Turquoise Coast Island Nature Reserves

Management Plan 2004

Management Plan No 50

Department of Conservation and Land Management

Conservation Commission of Western Australia

PREFACE

All national parks, conservation parks and nature reserves in Western Australia are vested in the Conservation Commission of Western Australia (Conservation Commission) and are managed on its behalf by the Department of Conservation and Land Management (CALM). CALM prepares management plans on behalf of the Conservation Commission which issues draft plans for public comment and provides final plans for approval by the Minister for the Environment.

The *Conservation and Land Management Act 1984* (CALM Act) specifies that management plans must contain:

- a statement of the policies or guidelines proposed to be followed; and
- a summary of operations proposed to be undertaken.

In accordance with Section 55 of the CALM Act, the term of this plan will be ten years, or until such time that the plan is superseded by a new management plan.

This management plan is for the 13 island nature reserves which represent a chain of approximately 40 islands off the Western Australian coast between Lancelin and Dongara. One island (Target Rock) is proposed for inclusion in the nature reserves. The reference to 'the islands' in this management plan refers to both the existing and proposed island nature reserves.

This management plan should be viewed in conjunction with the management plan for the Jurien Bay Marine Park in which many of the islands lie. The planning process for both the islands and marine park was undertaken concurrently, and their management will be integrated and implemented together.

ACKNOWLEDGMENTS

This Turquoise Coast Island Nature Reserves Management Plan was prepared by Liesl Jonker (CALM's Marine Conservation Branch) and Laurina Bullen (CALM's Management Planning Unit). Many people provided valuable assistance in the preparation of this plan, including:

- staff from CALM's Midwest Region and Moora District, in particular Sue Hancock, Keith Hockey, Andrew Darbyshire, Peter Fishwick, Nigel Sercombe, Kelly Gillen, Anthony Desmond and David Rose (former District Manager, Moora);
- staff from CALM's Science Division;
- staff from CALM's Information Management Branch; and
- Friends of Lancelin Island.

NOMENCLATURE

Inclusion of a name in this publication does not imply its approval by the relevant nomenclature authority.

The word 'Noongar' can be spelt in numerous ways. The spelling of Noongar in this form should also be seen to encompass all other spellings.

Table 1. Turquoise Coast Islands Access Summary

Reserve Name	Island Name	Access		Seabird Breeding
		Limited	Prohibited	
Lancelin and Edwards Islands Nature Reserve	Edwards Island		✗	♈
	Lancelin Island	✓		♈
Wedge Island Nature Reserve	Wedge Island	✓		♈
Proposed Nature Reserve	Target Rock		✗	♈
Buller, Whittell and Green Islands Nature Reserve	South Green Island	✓		♈
	North Green Island	✓		♈
	Whittell Island		✗	♈
	Buller Island		⌘	♈
Cervantes Islands Nature Reserve	South Cervantes Island	✓		♈
	Middle Cervantes Island		✗	♈
	North Cervantes Island	✓		♈
Ronsard Rocks Nature Reserve	South Ronsard Rocks		✗	♈
	North Ronsard Rocks		✗	
Outer Rocks Nature Reserve	South Outer Rocks		✗	♈
	North Outer Rocks		✗	♈
Essex Rocks Nature Reserve	South Essex Rocks		✗	♈
	Middle Essex Rocks		✗	♈
	North Essex Rocks		✗	♈
Escape Island Nature Reserve	Escape Island	✓		♈
Boullanger, Whitlock, Favorite, Tern and Osprey Islands Nature Reserve	Whitlock Island	✓		♈
	Boullanger Island	✓		♈
	Tern Island		✗	♈
	Osprey Island		✗	♈
	Favorite Island	✓		♈
Sandland Island Nature Reserve	Sandland Island		✗	♈
Fisherman Islands Nature Reserve	South Fisherman Island		○	♈
	North Fisherman Island		⌘	♈
Lipfert, Milligan and Snag Islands and Webb Islet and Orton & Drummond Rocks Nature Reserve	Milligan Island		✗	♈
	Orton Rock		✗	
	Lipfert Island		✗	♈
	Webb Islet		✗	♈
	Drummond Rock		✗	♈
	Snag Island		✗	♈
Beagle Islands Nature Reserve	South-West Beagle Island		✗	♈
	East Beagle Island		⌘	♈
	North-West Beagle Island		✗	♈

Note:

✓ limited access area

✗ prohibited access area

⌘ prohibited access area due to sea-lion breeding island

○ prohibited access area due to proximity to sea-lion breeding island

♈ seabirds use the island for breeding

islands located within the Jurien Bay Marine Park

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PART A. INTRODUCTION

1. OVERVIEW

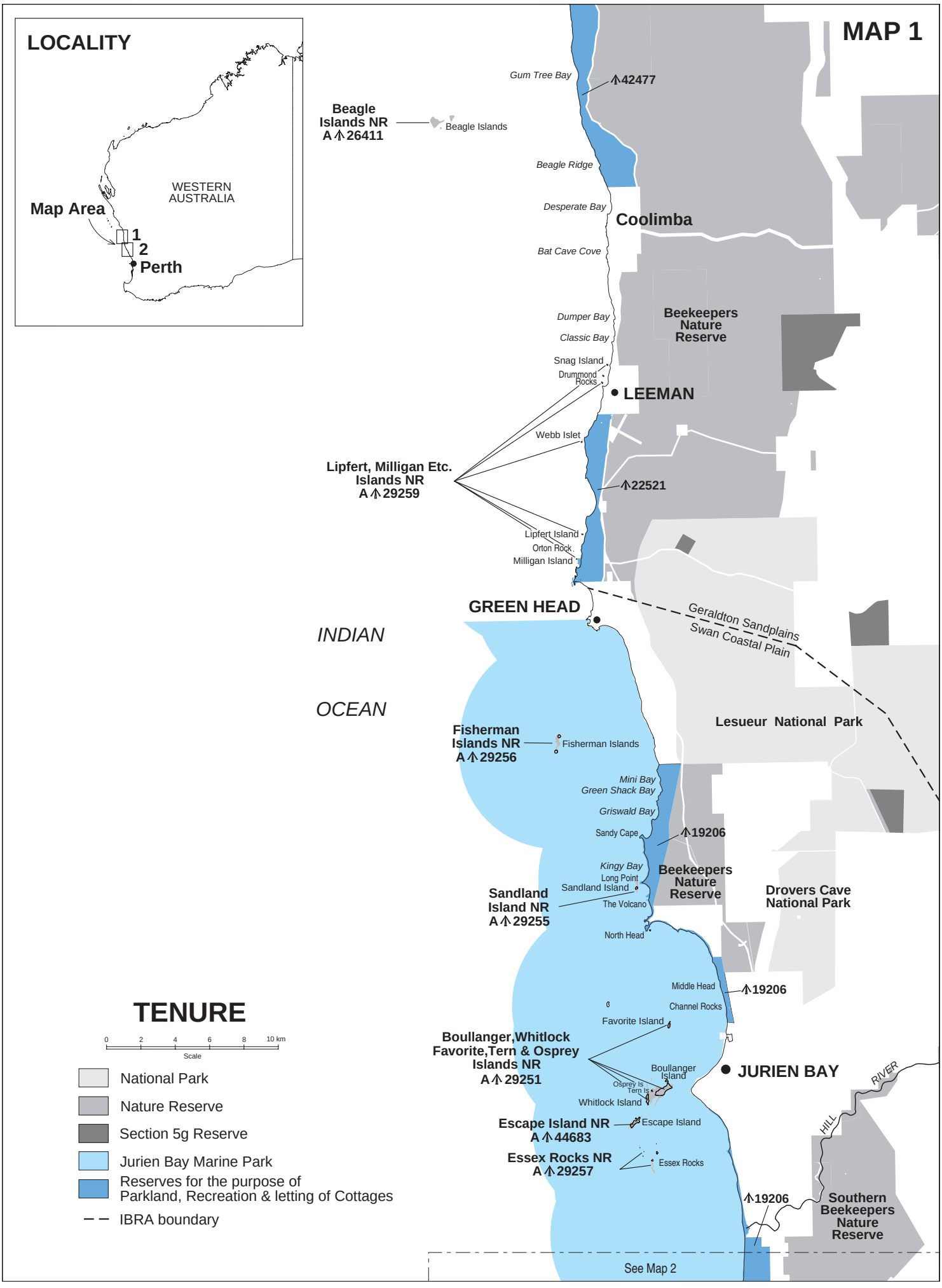
The Turquoise Coast island nature reserves are a chain of approximately 40 islands, islets and rocks lying between Lancelin and Dongara and extending from Lancelin Island and Edwards Island (approximately 110 km north of Perth) to the Beagle Islands group (260 km north of Perth) in Western Australia (see Maps 1 and 2). The islands range in size from less than 0.1 ha to approximately 31.5 ha and extend to low water mark, which includes the surrounding intertidal areas. The islands are grouped into 13 nature reserves, the majority of which were originally gazetted between 1958 and 1968, and are vested in the Conservation Commission of Western Australia (Conservation Commission) and managed by the Department of Conservation and Land Management (CALM). CALM collaborates with relevant agencies and authorities to ensure that various regulatory and management practices are complementary (Appendix 1).

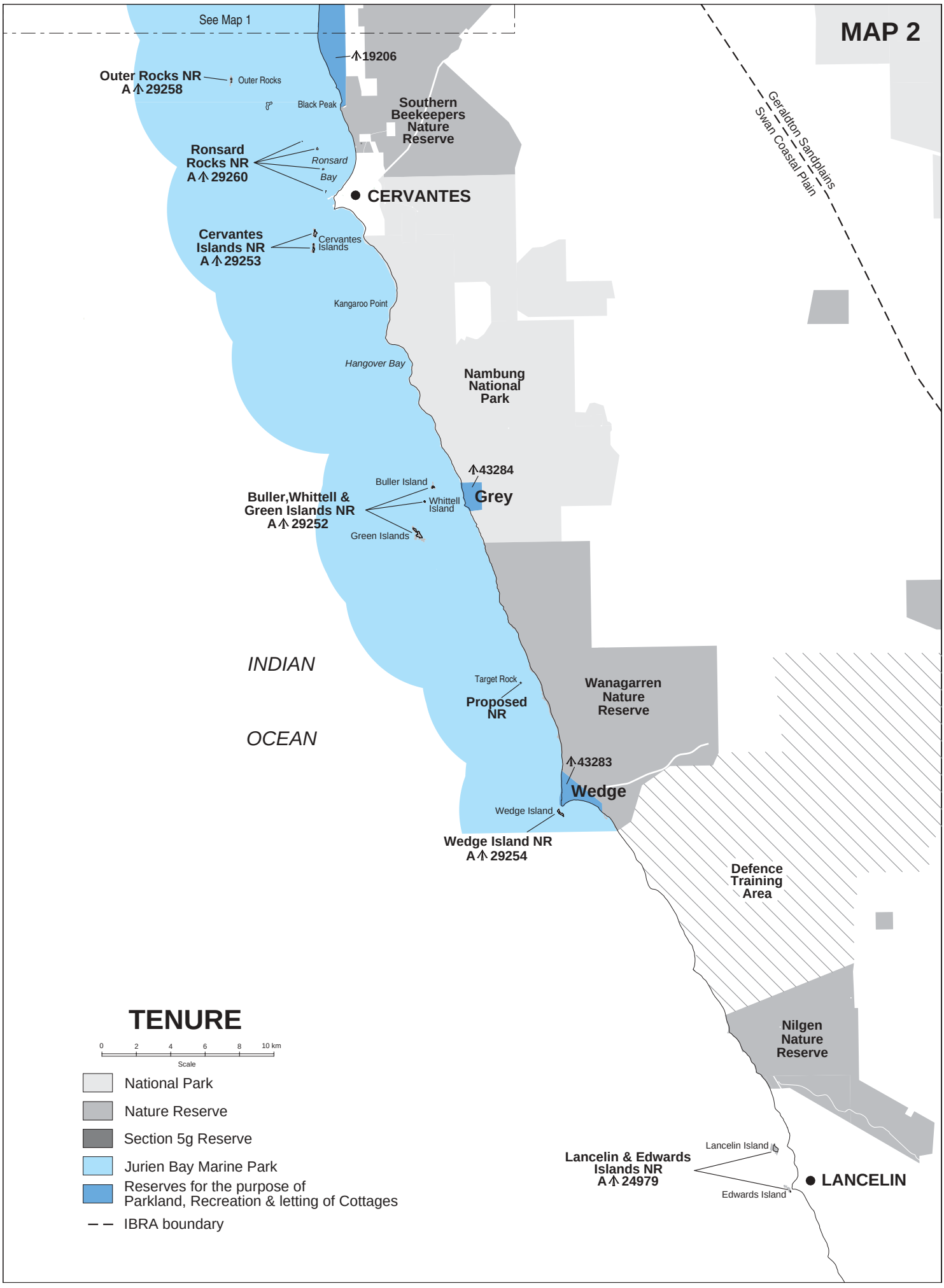
Three of the islands provide key breeding sites for the Australian sea-lion (*Neophoca cinerea*), which is specially protected under the *Wildlife Conservation Act 1950*. The endangered dibbler *(Parantechinus apicalis*) naturally occurs on two of the islands and has been translocated to a third island, while the Boullanger Island dunnart (*Sminthopsis griseoventer boullangerensis*), a subspecies of the grey-bellied dunnart, is listed as Vulnerable under Commonwealth legislation and threatened under State legislation. Sixteen reptile species are found on the islands, including the Lancelin Island skink (*Ctenotus lancelini*), of which the only viable population is known from Lancelin Island. As well as supporting threatened fauna species, the islands display a diverse assemblage of flora and fauna.

A key factor in the islands' conservation value is their location in the Central West Coast marine bioregion, a zone of overlap between temperate and tropical marine biogeographic areas. The islands are influenced by the Leeuwin Current, resulting in the presence of corals and many other tropical species around and on the islands. The geomorphology of the islands is diverse and includes significant intertidal reef platforms.

The islands provide educational, interpretive and recreational opportunities due to their diversity, conservation value and proximity to the coast. Visitor pressure is predicted to increase significantly following the completion of the coastal road linking Perth to the central west coast and also as a result of Jurien Bay's growth as a regional centre.

Commercial and recreational fishing occurs in the intertidal reef platforms surrounding the islands and is regulated under the *Fish Resources Management Act 1984*. The values of the intertidal reef platforms will be managed in consultation with the Department of Fisheries. Management of intertidal areas will be consistent with the management objectives of the adjoining Jurien Bay Marine Park.


MAP 1
LOCALITY
WESTERN AUSTRALIA
Map Area
1
2
Perth
Gum Tree Bay
A 42477
Beagle Islands NR
A 26411
Beagle Islands
Beagle Ridge
Desperate Bay
Coolimba
Bat Cave Cove
Dumper Bay
Classic Bay
Beekeepers Nature Reserve
Snag Island
Drummond Rocks
LEEMAN
Webb Islet
Lipfert, Milligan Etc. Islands NR
A 29259
A 22521
Lipfert Island
Orton Rock
Milligan Island
GREEN HEAD
Geraldton Sandplains
Swan Coastal Plain
INDIAN
OCEAN
Lesueur National Park
Fisherman Islands NR
A 29256
Fisherman Islands
Mini Bay
Green Shack Bay
Griswald Bay
Sandy Cape
A 19206
Kingy Bay
Long Point
Sandland Island
Sandland Island NR
A 29255
The Volcano
Beekeepers Nature Reserve
Drovers Cave National Park
North Head
Middle Head
A 19206
Channel Rocks
Favorite Island
Boullanger,Whitlock Favorite,Tern & Osprey Islands NR
A 29251
Boullanger Island
Osprey Is
Tern Is
Whitlock Island
JURIEN BAY
Escape Island NR
A 44683
Escape Island
Essex Rocks NR
A 29257
Essex Rocks
A 19206
HILL RIVER
Southern Beekeepers Nature Reserve
See Map 2
TENURE
0 2 4 6 8 10 km
Scale
National Park
Nature Reserve
Section 5g Reserve
Jurien Bay Marine Park
Reserves for the purpose of Parkland, Recreation & letting of Cottages
IBRA boundary


MAP 2
See Map 1
19206
Outer Rocks NR
A 29258
Outer Rocks
Black Peak
Southern
Beekeepers
Nature
Reserve
Ronsard
Rocks NR
A 29260
Ronsard
Bay
CERVANTES
Cervantes
Islands NR
A 29253
Cervantes
Islands
Kangaroo Point
Hangover Bay
Nambung
National
Park
Geraldton Sandplains
Swan Coastal Plain
43284
Buller Island
Grey
Buller,Whittell &
Green Islands NR
A 29252
Whittell
Island
Green Islands
INDIAN
OCEAN
Target Rock
Proposed
NR
Wanagarren
Nature
Reserve
43283
Wedge
Wedge Island
Wedge Island NR
A 29254
Defence
Training
Area
Nilgen
Nature
Reserve
Lancelin Island
Lancelin & Edwards
Islands NR
A 24979
Edwards Island
LANCELIN
TENURE
0 2 4 6 8 10 km
Scale
National Park
Nature Reserve
Section 5g Reserve
Jurien Bay Marine Park
Reserves for the purpose of
Parkland, Recreation & letting of Cottages
IBRA boundary

2. KEY VALUES

Conservation Values

- Rich and diverse terrestrial and marine communities and habitats, significant for the protection of priority and threatened fauna.
- Important examples of fauna and flora speciation on islands.
- Significant breeding and resting habitat for Australian sea-lions.
- Substantial habitat and breeding grounds for numerous seabird species.
- Diverse assemblages of native vegetation and flora.
- Sites of relatively undisturbed native vegetation and geomorphology.
- Varied natural landscapes, seascapes and associated aesthetic values.

Recreational Values

- Terrestrial and marine environment that offers varied passive recreation opportunities, including nature appreciation and wildlife observation.
- Recreational fishing from beaches and on shoreline intertidal reef platforms.

Educational and Cultural Values

- Community education opportunities based on island wildlife and environments.
- Display and interpretation opportunities for cultural and natural history.

Scientific Values

- Chain of biogeographically unique islands that serve as important references for broader studies of island ecosystems.
- Diverse flora and fauna, influenced by overlapping marine biogeographic regions.
- Dynamic ecology that may provide a sensitive indicator of environmental changes, as a result of Leeuwin Current fluctuations and increasing urbanisation on the mainland.

