

Australian Government **Director of National Parks** 

State of the parks report Director of National Parks Annual Report 2008–09 **Supplementary Information** 



Managing the Australian Government's protected areas

## Guide to the state of the parks report

The State of the Parks report presents systematic and consistent background information on each Commonwealth reserve proclaimed under the EPBC Act and for Calperum and Taylorville Stations.

The following information is common to the reports on each place:

- Area and locational information is derived from the Collaborative Australian Protected Areas Database and from a departmental Marine Protected Areas dataset–which includes data sourced from Geoscience Australia
- The World Conservation Union (**IUCN**) protected area management category is identified for each reserve, and where some of the reserve are assigned to different categories this is indicated. The IUCN categories are formally assigned under the EPBC Act, and schedule 8 of the EPBC Regulations defines the Australian IUCN reserve management principles applying to each category.
- Where possible, each reserve's **biogeographic context** is described by reference to the national biogeographic regionalisations: terrestrial (Interim Biogeographic Regionalisation for Australia) or marine (Interim Marine and Coastal Regionalisation for Australia).
- The report summarises the relevance of **international agreements** to each reserve, recognising both the international significance of the reserves and the Director's legal responsibility to take account of Australia's obligations under each agreement.
- The report summarises the occurrence in each reserve of **species listed under the EPBC Act** as threatened, migratory or marine, and the status of relevant recovery plans.
- Information on the **total number of different types of plant and animal species recorded** for each place is included, to the extent of available knowledge. The species information for the six terrestrial national parks includes the numbers of species which are a priority for management (defined as being all threatened species plus non-threatened species for which the park contains more than 1 per cent of its population). Species numbers for marine reserves have been taken from a recently developed species inventory based on documented sightings in the reserves and adjacent areas. The marine inventory is relatively new and is being updated and refined. Species numbers for marine reserves are likely to be underestimated.
- Monitoring is a key aspect of successful park management, and **major monitoring efforts** for the year are reported.
- Future planning is ongoing, and future challenges are reported for each area.
- Management arrangements (such as boards of management, committees, and management agreements with state agencies) are described.
- The report provides information by key result area on major issues, actions and performance results for 2008–09.

Also included in this section are **case studies** that provide more detailed reporting on management of specific issues.

The Director of National Parks is included in the Portfolio Budget Statements for the Environment, Water, Heritage and the Arts portfolio and contributes to the achievement of Outcome 1 (Environment). The Director contributes to meeting this outcome through sub-outcome: *Conservation and appreciation of Commonwealth reserves*; and Output 1.1: *Parks and Reserves*. Detailed reporting on the Portfolio Budget Statement 2008–09 targets is provided at Appendix A.

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## Australian National Botanic Gardens

#### anbg.gov.au



## **Special features**

The Australian National Botanic Gardens (ANBG) is a major scientific, educational and recreational resource. It was one of the first botanic gardens in the world to adopt the study and display of a nation's native species as a principal goal. Approximately one-third of the known flowering plant species that occur in Australia and about half the known eucalypt species are represented in its living collection. The ANBG is a national showcase for the horticultural use of Australia's native plants. It is a partner in the Australian National Herbarium which is the world's most comprehensive collection of Australian plant specimens and which underpins the scientific identification of native plants.

The ANBG contributes to meeting Australia's obligations under international environment conventions to which Australia is a signatory. In particular, the Convention on

Biological Diversity recognises the importance of botanic gardens in *ex situ* and *in situ* conservation, research, training, plant identification and monitoring, raising public awareness, providing access to genetic resources, and global cooperation in the sustainable use of plant biodiversity. The ANBG provides expert participation and contributes scientific data to the Global Biodiversity Information Facility and other international biodiversity projects.

Location	Latitude 35°16′ South, Longitude 149°06′ East
Area	85 hectares
Proclamation date	17 September 1991
IUCN category	Category IV
Biogeographic context	Displays plants from a diverse range of climatic and biogeographic regions – alpine to tropical, coastal to central desert
Management plan	Second management plan expired 9 January 2009. The third management plan (2009–2019) is currently being developed
Other significant management documents	Risk Assessment and Management Schedule; ANBG Masterplan (National Capital Authority); ANBG Fire Procedures 2008; Agreement for the Establishment and Operation of the Centre for Plant Biodiversity Research (CPBR) between the Director of National Parks and the Commonwealth Scientific and Industrial Research Organisation (CSIRO); CPBR Strategic Plan

Financial	Operating	\$9.562 million
	Capital	\$0.567 million
	Revenue	\$0.825 million
Visitors	413,170 to site 104,195 to visitor centre	
Living plants	Planted in 2008–09: 5,590 Total number of taxa in the living collection: 6,170 Total number of registered plants in the living collection: 73,695	
Herbarium specimens	Specimen records added to database in 2008–09: 19,223 Specimen records in database: 815,841 Total number of specimens in collection: approximately 1.2 million	
Australian Plant Name Index	Names added to APNI database in 2008–09: 18,866 Total names in APNI database: 207,798	
Australian Plant Census	Names added to APC database in 2008–09: 8,439 Total names in APC database: 43,342	
Australian Plant Image Index	Images added in 2008–09: 4,592 Total number of images in collection: 57,298	
Permits	4 commercial activity permits; 32 wedding or wedding photography licences; 85 licences to publish 594 photographs from the collection; 15 research permits	

International conventions and agreem	International conventions and agreements		
World Heritage Convention	Supports Australia's World Heritage sites through botanical research, scientific plant collections, plant identification, botanical information management, and horticultural and educational programs		
Wetlands (Ramsar) Convention	Supports Australia's obligations under the Ramsar Convention through access to plant identification services and data on aquatic plants in the Australian National Herbarium, and by delivering information on Australia's aquatic plants through its website		
Other agreements	Collaborates with international organisations including:		
	Botanic Gardens Conservation International		
	International Association of Plant Taxonomists		
	International Plant Propagators Society		
	International Union of Biological Sciences Taxonomic Databases Working Group		
	International Plant Name Index (Royal Botanic Gardens, Kew, and Harvard University)		
	Global Biodiversity Information Facility		
	International Organisation for Plant Information World Vascular Plant Checklist Project		
	Species 2000		
	Millennium Seed Bank Project		
	American Public Gardens Association		
	Global Partnership for Plant Conservation		

### Environment Protection and Biodiversity Conservation Act 1999

Heritage On Commonwealth Heritage List

### Management arrangements

The ANBG is managed by a Director appointed by the Director of National Parks. Since 1993 the ANBG has been involved in a joint research venture with CSIRO Plant Industry, the Centre for Plant Biodiversity Research which houses and manages the Australian National Herbarium. The herbarium retains voucher specimens for research and environmental studies and for plants at the ANBG.

## Monitoring

ANBG staff stocktake the living collection and record information on plant locations, plant deaths and the overall health of the collection. This information is linked electronically to scientifically documented voucher specimens in the Australian National Herbarium. A team of botanists, including national and international collaborators, ensure that the correct botanical names are always applied to the ANBG's living specimens and used in public interpretation. New accessions help to document the occurrence and distribution of plants in Australia.

Kangaroo, wallaby and rabbit populations are monitored and managed to protect the living collection from damage. A venomous snake management plan has been implemented to monitor snake interactions with people.

## **Future challenges**

Major challenges are:

- · securing sufficient resources to achieve government and national priorities
- developing new strategic directions for the ANBG, with a new long-term vision, and completing the third management plan in accordance with the EPBC Act
- water management and securing an alternative water supply in light of the continuing drought and sharp increases in water costs in Canberra
- integrating climate change considerations into management and research. Climate change affects water management, horticultural practices, education and the scope of the living collections held in Canberra.
- calculating financial, social and environmental values for the living, herbarium and photograph collections. This will help to ensure the collections are adequately resourced
- developing a new operational and funding agreement between the Director of National Parks and CSIRO for the continuation of the Centre for Plant Biodiversity Research. The current agreement concludes on 31 December 2009
- securing accommodation for the Australian National Herbarium collections. This has become critical as the current arrangements with their lack of workable space are creating operational problems
- engaging the latest information technology to improve taxonomy and systematics research
- continuing the Australian Plant Census project and implementing the next phase of Australia's Virtual Herbarium.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Water management and associated infrastructure
- Ex situ conservation
- Conducting a review of the living collection to determine the current and possible future value and role of the collection
- Managing plant record information, including introducing GIS technology to living collection management

#### Actions

- Increase water use efficiency
- Position the ANBG as a leader in ex situ conservation including seed banking
- Commence a review of the scope and operations of the living collection
- Accelerate the living collection census
- Use GIS to accurately map the living collection

#### Performance results 2008–09

- Completed the design of major water infrastructure improvements. Construction of separate potable and non-potable water supplies will commence early in 2010
- Continued a program for *ex situ* conservation of alpine plants with an emphasis on germplasm storage under controlled and cryogenic conditions. Seven field trips to the Mount Kosciuszko area were undertaken. The ANBG now has 150 species stored in the alpine seed bank
- Contributed to a review of seed banking in Australia in cooperation with state and territory botanic gardens and the Kew Gardens Millennium Seed Bank Project, with the aim of developing a long-term national seed bank partnership
- Developed a framework for a comprehensive review of the ANBG living collection and its interaction with other ANBG collections
- Completed a living plant census which will inform the living collection review in 2009–10.

#### KRA4: Visitor management and reserve use

#### Major issues

- · Visitor services including signage, interpretation and education programs
- Visitor safety
- Displaying the flora of Australia
- Education programs related to Australian flora and Indigenous stories

#### Actions

- Conduct visitor surveys
- Review communication and visitor services programs
- Develop a new climate change education program
- Progress development and installation of interpretive, information and directional signage
- Display the flora of Australia in a horticultural setting
- Review cultural interpretation and education programs about the Australian flora

- Surveyed visitor centre use and visitors' reasons for coming to the ANBG and upgraded the vehicle counting equipment
- Reviewed ANBG communication and visitor services programs
- Developed and implemented a new school education program on biodiversity and climate change
- Promoted the cultural values of Australian native plants through exhibitions in the visitor centre and elsewhere in the ANBG: 'Working on Country', 'Friends School Photographic Exhibition', 'Generate', 'Friends Botanical Art Group Exhibition', 'Pin Up Plants', 'Greening the Silver City', and 'Australian Plants Bonsai Exhibition'
- Hosted 11,060 students and 1,373 accompanying teachers/adults who took part in ANBG education programs: 5,957 students (54 per cent) from ACT schools and 5,103 students (46 per cent) from interstate schools as far away as Western Australia
- Fulfilled a successful calendar of public programs including NAIDOC Week celebrations, Science Week, Floriade events and the 'Snakes Alive' hands-on exhibition
- Continued to display about one-third of the plant species occurring naturally in Australia, in a managed horticultural setting. Water restrictions imposed during the drought continue to place the collection under stress
- Presented a floral display of Australian annuals and Sturt's desert pea (*Clianthus formosus*) as high-impact display plants during spring and summer. The project included interpretive signage and programs, and was a successful collaboration between horticulture, communication and visitor services staff and the Friends of the Australian National Botanic Gardens

- Distributed education resource material to schools and teachers including approximately 250 copies of the floral emblems of Australia poster and 100 copies of Bush Foods
- Reviewed ANBG education programs. The results will feed into the third management plan and the ANBG Education Strategy

#### KRA5: Stakeholders and partnerships

#### Major issues

- Supporting and participating in national and international botanical forums, including engagement with the Council of Heads of Australasian Herbaria, Council of Heads of Australian Botanic Gardens, Global Biodiversity Information Facility, Taxonomy Research and Information Network, Atlas of Living Australia, Encyclopedia of Life and Taxonomic Databases Working Group
- Servicing the department's and CSIRO's need for technical advice on Australian plants
- The need to develop memoranda of understanding and other instruments with government and nongovernment organisations associated with the ANBG
- Continuing a collaborative partnership with the Friends of the ANBG
- Supporting and engaging with the Australian Cultivar Registration Authority, the Australian Network for Plant Conservation and Greening Australia
- Ongoing support for the Centre for Plant Biodiversity Research

#### Actions

- Continue the ANBG's active leadership role as chair of the Council of Heads of Australian Botanic Gardens
- Continue strategic partnerships and cooperative data management with the Taxonomic Databases Working Group and the managers of the Global Biodiversity Information Facility, Taxonomy Research and Information Network, and Atlas of Living Australia
- Continue the Australian National Herbarium's engagement in the Council of Heads of Australasian Herbaria
- Undertake and promote the services that the ANBG and Centre for Plant Biodiversity Research can provide to the department and CSIRO in the form of technical and expert advice
- Formalise the strong relationship with non-government organisations located on site via memoranda of understanding
- Continue the partnership between the ANBG and the Friends of the ANBG
- Continue hosting on the ANBG website the Greening Australia Community Seed Bank, the Australian Cultivar Registration Authority and the Australian Network for Plant Conservation
- Continue the joint ANBG–CSIRO partnership in the Centre for Plant Biodiversity Research

- Took a leadership role within the Council of Heads of Australian Botanic Gardens in developing a national climate change adaptation strategy and action plan for botanic gardens which were endorsed by the Minister for the Environment, Heritage and the Arts and the state and territory environment ministers in November 2008
- The Australian National Herbarium continued to play a driving and coordinating role on behalf of the department for projects undertaken by the Council of Heads of Australasian Herbaria. These included developing plant profiles, and the Australian Plant Census
- The Centre for Plant Biodiversity Research continued its close association with the new Taxonomy Research and Information Network, housing the network's core staff and participating in projects such as systematic and diversity studies of weeds of national significance and biodiversity information management
- The ANBG and Centre for Plant Biodiversity Research entered into a partnership with the Australian Biological Resources Study and the Atlas of Living Australia to develop and manage a common taxonomic infrastructure for the Australian Faunal Directory, the Flora of Australia, the Australian Plant Census and the Australian Plant Name Index and to develop web services for the Atlas of Living Australia

- ANBG staff participated in a national workshop on collaborative biodiversity surveys and species documentation coordinated by the Australian Biological Resources Study. The results of these surveys will contribute to such projects as the Atlas of Living Australia
- Continued participation of ANBG staff in technical working groups under the Global Biodiversity Information Facility and Taxonomic Databases Working Group
- The Friends of the ANBG ran the annual students' photographic competition and the autumn and spring plant sales; published quarterly newsletters; provided volunteer guided walks each day and facilitators for Botanical Resource Centre twice a week; and supported the ANBG's annual summer concerts in January 2009
- The Australian Cultivar Registration Authority, based at the ANBG, documents the nomenclature of cultivated plants in the Australian Plant Name Index database. Funding was secured from private donors and the horticulture industry to enhance the index's cultivar data
- The Australian Network for Plant Conservation, based at the ANBG, continued to conduct workshops in plant conservation techniques throughout the country, held its second national forum and continued to produce its quarterly newsletter
- Continued the close collaboration between the ANBG seedstore and Greening Australia, including joint field collecting, seed storage and management. The ANBG also provides Greening Australia with ground space and irrigation for seedling production
- The Centre for Plant Biodiversity Research partnership in the new Australian Tropical Herbarium in Cairns was consolidated and the collections management is based on database services provided by the ANBG and the Centre for Plant Biodiversity Research

#### KRA6: Business management

#### Major issues

- Long-term sustainability for the ANBG's operation
- Budget management
- Staff management
- Risk management

#### Actions

- Commence development of the third management plan
- · Ensure business continuity and service delivery
- Manage staff resources efficiently
- Continue ongoing risk assessment

- Undertook a major consultation process with communities around Australia on people's perceptions and expectations about the ANBG's role as a national institution. This information will feed into the third management plan
- Addressed the challenge posed by increases in the costs of water, electricity and maintenance which placed considerable strain on the ANBG as savings in other areas are required to cover basic maintenance and running costs
- Maintained and improved staff consultation, involvement and capacity building formally (through training, the occupational health and safety committee and staff planning days) and informally (through opportunities for higher duties and informal consultation)
- Completed repairs to buildings and nursery polyhouses damaged in the February 2007 hailstorm, with all insurance claims settled
- Developed a staff internal communication plan

#### KRA7: Biodiversity knowledge management

#### Major issues

- Nationally consistent Australian plant names
- Taxonomic botanical research
- Developing the horticultural knowledge base
- Integrating the living collection database and herbarium database
- · Improving access to botanical information and photographs to assist in responding to climate change
- Engagement with national and international collaborative projects

#### Actions

- · Maintain and curate the Australian National Herbarium collections and associated data links
- Make botanical data, information and expertise available to the national and international botanical communities and the public
- Develop and maintain the Australian Plant Name Index and the Australian Plant Census to define and list all the flowering plants in Australia
- Undertake taxonomic and systematic research, and publish and disseminate research findings
- Develop and maintain scientific databases of Australian plant information
- Integrate departmental plant and animal name databases to allow more consistent management and delivery of biological data
- Add to the extensive plant image collection and improve electronic access to the collection
- Promote and provide information about Australian native plants via the internet
- Position the ANBG as a leader disseminating information on climate change issues in botanic gardens
- · Drive national collaborative biodiversity information management projects

- Databased 19,223 herbarium specimens with a total of 815,841 collection specimens now recorded
- Researchers completed scientific papers or publications resulting from research undertaken at the Australian National Herbarium. Areas of study include Australian Orchidaceae, Rutaceae, Myrtaceae, Malvaceae, Santalaceae and the bryophytes
- Brought Australian Plant Name Index compilation and data capture up to date
- Made significant progress on an agreed list of scientific names for Australia's flowering plants through management of the Australian Plant Name Index and the national collaborative Australian Plant Census project. The project is endorsed by Australian Government, state and territory herbaria
- The Centre for Plant Biodiversity Research successfully tendered to manage the weed images for the department's Weeds in Australia website. The agreement will result in additional staff in 2009–10 to add weed images to the Australian Plant Image Index, a new area of interest for the index which previously concentrated on native plants
- Collaborated with the Atlas of Living Australia and the Taxonomy Research and Information Network to develop specifications for species profiles for managing digital biodiversity data
- Continued research on the ecological function, structure and small-scale dynamics of grassland communities in south-eastern Australia, using grasslands in the West Wyalong district as model systems
- Updated the Australian Plant Image Index to make 4,592 additional images accessible on the internet
- Commenced redevelopment of the ANBG website to update content, modernise the site's appearance and improve site navigation
- The ANBG and Centre for Plant Biodiversity Research participated in national and international biodiversity information management and technical infrastructure projects including the Atlas of Living Australia, the Australian Faunal Directory, Taxonomy Research and Information Network, the Australian Plant Census, Australia's Virtual Herbarium, the Global Biodiversity Information Facility, the Encyclopedia of Life and the Taxonomic Databases Working Group

Alpine seed research project tackles climate change in the Australian Alps



The Australian Alps is one of the most plant-rich areas in Australia and its fragile ecology is among the most vulnerable to a changing climate.

The Australian National Botanic Gardens (ANBG) has recently entered into a three year research partnership to investigate how climate change will affect the reproductive ecology and demography of Australian alpine flora.

Little is currently known about how to actually grow most alpine plants from seeds. The new project involves not only collecting and storing alpine seeds but plant germination trials and ecological field studies on previously unstudied species.

Building on the past three years of seed collection and storage, the research will make a major contribution to understanding how Australia's alpine plants may be affected by climate change.  Australian National Botanic Gardens staff collecting seeds in the Australian alpine region for research into the effects of climate change on temperate flora

This research project is a collaboration of the ANBG, the Australian National University, the University of Queensland and the Friends of the Gardens, and has been funded under an Australian Research Council Grant.

The project also takes the ANBG one step closer to developing a national alpine seed bank as a conservation insurance policy to ensure Australia's alpine species are not lost.

As part of the project the ANBG will host a living collection of alpine plants to raise awareness about conservation of Australia's alpine biodiversity.



The Australian National Botanic Gardens is a national showcase for the horticultural use of Australia's native plants

Australia-wide consultation for the ANBG's next management plan brought out some definite views on the ANBG's role for the next ten years.

The national community expressed expectations that the work of the ANBG needs a strong scientific underpinning. There were views across the nation that the ANBG should be a leader in education and telling the Australian story that links people, plants, the Australian landscape and Australia's national identity.

## The next ten years at the Australian National Botanic Gardens

Since its beginnings, the ANBG has led the way as one of Australia's first all-native botanic gardens, focusing on the horticulture and propagation of Australian plants. To remain a relevant national institution, the ANBG must now adapt to reflect the changing needs of Australian society and new challenges in managing Australia's biodiversity.

The ANBG consulted widely with the Australian community and experts in botanic gardens management, botany, business development, education, heritage, horticulture, management of national collecting institutions and tourism.

The initial 'have your say' consultation for the new management plan called for written submissions. The ANBG went a step further and led a series of discussions with community members across Australia. Interested people came together to talk about their perceptions and expectations of a national botanic garden and its living collection in representing Australia's biodiversity.

The management plan for the next ten years will be based on results from:

- · national community consultation
- an extensive review of everyday operations in the living collection and horticulture, communication and visitor services, and science and information management
- a technical audit to identify achievements and areas of improvement from the previous management plan.

The next step is to examine and combine the conclusions from the consultation, review of operations and technical audit to create the new vision and management plan.

Taxonomy: an important tool in environmental weed management



Lantana is a Weed of National Significance. It is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts

Environmental weeds are one of the greatest threats to native plants and animals.

A research program at the Centre for Plant Biodiversity Research is using taxonomic methods to unravel the genetic history of weeds and identify where they came from. The program is focusing first on the Weeds of National Significance, particularly weeds for which lack of taxonomic knowledge is hampering land managers' control efforts.

Plant scientists are combining tools from traditional taxonomy and from molecular systematics and ecology to determine the existence of distinct genetic races, the forces behind these variations, their geographic distribution and how they came to Australia. This knowledge will help with finding better targeted biocontrol agents for each weed species and will allow land managers to use traditional control methods more effectively.

Under the program, the Centre for Plant Biodiversity Research is working closely with biocontrol entomologist Michael Day of Queensland Primary Industries and Fisheries on lantana (*Lantana camara*), one of the Weeds of National Significance. The project is funded by the Australian Government's Commonwealth Environmental Research Facilities taxonomy research hub.

The precise origins of lantana are unclear due to a long history of horticultural breeding and a poorly resolved taxonomy. Genetic profiling under the project has shown that the source for the most invasive form of weedy lantana is likely to be a single widespread species with considerable variation.

The testing also indicated that lantana in Australia originated from Venezuela and the West Indies, suggesting that efforts to find a biocontrol agent should be refocused away from Mexico and towards those regions.

Other work has focused on flower colour. Scientists have found that flower colour is a poor marker for some genetic variants and instead varies within populations. Colours also vary throughout the Australian landscape and in their susceptibility to biocontrol agents. Colour is thus an important marker for predicting variation among lantana populations and how they interact with their environments.

This information will permit much more precise design of protocols for developing biocontrol agents.

## **Booderee National Park**

environment.gov.au/parks/booderee



## Special features

Booderee National Park is of great significance to its traditional owners, the Wreck Bay Aboriginal community, who are increasingly involved through a unique and evolving joint management model in running and servicing the park, and providing Aboriginal cultural experiences to its many visitors. More than 100 prehistoric Aboriginal sites dating back thousands of years have been recorded on the Bherwerre Peninsula.

Booderee National Park protects most of the southern peninsula of Jervis Bay, the Bherwerre Peninsula, Bowen Island, and the waters and seabed in the southern part of the bay. Staff work cooperatively with the adjoining NSW Jervis Bay National Park and Jervis Bay Marine Park to protect much of the region's biodiversity. Intensive pest control, such as the fox control program, allows

species such as the endangered eastern bristlebird (*Dasyornis brachypterus*) and shore nesting hooded plover (*Thinornis rubricollis*) to flourish in Booderee.

