement; and liaison, consultation and advisory services to stakeholder groups.

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

To date, the community has been involved in the preparation of this management plan by providing initial comments on the issues within the planning area, via written submissions and consultation meetings.

Ongoing community support is essential for the successful implementation of the approved final management plan. The involvement and support of Aboriginal people, adjacent landowners and managers, planning area users, tour operators and interest groups is important to the conservation of the planning area's values and to provide more effective and integrated management of issues that are influenced by activities beyond the boundaries of reserves, such as fire, weeds and introduced animals.

Working together with Aboriginal people to 'care for country' will assist heritage preservation and conservation of the environment, as well as enrich cross-cultural awareness.

Volunteer activities are encouraged and supported within the planning area, and community groups, local schools and universities are encouraged to take part in volunteer activities such as waterbird surveys, water monitoring, rehabilitation, and interpretation and education. The department will seek to coordinate community groups to facilitate such work.

The department's *Good Neighbour Policy* (DEC 2007b) assists in delivering its objectives as outlined in the department's *Corporate Plan* (DEC 2007a). The policy outlines several principles for effective neighbour relations. The policy addresses issues such as fences adjacent to department-managed lands, fire management, control of weeds and introduced pest animals, stock on DEC managed lands, access to department-managed lands and others.

Desired outcome

Effective community involvement in the management of the planning area.

Strategies

1. Continue to encourage, promote and support volunteers and community groups with essential resources to help them carry out their activities.
2. Liaise with traditional custodians such as Balangarra and Miriuwung Gajerrong, neighbouring landowners and land managers, local authorities, relevant government agencies and other stakeholders in the management of cross boundary issues.
3. Notify adjacent pastoralists of cattle located within the planning area, permit pastoralists to muster cattle and advise pastoralists any stock remaining after mustering will be eradicated.

RESEARCH

There are many opportunities for research within the planning area, including studies of water levels and water quality, macroinvertebrates, waterbirds, mangrove birds, crocodiles, and fish such as barramundi. Research by universities and community groups will continue to be encouraged and supported by the department.

It is appropriate that research and monitoring programs involve a wide range of people and groups. The involvement of volunteers, educational institutions and individual researchers can reduce the costs of such programs and assist in providing information to the department and the broader community. However, it is important that all research undertaken within the planning area is coordinated by the department, as this will ensure an integrated approach, avoid duplication, minimise impacts and enable projects to be prioritised.

Desired outcome

Monitor possible impacts associated with implementing the management plan to provide for improved management.

Strategies

1. Conduct or support research, as resources permit and according to priority, that focus on issues and values required to report on this management plan, and the establishment of baseline information that includes:
 - ❖ current hydrological processes to determine adequacy to maintain the ecological character of the planning area
 - ❖ macroinvertebrate indicator species to determine water quality and detect levels of change
 - ❖ native plants that are rare, threatened or in need of special protection
 - ❖ vegetation condition and composition and any levels of change in condition and composition
 - ❖ abundance and composition of key fauna species and detect levels of change
 - ❖ threatening processes, such as fire and introduced plants and animals
 - ❖ the impacts of groundwater extraction within the planning area and from adjacent areas, particularly Mantinea Flats irrigation area
 - ❖ visitor's use of the area and its impacts.
2. Provide support for cultural heritage research of the reserves and incorporate traditional custodian's cultural knowledge in the management of the reserves.

Key Performance Indicators

Performance Measure	Target	Reporting Requirement
Condition and composition of vegetation.	Subject to natural variations, no deterioration in the condition and composition of vegetation.	5 yearly.
Abundance and composition of birds and crocodiles.	Subject to natural variations, no reduction of the abundance and composition of birds and crocodiles.	5 yearly.
Location and extent of high priority weed species.	A reduction in the location and extent of high priority weed species.	5 yearly.