3. PUBLIC PARTICIPATION

This plan has been developed in consultation with local communities, island users and other interested parties in a number of ways:

- pre-draft public submissions were invited through State and local newspapers during the preparation of the draft plan;
- community consultation meetings were conducted;
- meetings were held with stakeholder groups and interested individuals;
- government agencies were consulted, including the Department of Indigenous Affairs and the Department of Fisheries; and
- the draft management plan was released by the Minister for the Environment for a two-month public comment period. All of the submissions received were analysed and amendments were made where appropriate to produce this management plan.

PART B. MANAGEMENT DIRECTIONS AND PURPOSE

4. VISION

In the year 2014, the flora and fauna, habitats and refuge value of the Turquoise Coast island nature reserves will be in the same or better condition than in the year 2004. The islands will support ecologically sustainable activities and will be valued by the local community.

The vision for the islands is derived from the legislative specifications of the *Conservation and Land Management Act 1984* (CALM Act), the directives in CALM's *Corporate Plan*, and the policies of CALM and the Conservation Commission. The vision also reflects the key values of the islands and the importance of sustainably managing those values (see Section 2, *Key Values*).

5. LEGISLATIVE FRAMEWORK

CALM is directly responsible for the CALM Act and Wildlife Conservation Act, and their associated regulations. In addition, a number of other Acts affect CALM's activities or confer specific powers on CALM (eg. Fish Resources Management Act).

The CALM Act covers such matters as defining categories of lands and waters managed by CALM, establishing controlling bodies, establishing and defining the functions of CALM and the controlling bodies, management planning and auditing, permits, licences, contracts, leases, offences and enforcement.

The CALM Act imposes certain obligations upon CALM relating to management of protected areas, including the preparation of management plans. CALM is also responsible for administering the Wildlife Conservation Act for the conservation and protection of indigenous flora and fauna on all lands and waters within the State.

Nature reserves are vested in the Conservation Commission and managed by CALM in accordance with the CALM Act. Section 56 of the CALM Act specifies the objective for the management of nature reserves as *'to maintain and restore the natural environment, and to protect, care for, and promote the study of, indigenous flora and fauna, and to preserve any feature of archaeological, historical or scientific interest.'* Management of nature reserves includes the preparation of management plans as required by section 54(3)(a)(i) of the Act, which are to contain a statement of policies or guidelines to be followed in the management of the area, and a summary of the operations proposed to be undertaken over the life of the plan (section 55 of the Act).

Each plan is periodically subject to audit by the Conservation Commission, and remains in force until such time as a new plan is prepared in accordance with sections 54-60 of the CALM Act. The procedure to make an amendment to a gazetted management plan is governed by section 61

of the CALM Act and also involves a public consultation process.

6. EXISTING AND PROPOSED TENURE

The Turquoise Coast island nature reserves, the majority of which were originally gazetted between 1958 and 1968, comprise approximately 40 islands, islets and rocks in 13 Class A nature reserves, all with the purpose of 'Conservation of Flora and Fauna'.

The reserves are currently gazetted to the low water mark, therefore many reserves include substantial intertidal reef platforms and beaches. The area covered by this plan is in excess of 110 hectares (Appendix 2). Tenure of the reserves and adjacent mainland is presented in Maps 1 and 2.

Escape Island encompasses a 0.19 ha area leased by Australian Maritime Safety Authority from CALM to enable continued operation of the lighthouse on the island. Wedge Island contains an unvested 0.4 ha parcel of land at its southernmost end which is used as a trigonometric station. The Department of Land Information (formerly Department of Land Administration) is responsible for management of this area.

Target Rock, currently unallocated Crown land, forms part of the Turquoise Coast islands chain and is located north-northwest of Wedge Island. Target Rock was previously leased to the Department of Defence for use as a Royal Australian Air Force bombing range. As a result of unexploded ordnance (UXO) assessments, the Department of Defence considers negligible potential exists for any UXO to remain as a result of activities at the former range. In recognition of Target Rock's contribution to the conservation values of the area—Australian sea-lions are known to haul-out (rest) on Target Rock, while seabirds use the island to roost—CALM is progressing the vesting of Target Rock in the Conservation Commission for the purpose of 'Conservation of Flora and Fauna'.

Ronsard Rocks Nature Reserve includes four areas marked above the high water mark, according to the original reserve diagram. Anecdotal evidence from local community members at Cervantes indicates that only two rocks are exposed at high water. Upon clarification of the area submerged at high water, consideration may be given to including these areas in the Jurien Bay Marine Park.

Key Points

- The Turquoise Coast island nature reserves comprise approximately 40 islands in 13 Class A nature reserves.
- Target Rock is an important link in the Turquoise coast chain of islands. More specifically, Australian sea-lions are known to haul-out on Target Rock, while seabirds use the island to roost.
- Target Rock is proposed to be set aside as a nature reserve vested in the Conservation Commission for the purpose of 'Conservation of Flora and Fauna'.

The objective is to provide statutory protection for the conservation values of the islands.

This will be achieved by:

1. securing Target Rock with the Conservation Commission as a Class A nature reserve for the purpose of 'Conservation of Flora and Fauna'; and
2. investigating the area and position of Ronsard Rock Nature Reserve and recommending redescription of the reserve boundary and inclusion in the Jurien Bay Marine Park if appropriate.

7. MANAGEMENT ARRANGEMENTS WITH ABORIGINAL PEOPLE

There is a strong interest by Aboriginal people to be involved in the management of conservation estate in Western Australia. Working together with Aboriginal people to care for the land will assist heritage preservation and conservation of the environment, as well as enrich cross-cultural awareness.

The Government has shown a commitment to explore joint management arrangements with traditional owners by developing a consultation paper outlining options for ownership, administration and joint management of conservation lands in Western Australia (Government of Western Australia 2003). This includes a range of possibilities, from consultative management through to joint management of land that may be held by an Approved Aboriginal Body Corporate as inalienable freehold.

There are two native title representative bodies that cover the planning area—South West Aboriginal Land and Sea Council, and the Yamatji Barna Maaja Land and Sea Council. Prior to the preparation of the draft management plan, these native title representative bodies, as well as the two registered native title claimants, were contacted and notified of the management planning process.

8. LAND CLASSIFICATION

An important strategy for both the conservation of island values and the management of visitor impacts is the implementation of a land classification scheme to designate appropriate access to the islands. Section 62 of the CALM Act allows land classifications, some of which are applicable to nature reserves, including:

- prohibited area;
- limited access area;
- temporary control area; and
- such other class of area as the Minister, on the recommendation of the Conservation Commission, thinks necessary to give effect to the objects of this Act.

Two classification types are proposed for the islands: prohibited areas and limited access areas.

Prohibited areas are those which may not be entered except as authorised by the Executive Director of CALM, and then only to carry out those activities pursuant to the management plan. Limited access areas are those with conditions or limits imposed on their access.

There are approximately 26 islands proposed to be classified as prohibited areas, with the remaining islands proposed to be classified as limited access areas (see Table 1 and Appendix 3). In the case of East Beagle, North Fisherman and Buller Islands, access will be prohibited in recognition of their significance as the only breeding areas for the central west coast Australian sea-lion population. For the protection of these breeding colonies, which are easily disturbed by human activity, East Beagle, North Fisherman, South Fisherman (close to North Fisherman Island) and Buller Islands are also proposed to be classified prohibited areas. For the protection of nature conservation values on smaller islands where wildlife are easily disturbed it is recommended that these islands also be classified as prohibited areas. Prohibiting access to the smaller islands will effectively decrease the area where the impacts of human activity require management. Human use of the smaller islands is already low due to the dangers of the surrounding reefs which present a visitor safety risk.

Favorite, Boullanger, Whitlock, Escape, North Cervantes, South Cervantes, North Green, South Green, Wedge and Lancelin are proposed to be classified as limited access areas. These islands, with their attractive beaches and comparative ease of access, receive the highest numbers of visitors. Classifying these islands as limited access areas will allow the management of human use on the islands, particularly in relation to visitor safety (for example, risk of cliff collapse and unstable rock formations) and potential damage to the values of the islands (for example, vegetation loss, erosion and trampling of seabird nests). It is proposed that visitors to these islands be confined to intertidal reef platforms, sandy beach areas and designated paths or boardwalks. It is also proposed that access be limited for day use only, with overnight use prohibited.

Measures may also need to be taken to provide temporary or seasonal protection for fauna, or for the purpose of public safety. Potential impacts on the islands may be managed by using the *Conservation and Land Management Regulations 2002* (CALM Regulations). CALM Regulation 44 allows the Executive Director to immediately close an area "…for the protection, management and control of CALM land…" For example, a closed area may be effected on a section of beach where seabirds are nesting. The need for use of a closed area will be assessed on a case by case basis.

Key Points

- Most islands within the study area have been recommended to be classified as prohibited areas in their entirety due to their small size, presence of breeding sea-lions or proximity to breeding sea-lions.
- The remaining ten islands will be classified as limited access areas, with access restricted to day use of intertidal reef platforms, sandy beaches, designated pathways and boardwalks.
- Closed areas will be used to provide temporary or seasonal protection to fauna, or in the

interest of public safety.

The objective is to protect the islands' values by providing for statutory management of visitor access and activities.

This will be achieved by:

1. initiating appropriate notices under Section 62 of the CALM Act to implement the proposed land classification scheme for the islands;
2. providing appropriate information for visitors and stakeholders regarding the land classification scheme and access to the islands; and
3. initiating temporary or seasonal closures of areas where deemed necessary to protect the islands' values or to mitigate visitor risk.

9. PERFORMANCE ASSESSMENT

The Conservation Commission will measure the success of this plan by using performance indicators (summarised in Appendix 4), and other mechanisms as appropriate. It is not efficient to measure all aspects of management given resource and technical impediments—consequently, indicators will target 'key' components of the plan. Kanowski *et al.* (2001) defined 'key' performance indicators, when considering the conservation of biodiversity, as: '*the minimum set, which if properly monitored, provides rigorous data describing the major trends in, and impacts on, Australian biodiversity*'. This includes evaluation of a measure and target, reporting requirements and a management response to any target shortfall. These components provide a basis for adaptive management, whereby management is altered if necessary to meet a desired outcome. This management plan also includes indicators for community involvement and research.

CALM is responsible for providing information to the Conservation Commission to allow it to assess the success of CALM's management and meeting targets specified in the KPIs. The frequency of these reports will depend upon the requirements of each KPI. Where a report identifies a target shortfall, a response to the Conservation Commission is required. The response will identify factors that have led to the target shortfall, and propose alternative management actions where appropriate. The Conservation Commission will consider CALM's response on the target shortfall and evaluate the need for action in the context of its assessment and audit function under section 19(1)(g)(iii) of the CALM Act. The Conservation Commission will make the results of audits available to the public.

PART C. MANAGING THE NATURAL ENVIRONMENT

The responsibilities of the Conservation Commission and CALM include conservation of biodiversity at ecosystem, species and genetic levels, and the sustainable management of the resources they provide. CALM is guided by a number of principles in fulfilling these responsibilities, foremost of which are that the diversity and health of ecological communities and indigenous species throughout WA will be maintained and restored, and that a lack of knowledge will not be a reason for postponing measures which mitigate against loss of biodiversity.

Many environmental variables influence the populations of species on islands. Many of these are poorly understood, and consequently human-induced impacts can be extremely difficult to understand. The strategies presented in this section are based on current knowledge, and focus on maintaining or improving habitat quality on the assumption that this will benefit biodiversity conservation.

10. BIOGEOGRAPHY

The National Reserve System Program and the National Reserve System of Marine Protected Areas were adopted to establish a comprehensive, adequate and representative system of protected areas to conserve Australia's biodiversity. To ensure that a National Reserve System encompasses the full range of biological and biophysical diversity across Australia, the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995) and Interim Marine and Coastal Regionalisation for Australia (IMCRA) (Interim Marine and Coastal Regionalisation for Australia Technical Group 1998) were developed. The IBRA and IMCRA provide a planning framework for selecting a comprehensive, adequate and representative system of protected areas across Australia.

The IBRA divides Western Australia into 26 separate bioregions, based on lithology, geology, landform, and vegetation. Two IBRAs, the Geraldton Sandplains and the Swan Coastal Plain, meet just north of Green Head on the mainland adjacent to the islands (Maps 1 and 2). As both are under-represented in the reserve system, additions are considered a high priority for the Swan Coastal Plain and a moderate priority for the Geraldton Sandplains.

Three major marine biogeographical zones occur on the Western Australian coast: a tropical zone north of North West Cape, a temperate zone east of Cape Leeuwin and a biological overlap zone in between. These three zones are represented by 18 IMCRA bioregions. The Turquoise Coast islands are located within the Central West Coast marine bioregion
within the overlap zone), which extends from Perth to Kalbarri. The Jurien Bay Marine Park covers around 800km^2 within this bioregion (CALM 2000).

The most influential factor within the overlap zone is the Leeuwin Current, a southward flow of

tropical water, from the North West Shelf to the Great Australian Bight. The Leeuwin Current flows year round, although stronger and closer to shore during autumn and winter. In contrast, the cool Capes Current flows nearshore and northward along the central west coast during summer. According to the IMCRA, the marine flora and fauna of this sector are predominantly of southern Australian affinity but with a strong Indo-West Pacific influence through the agency of the Leeuwin Current. This carries propagules of tropical species (such as corals, tropical fish and seagrass species) southwards into temperate latitudes (Pearce & Walker 1991).

The distinct biogeography of the central west coast is illustrated by the assemblage of seabirds breeding on the islands. Seabirds associated with cool water habitats breed on the islands in conjunction with an increasing number of tropical seabird species. The recent southward expansion of tropical seabird species populations has been documented by Dunlop and Rippey (2000) and is believed to be in response to the changing distribution and abundance of prey resources induced by the Leeuwin Current.

The islands and Jurien Bay Marine Park are significant as reserves in a national context for representing particular ecosystem types within the Central West Coast IMCRA and Geraldton Sandplains and Swan Coastal Plain IBRAs. The importance of the island ecosystems is illustrated by their ability to support threatened fauna species and display a diverse assemblage of flora and fauna. Despite their relative small size and close proximity of the islands to the coast, reproductive isolation has resulted in speciation on some of the islands. This is evident on Lancelin Island, where the endemic Lancelin Island skink is found, and on Boullanger Island where a distinctive island form of the grey-bellied dunnart exists.

Key Points

- The mainland adjacent to the islands represents two IBRA regions, the Geraldton Sandplains and the Swan Coastal Plain.
- The islands are located in the Central West Coast IMCRA bioregion where the tropical and temperate biogeographical zones overlap.
- The most influential factor in the Central West Coast bioregion is the Leeuwin Current, which allows tropical species to survive in temperate latitudes.
- The islands are significant as reserves in a national context for representing particular ecosystem types within the Central West Coast IMCRA and Geraldton Sandplains and Swan Coastal Plain IBRAs.
- The distinct biogeography of the central west coast and the islands is illustrated by the assemblage of breeding seabirds and speciation of other fauna on the islands.

The objective is to ensure statutory protection to the islands in order to maintain their values and hence importance within the National Reserve System and National Reserve System of Marine Protected Areas.

This will be achieved by:

1. securing Target Rock with the Conservation Commission as a Class A nature reserve for the purpose of ‘Conservation of Flora and Fauna’.

11. CLIMATE, GEOLOGY AND GEOMORPHOLOGY

Climate

The Turquoise Coast experiences hot dry summers and cool wet winters with average daily minimum and maximum temperatures of 9.3°C and 30°C respectively. Based on weather data gathered at Jurien Bay and Lancelin, annual average rainfall ranges between 567.7 mm in the northern islands to 625.4 mm in the south of the study area, with the majority falling during the winter months (Bureau of Meteorology 2003). Temperatures and evaporation rates (which exceeds the rainfall received) increase from south to north.

Weather patterns in the area are characterised by periodic westerly gales during the winter with intervening periods of fine weather and light winds. During summer, easterly winds dominate the morning followed by strong south-westerly seabreezes in the afternoon. During late summer/early autumn the islands are occasionally influenced by tropical cyclones bringing strong winds and heavy rain.

Geology and Geomorphology

The islands were first formed approximately 10 000 years ago after successive periods of glaciation and deglaciation caused large fluctuations in sea level (Keighery *et al.* 2002). During periods of glaciation, when the sea level was at its lowest, broad areas of the continental shelf were exposed to wind erosion. As a result, extensive parallel sand dunes were formed and subsequently hardened to form limestone. When the sea reached its current level these hardened dunes were exposed, forming islands and emergent rocks. The majority of the islands have been separated from the mainland for at least 6500 years (Keighery *et al.* 2002). Wedge Island, however, connects to the mainland by a sand bar approximately every seven years.

The islands have since been exposed to the natural processes of erosion to produce capstone and solution pipes. Weathering of the limestone has resulted in slopes of eroded material called talus which are sometimes covered in shallow sand. The islands' soils are derived from bedrock, wind deposited sand or organic material and, where there are high densities of birds, the sand is rich in faecal matter, or, guano. Larger islands have sand dune systems which are derived from wind-transported sand or from weathering of the bedrock. Intertidal reef platforms and beaches surround some islands. These limestone reefs play an important function in protecting the low lying islands from erosion by the heavy oceanic swell in the area.

Some of the islands have interesting and well preserved Tamala limestone geological features, such as fragile fossil root networks known as rhizoliths (eg. Escape and Wedge Islands), and supra-tidal hard coral fossils in limestone formations on the Beagle Islands. Such features are susceptible to damage from human activity and related cliff collapse.

Disturbance from nesting seabirds and human activity can accelerate erosional processes and result in the loss of vegetation needed to stabilise and consolidate the islands' soil, leaving it vulnerable to wind erosion. Wind erosion can quickly escalate, causing sand "blowouts".

Key Points

- The islands are very exposed to wind, high summer temperatures and evaporation rates.
- The islands' geomorphology is varied, consisting of plateaus, talus slopes, cliffs, dunes, beaches and bays which are surrounded by extensive intertidal limestone reef platforms.
- Disturbance from nesting seabirds and uncontrolled human access is causing accelerated erosion.

The objective is to conserve the islands' values by maintaining stable geomorphological features, landforms and soils.