Jervis Bay is one of the major biogeographic nodes in Australia and contains a variety of relatively undisturbed marine and terrestrial habitats. The marine environment is one of the most diverse recorded in temperate Australia, with tropical and temperate species represented. The park is renowned for its exceptional water clarity, due to small intact catchments, and exceptionally white sands. The park has one of the largest seagrass meadows on the NSW coast, which provides habitat to a wide variety of marine species. Terrestrial vegetation communities include relic rainforest, littoral rainforest, forest, woodland, wet and dry heath, salt marsh and coastal wetlands, and coastal scrub and grassland communities. The park is rich in flora and fauna.

Location	Latitude 35° 09' South, Longitude 150°39' East	
Area	6,379 hectares (including a marine area of 875 hectares)	
Proclamation date	4 March 1992	
IUCN category	Category II	
Biogeographic context	Interim Biogeographic Regionalisation for Aust	ralia region: Sydney Basin
Management plan	First plan expired 3 April 2009, second plan in preparation	
Other significant management documents	Risk Assessment and Management Schedule; fire and pest management strategies; Memorandum of Understanding with NSW Rural Fire Service; draft Memorandum of Understanding with the Department of Defence; Botanic Gardens' Collections Policy; Joint Training Strategy with the Wreck Bay Aboriginal Community Council and Wreck Bay Enterprises Ltd	
Financial	Operating	\$6.772 million
	Capital	\$0.701 million
	Revenue	\$1.247 million
	Paid to traditional owners	\$0.577 million
Visitors	440,851	
Permits	25 commercial tour operators, 14 research, 6 wedding celebrants	

International conventions and agreements		
Migratory Species (Bonn) Convention 27 of 105 listed Australian species		
China-Australia Migratory Birds Agreement	20 of 81 listed species	
Japan-Australia Migratory Birds Agreement	23 of 77 listed species	
Korea–Australia Migratory Birds Agreement	15 of 59 listed species	

Listed fauna	Species	1 critically endangered
		4 endangered
		11 vulnerable
		36 migratory
		72 marine
	Recovery plans	<ul> <li>5 being implemented: humpback whale (<i>Megaptera novaeangliae</i>); southern right whale (<i>Eubalaena australis</i>); albatross (<i>Diomeda</i> spp. and <i>Thalassarche</i> spp.) and giant petrels (<i>Macronectes</i> spp.); marine turtles; grey nurse shark (<i>Carcharias taurus</i>)</li> <li>5 in preparation: grey-headed flying-fox (<i>Pteropus poliocephalus</i>); Gould's petrel (<i>Pterodroma leucoptera</i>); eastern bristlebird (<i>Dasyornis brachypterus</i>); green and golden bell frog (<i>Litoria aurea</i>); giant burrowing frog (<i>Heleioporus australiacus</i>)</li> </ul>
Listed flora	Species	1 vulnerable: magenta lilly-pilly (Syzygium paniculatum)
	Recovery plans	1 in preparation: magenta lilly-pilly (Syzygium paniculatum)
Heritage	On Commonwealth Heritage List (part of several listings)	

Mammals	Birds	Reptiles	Amphibians	Fish	Plants
26 (4)	200 (9)	17 (3)	14 (2)	308 (1)	625 (1)

Figures in brackets are the numbers of species that are a management priority

### Management arrangements: Board of Management

The Booderee National Park Board of Management has 12 members, including seven representatives nominated by the Wreck Bay Aboriginal Community Council. A new board was nominated in 2009. With the expiry of the first management plan in 2009, the board is overseeing preparation of the park's second management plan (for 2009–2019). A draft plan is expected to be released for public comment around October 2009.

### Monitoring

A five-year study which documented the role of fire in determining species distribution and abundance was completed in 2008, and results are progressively being published. A new partnership study commenced in 2009, building on the data collected over the previous five years, and looking in greater depth into impacts of weeds and fire on native species.

Threatened and listed species monitoring continued, with a focus on birds including the eastern bristlebird (*Dasyornis brachypterus*), sooty oystercatcher (*Haemotopus fuliginosus*), hooded plover (*Thinornis rubricollis*) and little penguin (*Eudyptula minor*). A number of research projects continued through the partnership between the Australian National University and the park funded by an Australian Research Council grant. They include a study of amphibians in the park which will provide valuable baseline data for measuring possible climate change impacts; and research into the ecology of the eastern chestnut mouse (*Pseudomys gracilicaudatus*), a rare species recently discovered in the park, its habitat requirements and its relationship to fire and other mammal species.

Wildlife monitoring also continued to focus on the effectiveness of regular fox baiting and long-term impacts of the 2003 Windermere and 2007 Cave Beach fires, particularly on long-nosed bandicoots (*Perameles nasuta*) and eastern bristlebirds.

Another study continued to examine the combined effects of fire, bitou bush, and wallaby grazing on native plant regeneration. Results of monitoring over the last 12 months confirm that wallabies have a major suppressive effect on the number of plant species and the abundance of individual plant species.

Staff continued to monitor compliance with the park's marine zoning scheme and catch limits.

## Future challenges

Major challenges are:

- continuing to improve control measures for key threats including bitou bush and foxes
- · restoring penguin nesting habitat on Bowen Island
- addressing the park's increasing isolation from adjacent natural areas due to development pressures in the region
- supporting the development of new Aboriginal business enterprises in the park
- · identifying ways of replacing critical ageing assets
- completing and implementing the cultural heritage strategy
- developing the second management plan with clear identification of outcomes for the next ten years and effective ways to measure and report on their implementation
- implementing the training strategy to support joint management and staff development
- progressing phase 2 service level agreements and contracting opportunities with the Wreck Bay Aboriginal Community to an agreed timetable and with clear employment benefits
- identifying impacts and possible actions to address climate change.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Foxes continue to be the most significant feral pest in Booderee and bitou bush continues to be the most significant weed
- Protection of seabird nesting habitat for the little penguin, three species of shearwater and the sooty oystercatcher
- Impact of macropod browsing on biodiversity and vegetation communities
- · Restoring biodiversity through introductions of native, locally extinct species
- · Preparing for the impacts of climate change and adapting management strategies accordingly
- Rapid residential development in surrounding areas that is isolating the park from other natural areas, possibly threatening a number of species

#### Actions

- Continue fox control with an emphasis on removing residual, bait-shy individual foxes and introducing alternative fox control methods
- Develop safer integrated management techniques (aerial spraying and fire) for bitou control. Refine integrated control measures (fire, spraying) and monitor ecological impacts of these control measures
- · Control the spread of kikuyu on Bowen Island, and improve penguin nesting habitat
- Continue to implement an ecologically appropriate and visitor-safe fire management program and upgrade training and monitoring to cope with larger, more intense fires
- Continue to consult with agencies on the park's regional value, the importance of maintaining habitat corridors and links with other natural areas, and possible impacts of development
- Work with researchers to better understand potential impacts of key threats including fire, weeds, and climate change on the park

#### Performance results 2008–09

- Sprayed approximately 400 hectares of bitou bush in June 2009. Since 2004, Booderee's aerial spraying program has resulted in a 70 per cent reduction in the area of high density infestation
- For the fourth year running, the threatened green and golden bell frog was not recorded in the park
- Continued to record high numbers of key indicator species (long-nosed bandicoot and eastern bristlebird), suggesting that fox baiting is succeeding. Although numbers of long-nosed bandicoots declined in 2008–09, this not unusual in recovering bandicoot populations
- Used fauna surveillance cameras to monitor residual fox populations. Early results have been indicated a likely reduction in fox numbers
- · Maintained native plantings to re-establish penguin nesting habitat on Bowen Island
- Secured a further five-year Australian Research Council grant to support the research project on best practice biodiversity management
- Trained and appointed three new crew leaders, four new bush firefighters and one prescribed burn supervisor
- Successfully completed a prescribed burn of 74 hectares to control bitou bush

#### KRA2: Cultural heritage management

#### Major issues

- Maintaining the park's cultural values
- Identifying Wreck Bay Aboriginal Community priorities for cultural heritage management through a cultural heritage strategy and the second management plan
- Developing and delivering a well-accepted cultural heritage education program in partnership with the Wreck Bay Aboriginal Community Council
- Supporting the Wreck Bay Aboriginal Community in developing business enterprises in cultural education

#### Actions

- · Offer school holiday interpretation programs with an increased focus on cultural interpretation
- · Develop Koori cultural themes to promote understanding of Aboriginal plant use
- Support the Wreck Bay Aboriginal Community to complete the cultural heritage strategy for the park
- Continue the Junior Ranger program with an integrated approach to education about natural and cultural park
  values

#### Performance results 2008–09

- Conducted over 120 cultural interpretation sessions for visiting school groups and as part of the spring, summer and autumn school holiday programs
- Completed construction of new signage, and walking trails in the Koori Gardens section of the Booderee Botanic Gardens
- Worked with the Wreck Bay Aboriginal Community Council in completing the cultural heritage strategy and identifying cultural heritage content for the second management plan. The strategy will give direction to the second management plan
- Continued the Junior Ranger program at Jervis Bay School

#### **KRA3: Joint management**

#### Major issues

- · Meeting the obligations of and re-negotiating the lease agreement
- Progressing the second phase of contracting arrangements between the park and Wreck Bay Aboriginal Community to an agreed timetable
- Developing relevant sections of the second management plan

#### Actions

- Continue to negotiate the second phase of service level agreements for provision of agreed park services under the terms of the services contract between the Wreck Bay Aboriginal Community and the Director
- Implement an integrated training strategy agreed by the Wreck Bay Aboriginal Community, the park and Wreck Bay Enterprises Ltd
- Prepare an annual management plan implementation schedule and report progress to the Board of Management
- Prepare the second management plan

#### Performance results 2008–09

- Reached agreement on services to be included in the second phase of outsourcing, draft service level agreements and a possible timetable for completion of outsourcing by November 2009
- Delivered a broad range of training to Booderee National Park, Wreck Bay Enterprises Ltd and Wreck Bay Aboriginal Community in accordance with the training strategy
- Wreck Bay Enterprises Ltd contractors undertook \$1.8 million of works in the park
- Record levels of revenue were paid to Wreck Bay under the lease agreement from increased visitation
- Successful recruitment of a Wreck Bay Aboriginal Community member to ongoing management position in the park (Gardens Manager)
- Technical Audit of 2002–2009 management plan presented to the Board of Management showing excellent results against prescriptions in the plan
- Significant progress achieved on drafting the new management plan, including cultural heritage issues

#### KRA4: Visitor management and reserve use

#### Major issues

- · Increasing visitors' awareness of the park's natural and cultural values
- Providing infrastructure to facilitate appropriate and safe use of the park, while protecting conservation values
- Age and costly maintenance requirements of the visitor centre
- Maintaining visitor numbers and revenue base in an increasingly competitive domestic tourism market

#### Actions

- Include conservation and cultural themes in interpretation programs
- Maintain campgrounds and public facilities and infrastructure to a high standard
- Monitor visitor numbers and experiences
- Continue to educate visitors about recreational fishing catch limits and marine zone restrictions and to enforce legislation where appropriate
- Renovate the visitor centre and plan for its replacement
- Manage risk through the park risk watch list and ParkSafe

- Conducted a comprehensive visitor survey in January 2009 which recorded a visitor satisfaction rate of 97 per cent; 96 per cent indicated they would recommend the park to others and 92 per cent said they intended to revisit. Visitor services were rated, and the park performed best in 'opportunities for guided walks/talks by rangers', 'access to friendly and responsive staff', 'access to pre-visit information' and 'clean and well-presented picnic and barbecue facilities'. Areas identified for improvement were toilet facilities and access to drinking water
- Visitor numbers exceeded 440,000, a 9.2 per cent increase
- Revenue from camp fees and park entry fees exceeded \$1.1 million for the first time. Camp fee revenue was up 6.5 per cent and entry fee revenue was up 13.8 per cent

- Delivered 114 school holiday interpretation sessions, focusing on Aboriginal cultural values and conservation themes, with over 3,000 attendees. A further 40 interpretation sessions were delivered to primary schools, high schools, universities and special interest groups, with more than 1,500 attendees in total
- The park won the 2008 New South Wales Indigenous Tourism award; was a finalist in the 'best New South Wales tourist attraction' category; won an Award of Distinction for the Tourist Attraction category at the South Coast Tourism Awards; and won a Commendation for Excellence in Environmental Innovation from the New South Wales Caravan and Camping Industry Association. Green Patch Beach won the Keep Australia Beautiful Clean Beach Award for resource protection in recognition of recycling, energy and water efficiency initiatives
- Further upgraded the website with additional features and information and a new system of tracking the most popular downloads and site pages visited
- Continued to upgrade visitor facilities including the Green Patch water mains; Murray's boat ramp, Booderee Botanic Gardens walking trails and bridges; visitor information signs, and roads, management trails and walking tracks. The park also continued to install water and electricity saving devices, which will eventually be installed in all public amenities, and completed work on one new public shelter
- Recorded generally high levels of compliance with marine zoning scheme and catch limits but there continues to be a problem with a small number of fishers allegedly taking commercial quantities of squid.

#### KRA5: Stakeholders and partnerships

#### Major issues

• Building stronger relationships with relevant regional stakeholders, partners and researchers.

#### Actions

- Continue integrated management programs in key areas
- Support research in conservation areas identified in the management plan
- · Support cooperative undergraduate and postgraduate programs
- Support community involvement in park management through volunteer programs

- Continued cooperative arrangements with other agencies including the New South Wales National Parks and Wildlife Service, New South Wales Rural Fire Service, Jervis Bay Marine Park, New South Wales Fisheries and Department of Defence. The park continued to lead regional fox management
- Issued nine undergraduate and one postgraduate research permit for conservation studies in accordance with the management plan. Cooperative undergraduate and postgraduate programs continued with the University of Canberra and the Australian National University
- Continued Community Development Employment Projects at Booderee Botanic Gardens involving Wreck Bay youth, and supported Vincentia High School's Students at Risk program through work experience
- Supported youth at risk programs with the New South Wales Police Force
- Conducted 19 Parkcare activities, including major weeding programs for sea spurge at Steamers Beach
- Continued membership of, and involvement with, regional tourism organisations

#### **KRA6: Business management**

#### Major issues

- · Ensuring that staff have all the necessary skills to do their jobs
- Trends in revenue from park fees
- Implementing the management plan
- · Managing the budget to accommodate increased salary and contracting costs
- Supporting outsourcing to the Wreck Bay Aboriginal Community

#### Actions

- Increase emphasis on individual learning identified in personal development plans
- · Continue to monitor trends in revenue from park fees and develop off-peak park use
- Identify budget savings and efficiencies wherever possible
- Contract work to the Wreck Bay Aboriginal Community where possible

- Offered training in line with personal development plans, with emphasis on contract and project management, fire preparedness/fighting and supervisory and management skills
- A better than expected revenue result from park use fees with a 6.5% increase in camp fee revenue and a 13.8% increase in entry fee revenue. Targeted promotions, good weather and better compliance contributed to this best ever result
- Improved compliance systems in the collection of entry and camping fees, with particular emphasis on weekend compliance at the entry station
- · Continued the roll out of power and water conservation measures to reduce the park's carbon footprint



The principal role of Booderee National Park is to protect and preserve the natural and cultural heritage of the park. To date, strategic planning has focused on natural heritage, and planning for protecting and passing on cultural heritage has been limited.

It is known that Aboriginal occupation of the region dates back more than 20,000 years. At the time of the last ice age, 6,000 to 10,000 years ago, Jervis Bay was a coastal plain 30 kilometres inland. When the ice melted at the end of the ice age rising sea levels obliterated evidence of occupation in coastal areas, as the coastline migrated inland. Sea level stabilised to the current coastline over 5,000 years ago.

More than 100 prehistoric sites have been recorded on the Bherwerre Peninsula, many dating back to this period. The sites show Aboriginal people had a strong association with the sea, with a high density of midden sites mirroring the preferred fishing areas of the current Wreck Bay Aboriginal Community.

The Wreck Bay Community formed in 1900 when Aboriginal groups from La Perouse and Kiama, who had been scattered following pressures of white

## Developing cultural heritage policy in Booderee NationalPark

 Staff regularly provide advice to visitors on traditional plant use and cultural connections to coast and ocean

settlement, returned to their homeland. They were a fishing community, made up of families with quite different stories, with a unifying ancient heritage evidenced throughout the park. Through much change, the community has remained, and in 1995 was granted freehold title to the park with a lease back to the Director of National Parks.

There is substantial demand from park visitors for information about this heritage. Booderee staff delivered 122 school holiday interpretation sessions this year focusing on Aboriginal cultural values and conservation themes, with 3,401 attendees. A further 50 interpretation sessions were delivered to primary schools, high schools and special interest groups, with 1,289 attendees.

The first management plan for the park stimulated much thought amongst the Wreck Bay Aboriginal Community about its cultural heritage, and how it could be protected and depicted, and the community has wisely chosen to take its time in planning this. The plan required the park to assist with the development of a cultural heritage strategy. A draft strategy was completed in 2008, and the community is currently considering how the strategy will be used. The Cultural Heritage Reference Group seeks to represent all community members, considering issues such as protection of cultural resources, cultural use of the park, and cultural business enterprises.

The direction of the park is likely to change with the development and implementation of the second management plan. Building a productive economic base for employment and sustainability was a major community goal in the first plan: the first plan saw the development of Wreck Bay Enterprises which provides an increasing range of services to the park, including staffing the entry station, road maintenance, and cleaning. As well as seeking to contract more park functions to the community, the second plan is likely to focus on protecting and presenting Booderee's' rich Aboriginal cultural heritage.

## Technical audit of the 2002 Booderee National Park Management Plan

Booderee National Park's first management plan (2002 to 2009) recognised it was an important and special part of Australia's heritage which needed careful management and cooperation between all interested parties. It is home to the Wreck Bay Aboriginal Community, has considerable cultural and biological significance and is a valued destination for a large number of visitors. The Plan contained 45 aims which related to the conservation and management of these values, and 487 prescriptions, or prescribed actions for the Park to complete, associated with these aims.

In January 2009 Booderee conducted an audit of the extent to which the first management plan has been implemented. The technical audit aimed to review management effectiveness under the first management plan and to inform future directions. Using a combination of data analysis and assessment by experienced park staff, we reported on the status and trend of principal park values by evaluating how effectively the management plan's aims had been met. We assessed this by a combination of the number of prescriptions contained within the plan which had been completed, and the extent to which completion of prescriptions had met overarching aims.

The main findings of the audit were as follows:

- Of 487 prescribed actions, 464 (95%) were completed, 20 (4%) were partially completed, and 3 (1%) were not commenced
- Booderee experienced an improvement in 14 of its 45 key values (31 per cent), with improvements in the standards of walking trails, the effectiveness of pest control, cooperative relationships with park neighbours and operation of the Booderee Botanic Gardens.

- 22 (49 per cent) of Booderee's key values were stable, with consistent performance in the areas of operational management, consulting and decision-making, compliance and enforcement, and access and roads. Booderee has identified several areas for improvement including a need to reduce its carbon footprint and improve water conservation.
- Booderee experienced a decline in nine (20 per cent) of its key values. Most worrying included the maintenance of biodiversity, the management of recreational fisheries and the incidence of wildfire. Downward trends in biodiversity measures have been reported in other Commonwealth protected areas, which probably reflects long-term trends across Australia. Large, damaging wildfires seem also to reflect broader trends. This is a challenging context for future management, especially with some impacts due to external influences. Remediation measures have been proposed to address these trends including an ongoing commitment to the control of invasive species, a review of fishing provisions and their impacts on key values, greater emphasis on landscape conservation and connectivity and further research into the impacts of climate change and fire.

The findings of this audit are being considered in setting the aims and actions for the next management plan.

## **Christmas Island National Park**

#### environment.gov.au/parks/christmas



### Special features

The Christmas Island landscape is a characteristic example of a relatively large oceanic coral atoll that has been tectonically uplifted, with a distinct series of stepped terraces (which few islands exhibit). There are few oceanic islands at similar latitudes with similar floral or faunal components or comparable landscape and ecological integrity. Christmas Island's remoteness, climate and the influence of land crabs have resulted in the development of distinct tropical rainforest ecosystems that support a number of endemic animals and 20 endemic plant species. The island provides important habitat for seven endemic land birds and eight species (and one endemic subspecies) of resident seabirds, including the last remaining nesting habitat of the endangered Abbott's booby (Papasula abbotti). The island has an extraordinary diversity and abundance of

land crabs, with notable species being robber crabs (*Birgus latro*) and red crabs (*Gecarcoidea natalis*). Red crabs are the island's 'keystone' species as they influence the structure and species composition of the island's rainforests and they are renowned for their annual wet season migration, when up to an estimated 50 million march to the sea to spawn.

The marine environments of Christmas Island and the park are relatively simple in structure and relatively low in species diversity but are largely pristine and relatively unthreatened. The island's marine environments include coral reef systems, outer reef slopes and walls, and oceanic waters that provide habitat for at least 607 fish species. Notable species include whale sharks (*Rhincodon typus*) which are found in waters around the island around November to May each year, and green turtles (*Chelonia mydas*) which nest on some of the island's beaches.

Location	Latitude 10°29' South, Longitude 105°38' East	
Area	8,719 hectares	
Proclamation dates	21 February 1980, 31 January 1986 and 20 December 1989	
IUCN category	Category II	
Biogeographic context	Christmas Island is the coral-encrusted, emergent summit of a basaltic, submarine mountain in the Indian Ocean. Its plants and animals are most closely linked with those of South-East Asia	
Management plan	Third plan expired 13 March 2009. The fourth plan is currently being prepared	
Other significant management documents	Christmas Island Mine-site to Forest Rehabilitation Memorandum of Understanding; Yellow Crazy Ant Management Plan	
Financial	Operating	\$4.126 million
	Capital	\$0.618 million
	Revenue	\$1.801 million
Visitors	Reliable estimates are not available	
Permits	2 photography; 12 research; 2 bushwalking	

International conventions and agreements		
Wetlands (Ramsar) Convention	The Dales and a small landlocked mangrove forest at Hosnie's Spring are listed under the convention	
Migratory Species (Bonn) Convention	31 of 105 listed species	
China-Australia Migratory Birds Agreement	48 of 81 listed species	
Japan-Australia Migratory Birds Agreement	45 of 77 listed species	
Korea–Australia Migratory Birds Agreement	40 of 59 listed species	

Species	2 extinct 1 critically endangered 4 endangered 7 vulnerable 63 migratory 92 marine
Recovery plans	10 plans being implemented: Christmas Island shrew ( <i>Crocidura attenuata trichura</i> ); Christmas Island pipistrelle ( <i>Pipistrellus murrayi</i> ); Abbott's booby ( <i>Papasula abbotti</i> ); Christmas Island goshawk ( <i>Accipiter fasciatus natalis</i> ); Christmas Island frigatebird ( <i>Fregata andrewsi</i> ); Christmas Island hawk-owl ( <i>Ninox natalis</i> ); marine turtles; whale shark ( <i>Rhincodon typus</i> ); Christmas Island gecko ( <i>Lepidodactylus listeri</i> ); pink blind snake ( <i>Ramphotyphlops exocoeti</i> ) A regional recovery plan is being prepared for Christmas Island which will incorporate recovery actions for multiple species
Species	2 critically endangered 1 endangered
Recovery plans	<ul> <li>2 being partially implemented: Asplenium listeri; Tectaria devexa var. minor</li> <li>1 awaiting preparation: Pneumatopteris truncata</li> <li>4 species being assessed for nomination: Asystasia alba, Amaracarpus pubescens,</li> <li>Cycas rumphii, Pteropus natalis</li> <li>A regional recovery plan is being prepared for Christmas Island which will incorporate</li> <li>recovery actions for multiple species</li> </ul>
On Commonwealth Her	itage List (as part of a wider listing of the island's natural areas)

Mammals	Birds	Reptiles	Fish	Invertebrates	Plants
3 (3)	95 (16)	9 (9)	607 (35) marine, 3 freshwater	More than 2,000 (198)	213 (91)

Figures in brackets are the numbers of species that are a management priority.