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PERSONAL COMMUNICATIONS

T. Sinclair – Kimberley Regional Leader of Nature Conservation, DEC

T. Handasyde – Botanist, DEC

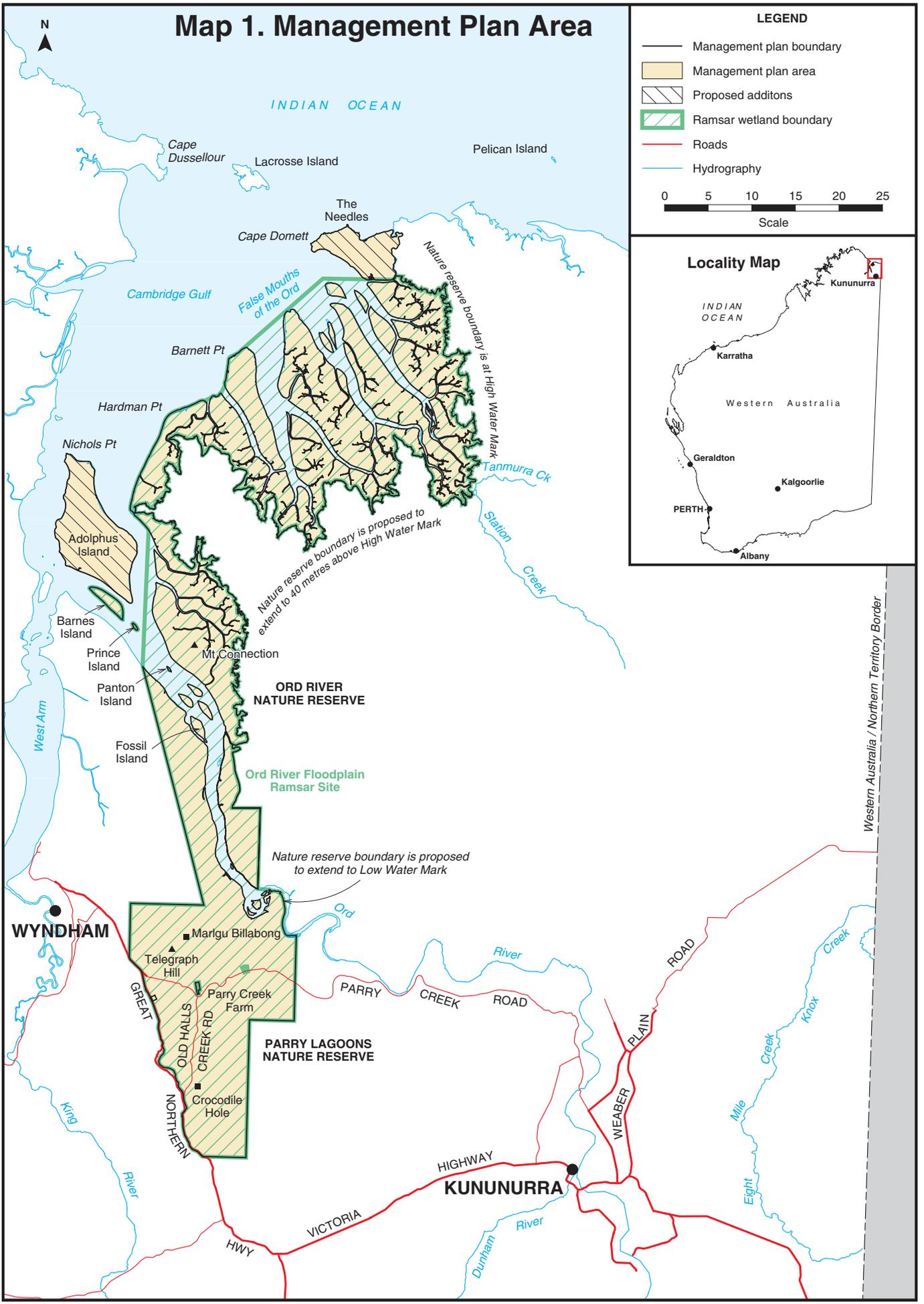
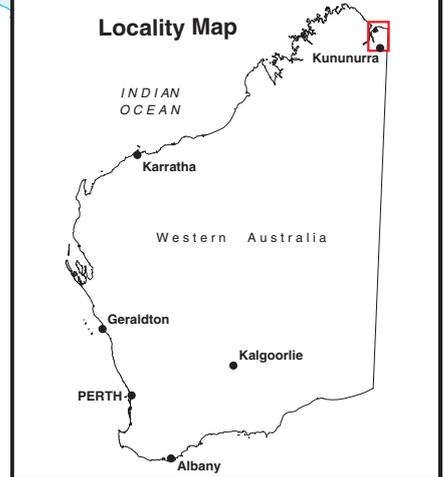
Map 1. Management Plan Area

LEGEND

-  Management plan boundary
-  Management plan area
-  Proposed additions
-  Ramsar wetland boundary
-  Roads
-  Hydrography



Locality Map



Map 2. Land Tenure

LEGEND

-  Management plan boundary
 -  CALM Act section 5(1)(g) reserve
 -  Miscellaneous reserve and land held under title by the CALM Executive Body
 -  National park
 -  Nature reserve
 -  Proposed additions
 -  Proposed conservation park
 -  Proposed Mantinea Flats irrigation area
 -  CALM Act section 16A Agreement
 -  Unallocated Crown land
 -  Unmanaged reserve
 -  Pastoral lease boundary
 -  Roads
 -  Hydrology
- 0 5 10 15 20 25
Scale