This will be achieved by:

1. identifying geomorphological and geological features potentially threatened by human use when considering provision of access;
2. planning management activities and proposed facilities to accommodate the area's climate, including the occasional influence of tropical cyclones and associated strong winds and heavy rains;
3. prohibiting access on all but ten of the islands;
4. rehabilitating eroding areas as necessary;
5. providing information for island users about the ecological importance of the islands' geomorphology; and
6. considering geomorphological and geological features in planning for visitor use.

12. NATIVE PLANTS AND PLANT COMMUNITIES

Keighery *et al.* (2002) documents floristic and vegetation data, including plant species lists and maps of structural vegetation forms, for the Turquoise Coast islands. There are 121 species of vascular plants, from 39 families and 96 genera, known from the islands. Of the 121 species, 73 are native and 48 are introduced species (see Appendix 5).

According to Keighery *et al*. (2002), Lancelin, Escape, Whitlock, North Cervantes and North Boullanger Islands support the highest diversity of plant species, with more than 50 species recorded on each. The predominant factor affecting the species richness recorded for each island is habitat diversity. The effect of habitat diversity upon species richness is illustrated by the recording of 62 species on the small, but geomorphologically diverse, North Boullanger Island (2.4 ha), compared to 50 for the considerably larger, but more uniform, Boullanger Island (31.45 ha).

Island vegetation is typically very low and dominated by salt-tolerant grasses and shrubs. Sandy areas are dominated by a low heath of species such as the thick-leaved fan-flower (*Scaevola crassifolia*). Herbfields and grasslands grow on very shallow soils over limestone. The most widespread species, nitre bush (*Nitraria billardierei*), present on all islands surveyed, grows in low open shrublands that dominate the slopes or plateaus of the islands, in some areas achieving 80 per cent cover. Nitre bush plants are relatively open underneath and tend to grow in shallow

guano-rich soils (the product of nesting seabirds or resting sea-lions). The distribution of vegetation on the islands is further influenced by the variability of soil depth.

The vegetation of the islands is representative of vegetation of offshore limestone islands in Western Australia, while the vegetation formations on the islands are essentially similar to those on the adjacent mainland, with two notable exceptions (Keighery *et al*. 2002). First is the presence of a specialised group of native plants associated with the guano-rich seabird rookeries. These include the Australian hollyhock (*Malva australiana*) and some species of *Lepidium*. The second is the tree-like forms of nitre bush present on East Beagle Island. This growth habit is caused by the numerous Australian sea-lions present for whom nitre bush is an important habitat component, especially when pupping.

Disturbance from nesting seabirds and human activity has significantly altered the vegetation on some islands (eg. Lancelin Island), with the loss of indigenous woody shrubs and replacement by succulents and trailing species (Dunlop & Rippey 2000). Excessive guano and trampling can make the environment unsuitable for some flora and fauna, and strongly favour others, such as invasive weed species. In severely damaged habitats perennials are replaced entirely by exotic annual grasses and herbs. Such changes in the vegetation and its quantity and quality reduces the area of suitable habitat available for breeding seabirds and other island fauna.

The re-establishment of woody native shrubs that are suitable for seabird nesting habitat is facilitated by the biennial Australian hollyhock. This native plant species plays an important role in the natural detoxification of seabird colony areas, which successively gives way to the indigenous shrub cover, predominantly nitre bush. The successional process occurring in the vegetation of seabird nesting islands off south-western Australia was described by Gillham (1961) (see also Section 13, *Seabirds* and Section 16, *Environmental Weeds*).

Key Points

- The island nature reserves support 73 native plant species. Those islands with greater habitat complexity generally have a correspondingly high plant species diversity.
- The plant species found on the islands also occur on the adjacent mainland. The vegetation formations are similar to those on the mainland, with two notable exceptions.
- Maintenance of habitat structure is an important component of vegetation management.
- The vegetation and flora on the islands is profoundly influenced by the disturbance and nutrient inputs from nesting seabirds.
- There has already been significant change in the vegetation of some islands, with the loss of low woody native species and invasion by environmental weeds.

The objective is to conserve indigenous plant species and communities.

This will be achieved by:

1. protecting vegetation and flora that is rare, unique or in need of special protection;
2. initiating notices under Section 62 of the CALM Act to implement the proposed land classification scheme for the islands;

3. monitoring for loss of native vegetation and environmental weed invasion;
4. controlling access and rehabilitating native vegetation cover on those islands that have been disturbed by human impact; and
5. providing information to island users about the importance of the island vegetation and its vulnerability to human impact.

Key Performance Indicator

The success of these strategies will be measured by:

Changes in the area of native woody and succulent shrubs (preferred seabird nesting habitat) on the islands.

Target

Maintain or increase the area of preferred seabird nesting habitat over the life of the plan.

Reporting

Every two years.

13. NATIVE ANIMALS AND HABITATS

The vertebrate fauna of the islands is relatively well known. Their isolation has allowed the evolution of endemic fauna in the case of the Lancelin Island skink, and a subspecies of the grey-bellied dunnart on Boullanger Island. The conservation significance of the islands is further heightened by the presence of several priority taxa.

The invertebrate fauna of these islands has not been adequately surveyed, and additional research will likely yield further species to add to the overall diversity of the area.

Sea-lions

The Australian sea-lion is endemic to Australia. Populations of the species are thought to have declined significantly since European settlement, primarily through hunting, and it is now specially protected under the Wildlife Conservation Act. The Turquoise Coast islands are significant for the conservation of the species, supporting approximately 20 per cent of the State population of 2700-3400 animals (Gales *et al.* 1994).

Within the Turquoise Coast, Australian sea-lions reside and breed on East Beagle, Buller and North Fisherman Islands. These represent the only sea-lion breeding sites on the west coast of Western Australia, excluding some small colonies on the Abrolhos Islands to the north. In addition, another 18 of the islands within the study area are used as haul-out (resting) sites. Sea-lion haul-out sites are also found on islands adjacent to the Perth metropolitan area. Breeding has not occurred on these metropolitan islands for over a century and males from this area are known to migrate north to the central west coast area for breeding. As the closest breeding to the south of the metropolitan area is east of Albany at Haul Off Rock, it is thought that the central west coast sea-lion colonies may be a genetically distinct sub-population. The islands used as breeding and haul-out sites are detailed in Appendix 6.

Estimates of sea-lion pup numbers obtained through regular monitoring over the last 10 years indicate that the breeding population may be stable, with approximately 150 pups born every 17-

18 month breeding cycle. However, the relatively small numbers and low fecundity of the central west coast sea-lion population, and the cessation of breeding on metropolitan islands since European settlement, suggests this species is vulnerable to continued human disturbance even in the absence of hunting. This is most likely from recreational activities on the breeding islands or haul-out sites.

Human interaction with sea-lions poses a potential threat to visitors to the islands. Sea-lions, particularly females with pups, are often aggressive if approached. Attacks have occurred in the past on breeding islands and this is a significant visitor risk management issue. To reduce the likelihood of attack by sea-lions and to ensure that breeding season sea-lions are not disturbed by human activity on the islands, it has been recommended that East Beagle, North Fisherman and Buller Islands be declared prohibited areas which may not be accessed by the general public.

Other pressures on the sea-lion populations in the marine environment include entrapment in rock lobster pots and entanglement in discarded fishing gear and litter, especially bands from bait boxes. These issues are addressed in the Jurien Bay Marine Park management plan and the *Draft Pinniped Management Plan* (CALM 1999a).

Key Points

- Australian sea-lions are specially protected under the Wildlife Conservation Act. The population within the study area may be genetically distinct from the next nearest population and hence worthy of added protection.
- Sea-lions breed on only three islands within the study area, but use a further 18 as haul-out sites. Recreational activities are the most likely impacts on breeding success, as well as placing visitors at risk from sea-lion attacks.

Dibblers and Dunnarts

The dibbler and the Boullanger Island dunnart are the only marsupials found on the islands. The latter, closely related to the mainland form of the grey-bellied dunnart, is found solely on Boullanger Island and is the only known record of the species to occur on an island. As a consequence, the Boullanger Island dunnart is a threatened species declared to be specially protected under the Wildlife Conservation Act, and is listed as Vulnerable under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*. The grey-bellied dunnart is widely distributed on the mainland of the south-west of Western Australia, occurring from the coast near Eneabba, inland to the eastern Goldfields and to the southern coast of the state.

Dibblers, discovered on Boullanger and Whitlock Islands in 1985, represent the only original island populations of the species. Boullanger Island and Whitlock Island provide habitat for approximately 100 and 80 animals respectively (McCulloch 1998). Dibblers were once widespread on the mainland of Western Australia (Moore River to King George Sound), but are

now restricted to the Fitzgerald River National Park. The dibbler is a threatened species declared to be specially protected under the State's Wildlife Conservation Act and listed as Endangered under the Environment Protection and Biodiversity Conservation Act.

The population of dibblers on Boullanger and Whitlock Islands are monitored and can fluctuate in some years. Dibblers are particularly susceptible to weather fluctuations, where several 'abnormal' years (eg. drought) can affect breeding. Dibbler population numbers can also be influenced by fire—dibblers have a preference for long-unburnt, dense vegetation (Chapman & Newbey 1995; Bencini *et al.* 2001), and the phenomenon shown by some dasyurids whereby males may die off after the breeding season (Mills & Bencini 2000). Several different species of seabirds breed on Boullanger and Whitlock Islands and this may be important to the dibbler populations. The burrows of some seabirds apparently provide shelter for dibblers (McCulloch 1998) and the high nutrient input from breeding seabirds may increase the productivity of the islands, and consequently increase the food resources for the dibbler (Wolfe *et al.* 2004).

According to the *Dibbler Recovery Plan* (Friend 2004), the recovery of the species depends upon ensuring the persistence of known populations, searching thoroughly for further existing populations and establishing additional populations through translocation of wild and/or captive-bred individuals. One of the significant achievements resulting from the *Dibbler Interim Recovery Plan* (Start 1998) has been the successful establishment of a new dibbler population on Escape Island from island stock (Moro 2002).

A captive breeding program was established at Perth Zoo to increase the number of island-dwelling dibblers. Eighty-eight captive-bred dibblers were released on Escape Island, selected for its habitat diversity, size and lack of introduced house mice (*Mus domesticus*), which may compete for resources (Moro 2002). Escape Island was also selected because it supports a thriving seabird colony, the burrows of which may be used by dibblers for shelter, foraging or nesting (Bencini *et al. 2001)*.

Although island populations of dibblers are probably subjected to less disturbance than the mainland populations, their small number infers that one chance event (eg. fire) could wipe out the entire population. Uncontrolled human access could result in trampling of seabird burrows, misuse of fire, and the introduction of predators (such as dogs, cats, and foxes) which would potentially devastate an island population of dibblers. To reduce the potential for disturbance of marsupials by visitors, domestic animals and lighting of fires are not permitted, and it is recommended that access be managed through the land classification scheme (see Section 8, *Land Classification*).

Key Points

- The dibbler and Boullanger Island dunnart are the only marsupials found on the island nature reserves.
- The dibbler is listed as Endangered under the Environment Protection and Biodiversity Conservation Act and is specially protected under the Wildlife Conservation Act. The Boullanger Island dunnart is a subspecies of the grey-bellied dunnart and is listed as Vulnerable under Commonwealth legislation and specially protected under State

legislation.

- Dibblers occur naturally on Boullanger and Whitlock Islands and have been translocated to Escape Island through a captive breeding program at Perth Zoo. The subspecies of grey-bellied dunnart is confined to Boullanger Island and is the only population of this species known to occur on an island.
- The persistence of the island populations of dibbler is dependent upon many factors, including lack of predators and minimal disturbance.

Reptiles

Seventeen reptile species have been recorded from the islands, comprising four gecko and 13 skink species (Williams unpublished). The number of lizard species found on individual islands varies according to island size and habitat diversity. Boullanger and Lancelin Islands support seven species of lizards while some of the smaller islands, such as Middle Cervantes Island and North Essex Rocks, have only one species present. Reptiles appear to be absent from islands less than 0.2 ha in area, although not all of the islands have been intensively surveyed. The island lizard fauna is tabulated in Appendix 7.

Apart from size and habitat diversity, the presence of other animals also affects the current distribution of reptiles on the islands. Islands that support a large population of sea-lions have few species of reptiles. Tracks made by sea-lions degrade the vegetation, thereby reducing the shelter available for lizards. Continual deposition of guano from the seabird colonies alters the soil nutrient status, changing the vegetation composition and making the habitat less suitable for some species.

All species of reptile found on the islands have extensive populations on the adjacent mainland, exceptions being a distinct subspecies of the skink *Egernia pulchra longicauda* (located on islands in the vicinity of Jurien Bay) and the endemic Lancelin Island skink. The latter species has one of the most restricted distributions of any reptile in Western Australia. Numbering approximately 3000 (Pearson and Jones 2000), the only viable population of the Lancelin Island skink is known to occur on Lancelin Island (approximately 8ha). The Lancelin Island skink is a threatened species declared to be specially protected under the Wildlife Conservation Act, and listed as Vulnerable under the Environment Protection and Biodiversity Conservation Act.

The *Lancelin Island Skink Recovery Plan* (Pearson & Jones 2000) identified four key factors to ensure the survival of the species by:

1. maintaining existing habitat on Lancelin Island;
2. increasing the size of the existing captive population;
3. searching for other populations; and
4. investigating translocation to other sites.

Islands from Rockingham to Dongara were assessed for their suitability to support a translocation, with Favorite Island proving the most suitable. Initial releases of captive-bred

skinks on Favorite Island occurred in 2002.

Lancelin Island is heavily frequented for recreation purposes, therefore human access and activity must be carefully managed. Pressures on the Lancelin Island skink population include the risks of introduction of predators, disturbance of habitat used for egg incubation and shelter, and the introduction of weeds which may change habitat characteristics.

Key Points

- A total of 17 species of reptiles are recorded from the island nature reserves. Not all of the islands have been intensively surveyed to determine the presence of reptile species.
- The only wild population of the Lancelin Island skink is found on Lancelin Island. The Lancelin Island skink is declared to be specially protected under the Wildlife Conservation Act.
- Initial translocation of the Lancelin Island skink to Favorite Island occurred in 2002.
- Human activity and access needs to be carefully managed to ensure the survival of the Lancelin Island skink.

Birds

Sixty-four bird species have been observed on the island nature reserves, of which 26 species are known to use the islands for breeding. Seventeen of the breeding species are seabirds (i.e. species that rely on the ocean for food), a number of which are migratory waterbirds recognised by international agreements including the Bonn Convention and Migratory Bird Agreements with Japan (JAMBA) and China (CAMBA). Migratory waterbirds listed under these agreements are protected at a national level under the Environment Protection and Biodiversity Conservation Act. A list of the islands' breeding seabirds is tabulated in Appendix 8.

The islands provide protected breeding sites as they are removed from the mainland and close to the birds' source of food. Islands most favoured by seabirds appear to be those from which the nesting birds can see the ocean and which have suitable vegetation formations, and are of insufficient size to support mammalian predators. Generally, nesting populations of seabirds are found on islands less than 25 ha.

Significant changes in the distribution and abundance of seabirds have been observed on the islands over the past 30-40 years. The most notable of these 'meta-population' changes has been the colonisation of the islands by seabirds of tropical and subtropical origin. The founder populations of these species originated from the Houtman-Abrolhos Islands off the coast of Geraldton. This phenomenon has been attributed to changes in ocean climates, possibly caused by variations in the frequency and intensity of the El Nino Southern Oscillation, and the subsequent fluctuations in prey availability (Dunlop & Wooller 1990).

According to Dunlop and Rippey (2000), breeding seabirds can be broadly divided into two categories: 'surface-nesters' and 'burrow-nesters.' Surface-nesters are those species which place their nests on the ground or on vegetation canopy. Burrow-nesters are those species that conceal their nests in an excavated chamber or natural cavity. The separation between the two nesting

types is not always distinct, however, as surface-nesters, such as bridled terns (*Sterna anaethetus*), typically conceal their nests under cover and burrow-nesters may nest on the surface under low, dense vegetation.

Human activity on and around the islands can impact breeding seabirds in a number of ways. Egg and chick mortality can be increased by island visitors trampling seabird nests and burrows. Humans may introduce predators, such as domestic dogs and cats, which would devastate breeding colonies. Weed introduction via island visitors can change the islands' vegetation structure resulting in the loss of particular niche habitats used for nesting. Aircraft activities, such as low overflying aircraft, can also disturb seabirds and disrupt their breeding activities on islands.

The level of seabird fidelity (i.e. strength of attachment) to the breeding site influences seabird responses to the presence of natural predators and human disturbance. Once a successful site has been established, seabird species with a strong site attachment return to the same nesting position in subsequent seasons. Seabirds that have developed a long-term attachment to their territories have a lower probability of abandoning a breeding attempt after an intermittent disturbance and are more tolerant of the presence of humans in their colony area.

The burrow-nesting wedge-tailed shearwaters (*Puffinus pacificus*), little shearwaters (*Puffinus assimilis*) and white-faced storm-petrels (*Pelagodroma marina*) typically display a strong attachment to an established nest site, particularly in stable habitats with low levels of nest predation (Warham 1990). Such seabirds avoid the risks associated with a regular breeding site by concealing the nest, rearing offspring in a burrow, and arriving at and departing from the colony at night. These adaptations mean that human visitors rarely disturb colony formation by being present at a colony during the day.

In contrast to those species with strong site attachment are those without fixed nest sites (low fidelity), whose relationship to the nest site and colony area vary and depend on a spectrum of adaptations to minimise the risk of predation. If these seabirds are disturbed by natural predators or human activity in the nesting area during the colony formation stage, then there is a high probability of colony abandonment.

Disturbance to nesting birds is of concern, particularly low fidelity species (see Appendix 8). Each species has a relatively standard 'critical approach distance', which is a measure of their sensitivity to human disturbance. Continued human disturbance can ultimately result in abandonment of nesting sites, shifts in colony distribution to sub-optimal breeding habitats and delayed breeding leading to lower breeding success. Low fidelity seabirds breed on most of the islands, but are more prevalent on those where access has been proposed to be classified as prohibited.

Conversely, seabirds may become habituated to the presence of island visitors, specifically when the human activity is predictable and contained. For example, where activity is confined to formalised pathways (including boardwalks), seabird species can become habituated to the pattern of movement. Humans are then perceived to be less of a threat. Design and placement of visitor facilities such as pathways must consider these disturbance and habituation issues.