### Management arrangements: advisory and consultative groups

The Christmas Island Crazy Ant Scientific Advisory Panel provides scientific and technical advice to the Director to inform the management of crazy ants in Christmas Island and Pulu Keeling National Parks.

In 2009 the Minister established an expert working group to provide additional advice on the decline of the pipistrelle bat and other biodiversity conservation management issues on Christmas Island (see case study on page 28).

Parks Australia is a member of the Christmas Island Tourism Association and Christmas Island Emergency Management Committee.

### Monitoring

A biennial island-wide survey assesses the effectiveness of the crazy ant control program, identifies areas for future control and estimates relative changes in red crab burrow densities. The survey also provides distributional data on other native and invasive species. The latest three-month survey began in May 2009.

The abundance and distribution of pipistrelle bats (*Pipistrellus murrayi*) is monitored as part of the recovery plan for this critically endangered species. The species is in serious decline and may soon become extinct. Native reptile species are also monitored and also in decline. The reasons for these declines are not known but may be linked to disease and invasive species, including centipedes.

Biophysical monitoring associated with the Christmas Island Mine-site to Forest Rehabilitation Program was conducted. This monitoring assesses the program's effectiveness by measuring species growth, soil characteristics and fauna species abundance.

## Future challenges

Major challenges are:

- developing and implementing island-wide landscape and ecosystem approaches to conserving and managing the island's biodiversity values
- enforcing quarantine measures to reduce the likelihood that new pest species will enter the island
- determining the reasons for the decline in terrestrial biodiversity, particularly reptiles and the pipistrelle bat, and implementing appropriate and feasible threat mitigation actions
- assessing the risks to species and habitats (such as ground-nesting sea birds and land birds) that may currently be secure but could be vulnerable to existing known threatening processes, such as predation by feral cats
- continuing to implement the Christmas Island Mine-site to Forest Rehabilitation Program. The memorandum of understanding for the program with the Attorney-General's Department ceases in February 2010 and a new memorandum and a long-term plan will need to be negotiated
- controlling invasive weeds. Although in 2008–09 substantial resources were committed to weed control, further
  resources are needed to bring major invasive weeds under long-term control
- contributing to the sustainable development of nature-based tourism, including maintaining and upgrading existing visitor infrastructure and developing new infrastructure.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- · Developing and implementing effective strategies for invasive species management, particularly yellow crazy ants
- Collaborative and island-wide conservation management
- · Continuing management of high priority weed species
- · Biodiversity decline and reducing impacts on threatened species
- · Reducing crab mortality from traffic impacts
- Marine conservation and management

#### Actions

- Yellow crazy ants:
  - conduct an island-wide survey
  - convene Crazy Ant Scientific Advisory Panel meetings
  - implement control programs
  - contract research into the indirect biological control of yellow crazy ants
  - develop a research and management program for habitats affected by yellow crazy ants post baiting
- Rehabilitate former mine-site areas
- Control invasive weed species
- Support the implementation of a collaborative national cat bait trial (the park is the tropical trial site)
- Implement actions from recovery plans, including for the pipistrelle bat

- Begin preparation of a Christmas Island Regional Recovery Plan
- Implement road management strategies (road underpasses and fencing, stakeholder engagement) to protect red crabs during their migration
- Conduct reptile surveys and establish a captive breeding program to secure populations of key threatened species and to better understand threatening processes to inform recovery and reintroduction needs
- Facilitate and support research projects, including seabird and robber crab research
- · Assess the marine values of Christmas Island and the Cocos (Keeling) Islands

#### Performance results 2008–09

- Revised the methodology and some of the existing data for the island-wide survey. The current survey was completed in August 2009. A scientifically rigorous sampling methodology for native skinks was developed and incorporated into the current survey
- Began a captive breeding program for native skinks
- Treated 90 hectares of yellow crazy ant supercolonies
- Planned an aerial baiting program, referred program under the EPBC Act and received approval to proceed in manner specified. Program commenced in September 2009
- Entered into an \$800,000 contract with LaTrobe University to conduct research into the indirect biological control
  of yellow crazy ants
- Completed earthworks and planted 23,000 trees on 18 hectares of new primary plantings and 23 hectares of secondary infill plantings on the former phosphate mine site
- Poisoned 82 hectares of invasive woody weed species
- Prepared a captive breeding report for the pipistrelle bat. The expert working group completed its report on thepipistrelle bat decline and broader island-wide biodiversity issues. The status of the pipistrelle bat remains critically endangered and it could soon become extinct. Prepared for a capture attempt and captive breeding of any remaining individuals. Capture attempts undertaken over a four week period failed to trap a single bat
- The distribution and abundance of several reptile species and the pipistrelle bat declined
- Commenced preparation of the Christmas Island Regional Recovery Plan which will incorporate recovery actions for multiple species
- Largely completed preparation of the draft fourth management plan

#### KRA4: Visitor management and reserve use

#### Major issues

- Developing island-wide approaches to the development of tourism consistent with the protection of park values, while providing visitors with opportunities for safe and high quality nature-based experiences
- Maintaining, upgrading and developing visitor infrastructure
- Accreditation of tour operators

#### Actions

- Continue participation in the Christmas Island Tourism Association Executive
- · Prepare a walking track signage strategy and tour operator accreditation program
- Maintain, and where possible improve, roads, trails and viewpoints, and produce new interpretive materials
- Support film crews and journalists working in the park

- Contributed to Christmas Island Tourism Association meetings, particularly on issues related to nature-based tourism opportunities. Parks Australia was represented on the Destination: Christmas Island Steering Committee to oversee implementation of the Tourism Destinations Development Report
- Maintained unsurfaced roads and management tracks
- Finalised the walking track signage strategy. New signage was ordered for installation in 2009–10
- Began to develop tour operator training resources

- Produced interpretive brochures on Christmas Island species
- Assisted film crews (Australian and international) and journalists publicising the island's biodiversity and conservation values

#### KRA5: Stakeholders and partnerships

#### Major issues

- · Progressing collaborative conservation management programs with stakeholders
- Effectively engaging and collaborating with stakeholders in aspects of park management

#### Actions

- Provide in-kind and field support for visiting scientists
- Undertake consultation and planning sessions with stakeholders and technical experts for the preparation of the fourth management plan
- Liaise with stakeholders on conservation and park management issues including road maintenance, cat and red crab management
- Deliver educational and interpretive sessions for students from the Christmas Island District High School, residents and tour groups
- Continue cooperative arrangements with the Shire of Christmas Island and Christmas Island Phosphates Pty Ltd for cat control, and investigate options and the potential for a feral cat control program
- Liaise with the Department of Immigration and Citizenship on induction and education for staff and contractors working on Christmas Island

#### Performance results 2008–09

- Supported visiting scientists and state government officers undertaking research projects into seabirds and land crabs
- Held educational sessions on park and conservation management for students from the high school, island residents and visiting tour groups including bird watching groups
- Consult stakeholders, including the Attorney-General's Department island representatives and the Crazy Ant Scientific Advisory Panel, to seek their views in preparing the fourth management plan
- Continued cooperative approaches to cat control with stakeholders including Victorian and Western Australian Government researchers; the Shire of Christmas Island and Christmas Island Phosphates. Worked with the Shire of Christmas Island to prepare an island-wide cat management plan, supported a national feral cat bait trial and contributed funds for desexing domestic cats

#### KRA6: Business management

#### Major issues

- Delivering quality management services within budget
- · Not all actions set out in the third management plan were implemented
- Ensuring up-to-date governance and management strategies are in place

#### Actions

- · Maintain park management services within budget
- Prepare the fourth management plan
- Implement the organisational review

- · Managed operational and capital budgets within approved parameters
- Completed implementation of the 2007–08 organisational review, changing the staff structure, functions and levels including closer integration of the management of Pulu Keeling and Christmas Island National Parks
- Largely completed preparation of the draft fourth management plan



Red crab populations have been impacted by invasive species and climatic events which affect spawning and jeuvenile return rates

In late January 2009 two scientists sounded a loud warning bell on the fate of the tiny Christmas Island pipistrelle bat (*Pipistrellus murrayi*). In a report to the Director of National Parks, Dr Lindy Lumsden and Martin Schulz called for a captive breeding program to avert the bat's imminent extinction.

Like all oceanic islands, Christmas Island has a vulnerable ecosystem – open to invasion and with low resilience to exotic species. Over the past century invasive yellow crazy ants, the giant African snail, the giant centipede, rats and feral cats have taken hold in the forest. Now the pipistrelle and two forest skinks are on the verge of extinction.

In early February Minister Garrett commissioned an expert working group to consider not only options for the bat but broader conservation threats on the entire island. The chair of the Threatened Species Scientific Committee Associate Professor Bob Beeton led a team of environmental scientists comprising Mr Norm Mackenzie, Dr John Woinarski, Dr Andrew Burbidge, Dr Ric Howe, and Dr Gordon Grigg.

## Christmas Island – a new ecosystem approach to biodiversity

The working group found that the whole of Christmas Island's fragile ecosystem is under threat from a complex range of interacting factors, including invasions on non-native species and human activity. They have suggested a possible ecological cascade – the impact of one change affecting others in unexpected ways. For example, while the removal of yellow crazy ants from parts of the forest is an achievement, the absence of red crabs in those same areas of forest has allowed an explosion of giant centipedes and the giant African snail.

It is time they say, to move away from the piecemeal approach of recovery plans for individual species and action to combat individual feral pests. The pipistrelle's pathway to extinction illustrates the need to manage the health of the whole ecosystem if we are to halt biodiversity decline.

The group's key recommendations are:

- protect the integrity of the island with improved quarantine systems and environmental governance.
- manage the island's ecological processes to prevent further biodiversity loss, taking action to better understand and control invasive species and protect the island's iconic keystone species, the red crab.
- prevent immediate biodiversity loss, with enforced feral cat control and efforts to undertake captive breeding of the pipistrelle bat and endangered reptiles.
- list Christmas Island as an ecological community under the EPBC Act.

The lessons from Christmas Island have broad implications for conservation of Australia's islands and the continent as a whole. With the EPBC Act now under review, it is timely to think about national environment law adopting a regional and ecosystem focus for environment protection and conservation management. Where have all of the reptiles gone? A biodiversity crisis on Christmas Island

Historically, the terrestrial reptiles of Christmas Island consisted of two endemic skinks (blue-tailed skink and forest skink), two endemic geckos (Lister's gecko and giant gecko), an endemic blind snake (Christmas Island blind snake) and one native skink (coastal skink). Since human inhabitation, one skink species (grass skink), two geckos (barking gecko and Asian house gecko), and two snakes (flowerpot blind snake and Asian wolf snake) have been introduced to the island. Since settlement, the Christmas Island blind snake and Lister's gecko appear to have gone extinct as they have not been recorded since the 1980s. The coastal skink has not been recorded since 2004 and is also probably extinct. The blue-tailed skink and forest skink are now only known from one location despite being common across the island in the early 1990s. However, there have been a few unsubstantiated reports of blue-tail skinks from other spots on the island. The giant gecko appears to be undergoing a decline, but the extent is unknown due to a lack of data.

Information shortage is a major problem in the fight to save the reptiles of Christmas Island. The declines are likely to be the consequence of the changes that humans have wrought. In addition to the reptiles, numerous other species have been introduced (including yellow crazy ants, cats, and giant centipedes) and consequential changes in habitat, not directly harmful, human disturbance to the habitat may amplify the impacts of the feral species.

Christmas Island National Park (CINP) is embarking on several programs to address the terrestrial reptile crises. The development of a captive breeding/ reintroduction program for the blue-tailed skink is underway. The captive breeding/reintroduction program will have to be a 'learn as we go' process that is run in parallel with research to better understand the causes of the declines. If successful, the breeding program will be used to conduct a series of adaptive experimental reintroductions to learn more about the threats and their management with the ultimate goal of self-sustaining populations in the wild.

CINP has also begun to develop appropriate and scientifically robust survey methods for the lizards and we are designing survey and monitoring programs for all of the terrestrial reptiles to better understand their distribution, monitor changes in densities, and to help in learning about threatening processes. Public awareness campaigns will be run to help us to locate new populations and to increase the communities' understanding of the plight of the reptiles on the island.

The endemic blue tailed skink is now only known from one location on Christmas Island, despite being common in the early 1990's.

food resources, competition, and predation pressures, as well as the introduction of diseases are all likely candidates. Climate change is probably affecting the island and its biological diversity and anthropogenic activities such as mining, clearing, and building may have had an impact. Even if



## Kakadu National Park

environment.gov.au/parks/kakadu



## Special features

Kakadu National Park is inscribed on the World Heritage List for both its natural and cultural values. It is one of the most ecologically and biologically diverse places in Australia.

Kakadu's traditional owners maintain strong links to their country, links that are demonstrated through their cultural practices, spiritual beliefs and traditional management and use of their country. An estimated 15,000 rock art sites and innumerable artefacts and sites of cultural, archaeological and historic significance in the Kakadu region contribute to archaeological evidence indicating that people have lived continuously in the region for at least 50,000 years.

The park contains almost an entire major tropical river catchment (the South Alligator River catchment) and

large representative examples of the wet-dry tropical ecosystems of northern Australia. Major landforms in the park include the sandstone plateau and escarpment, extensive areas of savanna woodlands, monsoon forest, riverine and riparian environments, billabongs, floodplains, mangroves and mudflats.

Location	Latitude 13°29' South, Longitude 132°26' East			
Area	1,979,767 hectares <sup>(a)</sup>			
Proclamation dates	5 April 1979, 28 February 1984, 12 June 1987, 22 November 1989, 24 June 1991 and 26 May 2007			
IUCN category	Category II			
Biogeographic context	Located in the wet-dry tropics Interim Biogeographic Regionalisation for Australia regions: Darwin Coastal; Arnhem Plateau; Pine Creek			
Management plan	Fifth plan expires 1 January 2014			
Other significant management documents	Shared Vision for Tourism; district fire management plans; Crocodile Management Strategy, feral species management plans; Gunlom Mine Sites Rehabilitation Strategy			
Financial	Operating	\$19.645 million		
	Capital	\$2.293 million		
	Revenue	\$1.052 million		
	Paid to traditional owners	\$1.636 million		
Visitors	229,111			
Permits	104 film and photography (July 2008–June 2009); 108 commercial tour operator (April 2008–March 2009); 33 research: 662 bushwalking (July 2008–June 2009)			

(a) The area of Kakadu was adjusted in 2007, taking into account more accurate survey data provided by the Northern Territory Government. This figure includes a number of old mining leases in the south of Kakadu, incorporated into the park in May 2007.

International conventions and agreements			
World Heritage Convention	Listed under cultural criteria (i) and (vi) and natural criteria (ii), (iii) and (iv), recognising the park's outstanding natural and cultural values		
Wetlands (Ramsar) Convention	1,375,940 hectares of wetlands are listed (683,000 hectares in stage 1 and stage 3 plus 692,940 hectares in stage 2)		
Migratory Species (Bonn) Convention	39 of 105 listed Australian species		
China-Australia Migratory Birds Agreement	51 of 81 listed species		
Japan-Australia Migratory Birds Agreement	49 of 77 listed species		
Korea-Australia Migratory Birds Agreement	41 of 59 listed species		

Species	2 critically endangered 8 endangered 11 vulnerable 108 migratory 114 marine		
Recovery plans	<ul> <li>3 being implemented: golden bandicoot (<i>lsoodon auratus</i>) and golden-backed tree rat (<i>Mesembriomys macrurus</i>); eastern partridge pigeon (<i>Geophaps smithii smithii</i>), crested shrike tit (<i>Falcunculus frontatus whitei</i>) and northern masked owl (<i>Tyto novaehollandiae kimberli</i>); marine turtles</li> <li>8 in preparation: bare-rumped sheathtail bat (<i>Saccolaimus saccolaimus nudicluniatus</i>); red goshawk (<i>Erythrotriorchis radiatus</i>); yellow chat (<i>Epthianura crocea macgregori</i>); Gouldian finch (<i>Erythrura gouldiae</i>); freshwater sawfish (<i>Pristis microdon</i>); speartooth shark (<i>Glyphis sp.A</i>); northern rivers shark (<i>Glyphis sp.C</i>); water mouse (<i>Xeromys myoides</i>)</li> </ul>		
Species	1 critically endangered 2 vulnerable		
Recovery plans	1 in preparation: multi-species boronia		
On National Heritage List			

Mammals	Birds	Reptiles	Amphibians	Fish	Plants
68 (19)	292 (35)	135 (32)	26 (2)	320 276 marine and estuarine, 44 freshwater (60)	2,022 (14)

Figures in brackets are the numbers of species that are a management priority

### Management arrangements: Board of Management

The Minister appoints members to the Kakadu National Park Board of Management. The board has 15 members, ten of whom are appointed as representatives of the park's traditional owners, representing the geographic spread of Aboriginal people in the region and the major language groupings. The remaining members are the Director of National Parks, the Assistant Secretary Parks Australia North, nominees with environmental and tourism expertise and a nominee of the Northern Territory Government. The current board has served four years of its five-year term.

### Monitoring

Monitoring and control continued for introduced plants including Mimosa pigra, mission grass (*Pennisetum polystachion*), olive hymenachne (*Hymenachne amplexicaulis*), salvinia (*Salvinia molesta*) at Yellow Water and gamba grass (*Andropogon gayanus*). Of these, salvinia and mission grass continue to be major challenges for the park. Two relatively new weed species were also targeted: snakeweed (*Stachytarphetta*) and knobweed (*Hyptis capitata*). In Jabiru township, park staff collaborated with the West Arnhem Shire and Energy Resources Australia in the Weedy Time Bomb Project, which addressed prominent weed species introduced into domestic gardens.

A major feral animal control program included detailed aerial surveys and two major control efforts. The program involved updating the park's aerial survey techniques as well as reducing the impact invasive species were having on the park. There were no instances of introduced invasive ants this year.

Studies of estuarine crocodile (*Crocodylus porosus*) populations and nesting flatback turtles (*Natator depressus*) in coastal areas of the park continued. A review of estuarine crocodile survey data gathered over ten years was finalised and a review of freshwater crocodile survey data over the same period commenced.

The second phase of the major program to monitor broad-scale fauna trends continued. This program involves fauna surveys at 134 fireplots in the park, which were initially set up to monitor the impacts of fire on different vegetation types. The program links fauna monitoring with fire and vegetation monitoring, and allows investigation of trends in a regional context, as comparable monitoring also takes place at Litchfield and Nitmiluk National Parks.

A major collaborative project with the Northern Territory Biodiversity Conservation Division commenced in 2008. This project involves targeted surveys of threatened species in recognised biodiversity hotspots in the park, largely in the Arnhem Land Plateau. Four surveys have been completed. The program concludes on 30 June 2009 All surveys involved Kakadu National Park staff (including trainees and school-based apprentices), Northern Territory Government staff, neighbouring Indigenous ranger groups and traditional owners from Arnhem Land.

These programs indicate there is a significant ongoing decline in some mammal species across northern Australia, including within the park. The park is continuing to support research and monitoring to determine the causes of the declines. One pleasing result was that the last two surveys in the biodiversity hotspot program went against this trend with good numbers of small mammals recorded. While the overall trend is still disturbing, further investigation of the areas where healthy populations persist may help determine the cause of decline in other areas.

Fire management and monitoring continued, based on a strategic framework of regular data collection and interdistrict meetings. The Stone Country Burning Program was implemented for the third year, and continues to achieve positive results in preventing late dry season intense fires on the sensitive stone country, and involving Bininj in bushwalking/burning activities. The program aims to establish an appropriate fire regime to protect sensitive biodiversity values and facilitate cultural activities on country.

Cultural heritage site monitoring and management continued, including visits to remote areas by traditional owners and district staff. Park staff also added to existing oral history recordings and development of a cultural heritage sites register, with the support and involvement of traditional owners.