Seabird nesting affects the nature of the island vegetation, its quantity and quality. The nesting and burrowing activities of the seabirds may trample or mechanically damage foliage, branches and roots, thus reducing vegetation cover and facilitating weed proliferation and soil erosion (Dunlop and Rippey 2000). This physical disturbance of vegetation by seabird colonies, as well as the elevated soil nutrient levels from guano deposition, results in the replacement of perennial woody shrubs by annual grasses and herbs. The successional processes occurring in the vegetation of small islands off south-western Australia were described by Gillham (1961) — refer to Section 12, *Native Plants and Plant Communities*.

Waste disposal on the mainland may indirectly affect the birds using the islands. Adequate disposal at waste sites could be vital in controlling an increase in the population of birds such as silver gulls (*Larus novaehollandiae*) who feed from these sites. The importance of preventing an increase in the abundance of one species is illustrated on metropolitan islands to the south of the study area. On Carnac Island, for example, an increase in the abundance of nesting pied cormorants has removed the succulent shrub cover that was the breeding habitat for other nesting species (Dunlop and Rippey 2000).

Key Points

- Sixty-four bird species have been observed on the islands and more than a third of these are known to use the islands for breeding.
- Changes in the distribution and abundance of seabirds on the islands has occurred over the past 30-40 years due to immigration of species from the Houtman-Abrolhos Islands, and continues to change.
- Islands are favoured for seabird breeding because they are removed from the mainland and close to the birds' food source.
- Birds breeding on some of the islands are at risk from human disturbance.
- Seabird nesting affects the nature of the vegetation and its quantity and quality. Introduced weed species can change the islands' vegetation structure, causing habitats used for nesting to be lost.

Terrestrial Invertebrates

The terrestrial invertebrate fauna of the islands is not well known. Knowledge about the terrestrial invertebrate populations needs to be developed through the implementation of basic survey work on the islands. This could be facilitated by CALM and carried out in conjunction with other organisations.

Aquatic Fauna

The island reserves currently extend to the low water mark and in doing so incorporate the marine fauna that inhabit the rocky shores, tidal pools and beaches of the intertidal zone. Intertidal reef platforms may contribute significantly to the biodiversity of the reserves by supporting populations of fishes and marine invertebrates.
Western rock lobster (*Panulirus cygnus*) and abalone (*Haliotis* spp.) are found on the intertidal reefs and are commonly targeted by commercial fishers.

The aquatic fauna of the islands' intertidal reef platforms are not well known. The species supported by the intertidal reef platforms will be monitored along with the impacts of human activities, particularly recreational and commercial fishers.

The objective is to conserve indigenous fauna on the islands with an emphasis on threatened or priority species.

This will be achieved by:

1. permitting access only on ten of the islands;
2. protecting fauna habitats from human disturbance;
3. protecting fauna from introduced animals through appropriate control regimes;
4. encouraging further fauna research, such as critical approach distances for nesting birds and a meta-population management plan for seabirds;
5. considering classification of the nesting sites of low fidelity seabird species as closed areas under the CALM Regulations;
6. supporting the preparation and implementation of recovery plans for threatened fauna species of the islands;
7. supporting monitoring programs on selected intertidal reef platforms to determine the impact of fishing and collecting; and
8. providing information to island visitors about the islands' fauna.

Key Performance Indicator 1

The success of these strategies will be measured by:

Changes to sea-lion pup production in the islands.

Target

No decrease from 1998 (last survey) levels, or as specified in subsequent management plans for the Jurien Bay Marine Park.

Reporting

Each breeding cycle (approximately every 17-18 months).

Key Performance Indicator 2

The success of these strategies will be measured by:

Changes in the population levels of dibbler on Boullanger and Whitlock Islands.

Target

Population levels remain at no less than 40% of 1998 numbers within the next 10 years, or as specified in subsequent up-dates of the Dibbler Recovery Plan.

Reporting

Annually (as per Recovery Plan).

Key Performance Indicator 3

The success of these strategies will be measured by:

Changes to population size of Lancelin Island skink.

Target

Number of Lancelin Island skinks to remain within 80% of 1996 population size (Lancelin Island Skink Recovery Plan), or as specified in subsequent reviews/updates of the Lancelin Island Skink Recovery Plan.

Reporting

Annually (as per Recovery Plan).

Key Performance Indicator 4

The success of these strategies will be measured by:

Nesting success of beach-nesting seabirds, sensitive to human disturbance.

Target

Continuation of successful breeding on Lancelin Island by beach-nesting seabirds, sensitive to human disturbance. For Fairy Terns, there should be at least one successful breeding attempt (i.e. eggs that result in fledglings) every five years.

Reporting

Every two years.

14. LANDSCAPE

Landscape management is based on the premise that the visual quality of any landscape is a resource in its own right and can be assessed and managed accordingly. The role of landscape management is to ensure that all uses and activities are planned and implemented to complement rather than detract from the inherent visual quality of the environments in which they occur. In this management plan, the term 'landscape' encompasses both landscapes and seascapes.

Every landscape has an identifiable visual character determined by its context of geomorphology, hydrology, soils, vegetation, land-use and cultural heritage values. According to these features, CALM (1994b) has identified and described landscapes in order to assess their values.

The islands are representative of two Landscape Character Types: the Swan Coastal Plain, which extends to just north of Lancelin, and the Geraldton Plains, situated from Cervantes to north of Geraldton (CALM 1994b).

Landscape management involves maintaining, restoring or enhancing natural and cultural landscape values, as well as planning and designing landuse activities and developments to provide diverse views and minimise negative impacts. Landscape management includes culturally sensitive site planning, design and construction. CALM's Policy Statement No. 34 - *Landscape Management of CALM's Lands and Waters* should be adhered to in all aspects of land management, particularly the planning and implementation of new facilities, buildings, recreation sites, signs and infrastructure.

The landscape values of the islands have the potential to be degraded by inappropriate and insensitively designed and located structures. As outlined in Section 20, *Recreation Use and Opportunities*, design and placement of facilities (if any) should minimise impacts on the islands' ecological and aesthetic values. Furthermore, developments on the adjacent coastline (eg. housing developments, industry) and marine environment (eg. petroleum exploration, aquaculture) can also have a detrimental impact on the scenic integrity of the islands' landscapes and viewsheds. Although CALM has no control over lands and waters it does not manage, developments can be encouraged to be sympathetic to reserves in the area.

Key Points

- The numerous offshore islands of the Turquoise Coast offer a richness and diversity of scenic features, which contribute significantly to the experience of landscape values in the area.
- Landscape values have the potential to become degraded by modifications to the natural environment.

The objective is to protect the islands' natural landscape qualities.

This will be achieved by:

1. assessing any proposed management activities and development of facilities to determine their impact on visual landscape values;
2. ensuring that facility design and location has minimal impact on the islands' visual quality; and
3. liaising with mainland landowners, industry, local and state government agencies to ensure visual landscape management guidelines are considered in any development or operations they may undertake, and provide advice where required.

15. FIRE

Fire history and knowledge of the impacts of fire on the islands is poor. Frequency and risk of fires on the islands is low due to low litter accumulation, salt-laden winds, the dominance of succulent plants, and the absence of residents. Despite the infrequency of fire, Hopkins and Harvey (1989) identified unchecked wildfire as a serious threat because of its ability to burn out an entire island and cause local extinctions.

The occurrence of uncontrolled, frequent burns could cause degradation of island vegetation, specifically a loss of shrubs and an increase in grasses. Fauna relying on shrubs for habitat and protection (eg. dibblers, nesting seabirds and reptiles) would be adversely affected by such an alteration and opportunistic fire weeds (eg. wild oats) would exacerbate the risk of further fire.

For these reasons, and that of visitor safety, lighting of fires is prohibited. Information will be provided to island users regarding the potential impacts of fire on the islands' values and the risk to visitor safety.

In the event of a fire, direct suppression may be possible and effective on larger islands, given their proximity to the mainland. Suppression by direct attack would utilise hand tools and

portable pumps.

Friend (2004) recommended that in the event of significant parts of Boullanger and Whitlock Islands being burnt, some dibblers may be taken into captivity. The number would be determined at the time and would depend on an assessment of the risk of mortality to animals surviving the fire.

Key Points

- Little is known of the islands' fire history.
- Frequent burning could alter the islands' vegetation structure from shrublands to grasses and weeds. This would change the habitat available to fauna and increase the risk of fire.
- Although the deliberate lighting of fires is prohibited in nature reserves, a fire risk remains from natural causes or misuse of fire.
- The suppression of island fires may be possible and effective on larger islands through the use of hand tools and portable pumps.

The objectives are to minimise the misuse of fire, and safeguard against habitat loss as a result of fire.

This will be achieved by:

1. providing information to island users on the impact that fire can have on island values and visitor safety, and that the lighting of fires on nature reserves is prohibited;
2. monitoring the effects of fires that do occur on the islands;
3. in the event of fire on an island, undertake direct suppression response wherever possible and practicable;
4. rehabilitating fire affected areas where necessary; and
5. translocating threatened species off burnt islands into captive breeding programs if deemed necessary for their long-term survival.

Key Performance Indicator

The success of these strategies will be measured by:

Number of wildfires resulting from human activity on the islands.

Target

No wildfire resulting from human activity on the islands.

Reporting

Annually.

16. ENVIRONMENTAL WEEDS

An environmental weed can be defined as an unwanted plant species growing in natural ecosystems. Weeds displace indigenous plants, particularly on disturbed sites, by competing with them for light, nutrients and water. They can also have a significant adverse impact on other conservation values by altering animal habitats, harbouring pests and diseases, and have the

potential to create a fire hazard. For example, weeds can affect breeding grounds for seabirds by reducing the open ground available for surface-nesting seabirds, reducing the amount of shrub cover and shade for chicks, thereby contributing to an increase in the rate of chick predation.

All except three of the islands have weeds, with 48 weed species recorded from the islands in total (Keighery *et al.* 2002). For some of the islands there is evidence of a decrease in the number of native species and an increase in weed species, especially *Mesembryanthemum crystallinum* (iceplant). Recorded on 30 islands, iceplant was the most widespread of the weed species identified in Keighery *et al.* (2002) and the second most widespread plant species overall. Iceplant is native to South Africa and has become a serious weed of pastures in southern Australia due to the plant's habit of accumulating and concentrating salt from the soil (Rippey and Rowland 1995).

Environmental weeds are transported to the islands by a number of vectors, including birds, wind, tidal movement and humans. Islands subjected to the greatest disturbances generally have a correspondingly high number and cover of weed species. For example, islands such as Wedge Island, Escape Island and Lancelin Island, which have access tracks on them, displayed a more diverse weed flora when compared to adjacent islands. In addition, islands with high levels of guano deposition are more susceptible to weed invasion, due to elevated nutrient levels. The soils of coastal south western Australia are typically low in nutrients and the indigenous flora has adapted to these conditions. However, islands that support seabird breeding colonies often have soils with very high levels of nitrogen and phosphorus. Many introduced weed species are adapted to higher nutrient conditions and can rapidly colonise and proliferate on islands subject to seabird disturbance. In general, increasing physical and nutrient pressure from burrowing and surface-nesting seabirds results in the replacement of perennial woody shrubs by succulent shrubs and trailing species (eg. iceplant). In severely damaged habitats perennials are replaced entirely by annual grasses and herbs (Gillham 1961).

Successive recovery of vegetation structure and composition relies upon indigenous plants, such as Australian hollyhock, that prefer guano-rich environments (ornithocoprophiles). The introduced tree mallow (*Malva dendromorpha*) is also an ornithocoprophile and has replaced the indigenous Australian hollyhock on islands off the metropolitan coast. Unlike Australian hollyhock, which plays an important role in the natural detoxification of seabird colony areas, the tree mallow does not give way to indigenous shrub cover (Dunlop and Rippey 2000). Although tree mallow has yet to be recorded on the Turquoise Coast islands, monitoring for this species is crucial as islands particularly at risk from invasion appear to be those on which the indigenous Australian hollyhock grows (32 of the Turquoise Coast islands).

African boxthorn (*Lycium ferocissimum*) is another woody weed with the potential to seriously affect the ecology of the islands. The red fruits of the African boxthorn are readily dispersed by birds and the plant aggressively colonises areas which have been heavily disturbed by seabirds, sea-lions or human activities (Robinson *et al.* 1996, cited in Dunlop & Rippey 2000). African boxthorn has been the focus of a weed removal program from a number of the islands. Eradication was successful on Lipfert and Milligan Islets and Orton Rock where it was replacing the evergreen native shrub, nitre bush. Partial success was achieved on East Beagle Island, but while this weed remains, the threat of spread onto uninfested islands continues. Total eradication from East Beagle Island will be staged to minimise the impact on sea-lions who appear to use the

African boxthorn as habitat. Progressive weed removal also allows the gradual rehabilitation of cleared areas with native vegetation.

An integrated approach to environmental weed management was developed in the *Environmental Weeds Strategy for Western Australia* (CALM 1999b). The interrelationship between soil disturbance, weed invasion and native plants is complex, hence weed control should be undertaken in a strategic and integrated manner with guidance from this Strategy. The most effective control program would encourage the growth of native species and the suppression of weeds with the overall aim of boosting the area's resilience to further weed invasion.

Key Points

- 48 weed species are found on the reserves, with the most on the highest disturbed sites.
- The environmental problems caused by weeds originate from their ability to act as 'disturbance opportunists.'
- If introduced to the Turquoise Coast islands, the tree mallow has the potential to replace the indigenous Australian hollyhock.
- An African boxthorn eradication program has been successfully implemented on several islands.

The objective is to minimise the impacts of environmental weeds on the islands' values.

This will be achieved by:

1. monitoring for loss of native vegetation and environmental weed invasion;
2. implementing suitable weed control and rehabilitation programs where weed invasion threatens the islands' values;
3. removing African boxthorn from the islands; and
4. undertaking weed control in accordance with the *Environmental Weed Strategy for Western Australia*.

Key Performance Indicator

The success of these strategies will be measured by:

Changes in the area covered by African boxthorn.

Target

Eradication of African boxthorn from the islands during the life of the plan.

Reporting

Every two years.

17. INTRODUCED AND OTHER PROBLEM ANIMALS

Introduced animal species, whether exotic or Australian native, have the potential to cause deleterious effects to the islands' conservation values. Introduced animals have been recorded on some of the islands, namely rabbits (*Oryctolagus cuniculus*) on North and South Green Islands and house mice on Boullanger and Whitlock Islands. Since then, the Agricultural Protection

Board (now the Department of Agriculture) has eradicated rabbits from North and South Green Islands.

There is potential for other introduced animals to invade the islands. For example, Wedge Island's proximity to, and periodic connection with, the mainland means it is possible that black rats, rabbits, cats and foxes may establish or visit the island. Some of the metropolitan islands closer to Perth have also been subject to colonisation by feral pigeons.

Introduction of other non-indigenous animal species could also result in increased competition, predation on endemic island species and other environmental impacts. For example, according to Friend (2004), the introduction of feral cats and foxes would pose a serious threat to the dibbler populations on Boullanger and Whitlock Islands.

Key Points

- Introduced animals have been recorded on some of the islands.
- Rabbits were successfully eliminated from the islands and further control measures may be necessary where an introduced species is having a detrimental impact.

The objective is to prevent and, where necessary, ameliorate the impact of introduced animals on the islands' ecosystems.

This will be achieved by:

1. where impacts on ecological values are known or found to be negative, implementing measures to eradicate introduced species from the islands;
2. facilitating research to investigate the impact of house mice on the dibbler populations on Boullanger and Whitlock Islands and taking steps to control if necessary;
3. providing information for island visitors about the impacts of animal introductions on the islands' ecological values; and
4. monitoring the presence of introduced species, and the efficiency of control programs on target species and any effects on non-target species.

Key Performance Indicator

The success of these strategies will be measured by:

The presence of introduced animal species on the islands.

Target

No introduction of non-native animal species to the islands.

Reporting

Annually.

PART D. MANAGING OUR CULTURAL HERITAGE

18. CULTURAL HERITAGE

Indigenous

The mainland adjacent to the islands has been identified as a significant area for Noongar people, with evidence of middens, yam grounds and stone artefacts in some caves. The coastal area between Greenhead and Jurien Bay has the largest number of midden deposits in the south-west of Western Australia. Most of these small middens consist of marine shells including limpet, turban whelk, abalone and chiton shells, plus some fish remains, particularly wrasses and leatherjackets (CALM 1998). These sites are significant as they provide evidence that marine molluscs and fish were an important food source in the traditional aboriginal diet.

The coastal dunes in the Jurien Bay region were used as burial sites and human skeletal remains have been exposed in dune blowouts. Such sites are protected under the *Aboriginal Heritage Act 1972*. It is an offence to damage, alter or destroy any Aboriginal sites unless written consent has been obtained from the Minister for Indigenous Affairs—this includes sites not yet registered with the Department of Indigenous Affairs.

The *Native Title Act 1993* requires government agencies to notify registered claimants and the Aboriginal representative bodies when preparing management plans or undertaking public works. There are currently two registered native title claims on the Turquoise Coast that incorporate the islands. Prior to the preparation of the draft plan, the registered claimants as well as the Yamatji Land and Sea Council were contacted, and further consultation is required to establish the significance of the islands to Aboriginal people.

The reservation of Target Rock under the *Land Administration Act 1997* will accord with the Native Title Act.

Non-indigenous

As early as 1658 Europeans were in the area of the islands as the Dutch ship *Waeckende Boeij* (Watchful Buoy), under the command of Captain Volkersen, sailed the Western Australian coast in search of wreckage from the *Gilt Dragon* lost two years earlier. The mainland town of Leeman was subsequently named in honour of Abraham Leeman, steersman of *Waeckende Boeij*, when it was gazetted in 1961 (Department of Land Information 2003).

In June 1801, the French ship *Naturaliste*, under the command of Captain Nicholas Baudin, sailed north along the Western Australian coastline. Jurien Bay was named on this expedition in honour of Charles Marie Jurien, a French navel administrator. Other maritime history of Jurien Bay includes visits by Lt William Preston in the hired cutter *Collonist* in 1830 and J. W. Gregory in the schooner *Thetis* in 1847-8. The Bay was first surveyed in 1865 by James Harding, Harbour

Master of Fremantle, and a more extensive survey was made by Staff Commander W. E. Archdeacon R. N. in 1875 (Department of Land Information 2003). The townsite of Jurien Bay was gazetted in 1956 in response to continued use of the area by campers and fisherman.

Lancelin Island was also named on the Baudin Expedition in honour of scientific writer P. F. Lancelin. In the late 1940s interest in the Lancelin Island area, both for camping and as a port for the rock lobster fishery, resulted in Lancelin town site being declared in 1950.

The Cervantes Islands were named after the *Cervantes*, an American whaler/sealer wrecked just north of the Islands in 1844. The townsite of Cervantes was subsequently named after these nearby islands. As it was thought (incorrectly) that the islands had also been named on the Baudin Expedition to honour a Spanish author, many of Cervantes streets received Spanish names (Department of Land Information 2003).

Several historic shipwrecks are recorded from Lancelin to Dongara (WA Maritime Museum 2003). Ships wrecked before 1900 are protected under State and Commonwealth legislation (the *Maritime Archaeology Act 1973* and the *Historic Shipwrecks Act 1976* respectively). The WA Maritime Museum has statutory responsibility for the management of these wrecks.

Historically the majority of residents of the coastal towns between Lancelin and Dongara have been commercial fishers, particularly commercial rock lobster fishers. However, settlements like Jurien and Lancelin are increasingly popular holiday destinations, offering a range of recreational opportunities close to Perth. Consequently, some of the islands are frequently visited. These are generally the larger, more accessible islands with recreational attractions such as beaches and nearby fishing areas. Lancelin Island, in particular, is a popular destination for residents and visitors to the area.

Key Points

- There are currently two registered native title claims that include the islands.
- Further consultation is needed to assess the importance of the islands to the Noongar people.
- The area has a significant European cultural heritage in terms of the early exploration of the State.
- The coastal towns developed to service the fishing industry and are increasingly focused on the growing demands from recreation and tourism.

The objective is to protect the islands' cultural heritage and values.

This will be achieved by:

1. developing, in collaboration with the local indigenous community, an understanding of the significance of the area to Aboriginal people;
2. notifying relevant native title claimants and representative Aboriginal bodies when preparing management plans or undertaking public works according to section 24JB(7) of the Native Title Act;

3. assessing the potential impacts of new developments to ensure that construction and subsequent activities do not adversely impact upon significant historical and cultural sites; and
4. incorporating material on historical and cultural sites in interpretive displays and community education programs, where appropriate.

PART E. MANAGING RECREATION AND TOURISM

19. VISITOR ACCESS

Appropriate access to the islands is designated at a strategic level through the implementation of the measures outlined in *Land Classification* (see Section 8). Ten of the islands are proposed as limited access for day use only, with visitors confined to intertidal reef platforms, beaches, boardwalks and designated pathways. The remaining islands are proposed to be declared as prohibited access areas (refer to Table 1). Access to many of these islands is naturally restricted by their surrounding intertidal reef platforms.

Within this framework, it may be necessary to further designate appropriate visitor access on the limited access islands. This detailed level of access planning will be undertaken for those islands where there is the possibility of disturbance to conservation values. Beach and intertidal areas provide important habitat for nesting seabirds and are themselves prone to periodic wave erosion and damage from human use. Access planning will identify and may restrict access to selected beach and intertidal areas to provide protection to wildlife, vegetation and geomorphological formations. Site-hardening through the provision of facilities such as boardwalks and pathways may also be necessary on the limited access islands where there is the possibility of disturbance to wildlife or damage to the vegetation and soils. Limited access islands may be considered for re-classification as prohibited access areas if the impacts of visitors and human activities become unmanageable.

Visitors usually arrive on the islands by boat, including jetskis, powerboats, windsurfers and paddled craft. Boat traffic can disturb the islands' wildlife by approaching too closely, particularly during the seabird and sea-lion breeding seasons. Motorised boats cause noise disturbance from their engines and can injure sea-lions with their propellers. To reduce the impact of boating activities on fauna, boat landing zones will be designated on limited access islands as part of detailed access planning. Closed areas, under the CALM Regulations 2002, may be used to provide temporary or seasonal protection to fauna. The use of boats (including all craft powered by human exertion, wind or mechanical power) in nature reserves is managed under CALM's draft Policy Statement No. 18 - *Recreation, Tourism and Visitor Services* and the CALM Regulations.

Wedge Island differs from the other islands in that it is periodically (approximately every seven years) joined to the mainland by a wide sandbar, enabling pedestrian and vehicular access. The presence of an old four-wheel drive track along the centre of the Island indicates previous use. This track has caused severe erosion and considerable weed invasion on Wedge Island, and has been closed to vehicular access.

Key Points

- Visitor access to the islands is designated through the implementation of limited, prohibited and closed access areas.
- Ten of the islands are recommended as limited access areas for day use only, with the remaining islands proposed to be declared as prohibited access areas.
- Access to the islands is primarily by boat, the traffic of which can disturb the islands' fauna.
- Wedge Island is accessible via a sandbar approximately every seven years.

The objective is to allow suitable access while ensuring the islands' values are not adversely affected.

This will be achieved by:

1. limiting visitor access to specific areas for wildlife conservation, safety or other reasons, as per Section 8, *Land Classification*;
2. undertaking access plans, in consultation with the Conservation Commission, for each of the limited access islands where necessary; and
3. designating boat landing zones on islands to which access is permitted.

20. RECREATION USE AND OPPORTUNITIES

Islands that are easy to access, close to the mainland and have desirable beaches are the main focus of recreational pursuits by island visitors. Activities are concentrated on the larger islands with nearby mainland communities, including Lancelin, Wedge, North Cervantes and Boullanger Islands. Visitation to the islands is predicted to increase with the completion of the planned coastal road from Perth to the central west coast and the growth of Jurien Bay as a regional centre.

Visitors to the islands pursue various recreation activities such as swimming, walking, bird watching, snorkelling, nature appreciation and fishing. Recreational linefishing has traditionally occurred from the islands' accessible beaches, targeting species such as Australian herring (*Arripis georgianus*), skipjack trevally (*Pseudocaranx wrighti*) and whiting (*Sillago spp.*). Recreational abalone and specimen collecting also takes place on some of the islands' intertidal reef platforms.

Fisheries management throughout Western Australia is the statutory responsibility of the Department of Fisheries under the Fish Resources Management Act. Within marine parks, recreational fishing is regulated and managed by the Department of Fisheries in consultation with CALM, as outlined in the Jurien Bay Marine Park management plan. Fishing and collecting from the shoreline intertidal reef platforms of nature reserves can be controlled by declaring a Fisheries Notice over the area to be protected (under the Fish Resources Management Act). Declaring a Fisheries Notice still allows access for low impact activities such as nature appreciation.

Recreational activities will be permitted only on the ten islands where access is allowed (see Section 8, *Land Classification*). Activities on these islands will be confined to intertidal reef platforms, beach areas, boardwalks and designated pathways.

Undoubtedly the attraction of the islands is their relatively undisturbed and undeveloped state. However, as visitor numbers increase and their potential impacts increase, management must be prepared to respond. This could include site-hardening through the provision of facilities (eg. boardwalks). One of the main threats to the islands is uncontrolled access and associated impacts on the islands' conservation values. These include direct impacts such as disturbance to seabirds from people flying kites or boats approaching too close, while indirect impacts include trampling of vegetation, erosion, the introduction of weeds and feral animals, and increased fire risk.

Design and placement of facilities should minimise impacts on the islands' ecological and aesthetic values. Issues such as resources for maintenance, sewage disposal impacts on conservation and landscape values all need to be considered if visitor facilities are to be provided. It is proposed that boardwalks and paths are provided on selected islands where they can mitigate disturbance to wildlife or damage to the vegetation and soils. Further, no toilet facilities are proposed for the islands, with all toilet waste being removed by visitors. Information should be placed at mainland launching sites to inform visitors of the lack of facilities on the islands. The effectiveness of visitor management needs to be monitored and amended where necessary to ensure that the lack of facilities does not lead to degradation of the environment.

Education of island visitors and supply of interpretative material will be crucial in managing visitor behaviour on the islands. Even so, it may become necessary during the life of the management plan to place restrictions on the number of visitors to the more commonly visited islands if visitor impacts begin to degrade the islands' ecological values. Restrictions may include seasonal closures of specific islands, visitation through seasonally operating guided tours and prohibiting access where there are severe threats or impacts cannot be reasonably managed. Visitor safety on the islands is addressed in Section 22, *Visitor Safety*.

Key Points

- Several of the larger islands are a focus for recreational activities such as swimming, walking and nature appreciation. Some activities have the potential to impact on the conservation and aesthetic values of the islands.
- The islands' intertidal reef platforms are targeted by recreational fishers and collectors.
- Visitors are restricted to ten of the islands, with recreational activity confined to day use of intertidal reef platforms, beaches, boardwalks and designated pathways.
- Education is of great importance for management and control of island visitors.

The objectives are to:

- **ensure that recreation activities are managed in a manner consistent with the islands' conservation purpose, and in an ecologically sustainable manner; and**
- **ensure, in collaboration with the Department of Fisheries, that recreational fishing and collection in the island nature reserves is managed in an ecologically sustainable manner.**

This will be achieved by:

1. confining recreation activities to the intertidal reef platforms, beach areas, designated pathways and boardwalks of limited access islands as per Section 8, *Land Classification*;
2. monitoring visitor use patterns through the formal collection of data from licensed tour operators (eg. records of visitor and vessel numbers, and types of recreational use);
3. assessing the need for visitor facilities. Ensure facility design and location have minimal impact on the islands' ecological and aesthetic values;
4. providing information at mainland launching sites to inform visitors of island regulations, restrictions and codes of behaviour before they leave the mainland;
5. providing information about the islands to communicate, for example, the need for controlled access, removal of rubbish and waste, visitor safety, respect for the environment and the potential impacts of inappropriate recreational use of the islands;
6. encouraging research into the effects of recreational fishing activities on the islands' values;
7. ensuring recreational fishers are aware of the restrictions that apply to their activities within the reserves; and
8. supporting and liaising with the Department of Fisheries in managing the fisheries in the islands in an ecologically sustainable manner.

Key Performance Indicator

The success of these strategies will be measured by:

Nesting success of beach-nesting seabirds, sensitive to human disturbance.

Target

Continuation of successful breeding on Lancelin Island by beach-nesting seabirds sensitive to human disurbance. For fairy terns, there should be at least one successful breeding attempt (i.e. eggs that result in fledglings) every five years.

Reporting

Every two years.

21. TOURISM AND COMMERCIAL OPERATIONS

The natural attributes and accessibility of some of the islands may be attractive to commercial tourism operators. Wildlife interaction licences currently issued for the study area (eg. licences for boat-based interactions with Australian sea-lions) do not permit landing on the islands. Wildlife interaction licences are administered under the Wildlife Conservation Act, and strict conditions apply to how interactions can occur. Operators within the Jurien Bay Marine Park require a commercial operators licence issued under section 101 of the CALM Act.

There has been some interest shown by commercial operators to take tours on to several of the islands. This demand will undoubtedly increase with land development and tourism promotion in the region and the completion of the coast road to link Lancelin with the Cervantes-Jurien Bay area. Commercial tour operations may be allowed on the ten islands where access is permitted (see Table 1) in accordance with the CALM Act and Regulations, and subject to the general

conditions specified in the Tour Operator Handbook (CALM 1999c), or any other conditions that may need to be applied.

Current knowledge of the biota of the islands indicates that uncontrolled commercial tourism operations may negatively impact on fauna, including the dibbler, nesting seabirds, Australian sea-lion and Lancelin Island skink populations, as well as island vegetation. In licensing for commercial operations, is important that monitoring programs be established to help assess the impact of commercial operations and recreational users.

The licensing of commercial tour operators to access the islands will be dependant upon the level of interest expressed by commercial operators and on an assessment of the islands' capability to sustain the activity. CALM issues two types of licences—'T' Class (open to many operators) and 'E' Class (limited number of licences issued due to environmental or management issues). It is recommended that licences initially be 'E' Class, in consideration of the islands' physical size and their high conservation value. These would only be issued following a public 'Expression of Interest'. Commercial operators conducting the activities on the islands will be required to become accredited under the National Ecotourism Accreditation Program (NEAP) or similar accreditation.

If commercial tour operations are permitted, a precautionary approach will be taken to ensure there is no significant impact from these operations. Therefore, the number of licences available would be limited and licence conditions developed to ensure this restriction. Conditions may include group size, trip frequency, time allowed on the island, the time of year islands can be visited and the collection of visitor surveys.

Key Points

- Due to the natural attributes and accessibility of some of the islands, there is potential for commercial tourism operations.
- Commercial Operators Licences may be issued depending on demand, the satisfactory maintenance of conservation values and the completion of an assessment of the islands' capability to sustain the activity.
- Commercial operations will be managed through the issuing of limited licences with strict conditions.

The objective is to manage commercial tourism operations on the islands consistent with the purpose of a nature reserve.

This will be achieved by:

1. initially allocating 'E' Class licences and reassessing the class of licence issued as necessary;
2. investigating appropriate licensing conditions such as group size, time spent on the islands and the frequency of trips;
3. ensuring all commercial operators using the reserves obtain a CALM Commercial Operators Licence, and have NEAP or similar accreditation;

4. requiring licensed operators collect appropriate information necessary for ongoing management as specified in their licence conditions;
5. ensuring that commercial tour operators have relevant and correct interpretative material;
6. offering interpretation training workshops for licensed tour operators where necessary; and
7. monitoring and regulating commercial activities through numbers of licences and licence conditions to ensure they do not compromise the sustainability of the island systems.

22. VISITOR SAFETY

There are several factors related to the substantial risk of injury to island visitors. These may include breeding Australian sea-lions, danger from fragile and undercut cliffs, and unexploded ordnance. CALM has a legal and moral responsibility to consider the personal safety and welfare of visitors, which it does by implementing measures that are reasonable and prudent in the context of the hazard, intensity of visitor usage and character of the site. This will be effected through the implementation of a visitor risk management program. This approach is consistent with CALM's Policy Statement No. 53 - *Visitor Risk Management*.

Target Rock was previously Crown land leased to the Department of Defence for use as a Royal Australian Air Force bombing range. As a result of unexploded ordnance (UXO) assessments, the Department of Defence has declared that negligible potential exists for any UXO to be remnant as a result of activities at the former range.

Key Points

- People expose themselves to a number of risks when visiting the islands.
- CALM addresses its responsibility to island visitors through the implementation of a visitor risk management program.

The objective is to minimise the potential for injuries and misadventure to island visitors.

This will be achieved by:

1. assessing each island to which public access is permitted with regard to potential risks to island visitors, and preparing a visitor risk management report;
2. undertaking actions as indicated in the report to minimise the potential for visitor injury on the islands; and
3. providing information to promote visitor safety.

23. DOMESTIC ANIMALS

In accordance with the CALM Regulations, dogs, cats, horses and other domestic animals are not permitted in nature reserves. Domestic animals can disturb wildlife and visitors, spread weeds,

introduce disease, disturb native vegetation, foul recreation areas, and, if they escape and establish on the islands, be devastating to the native fauna.

Guide dogs for blind visitors and tracker dogs for search and rescue operations are exempt.

The objective is to protect the islands and visitors from the impacts of domestic animals.

This will be achieved by:

1. prohibiting domestic animals on the islands (except guide dogs and tracker dogs in search and rescue operations); and
2. informing visitors of the reasons why domestic animals are not allowed on the islands.

PART F. MANAGING SUSTAINABLE RESOURCE USE

24. MINERAL AND PETROLEUM RESOURCES

Mineral and petroleum exploration and extraction are regulated under the *Mining Act 1978*, *Petroleum Act 1967*, *Petroleum (Submerged Lands) Act 1982* and the *Petroleum Pipelines Act 1969* and administered by the Department of Industry and Resources. Sections 24 and 25 of the Mining Act define Ministerial responsibilities for approving mineral exploration and mining on various land and waters of the State. According to this Act, no tenements will be approved until the Minister for State Development (formerly Minerals and Energy) obtains the advice of the Minister for the Environment. The Conservation Commission provides advice to the Minister for the Environment. Proposals for exploration and mining may be referred to the Environmental Protection Authority for assessment under the *Environmental Protection Act 1986*. During the assessment process, CALM and the Conservation Commission have the opportunity to comment on the impact of the proposal. All exploration activities are subject to stringent environmental controls.

There are currently no mining tenements on the islands. Mining can not be permitted in Class A nature reserves unless approved by both Houses of Parliament. Any exploration and mining activity will have a significant impact on the islands' values. Some of the impacts of mining and exploration within the islands and waters could include loss of vegetation and habitat, wildlife disturbance and loss of landscape values. If approved, exploration and mining should be subject to, and meet with, conditions that will ensure the impact on all conservation values are minimised.

The islands and surrounding waters are situated within the northern Perth Basin, an area of considerable interest to the petroleum industry. Exploration permits and production licences are held for almost the entire onshore and offshore areas between Lancelin and Geraldton. Major hydrocarbon fields have been discovered onshore near Dongara and Eneabba and these fields produce domestic gas supplies transported by pipeline to Perth and Pinjarra. In addition, onshore oil fields at Dongara produce crude oil and condensate with a combined value of $1.6 million in 1999/00 (Department of Local Government and Regional Development and Mid West Development Commission 2001).

In regard to the Jurien Bay Marine Park, current government policy on petroleum exploration and development in marine parks includes prohibition of drilling and production in sanctuary and recreation zones or in special purpose zones where the Minister administering the CALM Act declares that drilling or production is incompatible with the conservation purpose specified in the classified area notice. It is permitted in general use zones and some special purpose zones. Any proposal for seismic surveys, exploration and production are referrable under the Environmental Protection Act process.

Key Points

- Exploration and development of mineral and petroleum resources on the islands and surrounding waters is conducted under several Acts, administered by the Department of Industry and Resources.
- Mineral and petroleum exploration and development have the potential to affect the values of the islands.
- There are currently no mining tenements on the islands.
- Current exploration permits and licences are held for most onshore and offshore areas from Lancelin to Geraldton.

The objective is to protect the islands from the potential impacts of mineral and petroleum exploration and development.

This will be achieved by:

1. providing formal advice to the Environmental Protection Authority and the Department of Industry and Resources in relation to environmental assessments of proposed exploration and development activities on the islands;
2. in the event of an exploration or development proposal being approved, ensuring that stringent conditions under the CALM Regulations and other relevant Government policy are strictly adhered to for appropriate operating procedures; and
3. liaising with industry and relevant government agencies, including the Department of Industry and Resources, over any proposals for mineral or petroleum resource development on the waters and mainland adjacent to the islands to ensure that the islands' values are considered and protected.