### Future challenges

Major challenges are:

- ongoing implementation of management plan actions that support Indigenous business ventures and employment including capacity building, address caring for country challenges, support Kakadu's living cultural values and support its World Heritage values
- understanding the impacts of fire, ferals and climate change, coordinating research in these areas and adapting management accordingly
- identifying the cause of small mammal decline and taking appropriate action
- · controlling the spread of weeds and the impact of introduced animals
- rehabilitating old uranium mine sites in the southern Gunlom area (a major project over three years).
   Rehabilitation works include removing buildings that once supported mining activities and appropriate containment of mine tailings
- · developing systems and partnerships to make the best use of resources
- developing staff through formal and informal training programs
- ensuring visitor and staff safety.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- · Fire management, particularly in sandstone habitats
- Managing pest plant and animal species and their impacts
- Monitoring and protecting threatened species
- Decline of small-mammal populations
- Improving the recording, storage and display of species data
- · Improving understanding and protection of the marine environments of the Kakadu coast
- The future impact of climate change on Kakadu, particularly on freshwater wetlands

#### Actions

- Review and implement appropriate fire regimes for the variety of habitats within the park, particularly a sandstone habitat fire management plan
- Review the feral animal strategy following population modelling with recent survey results
- · Monitor threatened species in biodiversity hot spots
- Continue to control serious pest plant species, focusing on weeds of national significance
- Improve knowledge of landscape change processes
- · Address identified gaps in knowledge about potential climate change impacts
- · Continue monitoring native animals affected by cane toads
- Monitor the impact of visitor use on Kakadu's natural values
- Improve the use of GIS technology in recording weed locations and weed data
- · Continue to commission and support research that will improve management of the park's natural and cultural values

#### Performance results 2008–09

- Hosted workshops on fire management (April 2008), climate change (August 2008) and feral animals (December 2008)
- Completed four surveys as part of a three-year contract with the Northern Territory Government to undertake collaborative threatened species monitoring in biodiversity hotspots
- Continued resampling of fauna at Kakadu fire plots
- Continued the successful bushwalking burning program in the Arnhem Land Plateau
- Supported an ongoing study on the impact of cane toads on native frog populations
- Continued to support research on the magpie goose (*Anseranas semipalmata*) that examines critical relationships between geese and wetland food plants, seasonal dispersal patterns of geese, the impact of disease on populations and the likely ramifications of sea level rise
- Continued a collaborative project with the Northern Territory Government on two species of coastal dolphins, the Indo-Pacific humpback (Sousa chinensis) and Australian snubfin (Orcaella heinsohni)
- Supported a Northern Territory Government project to relocate golden bandicoots onto an offshore island

#### Major issues

- · Protection and appropriate presentation of World Heritage cultural values
- Managing the park as part of a living culture for Bininj
- Supporting traditional owner participation in cultural activities and traditional practices
- Balancing the need to protect rock art and other significant Aboriginal heritage with facilitating its appreciation by visitors

#### Actions

- · Develop strategic programs to conserve and monitor Kakadu's unique cultural values in consultation with Bininj
- Continue rock art protection and maintenance work
- · Continue cataloguing and preserving cultural heritage materials
- Develop a Cultural Information Management System
- Continue to collect oral histories and ensure these are properly protected and archived
- · Support traditional owner leadership in natural and cultural resource management activities
- Establish two-way learning strategies and programs
- Facilitate visits on country for Bininj, particularly in remote locations, as a tool for re-establishing cultural links to country
- Seek opportunities to transfer knowledge between generations
- Ensure that Kakadu's living cultural status is recognised in tourism strategy development and decision-making
- Review the approach to protection and interpretation of historic heritage in the park

#### Performance results 2008–09

- Continued the review of recorded cultural material, storage of cultural objects, and cultural heritage databases in consultation with Bininj/Mungguy. The review will include development of protocols to ensure that these sensitive cultural resources can be accessed appropriately and in a user-friendly format
- Produced DVDs recording the views of traditional owners and local Indigenous people on various management issues
- Continued to develop a register of oral history audio and video material and to record history from identified informants, in particular key traditional owners
- Completed a partnership agreement between the National Archives of Australia and the Director for long-term storage and protection of audio and video materials currently held in the park
- Began to develop the Cultural Information Management System
- · Continued rock art management with the involvement of relevant Bininj
- Continued discussions with the Aboriginal Areas Protection Authority and Northern Land Council about a register of sites of significance and access protocols
- Continued a review of historic (non-Aboriginal) cultural heritage sites
- Commissioned a project to record the history of the Mudginberri Abattoir and the associated buffalo industry in the area in particular the role that local Indigenous people played in this industry.
- Commenced development of Sickness Country protocols for the southern part of the park

#### Major issues

- Meeting the commitments outlined in the lease and the fifth management plan
- Ensuring shared decision-making occurs at all levels within the park
- Monitoring and reporting on implementation of the fifth management plan

#### Actions

- Ensure decision-making is consistent with the consultation guidelines
- Encourage increased Aboriginal engagement in work plans through recruitment and skills development programs
- Support traditional land management projects
- Support the Board of Management
- Continue day-to-day consultations with traditional owners

#### Performance results 2008–09

• Relevant Aboriginal staff continued certificate level studies, numeracy and literacy training. Bininj staff continued with workplace English language and literacy training

- Engaged Bininj in delivering interpretive and environmental programs
- Continued programs to re-engage young Aboriginal people in education and continued the Junior Ranger program with Jabiru and Gunbulunya Area Schools
- Completed a DVD outlining the opportunities and pathways available for young Aboriginal people to gain employment in Kakadu for circulation at local schools
- · Continued skill development and training for relevant Aboriginal staff via internal and external courses
- Consulted on wide-ranging park management issues with traditional owners and other relevant Aboriginal
   people through the Northern Land Council
- Continued day-to-day joint decision-making by relevant Aboriginal people and park staff
- Continued supporting a Northern Land Council Kakadu Officer position under contractual arrangements with the Northern Land Council
- Held regular meetings of the Kakadu National Park Board of Management

#### Major issues

- Implementation of a new brand for Kakadu which better positions the park as a major tourist destination in the Top End, nationally and internationally
- Improving the quality and range of visitor experiences
- Improving visitor safety
- Communicating with the tourism industry
- Implementing the Shared Vision for Tourism and strategic direction for increasing the benefits from tourism

#### Actions

- Continue to implement the new brand strategy focusing on experiencing Kakadu's World Heritage values and develop a tourism master plan
- Monitor the tour operations permit system and tour guide accreditation
- Increase knowledge of visitation patterns and experiences through the implementation of visitor surveys park wide and for specific sites
- Regularly review safety of visitor areas
- · Regularly inspect and maintain visitor facilities

- Launched the new Kakadu brand, including a new logo for the park, new uniforms for Park staff and a new Visitor Guide and Park Notes.
- · Reviewed and refreshed interpretive signage and park entry stations to reflect the new brand
- Released the draft tourism master plan for public comment and updated the plan in light of comments received
- Established a new branded Kakadu website for visitors which will help match visitor expectations to experiences in the park as well as conveying essential information to travellers
- Continued reviews of tour operator permit conditions and implementation of the park's tour guide accreditation program established in 2007
- Delivered seasonal interpretive ranger programs incorporating natural and cultural content
- Continued to provide detailed visitor information for use in tourism planning and resource allocation including improved monitoring methods and visitor survey data
- Supported Aboriginal enterprise development and involvement in tourism ventures such as the Goymarr Tourist
   Information Centre, Kakadu Culture Camp, Gunlom Kiosk, and Murdujul Art Centre through financial support for
   relevant Aboriginal people to attend tourism industry events and in-kind assistance to produce collective
   promotional material
#### KRA5: Stakeholders and partnerships

#### Major issues

- Continuing effective relationships with the tourism industry, Northern Territory Government, research institutions, and neighbours (particularly Indigenous ranger groups)
- Continuing to participate in local, regional, national and international initiatives associated with Kakadu's World
  Heritage values
- Building relationships with educational institutions to develop 'education to work' pathways for relevant Aboriginal people

#### Actions

- Build a cooperative relationship with tourism stakeholders such as Tourism Top End and the Northern Territory
   Government
- Develop an operational relationship with park neighbours, in particular Aboriginal associations and neighbouring Indigenous ranger groups
- · Take an active role in community programs
- Establish and support links with managers of other World Heritage areas
- Build a strategic alliance with the Jabiru Area School and Charles Darwin University to progress education to work programs

#### Performance results 2008–09

- Continued the relationship between the Australian and Northern Territory governments, with joint funding and planning to advance tourism in the park
- Continued to work cooperatively with the Northern Territory Bushfires Council and other Northern Territory
   Government agencies, West Arnhem Shire and the Northern Land Council
- Continued the Junior Ranger program as part of the Year 6 curriculum at Jabiru Area School and implemented a Junior Ranger program at the Gunbulunya Area School
- · Supported community events including festivals celebrating Indigenous culture and community spirit

#### KRA6: Business management

#### Major issues

- · Recognising high levels of staff expertise and performance
- Securing resources to implement the fifth management plan and meet park lease obligations
- Complying with obligations under the EPBC Act and Regulations for the management of Commonwealth reserves
- Maintaining and upgrading infrastructure

#### Actions

- · Implement outcomes from the organisational review of park operations
- · Implement the department's performance development scheme
- · Fulfil the department's financial management and reporting obligations
- · Manage park assets and developments to relevant Australian Standards

- · Continued ParkSafe, occupational health and safety training and incident reporting and assessment
- Continued to allocate and prioritise resources to meet the aims of the park lease and fifth management plan
- Implemented the performance development scheme for all staff focusing on key result areas and staff
   development
- · Prioritised asset management and the work program against risk considerations and maintenance schedules

# Feral buffalo in Kakadu



Since their introduction to northern Australia over 150 years ago feral Asian water buffalo (*Bubalus bubalis*) have done a great deal of damage to the natural systems of Kakadu National Park.

Buffalo have overgrazed the vegetation, their wallows have allowed salt water into the freshwater wetlands and their heavy hooves have killed countless turtles and plants in the swamps.

However, in the mid-1980s feral buffalo were all but removed from Kakadu as part of the Brucellosis and Tuberculosis Eradication Campaign and a slow recovery began. But it has not lasted. In the last quarter of a century buffalo numbers have gradually increased. If we are not careful to instigate and maintain vigorous control programs for buffalo, the rehabilitation benefits are likely to be lost. This is one reason investment in feral animal control has increased in Kakadu over recent years.

While such control effort has major local benefits, it also makes a surprising contribution to the reduction in greenhouse gas production. The reason is that buffaloes burp. In fact, according to the standards used by the Australian Government Department of A campaign to reduce the number of water buffalo in Kakadu National Park took place in 2008–09 to ease pressures on native species. The culling of feral buffalo also has the potential to reduced methane emissions from within the park

Climate Change, an average buffalo burps 45 kilograms of methane each year. As methane is 23 times more potent as a greenhouse gas than carbon dioxide, in a year each buffalo will produce greenhouse gases that are equivalent to a tonne of carbon dioxide.

The prospect of a price being placed on production of greenhouse gases raises some intriguing possibilities for feral animal control. The most effective way to cull buffalo is to shoot them from a helicopter. Helicopter use produces greenhouse gases. However, a buffalo will produce the same amount of greenhouse gas in a year that a helicopter will produce in ten hours of flying time - that is, culling at this rate would be greenhouse neutral. The actual average cull rate in Kakadu National Park in 2008–09 was 7.7 buffaloes per ten hours flying time. If a buffalo's lifespan was ten years, the greenhouse benefits of culling would be an order of magnitude greater. Additional feral animals such as horses, donkeys and pigs were also culled during these exercises within the same flying time, which potentially increases the carbon benefit.

Such trade is currently speculative – markets for such carbon would require much more science and careful consideration. Given the environmental benefits for Kakadu, greenhouse gas reduction is a bonus that makes feral buffalo control even more essential.



A Guratba in 1959, whilst it was an active mining operation

The next stage of the Gunlom Rehabilitation Project, which began in the dry season of 2009, is unique in being the first major, full-scale rehabilitation of radiologically contaminated materials in an area of high environmental and cultural sensitivity.

The project, Part B of the Gunlom Rehabilitation Plan, will provide a valuable precedent for the future rehabilitation of other such contaminated areas.

The Gunlom Rehabilitation Project is driven by a condition of the Director of National Parks' lease of Kakadu National Park land granted in 1996 to the Gunlom Aboriginal Land Trust. The area, including the high-profile site of Guratba (Coronation Hill), had been subject to small-scale uranium mining between 1956 and 1964, with virtually no environmental rehabilitation carried out after mining ceased.

Radiologically contaminated tailings residues, mining and processing machinery and equipment, as well as old pits, drill holes and cores, terraces and tracks remained in the area, risking human and environmental safety as well as relations with local traditional owners, for whom the area is known as 'sickness country', both sacred and dangerous.

Consultative planning for the project, involving traditional owners, the Northern Land Council, relevant Australian and Northern Territory government agencies, and mine and environmental rehabilitation experts, began in 1999. Extensive field and heritage investigations were undertaken in subsequent years. A detailed rehabilitation plan for the area was developed from the consultations and information provided in the many reports produced. Traditional owners have been very supportive of the project throughout its development.

# Gunlom Rehabilitation Project reaches a milestone

In 2006 the Australian Government allocated \$7.33 million over four years to implement the rehabilitation plan. In 2007 work was successfully completed on physical rehabilitation of sites without significant radiological contamination, including Guratba (Coronation Hill), Sleisbeck and El Sherana Mining Camp (which contained large amounts of unstable asbestos). In 2008 work was carried out to stabilise and restore three buildings at El Sherana retained for their heritage values, with a view to their potential future use as sites for tourism focusing on the region's mining heritage.

Part B of the rehabilitation plan involves secure, long-term disposal of low-level radiologically contaminated tailings, machinery and equipment in a purpose-engineered, below-ground containment on the long-disused and highly disturbed El Sherana airstrip. The project has all necessary approvals under the Kakadu National Park Management Plan, the EPBC Act, the Australian Radiation Protection and Nuclear Safety Act 1998, the Aboriginal Sacred Sites Act (NT) and other relevant legislation.

Currently the project is being delivered on time and is expected to come in on budget.

 Guratba in 1959, following rehabilitation works to remove terraces and tracks, seal open cores and pits and to stabilise the ground works with appropriate planting



# Norfolk Island National Park and Botanic Garden

environment.gov.au/parks/norfolk



# Special features

Historically, Norfolk Island has been subject to extensive land clearing for agriculture and housing.

Today, the national park and botanic garden are the last refuge for many plants and animals, including 31 endemic plant species, of which 15 are listed as critically endangered.

Of the 15 species and subspecies of birds endemic to Norfolk Island only seven definitely remain. Two species, the white-breasted white-eye (*Zosterops albogularis*) and the Norfolk Island thrush or greyheaded blackbird (*Turdus poliocephalus poliocephalus*), have not been sighted for some time and may be extinct. Four of the other endemic birds are listed threatened species under the EPBC Act: the Norfolk Island boobook owl (*Ninox novaeseelandiae undulata*), the Norfolk Island green parrot (*Cyanoramphus* 

novaezelandiae cookii), the Norfolk Island golden whistler (*Pachycephala pectoralis xanthoprocta*), and the Norfolk Island scarlet robin (*Petroica multicolor multicolor*). All these species are forest dependent, and hence the national park and botanic garden have become critical habitats for the future survival of these species.

The national park, particularly the Phillip Island section, provides important habitat for many species of seabirds, including many migratory and marine species listed under the EPBC Act.

There are two native reptiles, the Lord Howe Island (Norfolk Island) skink (*Oligosoma lichenigera*) and the Lord Howe Island (Norfolk Island) gecko (*Christinus guentheri*), that are endemic to the Norfolk and Lord Howe Island groups. Neither is found on the main island but both species occur on Phillip Island. Both are listed threatened species under the EPBC Act.

The national park and botanic garden are the refuge for many endemic species listed as threatened under the Act, including the entire populations of many of the 15 flora species that are listed in the critically endangered category. There are also 16 plant species endemic to Norfolk Island and Phillip Island which are not listed as threatened.

Location	Latitude 29°01′ South, Longitude 167°56′ East
Area	695.5 hectares (includes Mount Pitt section 493 hectares; Phillip Island 197 hectares; and Norfolk Island Botanic Garden 5.5 hectares)
Proclamation dates	National park 31 January 1986 (Mount Pitt section); 24 January 1996 (Phillip Island) Botanic garden 31 January 1986
IUCN category	Norfolk Island National Park: Category II (national park) Norfolk Island National Park Forestry Zone: Category VI (managed resource protected area Norfolk Island Botanic Garden: Category IV (habitat/species management area)
Biogeographic context	Isolated small islands of volcanic origin (2 to 3 million years old) in the South Pacific Ocean. Prior to European settlement, Norfolk Island was almost entirely covered by sub-tropical rainforest
Management plan	Current plan expires on 12 February 2018
Other significant management documents	Draft threatened species regional recovery plan

Financial	Operating	\$1.029 million
	Capital	\$0.106 million
	Revenue	\$0.003 million
Visitors	26,400 (estimated). Visitor survey indicates 94% of visitors to Norfolk Island visit the national park and/or botanic garden	
Permits	10 commercial tour operator; 3 commercial photography; 11 scientific research; 4 collection for traditional use	

International conventions and agreements		
Migratory Species (Bonn) Convention	17 of 105 listed Australian species	
China-Australia Migratory Birds Agreement	24 of 81 listed species	
Japan–Australia Migratory Birds Agreement	29 of 76 listed species	
Korea-Australia Migratory Birds Agreement	22 of 59 listed species	

Environment Protection and Biodiversity Conservation Act 1999		
Listed fauna Species	Species	5 extinct 5 critically endangered 2 endangered 4 vulnerable 37 migratory 57 marine
	Recovery plans	A regional recovery plan for the island expected to be completed in 2009–10 Current recovery plans for: Norfolk Island green parrot ( <i>Cyanoramphus cookii</i> ) Norfolk Island golden whistler ( <i>Pachycephala pectoralis xanthoprocta</i> ) and Norfolk Island scarlet robin ( <i>Petroica multicolor multicolor</i> )
Listed flora	Species	15 critically endangered 16 endangered 15 vulnerable
	Recovery plans	These species will be included in the regional recovery plan for the island which is expected to be finalised in 2009–10
Heritage	Phillip Island is on the Commonwealth Heritage List	

Numbers of native species recorded			
Mammals	Birds	Reptiles	Plants
2	50 (26)	2 (2)	92 (74)

Figures in brackets are the numbers of species that are a management priority

# Management arrangements: advisory committee

The Norfolk Island community provides guidance to the Director on national park and botanic garden management through the Norfolk Island National Park Advisory Committee, which meets formally twice a year and informally each month.

The Norfolk Island Administration currently manages forestry operations within the Forestry Zone of the national park. Any operations require approval from the Director of National Parks.

## Monitoring

Monitoring of Norfolk and Phillip Islands for new pest animals and plants continues. Isolated nests of the Asian paper wasp (*Polistes chinensis*) have been identified and destroyed to prevent their spread in the park.

Monthly surveys for Argentine ants (*Linepithema humile*) are conducted. At 30 June 2009, Argentine ants have not been detected in the park or garden. Parks Australia has been assisting with control efforts off-park to try to stop the spread of the ants into areas of high conservation value.

Rat populations are being monitored as part of a trial park-wide rodent management program. Records are kept of bait taken and animals trapped. In addition, eight rat monitoring stations are set three times per year to provide an indication of rat activity.

Recovery programs for the Norfolk Island green parrot and boobook owl include monitoring and recording nest sites and chicks. Identification bands on individual birds help researchers develop an historical database.

The Weed Control Strategy for the Preservation and Protection of the Endangered Plants of Norfolk Island is regularly reviewed and monitored to ensure its effectiveness.

# **Future challenges**

Major challenges are:

raising community awareness of invasive species' potential impacts, including those of rats, cats and feral fowl, and gaining community support to increase feral animal control off-park

finding more efficient and practical ways to meet the requirements of endangered species programs including through a multi-species recovery plan

achieving a sustainable balance between conserving threatened species and supporting tourism in the park, through enhanced visitor infrastructure

managing remnant endemic and important native species in the park's forestry zone.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- · Managing pest animals and weeds
- · Protecting and enhancing populations of endangered species
- Continuing the rehabilitation of Phillip Island
- Building an adequate knowledge base upon which to base management decisions

#### Actions

- Implement strategic weed control
- · Implement identified recovery actions for endangered species
- Continue vertebrate pest species programs
- Document existing knowledge and build the park's knowledge base

- Completed weed control in five of the 19 coups identified in the rehabilitation strategy for the park. Under the 10-year strategy coups are treated on a two-yearly cycle, focusing on priority weed control to increase habitat opportunities for native species
- Continued weed management activities on Phillip Island, effectively keeping the east end of the island relatively
   weed free
- Commenced work controlling morning glory (Ipomea cairica and I. indica) in the botanic garden
- Trapped 25 wild cats under the feral cat control program and desexed 58 cats in desexing clinics. Analysis of gut contents has commenced and will provide valuable information about prey items in the park
- Commenced an upgrade of rat stations to modern bait/trap boxes. Rodents took 1,200 kilograms of bait in the park and more than 250 rats were caught in traps
- Removed 54 feral chickens from the park and garden
- · Removed 108 crimson rosellas from the park as part of the green parrot recovery program
- Released the last three captive green parrots into the wild

- Monitored and managed 62 green parrot nesting sites. Fourteen green parrot chicks were recorded through the assisted wild breeding program
- Installed seven new boobook owl nesting boxes. Twenty-eight nesting boxes are available for use
- Continued preparation of the regional recovery plan, expected to be completed in 2009–10

#### KRA4: Visitor management and reserve use

#### Major issues

- Growing visitor expectations in relation to tourism infrastructure
- Some access tracks pose safety issues and are unsuitable for disabled visitors
- · Providing high quality interpretive signs and pamphlets
- · A growing demand for a professional environmental information centre

#### Actions

- Resurface walking tracks
- Review current access tracks, focusing on maintaining high visitation areas
- Redevelop walking tracks in the botanic garden
- · Develop a professional and functional interpretation centre

#### Performance results 2008–09

- Substantially upgraded and sealed Duncombe Bay Road in partnership with the Norfolk Island Government
- Completed eight new sections of the botanic garden boardwalk upgrade
- Resurfaced Palm Glen Circuit Track
- Continued trialling a range of surfaces to improve walking conditions on steep tracks
- Conducted a visitor survey to gauge the views and level of satisfaction of park visitors. Feedback was generally positive. A few respondents noted concerns in relation to accessing information about the park and walking tracks which did not meet expectations

#### KRA5: Stakeholders and partnerships

#### Major issues

• Working effectively with the Norfolk Island Government, local tourism operators, environmental groups, the community, and professional and amateur researchers

#### Actions

- Meet regularly with tourism industry representatives
- Work with the teachers and students of Norfolk Island Central School as a way to engage the younger members of the community
- Coordinate, or participate in, at least one community activity each year which promotes the national park and botanic garden, or promotes the values of these areas
- Coordinate bi-annual meetings of the Norfolk Island National Park Advisory Committee as the formal mechanism
  for community input into park management

- Through networking and regular contact, maintained professional and cordial relationships with the following stakeholders and partners: other departmental staff; other Australian Government departments on Norfolk Island; the Norfolk Island Government and administration; Norfolk Island tourism operators and industry groups; and environment and conservation groups
- Delivered three educational sessions to school classes
- Successfully managed a permit system for the public, stakeholders, and formal and informal partners

- · Provided newspaper articles covering topical issues with an environmental focus
- · Provided an on-island departmental presence primarily as a referral point for wider environmental and heritage issues

#### **KRA6: Business management**

## Major issues

- Delivering quality management services within a limited budget
- Maintaining transparent and accountable processes of permit issuance, contract management and decision-making

#### Actions

- · Maintain park management services within budget
- · Develop staff capacity to deliver legislative and administrative services

- Completed an organisational review of resources and operations which resulted in a reorganisation of staff and provided direction for improved administrative and management processes
- Managed operational and capital budgets within allowed parameters
- Reviewed permit applications and conditions to ensure compliance with legislation and policy
- Reviewed all contracts and fees for service with changes adopted to achieve best value for money outcomes

# Phillip Island – a rehabilitation success story

Phillip Island is an island recovering from a history of human occupation.

It is a small uninhabited island of 190 hectares about six kilometres south of Norfolk Island that is now part of Norfolk Island National Park.

The introduction of pigs, goats, rabbits and chickens in the late 1700s caused a dramatic degradation of the original vegetation, leading in turn to accelerated erosion of the friable soils. Some species of plants and animals survived but many became locally extinct; some were endemic to Phillip Island and were therefore lost forever.

By the early 1900s the pigs, goats and chickens had been removed but the rabbits remained. The island was a virtual moonscape.

It was in 1978 that the decision was made to implement a conservation program for the island. The Norfolk Island Government asked the Australian National Parks and Wildlife Service (now Parks Australia) to investigate means of eradicating rabbits and revegetating the island. In 1981 the rabbit eradication program commenced. Control techniques involved a combination of poisoning, trapping, biological control and shooting. The rugged terrain and steep coastal cliffs made for a difficult and potentially hazardous job but with skilled workers and the aid of climbing equipment, the whole island was covered. An intensive sevenyear program finally saw the last rabbit removed in 1988. This was a major conservation achievement and paved the way for the island's rehabilitation.

The removal of rabbits saw rapid regeneration of native species across large sections of the island. Park staff have concentrated on erosion control, revegetation and managing the woody weeds which have thrived in the disturbed environment.

The island has the advantage of being far enough from Norfolk Island that many major pest threats such as rats, cats and some weeds cannot get there.

Phillip Island still has some unique challenges but it is heading in the right direction. Since the removal of rabbits, the distribution and abundance of all the 11 threatened plant species have increased. Many are not yet secure, but they are recovering.

 Phillip Island in 1977 prior to the eradication of rabbits from the island



 Phillip Island in 2007 showing regrowth in areas least subject to erosion



Norfolk Island pine trees line the base of Long Valley on Phillip Island. The trees were planted by rangers in the late 1970's as part of an effort to mitigate erosion



On 6 May 2009 the last three captive Norfolk Island green parrots were set free from their aviary home in the Norfolk Island Botanic Garden.

The Norfolk Island green parrot (*Cyanoramphus cookii*) is found only on Norfolk Island and is one of the rarest and most endangered species in Australia.

The captive breeding program began back in 1983 when less than 30 green parrots were left. Captive breeding facilities were constructed in the botanic garden with the help of the Norfolk Island Lions Club and with advice from breeders of closely related species in New Zealand and captive breeding experts from Taronga Zoo.

Some wild green parrots and young chicks were chosen to start the captive breeding program. It was a slow start, with many years before the first successful breeding. There were a few further

# Norfolk Island green parrot – the end of the captive breeding program

A male wild Norfolk Island green parrot became familiar with a captive female though the aviary wire prior to the release of the three captive birds in May this year

successes but the main benefit for management was learning about parrot breeding – particularly about their discriminating choice of partners.

Meanwhile out in the park, an assisted wild breeding program was proving very successful. Rangers constructed artificial nesting sites complete with nicely chipped ironwood to make the nests as attractive as possible. They were specially designed to mimic natural green parrot hollows but with additional predator proofing to keep the rats and cats away from nesting parrots, their eggs and chicks.

The assisted wild breeding program continues to be successful. Ranger Ron Ward is currently responsible for the parrot program and spends many dedicated hours managing and monitoring the parrots' recovery. Ron now estimates that Norfolk Island has over 200 green parrots, with more and more chicks being produced each year – 14 in the last breeding season.

Given that the parrots breed better in the wild than in captivity, the decision was made to let the last three birds free in the hope that they may successfully breed before they become too old.

Contributing to the decision to release the last captive parrots were observations of the interaction between a wild parrot and one of the captives. For the past few years, a wild male has been regularly visiting the last captive female, feeding and courting her through the aviary wire. The release of the captive parrots has allowed this courtship to continue without the artificial separation.

We know that captive-bred parrots are more likely to do well in the wild if they are supported by wild birds, so the observed relationship is a promising sign for the successful assimilation of the parrots into their new natural home. Since the release, the female has been seen regularly with her male companion. The courtship seems to be continuing and park staff are hopeful that the pair may breed next season.

# **Pulu Keeling National Park**

environment.gov.au/parks/cocos



# **Special features**

Pulu Keeling National Park's most outstanding feature is its intact coral atoll ecosystem. With the widespread global decline of similar coral island habitats and their reefs due to human interactions, the conservation and protection of the park and its wildlife is of international importance.

The park, which makes up the whole of North Keeling Island, is an internationally significant seabird rookery. The breeding colony of the dominant bird species – the red-footed booby (*Sula sula*) – is one of the largest in the world. The island is also the main habitat of the endangered Cocos buff-banded rail (*Gallirallus philippensis andrewsi*) found only on the Cocos (Keeling) Islands.

The critically endangered Round Island petrel (*Pterodroma arminjoniana*) has been recorded on the island but has not been sighted in recent years, despite

intensive searching. Green turtles (*Chelonia mydas*) nest on the island and hawksbill turtles (*Eretmochelys imbricata*) inhabit the waters of the park; both species are listed as vulnerable.

Location	Latitude 11°50' South, Longitude 96°49' East	
Area	2,602 hectares (including marine area extending 1.5 kilometres around North Keeling Island)	
Proclamation date	12 December 1995	
IUCN category	Category II overall comprising: Terrestrial Zone Category Ia (122 hectares) Marine Zone Category II (2,480 hectares)	
Biogeographic context	Isolated atoll in the Indian Ocean formed atop an old volcanic seamount	
Management plan	Second plan expires 27 April 2011	
Other significant management documents	Visitor access, boating, diving and fishing strategies; Management Plan Implementation Schedule; Risk Assessment and Management Schedule	
Financial	Operating	\$0.458 million
	Capital	Not applicable
	Revenue	\$0.006 million
Visitors	87 visitors to Home Island Office 68 visitors to Pulu Keeling National Park	
Permits	5 commercial tour operator (3 still photography, 1 diving and 1 land-based tour); 1 research; 95 marine access	

International conventions and agreements	
Wetlands (Ramsar) Convention	Entire park listed
Migratory Species (Bonn) Convention	8 of 105 listed Australian species
China-Australia Migratory Birds Agreement	15 of 81 listed species
Japan-Australia Migratory Birds Agreement	15 of 77 listed species
Korea-Australia Migratory Birds Agreement	8 of 59 listed species

Environment Protection and Biodiversity Conservation Act 1999		
Listed fauna	Species	1 critically endangered 4 endangered 5 vulnerable 24 migratory 36 marine
	Recovery plans	4 being implemented: blue whale ( <i>Balaenoptera musculus</i> ); sei whale ( <i>Balaenoptera borealis</i> ); Round Island petrel ( <i>Pterodroma arminjoniana</i> ); marine turtle
Listed flora	Species	None
Heritage	North Keeling Island on Commonwealth Heritage List	

Numbers of native species recorded			
Mammals	Birds	Reptiles	Plants
5 (2)	24 (8)	6 (5)	31

Figures in brackets are the numbers of species that are a management priority

## Management arrangements: management committee

The Pulu Keeling National Park Community Management Committee comprises the Director of National Parks (or his nominee), three others nominated by the Director and six community representatives nominated by the Cocos (Keeling) Islands Shire Council.

## Monitoring

The red-footed booby population on North Keeling Island has been monitored since 1985. Analysis of the data in 2007 again put the number at around 30,000 breeding pairs.

With a current estimate of 1,000 individuals, the buff-banded rail population remains stable in the park and staff continue to monitor the population. A project to establish a second viable population within the Cocos (Keeling) Islands group began in 2008. Systematic monitoring of marine turtles has been maintained in the park over the last nine years.

Monitoring for presence of the the invasive yellow crazy ant (*Anoplolepis gracilipes*) on North Keeling Island has continued with an island-wide survey conducted in June 2008. Data have shown crazy ants are fairly widespread, with some sites recorded at 'supercolony' density. The program follows the methodology used at Christmas Island National Park.

## Future challenges

Major challenges are:

- preventing the introduction of pests and diseases to the park
- containing the impact of exotic species. Island fauna is especially vulnerable to the introduction of exotic species; outbreaks of scale insects and weeds, especially Siam weed (*Chromolaena odorata*) and die-back (*Phytophthera* spp.) on nearby Christmas Island and in Western Australia, may pose a threat to the park
- managing for global warming, which poses a particular challenge to the future management of low-lying atolls such as North Keeling.

# Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Regular access to the park to perform routine tasks
- Illegal entry to the park
- Illegal wildlife harvesting
- Monitoring red-footed boobies, coral reef health and exotic species
- Controlling or eradicating yellow crazy ants.

#### Actions

- Maintain a workable arrangement with the service provider to provide boats for access to the park
- Maintain surveillance and boat patrols
- Survey bird numbers regularly
- Provide appropriate ongoing assistance to the Cocos-Malay community with their submission to legally harvest the red-footed booby
- · Monitor the spread and potential impact of yellow crazy ants

#### Performance results 2008–09

- · Maintained sufficient access to the park by boat to undertake seabird monitoring and management duties
- Continued working with the community and with other law enforcement agencies to detect incidents involving protected species
- Completed yellow carzy ant Island-wide survey

#### KRA2: Cultural heritage management

#### Major issues

- The SMS Emden shipwreck is a popular diving site
- Visitors to Malay gravesites

#### Action

· Ensure access to sites is managed appropriately

#### Performance results 2008–09

- Managed cultural heritage sites effectively
- Conducted seven guided tours of the grave sites and the *Emden* memorial site on the beach
- Cleaned grave sites
- Communicated information on culturally significant sites to the community through educational activities

#### KRA4: Visitor management and reserve use

#### Major issue

· Potential for introduction of exotic species by park visitors

#### Actions

- Implement quarantine procedures
- Prevent introduction of exotic species

#### Performance results 2008–09

• Continued to inspect visitors' equipment, clothing and footwear prior to visitors swimming ashore and ensure that it is scrubbed. No evidence was found that new species have been introduced

#### **KRA5: Stakeholders and partnerships**

#### Major issues

- · Continuing to keep a positive working relationship with the community
- Dissatisfaction with park management due to a perceived lack of obvious benefits to the community

#### Action

- Promote the benefits of the park (including employment, tourism, local expenditure
- · Continue the ongoing community education and relations, and interpretation program

#### Performance results 2008–09

- Continued to staff the new Home Island office two days a week in addition to the existing office on West Island, to build Parks Australia's profile and to provide regular liaison with stakeholders, locals and tourists
- Distributed public notices publicising local temporary employment opportunities within Parks Australia and set
   up a temporary employment register
- · Maintained regular meetings and communication with stakeholders
- Carried out educational activities with the local school and community to encourage environmentally responsible behaviour and to develop greater appreciation of the park's biodiversity values

#### **KRA6: Business management**

#### Major issue

· Isolation restricts training opportunities

#### Action

 Train staff more effectively by making the best use of staff visits to the park to develop skills in the area of wildlife monitoring and management

- · Managed operational and capital budgets within approved parameters
- A ranger continued a lands, parks and wildlife correspondence course
- Established arrangement with Christmas Island National Park for staff support in some projects and on the job guidance by senior staff

More than 20 years of data – monitoring red-footed booby numbers at Pulu Keeling National Park



The Red-footed booby has extensive nesting sites across Pulu Keeling National Park which are greatly impacted by severe weather events, such as cyclones

Pulu Keeling National Park is an undisturbed breeding haven for seabirds especially the redfooted booby (*Sula sula*). The park, which makes up the whole of North Keeling Island, supports the biggest population of this species in the Indian Ocean and possibly the world.

Red-footed boobies have been surveyed at Pulu Keeling since 1985, well before the island became a national park. Accurately assessing population dynamics is important in long-term management to ensure the survival of the species, and to assist decision-making for any harvest proposals put forward by the local Cocos Malay community.

The survey methodology was assessed and revised in 1996 and again in 2001. The current methodology is in accordance with the 2001 recommendations. Park staff concentrate on prime breeding habitat (approximately 50 hectares dominated by *Pisonia grandis* trees). Surveys are concentrated when breeding activity and nest density are at their peak, generally from March to October. For data analysis, only the highest monthly count is used as this indicates the peak of breeding activity for the year.

In 2007 a detailed analysis of the data from 1987 to 2006 showed that the red-footed booby population can be conservatively estimated at around 30,000 breeding pairs, a figure consistent with previous assessments. There are large variations from year to year, notably corresponding with significant cyclonic events (see figure 1).

The breeding season following Cyclone John in January 1989 produced about 40 per cent of nests at the peak of the season in comparison to previous years. However, the population recovered rapidly after the cyclone, possibly due to the large number of surviving birds that made second breeding attempts.



#### Juvenile red-footed booby

Cyclone Walter hit Pulu Keeling National Park in April 2001 and to some extent repeated the damage. Approximately 14 per cent of large trees and 60 per cent of the canopy vegetation in the prime breeding habitat was demolished and many birds were killed. Again the red-footed booby population demonstrated its resilience with a remarkable recovery in the following years.

Overall, the red-footed booby population appears to exhibit an ability to bounce back to a sustainable breeding level. Variations in population levels are mainly linked to cyclones and insufficient data collection because there was no boat available to go to the island.

Nevertheless, there are other contributing factors that potentially affect the population that are not well understood. These include nutrient availability, possible migration of individuals and illegal poaching by the local community.

Figure 1 – Average number of red-footed booby nests per survey plot over time (containing an average of 3 trees per plot)



Monitoring yellow crazy ants – Pulu Keeling National Park's biggest threat



The development of supercolonies of yellow crazy ants on Pulu Keeling would have a potential devastating impact on the island's biodiversity

Highly invasive yellow crazy ants (*Anoplolepis gracilipes*) are the most significant immediate threat facing Pulu Keeling National Park.

Experience on neighbouring Christmas Island have shown that when the density of yellow crazy ants becomes so high that supercolonies are formed, they can have a destructive impact on island ecosystems by killing and displacing crabs and other grounddwelling fauna, leading to dramatic changes in the structure and composition of forest vegetation.

Monitoring the spread and potential impact of this species in Pulu Keeling National Park is a high priority for park staff. Surveys in 2001 and 2005 detected yellow crazy ants but only covered part of the park. Island-wide monitoring was undertaken for the first time in June 2008. The monitoring program aims to improve understanding of the distribution and density of yellow crazy ants, provide a basis for developing effective long-term management and detect signs of the ants' impact and the presence of scale insects, which produce the ants' main food.

Twenty-two permanent sites have been established across the island's 1.2 square kilometres covering all major vegetation communities and terrain types. Monitoring is to be conducted annually using a methodology established for Christmas Island National Park. The 2008 monitoring program provided the following results:

- Supercolonies were detected at five sites

   (although recordings were made close to nests
   at three sites which may explain the higher
   activity at those sites).
- Ants were found again at previously surveyed areas.
- Distribution is not restricted to particular vegetation structures.
- No evidence of scale insects was found.
- There were no signs of infestations on crabs and reptile populations.

While the detection of supercolonies is of concern, observations during the survey and afterwards have found no evidence of impacts on native species as yet. Predicting when or if a major infestation will occur will be difficult.

Despite the lack of impacts on crabs and other species so far, preparation is under way to ensure that park staff are well placed to manage the threat. This includes maintaining an effective quarantine barrier between the park and the southern islands of the Cocos group and finding the best control options for such a geographically isolated environment. For example, chemical control has been used successfully in other national parks but is known to have some impact on certain non-target species such as robber crabs. Therefore, baseline data need to be established on the distribution and density of other species, particularly those that may be affected by chemical application. Figure 2: Location of crazy ant monitoring sites in Pulu Keeling National Park



# Ulu<u>r</u>u–Kata Tju<u>t</u>a National Park

#### environment.gov.au/parks/uluru



# Special features

Uluru–Kata Tjuta National Park is inscribed on the World Heritage List for both the cultural and natural values of its landscape. The park supports Traditional Owners tomaintain their living culture and contains landscapes of exceptional scenic beauty. It also protects the iconic rock outcrops of Uluru and Kata Tjuta and outstanding examples of arid zone flora and fauna.

Uluru–Kata Tjura National Park is a place of great spiritual and cultural importance to Anangu (western desert Aboriginal people). For countless generations this ancient landscape has been influenced by the activities of Anangu and their ancestors. The land management techniques that are a feature of these activities are an intrinsic part of Tjukurpa (traditional law and culture) and a feature of the joint management of the park by Anangu and Parks Australia.

Location	Latitude 25°15′ South, Longitude 130°43′ East	
Area	132,566 hectares	
Proclamation dates	24 May 1977, 28 October 1985	
IUCN category	Category II	
Biogeographic context	Interim Biogeographic Regionalisation for Australia regionalisation for Australia	on: Great Sandy Desert
Management plan	Fourth plan officially expired 28 June 2007. In March 2007 the Board of Management requested the Director to continue to manage the park in accordance with the fourth management plan until the fifth plan is finalised and approved	
Other significant management documents	Lease between the Uluru–Kata Tjura Aboriginal Land Trust and the Director of National Parks; Visitor Infrastructure Master Plan; Uluru Climb Health and Safety Report; Cultural Heritage Action Plan; Women's Cultural Heritage Plan	
Financial	Operating	\$11.408 million
	Capital	\$5.411 million
	Revenue	\$7.159 million
	Paid to traditional owners	\$1.837 million
Visitors	299,821 paying visitors (16 years and above) based on park tickets sold	
Permits	225 film/photography; 110 tour operators; 4 research	

International conventions and agreements		
World Heritage Convention	Listed under cultural criteria (v) and (vi) and natural criteria (ii) and (iii), recognising the park's outstanding natural and cultural values and its significance as a cultural landscape	
Migratory Species (Bonn) Convention	10 of 105 listed Australian species	
China-Australia Migratory Birds Agreement	12 of 81 listed species	
Japan–Australia Migratory Birds Agreement	14 of 77 listed species	
Korea-Australia Migratory Birds Agreement	13 of 59 listed species	
Other agreements	Convention on Biological Diversity; Listed as a biosphere reserve under the UNESCO Man and the Biosphere Programme	

Environment Protection and Biodiversity Conservation Act 1999		
Listed fauna	Species	6 extinct 2 endangered 3 vulnerable 16 migratory 36 marine (birds)
	Recovery plans	3 being implemented: mala or rufous hare wallaby ( <i>Lagorchestes hirsutus</i> ); tjakura or great desert skink ( <i>Egernia kintorei</i> ); itjari itjari or southern marsupial mole ( <i>Notorcytes typhlops</i> ) 2 in preparation: murjta or mulgara ( <i>Dasycercus cristicauda</i> ); waru or black-flanked rock-wallaby ( <i>Petrogale lateralis</i> )
Listed flora	None	
Heritage	On National Heritage List and Commonwealth Heritage List	

Numbers of native species recorded					
Mammals	Birds	Reptiles	Fish	Amphibians	Plants
21 (14)	170 (2)	73 (3)	None	4 (1)	Over 400

Figures in brackets are the numbers of species that are a management priority

## Management arrangements: Board of Management

The current traditional owner representatives on the Ulu<u>r</u>u–Kata Tju<u>t</u>a Board of Management were appointed by the Minister for the Environment, Water, Heritage and the Arts in November 2008 for a period of five years.

The majority of board members must be Indigenous persons nominated by the park's traditional Aboriginal owners. The Board of Management comprises 12 members: four male and four female traditional owner representatives; the Director of National Parks; and one nominee each from the Northern Territory Government, the Minister for Tourism and the Minister for the Environment.

The board has a responsibility to prepare and implement the management plan and advise the Minister on the park's future development. Through joint management, *Anangu* and *Pinanpa* (non-Aboriginal people) work together to manage the park's cultural and natural heritage.

## Monitoring

The twelfth annual *tjakura* or great desert skink (*Egernia kintorei*) survey took place in February–March 2009. A record 205 active *tjakura* burrows were recorded, 63 containing juveniles and 54 containing sub-adults. This number of breeding burrows equals the previous highest number recorded. However, care must be taken when interpreting these results. It may be that the population is expanding, as the results suggest, or the results may be due to an increased search effort, with more staff involved in this year's survey.

The tenth annual murtja or mulgara (*Dasycercus blythi*) survey took place in November 2008. A single murtja was captured, an adult female that had weaned pouch young within the previous several weeks.

This year rapid spot-searches of suitable habitat were added to the usual survey method. Twenty sites, spread across the park, were searched for signs of murtja. The 20 sites were chosen for their potential suitability as murtja habitat. Thirteen sites had signs present, though only three sites showed current murtja activity.

Though evidence of murtja was quite widespread across the park murtja activity levels were relatively low, with just two occupied home burrows found and a single animal captured. The population will probably remain at a low level until significant rainfall events produce greater resources. Currently the great majority of the potential murtja habitat in the park is in the mid to early stages of regrowth following the 2002 wildfires that burnt over 50 per cent of the park. While this habitat is able to support successful breeding, there appears to be a limited level of successful recruitment into the overall population. A follow-up survey will be done in July.

Itjari-itjari or marsupial mole (*Notoryctes typhlops*) monitoring began, with monthly searches in a range of habitat types. The monitoring, whilst still in the early stages, will help to fill the knowledge gaps surrounding this elusive mammal. The monitoring looks for characteristic tracks and passageways in sand dune habitat and will help to answer questions about seasonal activity patterns and surfacing behaviour. The survey is also improving knowledge of the distribution and abundance of this EPBC Act listed species.

The park's first rare flora survey was completed in late 2008. Although the park has no EPBC Act listed flora species, it does have several populations of plants that are extremely restricted in their distribution, including Kata Tjuta wanderrie (*Eriachne scleranthoides*) and Kata Tjuta wattle (*Acacia olgana*). The new monitoring program will establish baseline data on distribution and abundance for each species so that the success of management activities can be assessed over time.

The sixth survey of the captive breeding population of mala or rufous hare wallaby (*Lagorchestes hirsutus*) took place in April 2009. Fourteen new animals were tagged from a total of 47 animals captured. The population appears healthy with the majority of animals gaining weight and many of the population's founding members still thriving.

The sixteenth vertebrate survey was undertaken in October–November 2008. A main objective of this resurvey and monitoring program is to periodically measure the health of the natural resources and ensure that the level of biodiversity within the eight vegetation types monitored remains constant. Seventy bird species, 18 mammal species, 60 reptile species and one frog species were detected. The general health of the park's fauna therefore appears to be good, with species richness and abundance for birds, mammals and reptiles within expectations.

A survey for arutju or fat tailed antechinus (*Pseudoantechinus macdonellensis*), a species previously only known from two small sites within the park, was conducted around the base of Ulu<u>r</u>u. The survey found that the species is widespread and abundant in that area.

Activity and abundance surveys for introduced predators continued. Anangu tracking skills are used in these surveys.

# Future challenges

Major challenges are:

- quantifying the impact of vertebrate pests on waterholes, native fauna and flora species and achieving a level
  of control
- managing the impact of visitors on cultural sites particularly those with high visitation around Uluru
- managing visitor safety in the harsh environment, in particular for visitors who choose to climb Uluru
- working with the NT Government and the Department of Families, Housing, Community Services and Indigenous Affairs to find alternative arrangements for the delivery of essential services (power, water and sewerage) to the Mutitjulu Community
- retaining and developing staff in a remote area
- increasing Anangu engagement in park management
- managing the budgetary impact of decreasing visitor numbers due to the global financial crisis.