25. COMMERCIAL FISHING AND COLLECTION

Commercial fishing and collecting activities have traditionally occurred on some of the islands' intertidal reef platforms. The platforms are targeted by commercial rock lobster fishers and commercial shell collectors, while those surrounding the Fisherman Islands are the focus of commercial abalone divers.

There are a number of shell collecting and aquarium fish collecting licences that allow collecting along the entire Western Australian coastline at any time of the year. Collectors occasionally visit the area of the islands for short time periods.

Western Australia's most common abalone species, Roe's abalone (*Haliotis roei*), is also harvested from some of the islands' intertidal reef platforms.

As for recreational fishing management, commercial fisheries management throughout WA is the statutory responsibility of the Department of Fisheries under the Fish Resources Management Act. Within marine parks, commercial fishing is regulated and managed by the Department of Fisheries in consultation with CALM, as outlined in the management plan for the Jurien Bay Marine Park. Fishing and collecting from the shoreline intertidal reef platforms of nature reserves

can be controlled by declaring a Fisheries Notice over the area to be protected (using the Fish Resources Management Act). This strategy is preferred over the alternative of declaring a prohibited access area over the reef platform (under the CALM Act) as it still allows access for low impact activities such as nature appreciation.

Land based aquaculture facilities would be opposed on the Turquoise Coast island nature reserves due to their high conservation values and limited size.

Key Points

- The islands' intertidal reef platforms are targeted by commercial fishers and collectors.
- The Department of Fisheries is responsible for fisheries management on the islands' intertidal reef platforms.

The objective, in collaboration with the Department of Fisheries, is to ensure that commercial fishing and collecting in the island nature reserves is managed in an ecologically sustainable manner.

This will be achieved by:

1. encouraging research into the effects of commercial fishing activities on the islands' values;
2. encouraging commercial fishers to be aware of the restrictions that apply to their activities within the reserves; and
3. liaising with the Department of Fisheries in managing the fisheries in the islands in an ecologically sustainable manner.

PART G. INVOLVING THE COMMUNITY

26. INFORMATION, EDUCATION AND INTERPRETATION

The Turquoise Coast island nature reserves provide a valuable opportunity for community education about island ecosystems. An effective information, education and interpretation program is vital to achieve the vision and objectives for the management of the islands. It informs the public of the attractions, facilities and opportunities available, and assists the community to appreciate and understand the natural and cultural environments. It also fosters a sense of community ownership of the islands, engenders support for their management, and encourages appropriate behaviour to minimise adverse impacts on the environment.

The process consists of these parts:

- Information - provides details of facilities, activities, features and regulations. Information includes off-site promotion of the islands and brochures.
- Education - provides resources and programs designed specifically for various educational groups. Education includes work sheets and support materials.
- Interpretation - explains natural and cultural features and management activities. Interpretation includes on-site signs, brochures, and interpretive activities.

Information, education and interpretation programs will concentrate on raising awareness about the islands' conservation values and their vulnerability to human impact, the land classification scheme of the islands, and the positive actions visitors can take to support island management.

CALM's publication, *Exploring Coastal Waters*, is used to help increase awareness and understanding of the marine environment in WA's temperate and coastal waters. The kit, aimed at primary school students and covering limestone reefs, sandy beaches, seagrass meadows and deep waters, is directly applicable to the islands. CALM is currently preparing a guide for interpreting our marine heritage. This will be similar in style to the existing publication *Best Recipes for Interpreting Our Heritage: Activities for Ecotourism Guides and Others.* These publications are focused on providing tour operators with a range of interpretive activities for their clients.

Key Points

- Information, education and interpretation provide different mechanisms for targeted communication with the public.
- It is important for the effective implementation of the management plan that community understanding and support is fostered for the islands.

The objective is to promote community understanding and awareness of the islands' conservation values and engender support for their effective management.

This will be achieved by:

1. developing and implementing a communications plan for the islands;
2. providing information to visitors on island values and issues such as visitor safety, permitted activities and regulations;
3. providing support, where possible, to institutions using the islands for educational and research purposes;
4. ensuring that commercial tour operators have relevant and factual interpretative material; and
5. offering interpretation workshops for licensed tour operators if necessary.

27. WORKING WITH THE COMMUNITY

A key function of the Conservation Commission is to promote and facilitate community involvement, which is an integral component of CALM's operations. The community, as groups or individuals, is encouraged to be involved in both the planning and management of many of CALM's activities, including volunteer programs.

The community have been involved in developing this management plan by providing initial comments as written submissions and participation in issue workshops. At the draft stage of the management plan, interested community members and organisations had the opportunity to formally comment on the proposed management of the islands either by written submission or by making an electronic submission on CALM's webpage, Naturebase.

Ongoing community support is essential for the successful implementation of this final management plan. Community groups are encouraged to take part in volunteer activities on the islands such as visitor surveys, clean up days and help with maintenance, such as erosion control, weed removal and boardwalk maintenance. CALM has a formal policy and administrative framework for volunteer activities (Policy Statement No. 32 - *Volunteers*) which includes initiatives to provide more volunteer opportunities, and to provide training to volunteers and CALM staff in their management. Volunteer activities not only increase CALM's work capabilities and skills base, but also foster communication links and understanding with the community.

Specific island management issues, which require community input, will be referred for public comment as necessary and a Community Advisory Committee established if required. Island management issues that are relevant to the Jurien Bay Marine Park will be referred to the community-based Jurien Bay Marine Park Management Advisory Committee, proposed in the marine park's indicative management plan (CALM 2000). This committee will provide a regular forum to hear public opinion and exchange advice on management issues.

Key Points

- Community involvement and support is critical to the successful implementation of the management plan.
- Specific island management issues requiring community input will be referred for public comment and/or to the proposed Jurien Bay Marine Park Management advisory Committee as necessary.

The objective is to facilitate effective community involvement in management of the islands.

This will be achieved by:

1. encouraging and supporting activities that involve the community in the management and monitoring of the islands;
2. establishing and maintaining a Community Advisory Committee if deemed necessary;
3. referring island management issues to the proposed Jurien Bay Marine Park Management Advisory Committee if necessary; and
4. liaising with commercial operators and community concerning the conditions for commercial licences.

Key Performance Indicator

The success of these strategies will be measured by:

The number of volunteer hours contributed for the islands.

Target

No decrease in the level of volunteer hours contributed over the life of the plan.

Reporting

Annually.

PART H. IMPLEMENTING THE PLAN

28. RESEARCH

The Turquoise Coast island nature reserves are of interest to scientists for various reasons, including specially protected animals, and extensive seabird breeding colonies. The islands' species are also significant biogeographically, as they are subject to different evolutionary pressures than those on the adjacent mainland (which can lead to speciation), and are located in a region of overlap between the temperate and tropical zones.

The range of scientific research opportunities available on the islands, and their proximity to academic institutions in Perth, has resulted in reptile, mammal, vegetation and bird surveys. Research into the Lancelin Island skink, Australian sea-lions, dibblers, grey-bellied dunnarts and seabirds has been ongoing for a number of years. All research within nature reserves requires a research permit issued by CALM. CALM's prioritisation of scientific research and monitoring programs on the islands will reflect the key performance indicators, tabulated in Appendix 4.

Although some social research has been conducted on the islands in the form of informal visitor surveys, this could be improved to assist in island management. Social research projects include the study visual impacts of visitors, visitor patterns, visitor activities, and visitor awareness of the islands. The requirement for social data collection will be included in the licence conditions for commercial tour operators.

Key Points

- The biogeographical significance of the islands, the evolutionary processes occurring on them and the specially protected animal species make the islands of special interest for scientists.
- Future studies will be prioritised according to the key performance indicators.

The objective is to further develop and maintain knowledge in regard to conserving and protecting the values of the islands.

This will be achieved by:

1. developing and implementing a research and monitoring plan;
2. supporting, where possible, scientific and social research on the islands by research, academic and educational institutions;
3. encouraging volunteers, educational institutions and other organisations to undertake and participate in research projects that promote the objectives of the management plan;
4. ensuring that research activities do not adversely impact on the islands' values;
5. requesting that licensed operators collect appropriate information necessary for ongoing management as specified in their licence conditions; and
6. focusing research and monitoring on meeting key performance indicators as identified in

Appendix 4.

Key Performance Indicator

The success of these strategies will be measured by:

The identification and delivery of research according to Departmental priorities and Government initiatives.

Target

All Department research conducted on the islands is identified as high priority.

Reporting

Annually.

29. ADMINISTRATION

CALM follows a purchaser–provider model to deliver operations on the ground, principally through nine regional centres that are further sub-divided into districts. The Turquoise Coast island nature reserves are in the Moora District of the Midwest Region and, as such, their operational management is the responsibility of the District Manager, Moora District. The administrative centre for the District is situated in the coastal town of Jurien Bay.

30. TERM OF THE PLAN

This plan is current for ten years from its date of approval. The CALM Act allows the plan to remain in force unless either revoked be the Minister for the Environment or a new plan is approved. Revisions or amendments to the plan are allowed under Section 61 of the CALM Act.

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APPENDICES

Appendix 1. Agencies Responsible For Management

AGENCY	RESPONSIBILITIES
Conservation Commission of Western Australia	❖ Vesting body for terrestrial reserves. ❖ Provides policy advice to the Minister for the Environment. ❖ Responsible for the preparation of management plans through the agency of CALM. ❖ Submits proposed management plans to the Minister. ❖ Audits management plan implementation by CALM.
Department of Conservation and Land Management	❖ Manages nature reserves vested in the Conservation Commission. This includes: . preparation of management plans; . implementation of management plans; . coordination with other agencies; . implementation of education and monitoring programs; . wildlife research and management; . management of recreation and nature-based tourism; and, . lead role in enforcement. ❖ Ensures integrated management of island nature reserves with adjoining mainland conservation reserves and adjacent marine reserves.
Marine Parks and Reserves Authority	❖ Vesting body for marine conservation reserves. ❖ Provides policy advice to the Minister for the Environment. ❖ Responsible for the preparation of management plans through the agency of CALM. ❖ Submits proposed management plans to the Minister. ❖ Audits management plan implementation by CALM.
Department for Planning and Infrastructure	❖ Responsible for all boating regulations including licensing, safety standards, marker buoys, moorings and jetties. ❖ Chairs and supports the State Coordinating Committee which provides the mechanism to coordinate the management of marine pollution incidents. ❖ Responsible for management of vessel navigation and the development and management of support facilities.
Department of Environment	❖ Assists the Environmental Protection Authority in the process of assessing proposals that may affect the environment, including nature reserves. ❖ Administers pollution control legislation.
Environmental Protection Authority	❖ Assesses, reports and makes recommendations on proposals that may significantly affect the environment, including nature reserves.
Department of Industry and Resources	❖ Administers acts which control mineral and petroleum exploration and development.
Department of Fisheries	❖ Manages and regulates commercial and recreational fishing, aquaculture and pearling in the marine environment. ❖ Lead role in enforcement of fisheries legislation within the marine environment.
WA Maritime Museum	❖ Protection of pre-1900 shipwrecks and artifacts under the ***Marine Archaeology Act 1973***. Shipwrecks over 75 years old are declared and protected under the Commonwealth ***Historic Shipwrecks Act 1976***.

Appendix 2. Turquoise Coast Islands Summary

Reserve Name	Islands	Island Area (ha)	Distance from Mainland (km)	Maximum Elevation A.S.L.	Island Co-ordinates
Lancelin & Edwards Islands NR	Lancelin Edwards	8.1653 0.4536 **8.61**	0.6 0.1	27 5	31°00'27"S, 115°18'56"E 31°01'51"S, 115°19'26"E
Wedge Island NR [1]	Wedge Island	**4.03**	0.2	21	30°49'45"S, 115°11'12"E
Proposed Target Rock NR	Target Rock	**0.08**	0.9	12	30°45'40"S, 115°09'53"E
Buller, Whittell & Green Islands NR	Buller Whittell North Green South Green	1.2950 0.9712 2.9137 3.2375 **8.42**	1.5 2.3 3.3 3.1	 8 8	30°39'30"S, 115°06'48"E 30°39'58"S, 115°06'28"E 30°40'50"S, 115°06'08"E 30°41'00"S, 115°06'17"E
Cervantes Islands NR	North Cervantes Middle Cervantes South Cervantes	2.8387 0.4516 0.7097 **4.00**	1.6 2.6 2.7	8	30°31'28"S, 115°02'41"E 30°31'48"S, 115°02'36"E 30°31'58"S, 115°02'37"E
Ronsard Rocks NR	North Ronsard Rocks South Ronsard Rocks	Area indeter-minable	2.1 0.6		30°28'46"S, 115°02'48"E 30°30'05"S, 115°02'59"E
Outer Rocks NR	North Outer Rocks South Outer Rocks	**6.85**	5.5 5.6		30°26'33"S, 114°59'47"E 30°26'38"S, 114°59'45"E
Essex Rocks NR	North Essex Rocks Middle Essex Rocks South Essex Rocks	0.80 4.0322 2.4193 **7.26**	4.2 4.4 4.6	5 5 5	30°21'01"S, 114°59'47"E 30°21'18"S, 114°59'49"E 30°21'37"S, 114°59'38"E
Escape Island NR	Escape Island	**27.33**	5.0	12	30°20'18"S, 114°59'32"E
Boullanger, Whitlock, Favorite, Tern and Osprey Islands NR	Favorite Island Boullanger Island Osprey Island Tern Island Whitlock Island	2.4193 31.4515 0.8064 0.4032 5.2419 **40.32**	3.3 1.1 2.3 2.5 2.4	14 7 4 4 10	30°17'02"S, 115°00'23"E 30°18'59"S, 115°00'13"E 30°18'54"S, 114°59'31"E 30°19'03"S, 114°59'41"E 30°19'19"S, 114°59'30"E
Sandland Islands NR	Sandland Island	**1.55**	0.3		30°12'41"S, 114°59'16"E
Fisherman Islands NR	North Fisherman South Fisherman	2.8226 2.4193 **5.24**	4.9 5.6	10 10	30°07'55"S, 114°56'36"E 30°08'20"S, 114°56'28"E
Lipfert, Milligan & Snag Islands, Webb Islet & Orton & Drummond Rocks NR	Snag Island Drummond Rock Webb Islet Lipfert Island Orton Rock Milligan Island	0.8064 0.8871 1.6129 1.6129 0.3226 1.1290 **6.37**	0.1 0.2 0.2 0.2 0.1 0.2		29°56'14"S, 114°58'33"E 29°56'46"S, 114°58'21"E 29°58'36"S, 114°57'34"E 30°01'30"S, 114°57'37"E 30°01'56"S, 114°57'44"E 30°02'20"S, 114°57'19"E
Beagle Islands NR	North West Beagle East Beagle South West Beagle	0.50 1.50 0.20 **2.20**	8.6 8.3 8.6		29°48'26"S, 114°52'26"E 29°48'28"S, 114°52'36"E

Note: NR = Nature Reserve; [1] = Wedge Island also has Reserve # 11907. This is a 0.4ha unvested parcel of land which is a trigonometrical station (i.e. a control point used for mapping)

Sources: Keighery ***et al.*** (2002); CALM TENure Information System (2003)

Appendix 3. Recommended Prohibited Access Islands

Island Name	Reason for Recommended Prohibition
Edwards Island	◆
Whittell Island	◆
Buller Island	⌘
Target Rock	◆
Middle Cervantes	◆
South Ronsard Rock	◆
North Ronsard Rock	◆
South Outer Rock	◆
North Outer Rock	◆
South Essex Rock	◆
Middle Essex Rock	◆
North Essex Rock	◆
Tern Island	◆
Osprey Island	◆
Sandland Island	◆
South Fisherman Island	O
North Fisherman Island	⌘
Milligan Island	◆
Orton Rock	◆
Lipfert Island	◆
Webb Islet	◆
Drummond Rock	◆
Snag Island	◆
South-West Beagle Island	◆
East Beagle Island	⌘
North-West Beagle Island	◆

Note:
◆ prohibited area; ⌘ prohibited area due to sea-lion breeding; O prohibited area due to proximity to sea-lion breeding island

Appendix 4. Performance Assessment

KEY VALUES	OBJECTIVE	KEY PERFORMANCE INDICATOR		
		Performance Indicator/Measure	Target	Reporting Requirements*
Rich and diverse terrestrial and marine communities and habitats, significant for the protection of priority and threatened fauna. Several important examples of fauna and flora speciation on islands. Significant breeding and resting habitat for Australian sea-lions. Substantial habitat and breeding grounds for numerous seabird species. Diverse assemblages of native vegetation and flora. Sites of relatively undisturbed native vegetation and geomorphology. Varied natural landscapes and associated aesthetic values.	To conserve indigenous plant species and communities.	Changes in the area of native woody and succulent shrubs (preferred seabird nesting habitat) on the islands.	Maintain or increase the area of preferred seabird nesting habitat over the life of the plan.	Every 2 years
	To conserve indigenous fauna on the islands with an emphasis on threatened or priority species.	Changes to sea-lion pup production in the islands.	No decrease from 1998 (last survey) levels, or as specified in subsequent management plans for the Jurien Bay Marine Park.	Each breeding cycle (approximately every 17 - 18 months)
		Changes in the population levels of dibbler on Boullanger and Whitlock Islands.	Population levels remain at no less than 40% of 1998 numbers within the next 10 years, or as specified in subsequent up-dates of the Dibbler Recovery Plan.	Annually (as per Recovery Plan)
		Changes to population size of Lancelin Island skink.	Number of Lancelin Island skinks to remain within 80% of 1996 population size (Lancelin Island Skink Recovery Plan), or as specified in subsequent reviews/updates of the Lancelin Island Skink Recovery Plan.	Annually (as per Recovery Plan)
		Nesting success of beach-nesting seabirds, sensitive to human disturbance.	Continuation of successful breeding on Lancelin Island by beach-nesting seabirds, sensitive to human disturbance. For Fairy Terns, there should be at least one successful breeding attempt (i.e. eggs that result in fledglings) every five years.	Every 2 years
	To minimise the misuse of fire, and safeguard against habitat loss as a result of fire.	Number of wildfires resulting from human activity on the islands.	No wildfire resulting from human activity on the islands.	Annually
	To minimise the impacts of environmental weeds on the islands' values.	Changes in the area covered by African boxthorn.	Eradication of African boxthorn from the islands during the life of the plan.	Every 2 years
	To prevent, and where necessary, ameliorate the impact of introduced animals on the islands' ecosystems.	The presence of introduced animal species on the islands.	No introduction of non-native animal species to the islands.	Annually

KEY VALUES	OBJECTIVE	KEY PERFORMANCE INDICATOR		
		Performance Indicator/Measure	Target	Reporting Requirements*
Terrestrial and marine environment that offers varied passive recreation opportunities, including nature appreciation and bird watching. Recreational fishing from beaches and on shoreline intertidal reef platforms. Commercial tour opportunities based on wildlife observation and natural and cultural history.	To ensure that recreation activities are managed in a manner consistent with the islands' conservation purpose and in an ecologically sustainable manner, and ensure, in collaboration with the Department of Fisheries, that recreational fishing and collection in the island nature reserves is managed in an ecologically sustainable manner.	Nesting success of beach-nesting seabirds, sensitive to human disturbance.	Continuation of successful breeding on Lancelin Island by beach-nesting seabirds, sensitive to human disturbance. For fairy terns, there should be at least one successful breeding attempt (i.e. eggs that result in fledglings) every five years.	Every 2 years
Community education opportunities based on island wildlife and environments. Display and interpretation opportunities for cultural and natural history.	To facilitate effective community involvement in management of the islands.	The number of volunteer hours contributed for the islands.	No decrease in the level of volunteer hours contributed over the life of the plan.	Annually

KEY VALUES	OBJECTIVE	KEY PERFORMANCE INDICATOR		
		Performance Indicator/Measure	Target	Reporting Requirements*
Chain of biogeographically unique islands that serve as important references for broader studies of island ecosystems. Diverse flora and fauna, influenced by overlapping marine biogeographic regions. Dynamic ecology that may provide a sensitive indicator of environmental changes, as a result of Leeuwin Current fluctuations and increasing urbanisation on the mainland.	To further develop and maintain knowledge in regard to conserving and protecting the values of the islands.	The identification and delivery of research according to Departmental priorities and Government initiatives.	All Departmental research conducted on the islands is identified as high priority.	Annually

* Note: the response to target shortfall for each of the key performance indicators is for CALM to investigate the cause and report to the Conservation Commission for action.