# Report on performance by key result areas

#### KRA1: Natural heritage management

- · Controlling the spread of introduced buffel grass (Cenchrus ciliaris)
- Reducing the impacts of vertebrate pests (fox, cat, camel, rabbit, feral dogs)
- · Monitoring the status of threatened species and managing threatening processes
- Reintroducing locally extinct species
- · Controlling erosion and repairing existing damage
- Using fire effectively as a habitat management tool

- Quantifying the impact of climate change on semi-arid ecosystems
- · Ensuring that monitoring activities provide effective data on ecosystem health

- Complete the fire and vegetation management strategy to guide fire planning and activity within the park
- Complete a buffel grass management strategy to improve the effectiveness and efficiency of resource use to achieve improved conservation and recreational outcomes over the next five years
- · Adapt and continue the buffel grass control program
- Release rabbit calicivirus into the mala enclosure to help control rabbit numbers and ensure no impact on the mala population
- Extend the annual fire planning workshop to two days to enhance the contribution by the park's traditional owners to planning the seasonal burn program
- Continue to monitor the park's threatened species to improve understanding of these species and ensure management is effective and adaptive
- Trial innovative programs aimed at improved feral species management including cat home range studies and targeted trapping, and developing a camel management program
- Maintain the pest-free enclosure
- · Continue to develop a species reintroduction program
- Continue revegetation programs in construction areas and locations where buffel grass has been successfully removed
- Continue the erosion control program
- Improve data and GIS management

#### Performance results 2008–09

- Achieved greatly improved outcomes in natural and cultural resources planning due to the new GIS position. This
  new position will continue to enhance strategic planning and data capture across the park
- · Cleared approximately 15 hectares of buffel grass
- · Mapped and assessed several species of rare flora
- Conducted monthly vertebrate pest monitoring for cats, foxes, dogs and camels in the borefields area of the park. Pest numbers continue to be low
- Concentrated rabbit control in the mala enclosure, trialling a combination of control methods including the release of rabbit calicivirus
- · Commenced the fox baiting trial using fox-specific delivery stations
- · Conducted mulgara, great desert skink, marsupial mole and mala surveys
- Conducted sampling for invertebrates and water quality testing at Uluru waterholes
- Completed the revegetation program of construction areas associated with the re-alignment of the Uluru base walk. This program included trials to determine the most effective method of maximising seed germination, which proved to be introducing small, low intensity fires in the vicinity of the sown seeds

#### KRA2: Cultural heritage management

- Supporting the continuation of Anangu living culture and knowledge
- Protecting historic and Anangu cultural information, sites and objects

- Revise the Cultural Heritage Action Plan (2002) and continue to implement the Women's Cultural Heritage Plan (2005)
- Continue the rock art conservation, oral history and repatriation programs
- · Identify, catalogue and conserve cultural, historical and archaeological sites and objects
- Protect cultural sites around Uluru
- Maintain the Cultural Sites Management System database as an information repository, planning and reporting tool
- Maintain the A<u>r</u>a Irititja (Stories from the Past) database, promote community access, and continue data entry. A<u>r</u>a Irititja is a multimedia database and associated project that enables A<u>n</u>angu to access archival material (film, photographs, sound recordings, documents, artefacts)
- Support staff and Anangu participation in the annual Women's Law and Culture meeting
- Support and promote the use of traditional knowledge and skills in all areas of park management and especially in fire management
- Facilitate and support the transfer of knowledge between Anangu generations

#### Performance results 2008–09

- Held three Cultural Heritage and Scientific Consultative Committee meetings to provide advice to the Board of Management on natural and cultural heritage issues
- Completed oral history recordings about waterhole management in the park and the surrounding regions and collated all oral data involving fire knowledge and management
- Completed assessment of all rock art sites at Uluru and began conservation treatments on women's sacred sites. Assessed the effectiveness of conservation treatments at public art sites on the Mala and Mutitjulu walks
- Repaired significant graffiti on public rock art sites
- Consulted with traditional owners on designing and building a new viewing platform and walking path for the Wave Cave, to prevent visitor impact on the site
- Cultural Heritage and Scientific Consultative Committee discussed plans for an archaeological survey and research program and began discussions about the October 2009 revision of the Cultural Heritage Action Plan
- Completed a proposal for a park-wide archaeological survey in partnership with the University of Queensland
- Upgraded the Cultural Site Management System database, including developing software to improve remote data capture and input
- Maintained the A<u>r</u>a Irititja database. A<u>n</u>angu regularly accessed this popular database. Staff worked with senior A<u>n</u>angu to enter information and stories about individual photographs and films in the database
- Provided logistical support for Anangu attending Women's Law and Culture meetings
- Hosted a visit from the traditional owners of the Rainbow Valley Conservation Reserve near Alice Springs to study the park's system of joint management and cultural heritage conservation

#### KRA3: Joint management

- Managing the park in accordance with the lease obligations and joint management principles
- Providing opportunities for Indigenous economic development in the park
- Maintaining relationships and partnerships with relevant Anangu organisations
- · Ensuring traditional owners are appropriately consulted in park projects and park management activities
- Supporting Anangu employment, education and training
- Supporting ongoing transfer of traditional knowledge between generations of Anangu

- · Maintain productive working relationships with joint management partners
- Work with the Central Land Council to ensure effective traditional owner consultation in the development of the fifth management plan and other significant park projects
- Support Anangu enterprise development at Talinguru Nyakunytjaku, the new visitor facility
- Develop an A<u>n</u>angu Employment, Education and Training Strategy and continue to provide opportunities for A<u>n</u>angu to develop park management skills and experience
- Continue to develop the Junior Ranger program

#### Performance results 2008–09

- Held three regular and one special meeting of the Board of Management, and eight meetings of the board's consultative committees
- · Seven new traditional owner representatives were appointed to the board
- The board chair attended the inaugural Australian World Heritage Advisory Committee meeting in Sydney
- The board participated in governance training, at its first meeting in February, jointly delivered by the Central Land Council and Parks Australia
- The park and the Central Land Council consulted traditional owners on development of the fifth management plan and other significant projects
- Continued to support the agreement between the Mutitjulu Community and the park in employing Anangu, including incorporating a traditional knowledge and skills component to acknowledge and recompense the specialised knowledge and skills of senior Anangu
- The board chair attended the Indigenous Tourism Conference in Townsville which showcased Indigenous business developments in tourism
- Undertook 21 Junior Ranger activities with Mutitjulu and Yulara primary schools, including a joint overnight campout with both schools at park headquarters
- Engaged Pitjantjatjara interpreters for board, consultative committee and other meetings to improve communication with traditional owners and community members

#### KRA4: Visitor management and reserve use

#### Major issues

- Construction of Talinguru Nyakunytjaku, the new visitor facility
- Reviewing the park ticket system
- · Managing the demands of international and Australian film crews and professional photographers
- Managing ageing infrastructure
- Maintaining a high level of visitor safety in the park
- · Managing the Uluru climb to reduce the risks to the health and safety of visitors, and to respect cultural traditions
- Interpreting key park messages to visitors

#### Actions

- Monitor visitor satisfaction
- Continue media briefings (using the DVD media package and electronic communications)
- · Introduce online ticket purchase as recommended by the ticketing system review
- Develop new interpretive signage
- Maintain visitor infrastructure including walking tracks and pathways
- Continue tour operator workshops and orientation programs
- · Finalise the online tour guide certification program

#### Performance results 2008–09

- Overall results from visitor surveys conducted in May and September 2008 indicated an average 83 per cent of domestic respondents and 81 per cent of international respondents were overall satisfied with their visit. Forty nine per cent of domestic and 44 per cent of international visitors (on average) indicated they were 'very satisfied' with their visit
- Undertook four rescues of visitors on Uluru and responded to a further 44 emergency situations
- Issued 225 media permits for filming or photography in the park
- Issued 110 tour operators permits
- Progressed planning and design of the interpretive panels at the cultural centre
- · Maintained the park's rock rescue, emergency response, first aid and fire suppression capabilities
- Completed walking tracks, viewing platforms and toilet facilities at Talinguru Nyakunytjaku
- Opened the new North Eastern track to visitors. The realignment takes the track away from sensitive sites while affording better views of Uluru through a range of habitats. The track was built by the rangers and Mutitjulu community members
- Delivered free interpretive events to visitors including seasonal plant walks. A total 8,145 visitors attended the daily ranger-guided Mala Walk at Uluru
- Delivered 161 presentations for visitors to the cultural centre, 82 presentations to school groups and 22 orientation sessions for Ayers Rock Resort staff
- Facilitated three VIP visits, by the Department of Foreign Affairs and Trade, German parliamentarians and a Japanese cultural group
- · Conducted a two-day tour operator workshop with 20 participants
- Completed material for the online tour guide training course. Charles Darwin University is now accepting enrolments in the course
- Continued to work with regional partners on the Red Centre National Landscape and Red Centre Way

#### KRA5: Stakeholders and partnerships

#### Major issues

- · Providing opportunities for new Indigenous business enterprises
- Maintaining an effective working relationship with the Mutitjulu Community
- Maintaining an ongoing partnership with the tourism industry
- Maintaining good relationships with other key stakeholders
- Engaging with new local government, Northern Territory and Australian Government agencies working with the Mutitjulu community

#### Actions

- Hold meetings of the board's consultative committees
- · Participate in the Yulara Advisory Committee and Resort Business Partners meetings
- · Communicate clearly with all parties about park developments
- Meet regularly with local stakeholder groups
- · Continue supporting volunteer and community groups in protecting park values

- Held several meetings of the Tourism Consultative Committee, the Film and Photography Consultative Committee and the Cultural Heritage and Scientific Consultative Committee and reported back to the Board of Management
- Held meetings in Mutitjulu to develop the Mutitjulu chapter of the fifth management plan
- Attended regular meetings of the Yulara Advisory Committee and Resort Business Partners

- Attended several Mutitjulu Community stakeholder meetings
- Engaged 107 Anangu through the two memoranda of understanding on day labour programs with the Mutitjulu Community
- Supported teams from Conservation Volunteers Australia working on weed control in the park
- Participated in Yulara Counter Disaster Committee meetings

#### **KRA6: Business management**

#### Major issues

- Implementing the organisational review to ensure the most effective and efficient staffing structure
- Preparing the new management plan
- Providing suitable staff housing and an improved office environment
- · Rising fuel prices for diesel power generation and the vehicle fleet
- · Maintaining park infrastructure and road networks
- · Providing essential services to the Mutitjulu Community
- Developing lease agreements for business enterprises at the cultural centre
- Improving corporate governance procedures
- · Reduced revenue due to a shortfall in expected visitor numbers
- · Staff training and development
- Maintaining staff health and safety at work

#### Actions

- Implement the organisational review
- Ensure that the Housing, Training, and Occupational Health and Safety committees are functional and meet regularly
- Complete the draft fifth management plan
- · Continue to implement the staff training plan and update the training calendar
- · Continue to develop new deeds of standing offer
- Continue to implement safe working procedures, including job safety analyses and standard operating procedures

- Completed the draft fifth management plan with the Board of Management. The plan was released for public comment early in July 2009
- Completed implementing stage 1 of the organisational review's recommendations
- Developed a staff online orientation package
- Staff, A<u>n</u>angu and Mu<u>t</u>itjulu Community members attended numerous training events, ranging from informal information sessions to accredited training and conferences
- Three staff members received assistance under the department's Study Support Scheme
- Indigenous staff attended the Department's Indigenous Employees Conference in Darwin
- · Administration staff attended the Remote Area Administration Forum in Canberra
- Visitor and Tourism Services Manager attended the Indigenous Tourism Conference in Townsville
- The Occupational Health and Safety Committee held two meetings, the Training Committee met once and the Housing Committee met as required
- · Staff completed the department's online occupational health and safety Safetrac training course

- Developed the solar power augmentation project for park headquarters and the cultural centre to reduce fuel costs and greenhouse gas emissions
- Deeds of standing offer are in place for sewerage and septic systems, cleaning, air conditioner maintenance, fleet servicing, fire detection, protective and electrical systems
- Received tenders for the office refit to relocate staff from visitor services (currently based at the cultural centre) to headquarters

# 'Talingu<u>r</u>u Nyakunytjaku' – a new perspective on Ulu<u>r</u>u

Around 300,000 local and international visitors come each year to enjoy views of Uluru and the surrounding landscape. Watching the sun rise over the rock is an unforgettable highlight of their visit.

A stunning new viewing area, named by the traditional owners Talingu<u>r</u>u Nyakunytjaku or 'to look from the sand dune' was opened in October 2009.

Talinguru Nyakunytjaku is the biggest ever capital upgrade to Uluru. It offers fantastic views of both Uluru and Kata Tjura at all times of day, with new business opportunities for Aboriginal people and improved protection of cultural sites.

The tourism industry lobbied for years for a new viewing area, and the location and design of the new viewing area were decided in close consultation with the traditional owners, Anangu, as part of the joint management of the World Heritage Area.

Visitors are able to see Uluru in the wider desert landscape of spinifex covered dunes and swales, dotted with *kurkura* or desert oaks. From the upper platforms they look out across open *wanari* or mulga woodlands to patches of *muurmuurpa* or desert bloodwood) woodland fed by Uluru's rocky catchment. They can also see landmarks more than 100 kilometres away, including the Musgrave Ranges in South Australia. The new viewing area replaces the park's old sunrise viewing area, which is unsafe and has gradually been overwhelmed by increased visitor numbers and vegetation regrowth in recent years. The new investment provides better parking, shade structures, visitor walkways, elevated paths and viewing platforms, and is designed to accommodate up to 3000 visitors.

A walking track network follows the contours of the landscape, with spinifex thatched shade shelters, modelled on '*wiltja*', the traditional A<u>n</u>angu shelter. Toilet facilities and a solar powered wayfinder lighting system are also featured in the project.

The first stage of the new viewing area project was completed last year, with the opening of a new 11 kilometre road around the rock and a new carpark and coach area.

The new approach road to the viewing area provides a wonderful tourist drive through desert oak and mulga forest, and takes visitors into previously inaccessible areas of the landscape.

The new road also provides easier access to the Cultural Centre where visitors can learn about the park's World Heritage living cultural landscape.



The stunning new Talingu<u>r</u>u Nyakunytjaku viewing area with its shade structures, visitor walkways, elevated paths and viewing platforms is designed to accommodate up to 3000 visitors



Anangu staff learning to treat graffiti damage to rock art

Conserving and protecting Ulu<u>r</u>u's World Heritage rock art is a high priority for the traditional owners and park staff.

Following assessment of the public rock art sites on the Mutitjulu and Mala walks in 2007, over the past year conservators assessed all 74 non-public rock art sites and began conservation treatment in the women's sacred areas.

An angu cultural heritage project officer, Mick Starkey, worked closely with art conservators and An angu staff to document the art and to identify the many different causes of rock art deterioration and trial a range of methods, before choosing the most appropriate conservation treatment.

Rock art around the park is extremely fragile and can be easily damaged. Natural elements such as water, dust, salt and lichen growth cause paintings to fade or flake off. Mud nests built by freemartins and wasps,

# Conserving rock art at Ulu<u>r</u>u

and bird and bat droppings can also damage the art.

The team removed salt from rock surfaces to enable dust removal, re-attached flaking stone and stabilised pigments. Water repellent bands have been placed where paintings are vulnerable to water flowing over the surface, to divert water away from the paintings.

Paintings deteriorate when people touch them, and so platforms have been built around public art sites to allow people to view the art without touching it. The platforms also reduce the amount of dust stirred up. Yet despite interpretation programs to inform visitors of the park's World Heritage cultural values, graffiti is relatively common. It ranges from small scratched or drawn initials to the application of large amounts of sunscreen across the surface of very fragile art work.

Some graffiti is removed by Anangu staff who have received training in rock art conservation techniques. Major vandalism requires expensive professional restoration. In early 2009 the main Mutitjulu rock art site was closed while graffiti damage was repaired – something that neither the traditional owners nor the tour operators were happy about. One of the motifs, originally painted by the father of a traditional owner, had been repeatedly scratched with a sharp object rupturing the dark crust. During the closure, four more examples of graffiti were found and repaired.

**w** Graffiti at a rock art site near the Mu<u>t</u>itjulu waterhole



 The same site after graffiti was effectively removed through careful treatment, conservation and restoration



# **Calperum and Taylorville Stations**

environment.gov.au/parks/biosphere/riverland



# Special features

Calperum and Taylorville Stations are adjoining pastoral leases in the Riverland area of South Australia approximately 250 kilometres east of Adelaide, near the Victorian border.

Calperum and Taylorville are important locally, nationally and internationally because of their intact mallee vegetation, the presence of several threatened bird species, and their wetlands and related species. The properties form critical habitat for the endangered black-eared miner (*Manorina melanotis*). They are also important for the conservation of the nationally vulnerable malleefowl (*Leipoa ocellata*) and the regionally vulnerable bush stone-curlew (*Burhinus grallarius*).

The properties are key components of the Riverland (formerly Bookmark) Biosphere Reserve. While

biodiversity conservation guides the management of both properties and both actively rely on community participation in management activities, there are differences in the management objectives of the two properties. Taylorville is managed as an IUCN Category IV reserve, for habitat and species conservation. Calperum is managed for a broader, additional set of objectives, including environmentally sustainable development such as tourism.

Location	Latitude 33°49' South, Longitude 140°34' East (Calperum)				
	Latitude 33°56 South, Longitude 140°11'East (Taylorville)				
Area	331,238 hectares combined area:				
	Calperum 238,638 hectares; Taylorville 92,600 hectares				
Status	Pastoral leases in South Australia, held by the Australian Government through the Director of National Parks				
	(Calperum acquired in 1993, Taylorville acquired in 2000)				
IUCN category	Calperum: not assigned				
	Taylorville: Category IV				
Biogeographic context	Interim Biogeographic Regionalisation for Australia region: Murray–Darling Depression				
Management plan	Non-statutory management plan covering both properties finalised in February 2005 (expired with previous				
	management contract in 2008, but still in effect until the next plan is finalised, expected March 20				
Other significant	Management contract with Austland Services Pty Ltd; Biosphere Reserves Seville Strategy and statutory				
management documents	framework				
Financial	Operating *	\$0.615 million			
	Capital	\$0.030 million			
	Revenue	\$0.622 million			
Visitors	Over 2,400 bed-nights in camping grounds, dormitories and other accommodation				

\* This funding is provided by the Director of National Parks. Austland Services provides at least matching resources

International conventions and agreements				
Wetlands (Ramsar) Convention	Part of Calperum included in Riverland Ramsar site			
Migratory Species (Bonn) Convention	8 of 105 listed Australian species			
China-Australia Migratory Birds Agreement	16 of 81 listed species			
Japan-Australia Migratory Birds Agreement	14 of 77 listed species			
Korea-Australia Migratory Birds Agreement	12 of 59 listed species			
Other international agreements	Major component of the Riverland Biosphere Reserve under the			

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	1 endangered 6 vulnerable 12 migratory 45 marine (birds)	
	Recovery plans	2 being implemented: malleefowl (Leipoa ocellata); black-eared miner (Manorina melanotis)	
Listed flora	Species	None	
Heritage	On Commonwealth Heritage List		
Other	Taylorville and most of Calperum listed as critical habitat for black-eared miner		

Numbers of native species recorded						
Mammals	Birds	Reptiles	Amphibians	Fish	Plants	
25	188	68	10	12	Over 300	

## Management arrangements

Calperum and Taylorville Stations are managed by Austland Services Pty Ltd (a company established by the Australian Landscape Trust) under contract to the Director of National Parks. The current management contract runs from 3 July 2008 to 30 June 2013. During 2008–09 the contract was funded through the Australian Government's Caring for our Country initiative. Austland Services provides additional support for management activities and community-based programs.

# Monitoring

Significant monitoring programs track the physical and biological attributes of both properties. Annual biological surveys in 2008–09 included pitfall trapping of small vertebrates, vegetation photopoints, and monitoring malleefowl mound activity, black-eared miners, bush stone-curlews, waterbirds, fish, possums, frogs, nestboxes and aquatic vegetation.

These surveys indicate ongoing improvement in underlying vegetation/landscape condition, and point to the impacts of specific events such as drought and bushfire on particular species. For instance, while follow-up surveys after the 2006 bushfires indicated substantial overall decline in black-eared miner numbers, recent observations on Taylorville Station suggest that the decline is primarily attributable to drought. Significantly, a number of colonies have been recorded living within burnt areas, and one volunteer land manager has made the first recorded observation of successful black-eared miner breeding in a burnt area. Floodplain surveys of bush-stone curlews, in collaboration with the South Australian Department for Environment and Heritage, have identified optimal survey strategies for this species, which will lead to more efficient and effective long-term monitoring.

In addition, a program of rabbit warren mapping and rabbit impact surveying (based on protocols recently developed by the Vertebrate Pest CRC) has been established, and is being used to direct rabbit control efforts, within an active landscape restoration program.

Monthly rainfall data are collected from 25 rain gauges across the two stations. An analysis of rainfall records since the mid 1990's has identified landscape-scale patterns in rainfall within Calperum Station. This pattern has

implications for species management in the future, particularly in the context of climate change. A network of groundwater test wells monitors groundwater hydrology and water salinity beneath the floodplain and wetlands of Calperum Station. Water quality in creeks and wetlands is also monitored. Effects of wetland watering on groundwater hydrology have been detected, using the GridWell array of groundwater test wells, and further investigation of the underlying mechanisms is being undertaken in collaboration with the Bureau of Rural Sciences.

# **Future challenges**

Major challenges are:

- supporting and promoting the development of sustainable economic activities based on the region's natural resources, particularly ecotourism
- developing an appropriate management regime for Calperum Station's wetlands, as part of management planning for the Riverland Ramsar site, that can respond to changing conditions
- protecting the critical threatened species habitat provided by mature mallee on Taylorville and Calperum from fire and other potential threats
- developing cross-tenure approaches to managing the broader landscape for shared goals
- landscape-scale restoration of ecological communities and functions.

#### KRA1: Natural heritage management

#### Major issues

- Rehabilitating and conserving native vegetation and endemic fauna
- Controlling feral animals and weeds
- Conserving fauna
- Managing the floodplain
- Managing fire

#### Actions

- Rationalise watering points
- Maintain captive colonies of the Murray River snail (Notopala sublineata hanleyi)
- Investigate and monitor saline groundwater
- · Review fire management strategies and infrastructure, respond to fires, do hazard reduction burning
- · Restore and revegetate wetlands and semi-arid woodlands
- · Implement feral animal control programs
- Monitor native animal populations
- · Contribute to recovery programs for threatened birds

- Installed and upgraded water storage tanks on Taylorville Station to support fire-fighting
- Maintained captive Murray River snail populations. A study continued to test the ability of Murray River snail populations to survive, reproduce and disperse in the wild when given varying levels of protection from factors such as predation
- Continued to expand the network of floodplain test-wells established under the GridWell project. Regular monitoring of all wells was continued
- A Bureau of Rural Sciences project to map groundwater salinity in the Calperum floodplain using airborne electromagnetic survey techniques continued. The bureau finished mapping floodplain conductivity/salinity, and analysed data to generate a 3-D model. The installation of additional monitoring wells was planned, based on results of the airborne survey
- The Bookmark Mallee Fire Plan was finalised

- Continued to implement key actions in the Bookmark Mallee Fire Plan. These included installing more dedicated fire-fighting water storage on Taylorville Station, fuel reduction burning on Calperum Station, fire-track/fire-break maintenance and upgrading, installing better signage in mallee areas, and upgrading evacuation points/shelter areas
- Continued existing revegetation projects, including the Revegetation Gardens research project. Enhancement of floodplain camping areas continued
- Continued a pilot project investigating approaches to revegetating a section of dune crest joining mallee woodland and floodplain ecosystems
- Developed and secured funding for a two-year restoration program for semi-arid woodland areas. This is stage 1 of a long-term project
- Completed planning for vegetation restoration in selected floodplain areas
- Continued detailed reviews of vegetation condition and weed status across both properties by skilled volunteers
- Continued regular feral animal control programs. Over 3,000 fox baits were laid and monitored, 50 kilometres of rabbit control trail established, more than 50 rabbit warrens ripped and feral goat culling continued
- Maintained a comprehensive biological monitoring program. The program covered 183 separate sites, and was supplemented by monitoring of rainfall, groundwater and surface water at a further 77 sites. A volunteer analysed accumulated Calperum rainfall records, identifying a band of consistently wetter areas across central Calperum
- Continued participation in a research program to develop and apply enhanced bird monitoring procedures led by the South Australian Government's regional Threatened Species Ecologist for Mallee Birds. Staff also continued to implement established recovery plans for threatened birds, such as the black-eared miner and malleefowl
- Continued to support a South Australian Government research program into the distribution of the bush stone-curlew, which is listed as rare under South Australian legislation
- Undertook environmental watering of Lake Merreti, along with monitoring activities to document the impact of the lake's filling

#### KRA2: Cultural heritage management

#### Major issue

• Protecting and conserving Indigenous and non-Indigenous heritage

#### Action

- Protect, conserve and encourage awareness and recognition of heritage
- Performance results 2008–09
- · Continued to monitor, protect and revegetate identified Indigenous heritage sites
- Employed the first group of full-time trainees under the Aboriginal Learning on Country Project at Calperum. This major project aims to develop natural resource management skills in the region's Aboriginal population, and is supported by government and private agencies
- Continued to protect and maintain iconic structures that recall the early pastoral industry, including the Yubalia outstation ruins, the Cooper's Camp fisherman's hut and various items of pastoral-era infrastructure

#### KRA4: Visitor management and reserve use

- Providing quality visitor services that are compatible with conservation objectives, visitor safety and management requirements
- · Communicating the values of Calperum and Taylorville
- · Conducting relevant research to support management objectives
- Conducting commercial activities that achieve ecologically sustainable use of natural resources, provide financial benefits that support the protection and/or rehabilitation of natural and cultural assets, and serve as models for the region

- · Manage and monitor day-to-day recreational use
- Develop, maintain and promote education programs for a range of audiences, using the resources at Calperum and Taylorville and the McCormick Centre for the Environment in Renmark
- Continue current research programs, develop further research programs as needed and manage research data
- Develop suitable ecologically sustainable activities
- · Review how efficiently available water resources are used