Appendix 5. Vascular Plants

Source: Keighery ***et al.*** (2002)

Note: ◆ denotes occurrence of vascular plants on the islands; * denotes introduced species

NAME	ISLAND																																		
	Edwards Island	Lancelin Island	Hinge Island	Target Rock	South Green Island	North Green Island	Whitnall Island	Stiller Island	South Carnac Island	Middle Carnac Island	North Carnac Island	South Bernard Rocks	North Bernard Rocks	South Outer Rocks	North Outer Rocks	South Green Rocks	Middle Green Rocks	North Green Rocks	Escape Island	Whitlock Island	Boullanger Island	North Boullanger Island	Twin Island	Osprey Island	Favorite Island	Sandland Island	South Fisherman Island	North Fisherman Island	Milligan Island	Orton Rock	Lighet Island	Webb Inlet	Drummond Rock	Snag Island	South-West Beagle Island	East Beagle Island	North-West Beagle Island
AIZOACEAE																																				
Carpobrotus virescens	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆				◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
* *Mesembryanthemum crystallinum*	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆				
* *Tetragonia decumbens*		◆	◆		◆	◆					◆								◆	◆	◆	◆			◆			◆								
Tetragonia implexicoma											◆								◆	◆	◆	◆	◆				◆	◆								
ANTHERICACEAE																																				
Thysanotus patersonii																					◆	◆														
APIACEAE																																				
Apium annuum		◆	◆																																	
Daucus glochidiatus		◆	◆		◆	◆															◆				◆											
APOCYNACEAE																																				
Alyxia buxifolia																			◆																	
ASPHODELACEAE																																				
* *Trachyandra divaricata*		◆																	◆		◆				◆											
ASTERACEAE																																				
Angianthus cunninghamii																				◆																
* *Arctotheca calendula*		◆	◆																			◆														
* *Arctotheca populifolia*		◆	◆																		◆															
Brachyscome exilis									◆		◆																									
Brachyscome ciliaris											◆								◆	◆	◆	◆														
Leucophyta brownii		◆	◆																																	
Cotula cotuloides		◆	◆		◆		◆	◆			◆						◆		◆	◆		◆			◆	◆								◆		
Euchiton sphaericus											◆									◆														◆		
Gnaphalium indutum											◆									◆																
* *Hypochaeris glabra*																			◆	◆	◆	◆														
Olearia axillaris		◆	◆		◆	◆					◆								◆	◆	◆	◆			◆											
Ozothamnus cordatus		◆																	◆		◆	◆			◆											
Podotheca angustifolia																					◆				◆											
* *Pseudognaphalium luteoalbum*																				◆																
Senecio lautus		◆	◆			◆	◆	◆									◆	◆	◆	◆	◆	◆	◆		◆	◆										

NAME	ISLAND																																				
	Edwards Island	Lancelin Island	Wedge Island	Target Rock	South Green Island	North Green Island	Whittell Island	Buller Island	South Cervantes Island	Middle Cervantes Island	North Cervantes Island	South Bernard Rocks	North Bernard Rocks	South Outer Rocks	North Outer Rocks	South Essex Rocks	Middle Essex Rocks	North Essex Rocks	Escape Island	Whitlock Island	Boullanger Island	North Boullanger Island	Tern Island	Osprey Island	Favourite Island	Sandland Island	South Fisherman Island	North Fisherman Island	Milligan Island	Orton Rock	Ligurt Island	Webb Islet	Drummond Rock	Snag Island	South-West Beagle Island	East Beagle Island	North-West Beagle Island
* *Sonchus oleraceus*		◆	◆		◆	◆	◆	◆	◆	◆	◆						◆	◆	◆	◆	◆	◆	◆		◆	◆		◆	◆	◆	◆	◆	◆	◆		◆	
* *Sonchus* sp.																	◆	◆		◆	◆	◆	◆			◆											
* *Urospermum picroides*									◆										◆	◆	◆	◆															
BRASSICACEAE																																					
* *Brassica tournefortii*		◆																			◆				◆	◆											
* *Cakile maritima*		◆	◆		◆	◆					◆									◆	◆	◆			◆	◆											
* *Hornungia procumbens*		◆				◆												◆		◆					◆					◆		◆					
Lepidium foliosum		◆					◆	◆	◆	◆	◆							◆				◆				◆	◆	◆	◆		◆			◆		◆	◆
Lepidium lyratogynum																			◆	◆	◆	◆			◆												
Lepidium puberulum																						◆				◆											
* *Sisymbrium irio*		◆																													◆						
* *Sisymbrium orientale*		◆																																			
CARYOPHYLLACEAE																																					
* *Cerastium glomeratum*											◆								◆	◆		◆								◆				◆		◆	
* *Polycarpon tetraphyllum*		◆							◆		◆											◆															
* *Sagina apetala*																			◆	◆																	
* *Spergularia diandra*									◆		◆								◆	◆		◆									◆	◆	◆			◆	
* *Spergularia rubra*																			◆																		
* *Stellaria media*		◆																																			
CHENOPODIACEAE																																					
Atriplex cinerea		◆			◆	◆	◆		◆		◆								◆	◆	◆	◆	◆		◆	◆		◆									
Atriplex isatidea		◆	◆		◆						◆								◆	◆	◆		◆		◆	◆	◆	◆									
* *Chenopodium murale*		◆															◆	◆	◆																	◆	
Enchylaena tomentosa		◆			◆	◆			◆		◆						◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆		◆				◆			
Halosarcia halocnemoides		◆																							◆			◆		◆		◆					
Halosarcia indica																						◆															
Rhagodia baccata		◆	◆		◆	◆			◆		◆								◆	◆	◆	◆	◆	◆	◆						◆						
Salsola tragus		◆	◆		◆	◆					◆								◆	◆	◆	◆			◆		◆	◆									
Sarcocornia blackiana	◆	◆																																			
Sarcocornia quinqueflora		◆			◆			◆			◆															◆		◆									
Sclerostegia arbuscula																										◆											
Threlkeldia diffusa		◆	◆		◆	◆	◆		◆	◆	◆				◆		◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆						◆			
CONVOLVULACEAE																																					
Wilsonia backhousei	◆	◆																				◆															
Wilsonia humilis		◆			◆	◆			◆	◆							◆		◆	◆		◆		◆													

NAME	ISLAND																																				
	Edwards Island	Lancelin Island	Wedge Island	Target Rock	South Green Island	North Green Island	Whittell Island	Buller Island	South Cervantes Island	Middle Cervantes Island	North Cervantes Island	South Bernard Rocks	North Bernard Rocks	South Outer Rocks	North Outer Rocks	South Essex Rocks	Middle Essex Rocks	North Essex Rocks	Escape Island	Whitlock Island	Boullanger Island	North Boullanger Island	Tern Island	Osprey Island	Favourite Island	Sandland Island	South Fisherman Island	North Fisherman Island	Milligan Island	Orton Rock	Lipfert Island	Webb Inlet	Drummond Rock	Snag Island	South-West Beagle Island	East Beagle Island	North-West Beagle Island
CRASSULACEAE																																					
Crassula colorata		◆	◆								◆								◆	◆	◆	◆	◆														
Crassula exserta					◆	◆					◆									◆	◆	◆			◆												
* *Crassula glomerata*		◆																																			
CYPERACEAE																																					
Carex preissii																				◆		◆															
* *Isolepis marginata*		◆																																			
Isolepis nodosa		◆	◆																◆		◆	◆	◆														
Lepidosperma gladiatum																					◆	◆															
DASYPOGONACEAE																																					
Acanthocarpus preissii		◆									◆								◆	◆	◆	◆															
EUPHORBIACEAE																																					
Phyllanthus calycinus																			◆	◆																	
FRANKENIACEAE																																					
Frankenia pauciflora	◆	◆	◆		◆	◆			◆	◆	◆						◆		◆	◆	◆	◆			◆	◆								◆			
GENTIANACEAE																																					
* *Centaurium erythraea*											◆								◆																		
GERANIACEAE																																					
* *Erodium cicutarium*																						◆															
GOODENIACEAE																																					
Scaevola crassifolia		◆	◆		◆	◆					◆								◆	◆	◆				◆			◆		◆							
HAEMODORACEAE																																					
Conostylis candicans																					◆																
JUNCACEAE																																					
* *Juncus bufonius*		◆									◆																										
JUNCAGINACEAE																																					
Triglochin calcitrapum									◆		◆																										
Triglochin centrocarpum		◆	◆																		◆																
Triglochin minutissimum																			◆																		
Triglochin mucronatum		◆				◆																															

NAME	ISLAND																																				
	Edwards Island	Lancelin Island	Wedge Island	Target Rock	South Green Island	North Green Island	Whittell Island	Buller Island	South Cervantes Island	Middle Cervantes Island	North Cervantes Island	South Ronsard Rocks	North Ronsard Rocks	South Outer Rocks	North Outer Rocks	South Essex Rocks	Middle Essex Rocks	North Essex Rocks	Escape Island	Whitlock Island	Boullanger Island	North Boullanger Island	Tern Island	Osprey Island	Favourite Island	Sandland Island	South Fisherman Island	North Fisherman Island	Milligan Island	Orton Rock	Lipfert Island	Webb Islet	Drummond Rock	Snag Island	South-West Beagle Island	East Beagle Island	North-West Beagle Island
LAURACEAE																																					
Cassytha racemosa																					◆																
MALVACEAE																																					
Malva australiana	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆				◆	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
* *Malva parviflora*		◆							◆		◆									◆		◆			◆												
MIMOSACEAE																																					
Acacia cyclops		◆	◆																		◆	◆															
Acacia rostellifera																			◆		◆	◆															
MYOPORACEAE																																					
Eremophila glabra											◆								◆	◆																	
Myoporum insulare		◆	◆		◆	◆	◆	◆			◆								◆	◆	◆	◆	◆		◆	◆	◆	◆		◆						◆	
OXALIDACEAE																																					
* *Oxalis corniculata*																				◆		◆															
Oxalis perennans																			◆	◆		◆															
PAPILIONACEAE																																					
* *Medicago polymorpha*											◆								◆	◆																	
* *Melilotus indicus*		◆	◆																																		
Templetonia retusa																			◆	◆	◆	◆															
PITTOSPORACEAE																																					
Pittosporum phylliraeoides																			◆																		
PLANTAGINACEAE																																					
Plantago debilis											◆								◆	◆		◆															
POACEAE																																					
* *Aira caryophyllea*																			◆																		
Austrostipa elegantissima																			◆		◆																
Austrostipa flavescens																					◆	◆															
* *Avellinia michelii*											◆																										
* *Avena barbata*		◆	◆						◆		◆							◆	◆	◆	◆	◆												◆			
Bromus arenarius		◆	◆		◆	◆	◆	◆	◆	◆	◆						◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆		◆			◆		◆	◆
* *Bromus diandrus*		◆	◆					◆	◆										◆		◆								◆		◆			◆		◆	◆
* *Bromus rubens*											◆																										
* *Cynodon dactylon*																							◆			◆											
* *Ehrharta brevifolia*																			◆	◆		◆			◆												

NAME	ISLAND																																			
	Edwards Island	Lancelin Island	Wedge Island	Target Rock	South Green Island	North Green Island	Whitsell Island	Baker Island	South Cervantes Island	Middle Cervantes Island	North Cervantes Island	South Rimond Rocks	North Rimond Rocks	South Outer Rocks	North Outer Rocks	South Boss Rocks	Middle Boss Rocks	North Boss Rocks	Escape Island	Whitlock Island	Boullanger Island	North Boullanger Island	Twin Island	Osprey Island	Passarilla Island	Sandland Island	South Fisherman Island	North Fisherman Island	Milligan Island	Orton Rock	Lipfert Island	Webb Islet	Drummond Rock	Sving Island	South-West Beagle Island	East Beagle Island	North-West Beagle Island
* *Ehrharta longiflora*		◆	◆		◆														◆	◆	◆	◆			◆											
* *Ehrharta villosa*		◆																																		
Eragrostis dielsii																			◆																	
* *Hordeum leporinum*		◆	◆						◆		◆								◆				◆			◆			◆		◆		◆	◆		◆	◆
* *Lolium rigidum*		◆	◆								◆								◆			◆														
* *Parapholis incurva*		◆	◆																◆							◆						◆	◆			
* *Phalaris minor*																			◆														◆			
Poa poiformis		◆	◆																	◆	◆	◆														
* *Rostraria cristata*									◆										◆			◆			◆					◆					
Spinifex hirsutus																					◆															
Spinifex longifolius		◆	◆		◆	◆					◆								◆	◆	◆	◆			◆		◆	◆								
Sporobolus virginicus					◆		◆	◆			◆								◆	◆	◆	◆						◆								
* *Vulpia fasciculata*		◆																																		
* *Vulpia myuros*		◆																	◆	◆	◆	◆														
PORTULACACEAE																																				
Calandrinia calyptrata		◆							◆	◆	◆						◆		◆	◆		◆	◆		◆								◆	◆		
PRIMULACEAE																																				
* *Anagallis arvensis*		◆	◆																																	
Samolus junceus											◆								◆																	
Samolus repens																			◆		◆	◆														
RANUNCULACEAE																																				
Clematis linearifolia																					◆	◆														
RHAMNACEAE																																				
Spyridium globulosum		◆	◆																◆	◆	◆															
RUBIACEAE																																				
* *Galium aparine*																				◆		◆														
Galium migrans																				◆																
SANTALACEAE																																				
Exocarpos sparteus		◆	◆																◆		◆	◆														
SCROPHULARIACEAE																																				
* *Dischisma arenarium*		◆	◆																◆		◆	◆			◆											

NAME	ISLAND																																			
	Edwards Island	Lawsellin Island	Wedge Island	Turgis Rock	South Green Island	North Green Island	Whitsell Island	Bullen Island	South Gervasius Island	Middle Cervantes Island	North Gervasius Island	South Barnard Rocks	North Barnard Rocks	South Outer Rocks	North Outer Rocks	South Binns Rocks	Middle Binns Rocks	North Binns Rocks	Escape Island	Whitlock Island	Boulanger Island	North Boulanger Island	Tern Island	Osprey Island	Pinnette Island	Bardfjord Island	South Fisherman Island	North Fisherman Island	Milligan Island	Orton Rock	Lipfert Island	Welch Inlet	Drummond Rock	Snug Island	South-West Beagle Island	East Beagle Island	North-West Beagle Island
SOLANACEAE																																				
Anthocercis littorea		◆																			◆															
* ***Lycium ferocissimum***																													◆	◆	◆					◆	
Nicotiana occidentalis subsp. ***hesperis***					◆	◆	◆		◆		◆						◆	◆	◆	◆	◆	◆	◆		◆	◆								◆			
* ***Solanum nigrum***									◆		◆											◆	◆														
THYMELAEACEAE																																				
Pimelea gilgiana											◆								◆	◆																
URTICACEAE																																				
Parietaria debilis		◆							◆		◆								◆		◆	◆	◆								◆			◆		
* ***Urtica urens***									◆														◆													
ZYGOPHYLLACEAE																																				
Nitraria billardierei	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Zygophyllum aurantiacum		◆																																		
Zygophyllum billardierei		◆	◆		◆	◆		◆	◆		◆							◆	◆	◆	◆	◆	◆		◆	◆		◆								
Zygophyllum fruticulosum		◆																	◆																	

Source:
Keighery ***et al.*** (2002)

Note:

◆ denotes occurrence of vascular plants on the islands; * denotes introduced species

APPENDIX 6. Australian Sea-lion Use of the Islands

Island Name	Used for Breeding	Non-breeding
Edwards Island		✓
Lancelin Island		✓
Wedge Island		
Target Rock		✓
South Green Island		
North Green Island		✓
Whittell Island		✓✓
Buller Island	✗	✓✓
South Cervantes Island		✓✓
Middle Cervantes Island		✓✓
North Cervantes Island		✓
South Ronsard Rock		✓
North Ronsard Rock		✓✓
South Outer Rock		
North Outer Rock		
South Essex Rock		
Middle Essex Rock		✓
North Essex Rock		✓✓
Escape Island		✓
Whitlock Island		
Boullanger Island		
Tern Island		
Osprey Island		
Favorite Island		
Sandland Island		✓✓
South Fisherman Island		
North Fisherman Island	✗	✓✓
Milligan Island		
Orton Rock		✓
Lipfert Island		✓
Webb Island		
Drummond Rock		
Snag Island		
East Beagle Island	✗	✓✓
South-west Beagle Island		✓
North-west Beagle Island		✓