- Continued to redevelop and enhance floodplain camping areas and develop a mallee interpretive garden
- Installed new interpretive signs
- Continued occasional 'tag-along' tours to provide the public with safe access to the remote mallee woodland areas of Calperum Station
- Continued to support the development of sustainable ecotourism in the region through the Riverland Ecotourism Association, Riverland Tourism Association and Riverland Biosphere including supporting development of the region as a destination under the National Landscapes program
- Provided more than 2,400 bed-nights of accommodation to volunteers, students and visitors to Calperum Station
- Conducted educational programs for students from pre-primary to tertiary, using Calperum Station and the McCormick Centre for the Environment as key activity sites
- Calperum Station and the McCormick Centre for the Environment delivered over 3,100 person-days of education and training to students from 23 primary or secondary schools, four TAFE campuses and five universities, as well as the general community
- Continued field trips for Year 8 and Year 9 Renmark High School Science and Society and Environment courses
- · Supported professional development days for teachers of environment-related subjects
- Continued a Vocational Education and Training program for senior secondary students, with three students studying for Certificate 1 and 2 units in Conservation and Land Management under the guidance of Calperum Station staff
- Three fulltime trainees completed Certificate 2 courses in Conservation and Land Management
- Hosted a Year 12 Renmark High School student studying approaches to revegetation on Calperum, a one-year study/work experience placement for an undergraduate Wildlife Conservation student from the University of Hertfordshire (UK), and three groups of North American tertiary students under the International Student Volunteer program
- Provided a field site, operational support and exhibition facilities for the Australian National University's Engaging Visions project
- Hosted numerous field trips and camps for TAFE SA (Technical and Further Education), university and nongovernment groups studying biology, ecology and environmental management. Sessions were held on floodplain management; communities' capacity to understand and respond to environmental issues involving the river; conducting biological surveys; collecting and classifying native plants; and the aims and methods of community-based management of Calperum and Taylorville Stations
- Hosted and/or supported activities for compatible programs run by other organisations, including CSIRO's Lab on Legs and Double Helix Science Club, Waterwatch, Community Stream Sampling, Oz Green's My RiveR Murray project and the GrowSmart Careers in Science
- In conjunction with TAFE SA, ran numerous accredited training courses for volunteers and the community on natural resource management, including plant and animal identification, biological survey techniques, native seed collection and plant propagation and feral animal control
- Continued to develop spatial data management systems
- Hosted three PhD students using Calperum Station as a field research site
• Enhanced the capacity to capture and use rainwater across Calperum Station. Rainwater captured at Oak Bore Outstation now sustains visitor use and provides a fire-fighting reserve. None of Calperum's irrigation water entitlement was used for production

#### **KRA5: Stakeholders and partnerships**

#### Major issues

- Promoting the UNESCO Man and the Biosphere Programme
- Involving the community in land management
- Supporting and recognising volunteers
- Fostering long-term capacity for sustainable development in the community

#### Actions

- Promote and disseminate information that assists in achieving the goals of the Man and the Biosphere Programme
- Promote, support and oversee extensive volunteer involvement
- Develop a system for consistently recording volunteer hours
- Participate in the Riverland Biosphere Community Committee
- Performance results 2008–09
- Continued to promote Calperum and the McCormick Centre as places available for research and monitoring, education, skill-sharing and public recreation. Encouraged volunteers to foster these objectives at all suitable opportunities
- Continued to providing various forms of support and encourage existing and potential volunteers, and maintained a database to record and analyse volunteer contributions to management of the properties
- The McCormick Centre continued to disseminate information on the Man and the Biosphere Programme
- Continued regular participation in management of the Riverland Biosphere through its Community Committee
- Continued the Paddock Adoption Scheme under which community members take direct responsibility for the day-to-day management of parts of Calperum and Taylorville
- Supported the development of a diversionary program for at-risk Riverland youth, using Calperum Station as a site for environmental training activities
- Continued to engage with Adelaide Rotary clubs to promote Calperum and Taylorville as a focus for activity under Rotary's Preserve Planet Earth program

#### KRA6: Business management

#### Major issues

- Property maintenance
- Business management
- Environmentally sustainable management

#### Actions

- Maintain infrastructure
- Manage the two properties professionally and accountably

#### Performance results 2008–09

- · Continued producing seed for revegetation and occasional commercial sale
- Maintained existing equipment, buildings, fencing, tracks and other infrastructure
- Continued to developed an outstation at Casuarina Dam on Taylorville Station to support enhanced field work and to act as a forward fire-fighting facility
- · Refurbished visitor accommodation areas and developed a joint-use teaching and camp-kitchen facility
- Further upgraded computing and communications infrastructure
- Maintained a recycling program

# Marine bioregional planning

#### environment.gov.au/coasts/mbp

Marine bioregional planning is the Australian Government's approach to protecting the conservation values of the marine environments found in Commonwealth waters. Five marine regions – South-east, South-west, North-west, East and North – have been identified and are shown in Figure 3.

# North-west Orth-west South-west Orth-west South-west Orth-west The boundaries depicted do not necessarily strok South-east The boundaries depicted do not necessarily strok Decimal South-east COPYRIGHT Commonwealth of Australia, 2003 Decimal South-east

Figure 3: Marine planning regions

Marine bioregional plans being prepared under the EPBC Act will provide a clear focus on conservation and sustainable management of the marine environment and offer certainty for stakeholders. The plans will guide the minister, sectoral managers and industry in making decisions about the conservation issues and priorities in each marine region and will cover Australia's 14 million square kilometre ocean jurisdiction. Four marine bioregional plans are scheduled for completion in 2010.

Marine bioregional plans are developed in three stages: firstly a profile of the region's characteristics; secondly a draft plan; and finally a marine bioregional plan which includes network of candidate marine protected areas. Marine protected areas must be proclaimed under the EPBC Act before coming into effect. Once these are proclaimed, activities within marine protected areas are regulated through a Management Plan prepared by the Director of National Parks. The South East Commonwealth Marine Reserve Network has already been established.

The Director of National Parks is responsible for Commonwealth marine reserves which already exist in four of the five marine regions. Marine reserves are managed under delegation from the Director of National Parks by the department's Marine Division.

The North Marine Region which covers more than 715,000 square kilometres of water in the Gulf of Carpentaria, Arafura Sea and the Timor Sea as far west as the Northern Territory – Western Australian border does not contain any existing marine protected areas.

The following sections report on management of reserves in the South-east, South-west, North-west and East marine regions.

# South-east Commonwealth Marine Reserve Network





## Special features

The South-east Commonwealth Marine Reserve Network (the Reserve Network) is the first temperate, deep-sea marine reserve network in the world. This large network includes 14 reserves that are representative examples of the diverse sea floor features and associated habitats found in the South-east Marine Region. The South-east Marine Region stretches from the far south coast of New South Wales, around Tasmania and Victoria and west to Kangaroo Island off South Australia, and includes Macquarie Island Commonwealth Marine Reserve.

The Reserve Network includes significant underwater features such as canyons,

seamounts, and diverse marine life associated with them, some of which is new to science and found nowhere else in the world. The Reserve Network provides habitat and feeding grounds for a variety of birds and sea life including large iconic species such as the great white shark (*Carcharodon carcharias*), southern bluefin tuna (*Thunnus maccoyii*) and migrating whales. The deeper parts of the Reserve Network are home to a diverse range of fish and other creatures such as crabs, coral, sea urchins and sponges.

The 14 reserves in the South-east Commonwealth Marine Reserve Network are:

- Apollo Commonwealth Marine Reserve
- Beagle Commonwealth Marine Reserve
- Boags Commonwealth Marine Reserve
- East Gippsland Commonwealth Marine Reserve
- Flinders Commonwealth Marine Reserve
- Franklin Commonwealth Marine Reserve
- Freycinet Commonwealth Marine Reserve
- Huon Commonwealth Marine Reserve
- Macquarie Island Commonwealth Marine Reserve
- Murray Commonwealth Marine Reserve
- Nelson Commonwealth Marine
- South Tasman Rise Commonwealth Marine Reserve
- Tasman Fracture Commonwealth Marine Reserve
- Zeehan Commonwealth Marine Reserve

## South-east Commonwealth Marine Reserve Network Overview

Area	388,458 square kilometres	
Proclamation date	28 June 2007 (effective 3 September 2007)	
IUCN category	Includes Categories Ia, II, IV and VI. See individual reserves	
Biogeographic context	See individual reserves	
Management plan	A management plan (to include the Macquarie Island Commonwealth Marine Reserve) is currently being developed	
Other significant management documents	Australian Government annual business agreements with the Victorian and South Australian governments, Tasmania Police and Tasmanian Parks and Wildlife Service; memorandum of understanding between the Department of the Environment, Water, Heritage and the Arts and Australian Fisheries Management Authority	
Financial	Operating	\$825,413
	Capital	Not applicable
	Revenue	Not applicable
Permits/approvals	386 commercial fishing and tourism approvals	
	2 scientific approvals	
	No permits	

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the department on behalf of the Director of National Parks. The expenditure covered professional services permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities

International conventions and agreements		
World Heritage Convention	Macquarie Island and waters within a 12 nautical mile radius were listed as a World Heritage Area in 1997	
Migratory Species (Bonn) Convention	25 of the 105 listed species	
China-Australia Migratory Birds Agreement	4 of 81 listed species	
Japan-Australia Migratory Birds Agreement	5 of the 77 listed species	
Korea-Australia Migratory Birds Agreement	3 of the 59 listed species	
Other agreements	Agreement on the Conservation of Albatrosses and Petrels; International Convention for the Regulation of Whaling; Convention on the Conservation of Antarctic Marine Living Resources	

Environment Protection and Biodiversity Conservation Act 1999		
Listed fauna	Species	21 endangered 44 vulnerable 30 migratory 72 marine
	Recovery plans	11 being implemented: albatross ( <i>Diomeda</i> spp. and <i>Thalassarche</i> spp.) and giant petrels ( <i>Macronectes</i> spp.); marine turtles; 10 seabird species; southern right whale ( <i>Eubalaena australis</i> ); blue whale ( <i>Balaenoplera musculus</i> ), fin whale ( <i>B. physalus</i> ) and sei whale ( <i>B. borealis</i> ); white shark ( <i>Carcharodon carcharias</i> ); grey nurse shark ( <i>Carcharias taurus</i> ); humpback whale ( <i>Megaptera novaengliae</i> ); 4 handfish species; and sub-Antarctic fur seal ( <i>Arctocephalus tropicalis</i> ) and southern fur seal ( <i>Mirounga leonine</i> )
Listed flora	None	
Heritage	Part of Macquarie Island Commonwealth Marine Reserve on National Heritage List Part of Huon Commonwealth Marine Reserve on Commonwealth Heritage List	

Numbers of native species recorded (a)				
Mammals	Birds	Reptiles	Fish	Plants
At least 44	At least 61	At least 4	At least 158	Not known

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined. It is likely to currently underestimate species numbers.

#### Management arrangements

A management plan for the Reserve Network, which will also cover the management of Macquarie Island Commonwealth Marine Reserve, is currently being developed. The draft management plan is expected to be released for public consultation in late 2009.

A first round of public consultation was held between 19 January and 28 February 2008. Submissions were received from individuals, businesses, conservation organisations, recreational associations, industry groups and government agencies.

Interim arrangements are in place to manage use of the Reserve Network until a management plan is in operation.

## Monitoring

Relatively little is known about the plants and animals of the South-east Region's deep-water habitats. The department is developing a research and monitoring strategy to identify the main knowledge gaps for the South-east Marine Region and address them as efficiently as possible.

In the meantime, the Director of National Parks will continue to undertake and approve research projects where the aims of those projects clearly address management needs for the Reserve Network. Two major projects continued in 2008–09, studying aspects of the South-east Marine Region's ecology in both continental shelf and deep-water habitats.

## **Future challenges**

Major challenges are:

- finalising the South-east Commonwealth Marine Reserve Network management plan
- understanding the full extent of the social, economic and environmental values associated with the Reserve Network and implementing a management program that sustains these values
- liaising with key stakeholders and other community interest groups about reserve and network management
- maintaining productive partnerships with relevant state and Australian Government agencies
- developing and implementing an awareness program for key stakeholder groups and the community generally
- encouraging appropriate use of the Reserve Network, compliance with its rules and active stakeholder involvement in its day-to-day management
- establishing a research and monitoring program to guide management over the longer term.

#### Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Limited information on the ecological communities and processes within the Reserve Network
- Degradation of feeding and breeding areas within state jurisdiction on Macquarie Island that affects reserve values offshore

#### Actions

- Develop an integrated and focused research and monitoring strategy to underpin management of the Reserve Network
- Continue to work in partnership with the Tasmanian Government to protect and develop understanding of species, habitats and marine systems

#### Performance results 2008–09

- Funded research projects by the Tasmanian Aquaculture and Fisheries Institute and CSIRO were undertaken with an emphasis on determining baseline biological information for several of the reserves. The projects are due for completion late in 2009
- Inventoried scientific literature relevant to the Reserve Network
- Recommenced development of a research and monitoring strategy for the Reserve Network which had stalled due to low staffing levels
- No surveillance was conducted at Macquarie Island Commonwealth Marine Reserve due to a reliance on informal service provision arrangements and higher Coastwatch priorities elsewhere
- Tasmanian Department of Tourism, Parks, Heritage and the Arts monitored key seabird and pinniped species on Macquarie Island, and collected and removed marine debris. This work will provide valuable data on populations of key species and will minimise risk to island-based species that use Macquarie Island Commonwealth Marine Reserve as a foraging area

#### KRA4: Visitor management and park use

#### Major issues

- · Reserve use under the interim management arrangements
- Lack of Australian Government compliance and enforcement capacity for the South-east Marine Region
- · Monitoring and detection of illegal activities
- · Lack of knowledge of Reserve Network management arrangements within industry and the community
- Potential non-compliance with Reserve Network management arrangements by some recreational and commercial fishing operators

#### Actions

- Develop strategies to detect and monitor illegal activities including entering into information sharing arrangements and contracting compliance services with relevant parties
- Develop educational material, including posters, brochures and DVDs, to raise community awareness and understanding of the Reserve Network values and the management arrangements

#### Performance results 2008–09

- Implemented interim management arrangements to provide for use of the Reserve Network consistent with the zoning of the individual reserves, pending development of the Reserve Network management plan
- Entered into arrangements with state and Australian Government agencies to establish an active compliance and enforcement capacity in the South-east Marine Region
- Developed the Warden's Field Manual for the South-east Marine Region in consultation with state agencies to assist wardens in administering the EPBC Act
- · Agreed with the Australian Fisheries Management Authority to share compliance and monitoring data
- Distributed educational products (including bulletins, user guides, posters, brochures and a DVD) to stakeholders and the community
- Agreed with the Tasmanian Parks and Wildlife Service to develop a communication/education concept plan for the network with emphasis on promoting the values and appropriate use of Freycinet Commonwealth Marine Reserve

#### KRA5: Stakeholders and partnerships

#### Major issues

- Ensuring ongoing and constructive engagement with the community, key interest groups and government agencies
- Establishing complementary management arrangements with state and Australian Government agencies

#### Actions

- Develop formal partnerships with state and Australian Government agencies to establish an active compliance and enforcement capacity for the South-east Marine Region
- · Consult with key stakeholders and industry bodies on management arrangements and planning

#### Performance results 2008–09

- Signed annual business agreements with Victorian, Tasmanian and South Australian government departments to undertake sea patrols and air surveillance, including joint patrols with departmental staff
- Continued consultation with the South East Region Fishing Industry Working Group and fishing industry representatives, and funded a fishing industry liaison officer
- Consulted with stakeholders and the community on development of the Reserve Network management plan
- Continued the service level agreement with the Tasmanian Government on the cooperative management
  of marine protected areas, including Macquarie Island Commonwealth Marine Reserve, and expanded this
  to include communication and educational services

# **Apollo Commonwealth Marine Reserve**

environment.gov.au/coasts/mpa/southeast/apollo



# Special features

Apollo Commonwealth Marine Reserve is located off Apollo Bay on Victoria's west coast. It lies in the shallow waters of the continental shelf at depths of 80 to 120 metres. The reserve complements the Victorian Government's marine protected area network.

The reserve contains representative samples of the Bass Strait Province bioregion that extends from South Australia to the west of Tasmania. The area includes the Otway Depression, an undersea valley that joins the Bass Basin to the open ocean. This valley was an outlet channel from the old Bass Lake and mainland river systems during the last ice age.

The continental shelf is a high-energy environment, exposed to large swell waves from the south-west and strong tidal flows. These rough seas are home to such species as fur seals and school sharks (*Galeorhinus galeus*).

Location	Latitude 39°16′ South, Longitude 143°35′ East
Area	118,360 hectares
Proclamation date	28 June 2007 (effective 3 September 2007)
IUCN category	Category VI
Biogeographic context	IMCRA 4.0 provincial bioregion: Bass Strait Province

# **Beagle Commonwealth Marine Reserve**

environment.gov.au/coasts/mpa/southeast/beagle



# **Special features**

Beagle Commonwealth Marine Reserve is situated entirely within the shallow Bass Strait. It lies mostly between depths of 50 to 70 metres with its north-western edge abutting Victorian waters to the south-east of Wilsons Promontory.

Beagle Reserve is representative of an area of shallow continental shelf ecosystems that extends around south-eastern Australia to the east of Tasmania. It covers an area of the sea floor that is thought to have formed a land bridge with Tasmania as recently as 10,000 years ago during the last ice age.

The reserve encompasses the fauna of central Bass Strait which is expected to be especially rich based on studies of several sea floor dwelling animal groups. Its boundary encloses the Tasmanian Kent Group Marine Reserve and the Hogan and Curtis Island groups. Its ecosystems are similar to those documented for the

deeper sections of the Kent Group Marine Reserve, especially those based around rocky reefs. They support beds of encrusting, erect and branching sponges, and sediment composed of shell grit with patches of large sponges and sparse sponge habitats.

The reserve's deep rocky reefs support a rich array of life, and the area provides homes and feeding grounds for seabirds, little penguins (*Eudyptula minor*) and Australian fur seals (*Arctocephalus pusillus doriferus*). The reserve is located near the Hunter group of islands, which is an important breeding area for the fairy prion (*Pachyptila turtur*), shy albatross (*Thalassarche cauta cauta*), silver gull (*Larus novaehollandiae*), short-tailed shearwater (*Puffinus tenuirostris*), black faced cormorant (*Phalacrocorax fuscescens*), Australian gannet (*Morus serrator*), common diving petrel (*Pelecanoides urinatrix*) and little penguin (*Eudyptula minor*).

Location	Latitude 39°21′ South, Longitude 146°58′ East
Area	292,758 hectares
Proclamation date	28 June 2007 (effective 3 September 2007)
IUCN category	Category VI
Biogeographic context	IMCRA 4.0 provincial bioregion: Southeast Transition

# **Boags Commonwealth Marine Reserve**

environment.gov.au/coasts/mpa/southeast/boags



# Special features

Boags Commonwealth Marine Reserve is situated off the north-western tip of Tasmania, north of Three Hummock Island. The reserve is wholly contained within western Bass Strait with a depth range mostly between 50 and 80 metres.

The reserve represents an area of shallow continental shelf ecosystems that extends through central Bass Strait. It encompasses the fauna of central Bass Strait, which is expected to be especially rich based on studies of several sea floor dwelling animal groups.

The reserve contains a rich array of life, particularly bottom dwelling animals, as is common for the central Bass Strait area. It is also a foraging area for a variety of seabirds, including the fairy prion (*Pachyptila turtur*), shy albatross (*Thalassarche cauta cauta*), silver gull (*Larus novaehollandiae*), short-tailed shearwater

(Puffinus tenuirostri), black faced cormorant (Phalacrocorax fuscescens), Australian gannet (Morus serrator), common diving petrel (Pelecanoides urinatrix) and little penguin (Eudyptula minor). It lies adjacent to an important breeding area in Tasmania's north-west, particularly the Hunter group of islands.

Location	Latitude 40°14' South, Longitude 144°59' East
Area	53,748 hectares
Proclamation date	28 June 2007 (effective 3 September 2007)
IUCN category	Category VI
Biogeographic context	IMCRA 4.0 provincial bioregion: Bass Strait Province

# East Gippsland Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/east-gippsland



## Special features

East Gippsland Commonwealth Marine Reserve is located in Commonwealth waters off Mallacoota near the NSW/Victoria border. The reserve contains representative samples of an extensive network of canyons, continental slope and escarpment in depths from 600 metres to deeper than 4,000 metres.

The reserve has impressive geomorphic features such as rocky-substrate habitat, submarine canyons, escarpments and a knoll which juts out from the base of the continental slope.

The reserve includes both warm and temperate waters and supports free-floating aquatic plants or microscopic plant (phytoplankton) communities. Complex seasonality in oceanographic patterns influences biodiversity and local productivity. There are summertime incursions of the warm East Australian Current and a wintertime cascade of cold water from Bass Strait that sinks along the upper slope and forms

a temperature front. This cold front helps nutrients come to the surface and in turn this supports a diverse phytoplankton community and other sea life. The area may also include foraging area for wandering albatross (Diomedea exulans).

Location	Latitude 38°04' South, Longitude 150°20' East
Area	413,664 hectares
Proclamation date	28 June 2007 (effective 3 September 2007)
IUCN category	Category VI
Biogeographic context	IMCRA 4.0 provincial bioregion: Southeast Transition

# Flinders Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/flinders



# Special features

Flinders Commonwealth Marine Reserve is named after the adjacent Flinders Island in the Furneaux group of islands to the north-east of Tasmania. The reserve covers a depth range from about 40 metres on the shallow continental shelf to abyssal depths of approximately 3,000 metres at the edge of Australia's Exclusive Economic Zone.

The reserve spans continental shelf, slope and deeper water ecosystems of the major biological zone that extends around south-eastern Australia to the east of Tasmania. Key features of this area are the continental shelf, and a long portion of steep continental slope escarpment incised by a series of submarine canyons. Sea bottom habitats include sheer rocky walls and large rocky outcrops that support a rich diversity of small seabed animals, such as lace corals and sponges. These and the large expanses of sandy and muddy sediments are habitats for a wide variety of fishes and invertebrates.

Biodiversity is influenced by summertime incursions of the warm East Australian Current and associated large-scale, anti-clockwise whirlpools. Another prominent feature is a large offshore seamount believed to be too deep to have been fished. Seamounts are generally considered to be important centres of deep ocean biodiversity.

The shallower part of the reserve includes habitat important to the white fronted tern (*Sterna striata*), Australian gannet (*Morus serrator*), black faced cormorant (*Phalacrocorax fuscescens*), common diving petrel (*Pelecanoides urinatrix*), fairy prion (*Pachyptila turtur*), little penguin (*Eudyptula minor*), shy albatross (*Thalassarche cauta cauta*), silver gull (*Larus novaehollandiae*), crested tern (*Sterna bergii*), short-tailed shearwater (*Puffinus tenuirostris*) and white faced storm petrel (*Pelagodroma marina*). Importantly, it includes the habitat of a suite of continental shelf and slope shark species, including school shark (*Galeorhinus galeus*) and, between 400 and 600 metre depths, gulper sharks – Harrison's dogfish (*Centrophorus harrissoni*) and southern dogfish (*C. zeehaani*). Among the fishes, sponges and deep water corals of this reserve can also be found the giant crab (*Pseudocarcinus gigas*), weighing up to 15 kilograms and one of the largest crabs in the world.

Location	Latitude 40°00' South, Longitude 151°17' East
Area	2,704,306 hectares
Proclamation date	28 June 2007 (effective 3 September 2007)
IUCN category	Category la overall comprising:
	Sanctuary Zone Category la (2,581,195 hectares)
	Multiple Use Zone Category VI (123,111 hectares)
Biogeographic context	IMCRA 4.0 provincial bioregions: Tasmanian Province, Southeast Transition

# Franklin Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/franklin



# Special features

Franklin Commonwealth Marine Reserve is situated off the north-western tip of Tasmania, south of King Island. The reserve covers an area of continental shelf waters in a depth range of 50 to 150 metres.