Note:
Frequency of use by Australian sea-lions on non-breeding islands ✓ denotes occasional use, few animals ✓✓ denotes frequent use, many animals

Appendix 7. Reptile Distribution

NAME	ISLAND																																				
	Edwards Island	Lancelin Island	Wedge Island	Target Rock	South Green Island	North Green Island	Whittell Island	Buller Island	South Cervantes Island	Middle Cervantes Island	North Cervantes Island	South Ronsard Rocks	North Ronsard Rocks	South Outer Rock	North Outer Rock	South Essex Rock	Middle Essex Rock	North Essex Rock	Escape Island	Whitlock Island	Boullanger Island	Tern Island	Osprey Island	Favorite Island	Sandland Island	South Fisherman Island	North Fisherman Island	Milligan Island	Orton Rock	Lipfert Island	Webb Islet	Drummond Rock	Snag Island	South-West Beagle Island	East Beagle Island	North-West Beagle Island
GEKKONIDAE																																					
Christinus marmoratus			◆		◆	◆	◆	◆																	◆			◆								
Crenadactylus ocellatus									◆		◆								◆	◆	◆															
Strophus spinigerus		◆									◆										◆															
Underwoodisaurus milii									◆		◆																									
SCINCIDAE																																					
Ctenotus australis			◆		◆																◆			◆	◆											
Ctenotus fallens		◆	◆																		◆			◆												
Ctenotus lancelini		◆																																			
Cyclodomorphus celatus		◆																																			
Egernia kingii					◆	◆			◆		◆								◆		◆															
Egernia multiscutata bos		◆														◆	◆		◆		◆			◆	◆											
Egernia pulchra longicauda																								◆												
Hemiergis quadrilineata					◆	◆			◆		◆						◆	◆																		
Lerista elegans																											◆									
Lerista lineopunctulata		◆																	◆	◆	◆															
Lerista praepedita									◆																											
Morethia lineoocellata										◆	◆									◆																
Morethia obscura		◆				◆	◆	◆	◆										◆								◆									

Source:
Williams (unpublished)

Appendix 8. Breeding Birds

NESTING TYPE & SPECIES NAME	COMMON NAME	ISLAND																																								
		Edwards Island	Lancelin Island	Wedge Island	South Green Island	North Green Island	Whittell Island	Buller Island	South Cervantes Island	Middle Cervantes Island	North Cervantes Island	South Romsard Rocks	North Romsard Rocks	South Outer Rocks	North Outer Rocks	South Essex Rocks	Middle Essex Rocks	North Essex Rocks	Escape Island	Whitlock Island	Boullanger Island	Tern Island	Osprey Island	Favorite Island	Sandland Island	South Fisherman Island	North Fisherman Island	Milligan Island	Orton Rock	Lipfert Island	Webb Islet	Drummond Rock	Snag Island	South-West Beagle Island	East Beagle Island	North-West Beagle Island
Burrow-nesters																																									
Puffinus pacificus	Wedge-tailed Shearwater (H)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆							◆	◆
Puffinus assimilis	Little Shearwater (H)				◆	◆	◆	◆	◆	◆	◆						◆		◆					◆		◆	◆								
Pelagodroma marina	White-faced Storm-petrel (H)	◆	◆		◆	◆		◆										◆	◆	◆	◆			◆	◆	◆	◆							◆	
Surface-nesters																																									
Phalacrocorax melanoleucos	Little Pied Cormorant										◆														◆			◆			◆	◆	◆			
Phalacrocorax varius	Pied Cormorant (L)	◆	◆	◆			◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆			◆	◆		◆	◆	◆	◆	◆		◆	◆		◆		◆	◆
Egretta sacra	Eastern Reef Egret						◆										◆					◆		◆		◆	◆								
Pandion haliaetus	Osprey	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆	◆	
Haliaeetus leucogaster	White-bellied Sea-eagle																			◆		◆												◆		◆
Haematopus longirostris	Pied Oystercatcher		◆	◆	◆			◆	◆	◆	◆						◆			◆	◆			◆											
Larus pacificus	Pacific Gull (H)	◆	◆	◆			◆	◆	◆	◆	◆						◆	◆	◆	◆	◆	◆		◆											
Larus novaehollandiae	Silver Gull (H)	◆	◆				◆	◆	◆	◆	◆					◆	◆	◆			◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	◆
Sterna caspia	Caspian Tern (L)	◆	◆			◆			◆	◆	◆					◆	◆	◆	◆		◆	◆		◆	◆	◆	◆	◆		◆	◆	◆		◆	
Sterna bergii	Crested Tern (L)	◆	◆		◆				◆	◆	◆			◆	◆	◆	◆		◆			◆			◆	◆	◆								
Sterna dougallii	Roseate Tern (L)	◆	◆		◆	◆	◆	◆	◆	◆	◆															◆	◆						◆	◆	◆
Sterna nereis	Fairy Tern (L)	◆	◆	◆																◆	◆										◆				
Sterna anaethetus	Bridled Tern (H)	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆		◆		◆				◆	◆						◆	◆	◆
Sterna fuscata	Sooty Tern (H)		◆																																
Anous stolidus	Common Noddy		◆																																
Hirundo neoxena	Welcome Swallow	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆						◆	◆		◆	◆			◆	◆		◆	◆				◆	◆			
Falco cenchroides	Australian Kestrel		◆						◆	◆	◆								◆	◆	◆										◆				
Gallirallus philippensis	Buff-banded Rail		◆																																
Neophema petrophila	Rock Parrot	◆	◆		◆	◆		◆	◆	◆	◆						◆	◆		◆	◆			◆	◆							◆	◆	◆	◆
Zosterops lateralis	Silvereye				◆																														
Corvus coronoides	Australian Raven																		◆					◆											
Cheramoeca leucosternus	White-backed Swallow																				◆														
Tadorna tadornoides	Australian Shelduck																							◆											

Sources:
CALM Seabird Breeding Islands Database; WMB Oceanics & Claridge (1997); Nic Dunlop (2000 - personal communication); Andrew Darbyshire (2003 - personal communication)

Note:
(H) high fidelity; (L) low fidelity; ▭ access permitted

Appendix 9. Strategy Implementation Schedule

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
6. Existing and Proposed Tenure	**The objective is to provide statutory protection for the conservation values of the islands.** *This will be achieved by:* 1. securing Target Rock with the Conservation Commission as a Class A nature reserve for the purpose of 'Conservation of Flora and Fauna'; and 2. investigating the area and position of Ronsard Rock Nature Reserve and recommending redescription of the reserve boundary and inclusion in the Jurien Bay Marine Park if appropriate.	→	→									
8. Land Classification	**The objective is to protect the islands' values by providing for statutory management of visitor access and activities.** *This will be achieved by:* 1. initiating appropriate notices under Section 62 of the CALM Act to implement the proposed land classification scheme for the islands; 2. providing appropriate information for visitors and stakeholders regarding the land classification scheme and access to the islands; and 3. initiating temporary or seasonal closures of areas where deemed necessary to protect the islands' values or to mitigate visitor risk.	→	→									⇢
												⇢

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
10. Biogeography	**The objective is to ensure statutory protection to the islands in order to maintain their values and hence importance within the National Reserve System and National Reserve System of Marine Protected Areas.** *This will be achieved by:* 1. securing Target Rock with the Conservation Commission as a Class A nature reserve for the purpose of 'Conservation of Flora and Fauna'.	→										
11. Climate, Geology and Geomorphology	**The objective is to conserve the islands' values by maintaining stable geomorphological features, landforms and soils.** *This will be achieved by:* 1. identifying geomorphological and geological features potentially threatened by human use when considering provision of access; 2. planning management activities and proposed facilities to accommodate the area's climate, including the occasional influence of tropical cyclones and associated strong winds and heavy rains; 3. prohibiting access on all but ten of the islands; 4. rehabilitating eroding areas as necessary; 5. providing information for island users about the ecological importance of the islands' geomorphology; and 6. considering geomorphological and geological features in planning for visitor use.	→		⇢	⇢	⇢	⇢	⇢	⇢	⇢	⇢

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
12. Native Plants and Plant Communities	**The objective is to conserve indigenous plant species and communities.** *This will be achieved by:* 1. protecting vegetation and flora that is rare, unique or in need of special protection; 2. initiating notices under Section 62 of the CALM Act to implement the proposed land classification scheme for the islands; 3. monitoring for loss of native vegetation and environmental weed invasion; 4. controlling access and rehabilitating native vegetation cover on those islands that have been disturbed by human impact; and 5. providing information to island users about the importance of the island vegetation and it's vulnerability to human impact.	→	→									⇢
			→									⇢
												⇢
		→										⇢

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
13. Native Animals and Habitats	**The objective is to conserve indigenous fauna on the islands with an emphasis on threatened or priority species.** *This will be achieved by:* 1. permitting access only on ten of the islands; 2. protecting fauna habitats from human disturbance; 3. protecting fauna from introduced animals through appropriate control regimes; 4. encouraging further fauna research, such as critical approach distances for nesting birds and a meta-population management plan for seabirds; 5. considering classification of the nesting sites of low fidelity seabird species as closed areas under the CALM Regulations; 6. supporting the preparation and implementation of recovery plans for threatened fauna species of the islands; 7. supporting monitoring programs on selected intertidal reef platforms to determine the impact of fishing and collecting; and 8. providing information to island users about the islands' fauna.	→										→

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
14. Landscape	**The objective is to protect the islands' natural landscape qualities.** *This will be achieved by:* 1. assessing any proposed management activities and development of facilities to determine their impact on visual landscape values; 2. ensuring that facility design and location has minimal impact on the islands' visual quality; and 3. liaising with mainland landowners, industry, local and state government agencies to ensure visual landscape management guidelines are considered in any development or operations they may undertake, and provide advice where required.											

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
15. Fire	**The objectives are to minimise the misuse of fire, and safeguard against habitat loss as a result of fire.** *This will be achieved by:* 1. providing information to island users of the impact that fire can have on island values and visitor safety, and that the lighting of fires on nature reserves is prohibited; 2. monitoring the effects of fires that do occur on the islands; 3. in the event of fire on an island, undertake direct suppression response wherever possible and practicable; 4. rehabilitating fire affected areas where necessary; and 5. translocating threatened species off burnt islands into captive breeding programs if deemed necessary for their long-term survival.	→	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
16. Environmental Weeds	**The objective is to minimise the impacts of environmental weeds on the islands' values.** *This will be achieved by:* 1. monitoring for loss of native vegetation and environmental weed invasion; 2. implementing suitable weed control and rehabilitation programs where weed invasion threatens the islands' values; 3. removing African boxthorn from the islands; and 4. undertaking weed control in accordance with the *Environmental Weed Strategy for Western Australia*.	→	→	⇢	⇢	⇢	⇢	⇢	⇢	⇢	⇢	⇢

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
17. Introduced and Other Problem Animals	**The objective is to prevent and, where necessary, ameliorate the impact of introduced animals on the islands' ecosystems.** This will be achieved by: 1. where impacts on ecological values are known or found to be negative, implementing measures to eradicate introduced species from the islands; 2. facilitating research to investigate the impact of house mice on the dibbler populations on Boullanger and Whitlock Islands and taking steps to control if necessary; 3. providing information for island visitors about the impacts of animal introductions on the islands' ecological values; and 4. monitoring the presence of introduced species, and the efficiency of control programs on target species and any effects on non-target species.	→	→	→	→	→	→	→	→	→	→	→

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
18. Cultural Heritage	**The objective is to protect the islands' cultural heritage and values.** *This will be achieved by:* 1. developing, in collaboration with the local indigenous community, an understanding of the significance of the area to Aboriginal people; 2. notifying relevant native title claimants and representative Aboriginal bodies when preparing management plans or undertaking public works according to section 24JB(7) of the Native Title Act; 3. assessing the potential impacts of new developments to ensure that construction and subsequent activities do not adversely impact upon significant historical and cultural sites; and 4. incorporating material on historical and cultural sites in interpretive displays and community education programs, where appropriate.											→

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
19. Visitor Access	**The objective is to allow suitable access while ensuring the islands' values are not adversely affected.** *This will be achieved by:* 1. limiting visitor access to specific areas for wildlife conservation, safety or other reasons, as per Section 8, *Land Classification*; 2. undertaking access plans, in consultation with the Conservation Commission, for each of the limited access islands where necessary; and 3. designating boat landing zones on islands to which access is permitted.		→	→								→

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
20. Recreation Use and Opportunities	**The objectives are to:** ❖ **ensure that recreation activities are managed in a manner consistent with the islands' conservation purpose, and in an ecologically sustainable manner; and** ❖ **ensure, in collaboration with the Department of Fisheries, that recreational fishing and collection in the island nature reserves is managed in an ecologically sustainable manner.** *This will be achieved by:* 1. confining recreation activities to the intertidal reef platforms, beach areas, designated pathways and boardwalks of limited access islands as per Section 8, *Land Classification*; 2. monitoring visitor use patterns through the formal collection of data from licensed tour operators (eg. records of visitor and vessel numbers, and types of recreational use); 3. assessing the need for visitor facilities. Ensure facility design and location have minimal impact on the islands' ecological and aesthetic values; 4. providing information at mainland launching sites to inform visitors of island regulations, restrictions and codes of behaviour before they leave the mainland;											

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
	5. providing information about the islands to communicate, for example, the need for controlled access, removal of rubbish and waste, visitor safety, respect for the environment and the potential impacts of inappropriate recreational use of the islands; 6. encouraging research into the effects of recreational fishing activities on the islands' values; 7. ensuring recreational fishers are aware of the restrictions that apply to their activities within the reserves; and 8. supporting and liaising with the Department of Fisheries in managing the fisheries in the islands in an ecologically sustainable manner.	→										→

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
21. Tourism and Commercial Operations	**The objective is to manage commercial tourism operations on the islands consistent with the purpose of a nature reserve.** *This will be achieved by:* 1. initially allocating 'E' Class licences and reassessing the Class of licence issued as necessary; 2. investigating appropriate licensing conditions such as group size, time spent on the islands and the frequency of trips; 3. ensuring all commercial operators using the reserves obtain CALM Commercial Operators Licence, and have NEAP or similar accreditation; 4. requiring licensed operators collect appropriate information necessary for ongoing management as specified in their licence conditions; 5. ensuring that commercial tour operators have relevant and correct interpretive material; 6. offering interpretation training workshops for licensed tour operators where necessary; and 7. monitoring and regulating commercial activities through numbers of licences and licence conditions to ensure they do not comprise the sustainability of the island systems.											→

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
22. Visitor Safety	**The objective is to minimise the potential for injuries and misadventure to island visitors.** *This will be achieved by:* 1. assessing each island to which public access is permitted with regard to potential risks to island visitors, and preparing a visitor risk management report; 2. undertaking actions as indicated in the report to minimise the potential for visitor injury on the islands; and 3. providing information to promote visitor safety.	→	→									⇢
												⇢
		→										
23. Domestic Animals	**The objective is to protect the islands and visitors from the impacts of domestic animals.** *This will be achieved by:* 1. prohibiting domestic animals on the islands (except guide dogs and tracker dogs in search and rescue operations); and 2. informing visitors of the reasons why domestic animals are not allowed in the islands.											⇢
		→										⇢

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
24. Mineral and Petroleum Resources	**The objective is to protect the islands from the potential impacts of mineral and petroleum exploration and development.** *This will be achieved by:* 1. providing formal advice to the Environmental Protection Authority and the Department of Industry and Resources in relation to environmental assessments of proposed exploration and development activities on the islands; 2. in the event of an exploration or development proposal being approved, ensuring that stringent conditions under the CALM Regulations and other relevant Government policy are strictly adhered to for appropriate operating procedures; and 3. liaising with industry and relevant government agencies, including the Department of Industry and Resources, over any proposals for mineral or petroleum resource development on the waters and mainland adjacent to the islands to ensure that the islands' values are considered and protected.											

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
25. Commercial Fishing and Collection	**The objective, in collaboration with the Department of Fisheries, is to ensure that commercial fishing and collecting in the island nature reserves is managed in an ecologically sustainable manner.** *This will be achieved by:* 1. encouraging research into the effects of commercial fishing activities on the islands' values; 2. encouraging commercial fishers to be aware of the restrictions that apply to their activities within the reserves; and 3. liaising with the Department of Fisheries in managing the fisheries in the islands in an ecologically sustainable manner.											

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
26. Information, Education and Interpretation	**The objective is to promote community understanding and awareness of the islands' conservation values and engender support for their effective management.** *This will be achieved by:* 1. developing and implementing a communications plan for the islands; 2. providing information to visitors on island values and issues such as visitor safety, permitted activities and regulations; 3. providing support, where possible, to institutions using the islands for educational and research purposes; 4. ensuring that commercial tour operators have relevant and factual interpretive material; and 5. offering interpretation workshops for licensed tour operators if necessary.	→	→	⇢	⇢	⇢	⇢	⇢	⇢	⇢	⇢	⇢

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
27. Working with the Community	**The objective is to facilitate effective community involvement in management of the islands.** *This will be achieved by:* 1. encouraging and supporting activities that involve the community in the management and monitoring of the islands; 2. establishing and maintaining a Community Advisory Committee if deemed necessary; 3. referring island management issues to the proposed Jurien Bay Marine Park Management Advisory Committee if necessary; and 4. liaising with commercial operators and community concerning the conditions for commercial licences.											→

SECTION	OBJECTIVE & STRATEGIES	IMPLEMENTATION SCHEDULE										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	As necessary/ Ongoing
29. Research	**The objective is to further develop and maintain knowledge in regard to conserving and protecting the values of the islands.** *This will be achieved by:* 1. developing and implementing a research and monitoring plan; 2. supporting, where possible, scientific and social research on the islands by research, academic and educational institutions; 3. encouraging volunteers, educational institutions and other organisations to undertake and participate in research projects that promote the objectives of the management plan; 4. ensuring that research activities do not adversely impact on the islands' values; 5. requesting that licensed operators collect appropriate information necessary for ongoing management as specified in their licence conditions; and 6. focusing research and monitoring on meeting key performance indicators as identified in Appendix 4.	→	→									→