The reserve represents an area of shallow continental shelf ecosystems. It incorporates two major biological zones: the Franklin Zone, which runs down the west coast of Tasmania (from which the reserve takes its name) and the biological zone that extends from South Australia and western Victoria.

This reserve provides a feeding ground for a variety of seabirds, including the fairy prion (*Pachyptila turtur*), shy albatross (*Thalassarche cauta cauta*), silver gull (*Larus novaehollandiae*), short-tailed shearwater (*Puffinus tenuirostris*), black faced cormorant (*Phalacrocorax fuscescens*), common diving petrel (*Pelecanoides urinatrix*) and, in particular, the Australian

gannet (Morus serrator) that breeds at the nearby Black Pyramid Rock – one of only eight breeding sites in Australia.

Location	Latitude 40°46' South, Longitude 144°16' East
Area	67,077 hectares
Proclamation date	28 June 2007 (effective 3 September 2007)
IUCN category	Category VI
Biogeographic context	IMCRA 4.0 provincial bioregions: Western Bass Strait Transition, Tasmanian Transition

# Freycinet Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/freycinet



# Special features

Freycinet Commonwealth Marine Reserve is named after the adjacent Freycinet National Park on the east coast of Tasmania. It covers a depth range from about 40 metres on the continental shelf to abyssal depths of approximately 3,000 metres at the edge of Australia's Exclusive Economic Zone.

The reserve spans the continental shelf, slope and deeper water ecosystems of the major biological zone that extends around south-eastern Australia to the east of Tasmania. Key features of this area are the continental shelf and a long portion of steep continental slope escarpment that joins a large offshore saddle.

Other prominent features include large offshore seamounts, which are believed to be too deep to have been fished. The large seamounts to the east of Tasmania are believed to be individually important, providing habitat to species that may be unique to each seamount and to a range of more widely occurring species.

The shallower part of the reserve includes habitat important to the white fronted tern (*Sterna striata*), Australian gannet (*Morus serrator*), black faced cormorant (*Phalacrocorax fuscescens*), common diving petrel (*Pelecanoides urinatrix*), fairy prion (*Pachyptila turtur*), little penguin (*Eudyptula minor*), shy albatross (*Thalassarche cauta cauta*), silver gull (*Larus novaehollandiae*), crested tern (*Sterna bergii*), short-tailed shearwater (*Puffinus tenuirostris*) and white faced storm petrel (*Pelagodroma marina*).

Additionally, the reserve includes the habitat of a group of continental shelf and slope shark species, including school shark (*Galeorhinus galeus*) and, between 400 and 600 metres, gulper sharks including Harrison's dogfish (*Centrophorus harrissoni*) and southern dogfish (*C. zeehaani*).

Location	Latitude 42°12′ South, Longitude 151°07′ East
Area	5,794,248 hectares
Proclamation date	28 June 2007 (effective 3 September 2007)
IUCN category	Category la overall comprising:
	Sanctuary Zone Category la (5,679,269 hectares)
	Recreational Use Zone Category II (32,330 hectares)
	Multiple Use Zone Category VI (82,649 hectares)
Biogeographic context	IMCRA 4.0 provincial bioregions: Tasmania Province, Southeast Transition, Tasmanian IMCRA Province

# Huon Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/huon



# Special features

Huon Commonwealth Marine Reserve is situated to the south of Tasmania. It covers a broad depth range from the inner continental shelf at about 70 metres, to the abyss at over 3,000 metres. The majority of the reserve's area is in deep water.

The Tasman Seamounts Marine Reserve, that was proclaimed in 1999 and covered a small part of this area, has been revoked and wholly incorporated into the Huon Commonwealth Marine Reserve.

The reserve spans the continental shelf, continental slope and deeper water ecosystems of a primary biological zone to the south of Tasmania. Close to the shore seabirds and school sharks (Galeorhinus galeus) can be found, while further into the open ocean the seabed is made up of deep plains, which are broken up by submerged mountains. A diverse range of fish, coral, squid, crabs and other animals make these seamounts their home.

The reserve's most remarkable feature is a cluster of cone-shaped submerged seamounts. The natural values of these seamounts include a rich seabed fauna characterised by high numbers of endemic species and the presence of large, erect seabed animals, including habitat-forming corals and sponges. Some of these are extremely long-lived – hundreds and possibly thousands of years old – making them some of the longest-lived animals on earth. The reserve's seamounts provide an important connection between seamounts of the Indian Ocean and the Tasman Sea.

The reserve includes an area of continental shelf and slope known to be important foraging habitat for the Australian gannet (*Morus serrator*), shy albatross (*Thalassarche cauta cauta*) and silver gull (*Larus novaehollandiae*) from adjacent nesting areas. Based on the distribution of larvae, this area is also known to provide spawning or nursery areas for important commercial fishes including the ocean perch (*Helicolenus barathri and also H. percoides*) and blue warehou (*Seriolella brama*). Other offshore geological features include terraces, rotated continental blocks, saddles, pinnacles and canyons, which are believed to provide habitat for unique fauna.

Location	Latitude 44°19' South, Longitude 147°40' East
Area	999,074 hectares
Proclamation date	28 June 2007 (effective 3 September 2007)
IUCN category	Category VI overall comprising:
	Benthic Sanctuary Category Ia (38,897 hectares)
	Multiple Use Zone Category VI (960,177 hectares)
Biogeographic context	IMCRA 4.0 provincial bioregions: Tasmanian IMCRA Province, Tasmania Province

# Macquarie Island Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/macquarie



# Special features

Macquarie Island Commonwealth Marine Reserve protects the unique and vulnerable marine ecosystems of the south-eastern portion of Commonwealth waters around Macquarie Island. The marine reserve includes significant feeding and migratory areas for a number of threatened marine mammals and seabirds. It contains a variety of large-scale benthic (seabed) habitats, each exposed to different depths, currents, nutrient levels, wave activity and temperatures.

The Macquarie Island region has unique geological characteristics. It is the only known location where oceanic crust from a normal mid-ocean ridge has been lifted above sea level in a major oceanic basin.

In 1997, Macquarie Island and waters within a 12 nautical mile radius were inscribed on the World Heritage List.

Several species found in the region are under threat, including albatross, penguin and seal species. Macquarie Island is also listed as a critical habitat under the EPBC Act for the grey headed albatross (*Diomedea chrysostoma*) and wandering albatross (*Diomedea exulans*).

Location	Latitude 55°54' South, Longitude 161°38' East	
Area	16,189,466 hectares	
Proclamation date	27 October 1999	
IUCN category	Category IV overall comprising:	
	Highly Protected Zone Category la (5,713,710 hectares)	
	Habitat Species Zone Category IV (10,475,756 hectares)	
Biogeographic context	IMCRA 4.0 provincial bioregion: Macquarie Island Province	

# Murray Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/murray



# **Special features**

Murray Commonwealth Marine Reserve stretches south of the River Murray mouth off the South Australian coast for a distance of more than 400 kilometres. It runs from the inshore state waters to the edge of Australia's Exclusive Economic Zone.

The reserve protects samples of the region's key features, including continental shelf and slope, abyssal plain and canyons. It includes areas of Australian sea lion (*Neophoca cinerea*) and New Zealand fur seal (*Arctocephalus forsteri*) habitat, a residence area for school shark (*Galeorhinus galeus*) and, at depths of 400 to 600 metres, habitat for the southern dogfish (*Centrophorus zeehaani*).

The reserve spans an extensive area across the Lacapede shelf, continental slope and deeper water ecosystems, that extends from South Australia to the west of Tasmania. It contains one of the most spectacular geological formations on the Australian

continental block, the Murray Canyons. The canyons are situated south of Kangaroo Island, off the South Australian coast, and stretch for more than 150 kilometres. Deeper than America's Grand Canyon and more than twice the height of Mount Kosciuszko, the Murray Canyons descend to 4,600 metres below sea level.

The marine life that inhabits the Murray Canyons is supported by nutrient-rich sediments that have been deposited over thousands of years by the River Murray. Occasional seasonal upwelling occurs in this area, where nutrient-rich deeper waters are brought to the surface. This upwelling stimulates the food chain by encouraging the growth of phytoplankton, which in turn become food for larger predators, resulting in a profusion of life.

Location	Latitude 37°26′ South, Longitude 137°12′ East	
Area	2,580,312 hectares	
Proclamation date	28 June 2007 (effective 3 September 2007)	
IUCN category	Category la overall comprising: Multiple Use Zone Category VI (590,687 hectares) Special Purpose Zone Category VI (714,709 hectares) Sanctuary Zone Category la (1,274,916 hectares)	
Biogeographic context	IMCRA 4.0 provincial bioregions: Spencer Gulf IMCRA Province, Southern Province, West Tasmania Transition	

# Nelson Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/nelson



## Special features

Nelson Commonwealth Marine Reserve lies off the far south-east corner of South Australia and spans the deep water ecosystems (below 3,000 metres) extending from South Australia to the west of Tasmania. It encloses geological features including plateaus, knolls, canyons and the abyssal plain (a large area of extremely flat or gently sloping ocean floor just offshore from a continent). The knoll features a rocky substrate above the abyssal plain.

Scientists believe these areas are home to unique fauna, but little is known about what lives on the seabed of this reserve. The reserve is known to be an important area for a number of whale species including the southern right (*Eubalaena australis*), sperm (*Physeter macrocephalus*), minke (*Balaenoptera acutorostrata*), killer (*Orcinus orca*), long-finned pilot (*Globicephala melas*), short finned pilot (*Globicephala macrorhynchus*) and blue (*Balaenoptera musculus*).

Location	Latitude 39°18' South, Longitude 139°52' East	
Area	612,311 hectares	
Proclamation date	28 June 2007 (effective 3 September 2007)	
IUCN category	Category VI	
Biogeographic context	IMCRA 4.0 provincial bioregion: West Tasmania Transition	

# South Tasman Rise Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/south-tasman-rise



# Special features

South Tasman Rise Commonwealth Marine Reserve covers an area of deep ocean to the south-east of Tasmania. It includes a section of the mid-continental slope of the South Tasman Rise, at depths of 1,200 to 3,000 metres. Its southern edge follows the boundary of Australia's Exclusive Economic Zone, 200 nautical miles from land.

The reserve spans the mid-continental slope and deeper water ecosystems to the south of Tasmania. It encloses a submerged ridge of continental rock that stands as the last remnant of the link between Australia and Antarctica.

Deformed by the massive rifting process when the Australian continental block moved north, the South Tasman Rise supports unique environments for marine life and is an area of significant scientific interest.

The reserve contains several seamounts, some of which have flat summits, which indicates a period of exposure above the surface at some time.

Location	Latitude 46°17′ South, Longitude 149°04′ East	
Area	2,770,437 hectares	
Proclamation date	28 June 2007 (effective 3 September 2007)	
IUCN category	Category VI	
Biogeographic context	IMCRA 4.0 provincial bioregion: Tasmania Transition	

# **Tasman Fracture Commonwealth Marine Reserve**

environment.gov.au/coasts/mpa/southeast/tasman-fracture



## Special features

Tasman Fracture Commonwealth Marine Reserve extends south-west of Tasmania from the continental shelf to the Exclusive Economic Zone boundary, 200 nautical miles from land. It complements the Port Davey Marine Reserve declared by the Tasmanian Government.

The reserve spans the continental shelf, continental slope and deeper water ecosystems to the south of Tasmania. It is scored by steep canyons and encloses other geological features, which are believed to be characterised by unique fauna. These features include steep escarpments and troughs, saddles, canyons, basins and part of a plateau that is over 400 kilometres long and rises up to three kilometres above the sea floor.

The northernmost section of the reserve includes a drowned river valley. The natural values of this reserve include important habitat for the fairy prion (*Pachyptila turtur*), little penguin (*Eudyptula minor*), common diving petrel (*Pelecanoides urinatrix*), short-tailed shearwater (*Puffinus tenuirostris*), silver gull (*Larus novaehollandiae*), school shark (*Galeorhinus galeus*) and blue warehou (*Seriolella brama*).

Due to its location, extending south of the subtropical convergence zone and into the sub-Antarctic front, the reserve's fauna includes sub-Antarctic fishes and seabed invertebrates in at least the continental shelf and continental slope areas. Biodiversity in the reserve is also influenced by the Zeehan Current, which is the most easterly extent of flow from the Indian Ocean around southern Australia.

Location	Latitude 44°49' South, Longitude 144°49' East	
Area	4,250,056 hectares	
Proclamation date	28 June 2007 (effective 3 September 2007)	
IUCN category	Category VI overall comprising:	
	Sanctuary Zone Category 1a (69,212 hectares)	
	Multiple Use Zone Category VI (2,049,572 hectares)	
	Special Purpose Zone Category VI (2,131,272 hectares)	
Biogeographic context	IMCRA 4.0 provincial bioregions: Tasmania Province, West Tasmania Province, Tasmanian IMCRA Province	

# Zeehan Commonwealth Marine Reserve

environment.gov.au/coasts/mpa/southeast/zeehan



## **Special features**

Zeehan Commonwealth Marine Reserve lies to the west and south-west of King Island off north-west Tasmania. It covers a broad depth range from the shallow continental shelf of approximately 50 metres to the abyssal plain that is over 3,000 metres deep.

The reserve spans the continental shelf, continental slope and deeper water ecosystems of the major biological zone that extends from South Australia to the west of Tasmania. A significant feature of the reserve is a series of four submarine canyons that incise the continental slope, extending from the shelf edge to the abyssal plains. Biodiversity and productivity on the outer shelf and upper slope in the reserve are influenced by the Zeehan Current and its interactions with the canyons.

The reserve includes a variety of seabed habitats including rocky limestone banks. These support rich

animal communities, made up of large sponges and other permanently attached or fixed invertebrates on the continental shelf. There are also extensive 'thickets' of low invertebrate animals – mostly lace corals and sponges – on the continental slope. These communities are exceptionally diverse and include species new to science. The rocky limestone banks provide important seabed habitats for a variety of commercial fish species, including Australia's giant crab (*Pseudocarcinus gigas*). Concentrations of larval blue warehou (*Seriolella brama*) and ocean perch (*Helicolenus barathri and also H. percoides*) indicate the area's role as a nursery ground.

The reserve is also a foraging area for a variety of seabirds, including the fairy prion (*Pachyptila turtur*), shy albatross (*Thalassarche cauta cauta*), silver gull (*Larus novaehollandiae*) and short-tailed shearwater (*Puffinus tenuirostris*).

Location	Latitude 41°10′ South, Longitude 142°18′ East	
Area	1,989,697 hectares	
Proclamation date	28 June 2007 (effective 3 September 2007)	
IUCN category	Category VI overall comprising: Multiple Use Zone Category VI (93,298 hectares) Special Purpose Zone Category VI (1,896,399 hectares)	
Biogeographic context	IMCRA 4.0 provincial bioregions: West Tasmania Transition, Western Bass Strait IMCRA Transition, Tasmania Transition	

# South-west Marine Region

#### environment.gov.au/coasts/mbp/south-west



# **Special features**

The South-west Marine Region covers more than 1.3 million square kilometres of ocean waters from the eastern tip of Kangaroo Island off the South Australian coast to waters off Shark Bay, Western Australia. The region features high biological diversity and a large number of species found nowhere else in the world.

The flora and fauna include a blend of tropical, subtropical and temperate species. Temperate species dominate the southern and eastern parts of the region while tropical species become more common moving north.

The Leeuwin Current has a significant impact on the productivity, ecosystems and biodiversity in the region. It is a shallow current that transports warm tropical water southward along the continental shelf, and east to Cape Grim, the north-west cape of Tasmania. The Flinders and seasonal currents also have strong influences on the region's environment.

Australia's deepest waters are found in the South-west Marine Region, reaching a maximum depth of 5,900 metres in the Diamantina Fracture Zone south of Cape Leeuwin. The region is distinguished by a continental shelf with high wave exposure, punctuated by island groups, fringing reefs and sheltered habitats for marine communities. The continental slope is one of the most canyon-rich areas on the Australian margin and the region contains vast areas of abyssal plain.

The region is acknowledged as an area of global significance as breeding or feeding grounds for a number of rare and endangered marine animals, including Australian sea lions (*Neophoca cinerea*), southern right whales (*Eubalaena australis*) and white sharks (*Carcharodon carcharias*). It was recently identified as a key area for beaked whales, a group of whales that is very rarely seen and of which little is known. The region also provides habitat for a large number of seabird species; some, like the Australian lesser noddy (*Anous tenuirostris melanops*), are found nowhere else in the world.

The South-west Marine Region is adjacent to the Western Australian and South Australian coasts, where a range of industries rely on the ocean. The industries and activities of most significance include aquaculture, commercial and recreational fishing, defence training activities, marine tourism and recreation, petroleum exploration and production, and ports and shipping.

# Marine bioregional planning

The South-west Bioregional Profile was released in October 2007 (see environment.gov.au/coasts/mbp/ publications/south-west/sw-region-profile.html) The profile identifies the conservation values of the region: 105 protected species, 17 key ecological features, five historic shipwrecks including the HMAS *Sydney* and HSK *Kormoran*, and one large marine reserve, the Great Australian Bight Marine Park.

The department has identified areas for further assessment across the region and is undertaking consultation to inform the design of reserve boundaries and zonings in these areas.

The draft South-west Marine Bioregional Plan is due to be completed late in 2009. The draft plan will include a proposal for a South-west Commonwealth Marine Reserves Network.

## **Existing Commonwealth marine reserves**

The South-west Marine Region includes one existing Commonwealth marine reserve, the Great Australian Bight Marine Park (Commonwealth Waters).

# Great Australian Bight Marine Park (Commonwealth Waters)

environment.gov.au/coasts/mpa/gab



# Special features

The Great Australian Bight (GAB) Marine Park (Commonwealth Waters) protects marine mammal habitat and the ecological communities and sediments of the seabed in Commonwealth waters adjacent to the South Australian GAB Marine Park (State Waters). Notable EPBC Act listed species are the endangered southern right whale (*Eubalaena australis*) and the vulnerable Australian sea-lion (*Neophoca cinerea*).

The park is adjacent to Head of Bight, the most important breeding place for southern right whales in Australian waters and one of the most important, discrete breeding locations for the species in the world. The area also offers a unique opportunity to observe the species in a pristine environment.

The park protects a transect of the wide continental shelf of the Great Australian Bight, which is remarkable for its high levels of invertebrate endemism and diversity.

The park is also the largest representative sample of the southern continental margin of Australia in a reserve.

The park provides for the sustainable use of its natural resources, including commercial fishing and mineral exploration, while ensuring these activities do not impact on the park's values.

Location	Latitude 31°43' South, Longitude 130°23' East		
Area	1,937,162 hectares		
Proclamation date	22 April 1998		
IUCN category	Category VI overall comprising: Marine Mammal Protection Zone Category VI (385,380 hectares) Benthic Protection Zone Category VI (1,608,463 hectares) (Overlap of these two zones = 56,681 hectares)		
Biogeographic context	IMCRA 4.0 provincial bioregions: Great Australian Bight Shelf, and Southern Province		
Management plan	Second plan expires 16 May 2012		
Other significant management documents	Service level agreement and subsidiary annual business agreements between the Australian and South Australian governments		
Financial	Operating	\$258,712*	
	Capital	Not applicable	
	Revenue	Not applicable	
Visitors	None recorded		
Permits	30 commercial fishing, 1 research		

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements		
Migratory Species (Bonn) Convention	28 of 105 listed species	
China-Australia Migratory Birds Agreement	2 of 81 species	
Japan–Australia Migratory Birds Agreement	3 of 77 species	
Korea–Australia Migratory Birds Agreement	2 of 59 species	
Agreement on the Conservation of Albatrosses and Petrels	15 of 26 species	

Environment Protection and Biodiversity Conservation Act 1999		
Listed fauna	Species	6 endangered 17 vulnerable 31 migratory 57 marine
	Recovery plans	Four implemented: southern right whale ( <i>Eubalaena australis</i> ); great white shark ( <i>Carcharodon carcharias</i> ); marine turtles; albatross ( <i>Diomeda</i> spp. and <i>Thalassarche</i> spp.) and giant petrels ( <i>Macronectes</i> spp.) One in preparation: Australian sea-lion ( <i>Neophoca cinerea</i> )
Listed flora	None	

Numbers of native species recorded <sup>(a)</sup>				
Mammals	Birds	Reptiles	Fish	Invertebrates
38	29	1	185	Over 800 <sup>(b)</sup>

(a) Species numbers are from a recent species inventory based on documented sightings in the park and adjacent areas. The inventory is still new and is continuing to be updated and refined; it is likely to underestimate current species numbers.

(b) Based on the following research:

Ward, T.M., Sorokin, S.J., Rogers, P.J., McLeay, L.J. and Turner, D.J. (December 2003). *Benthic Protection Zone of the Great Australian Bight Marine Park: 3. Pilot Study for Performance Assessment (Volume 1)*. South Australian Research and Development Institute (Aquatic Sciences), Final Report to National Parks and Wildlife South Australia and the Commonwealth Department for Environment and Heritage.

Currie, D.R., Sorokin, S.J. and Ward, T.M. (2007). Infaunal Assemblages of the Eastern Great Australian Bight: Effectiveness of a Benthic Protection Zone in Representing Regional Biodiversity. South Australian Research and Development Institute (Aquatic Sciences), Adelaide.

Currie, D.R., Sorokin, S.J. and Ward, T.M. (2008). *Performance Assessment of the Benthic Protection Zone of the Great Australian Bight Marine Park: Epifauna*. South Australian Research and Development Institute (Aquatic Sciences), Adelaide.

#### Management arrangements

The park is managed by the department's Marine Division under delegation from the Director of National Parks. On-site management and surveillance are provided through formal arrangements with a number of other government agencies.

The Australian Government and the South Australian Government manage the park through the joint GAB Marine Park Steering Committee. A park manager is employed jointly by the department and the South Australian Department for Environment and Heritage. The GAB Consultative Committee, with community representatives, advises the steering committee on management issues.

#### Monitoring

A survey of the seabed communities of the Benthic Protection Zone was conducted in October 2006. The data collected from this survey and one in 2002 are contributing to a 20-year performance assessment program for the Benthic Protection Zone.

A study was completed into the foraging range and behaviour of the Australian sea-lion, its interactions with commercial fishing vessels, and how the risks of injury resulting from those interactions can be minimised.

## Future challenges

Major challenges are:

- consolidating past and ongoing research into a program to assess the park's performance
- increasing the effectiveness of compliance strategies, including improving the fishing industry's compliance reporting

# Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Lack of baseline information on seabed surface and below seabed surface species and their biology
- Lack of information on the foraging behaviour and abundance of Australian sea-lions and the effects of human interactions with Australian sea-lion populations

#### Action

· Continue to establish baseline data

#### Performance results 2008–09 (in cooperation with the South Australian Government)

- Completed a report on the second round of ongoing baseline studies of seabed communities
- Developed a database to assist with continuing population studies on regional southern right whales
- Completed a study into Australian sea-lion foraging behaviour and interactions with fishing vessels and the park's effectiveness in protecting Australian sea-lions

#### KRA4: Visitor management and park use

#### Major issues

- · Establishing effective management arrangements to prevent illegal fishing
- · Encouraging community participation in management activities

#### Actions

- Review surveillance plans
- Continue aerial surveillance by Coastwatch, on-ground surveillance by Yalata Land Management, and sea patrols by the SA Department of Primary Industries and Resources
- Investigate suspected illegal activity
- · Continue to support the Yalata Community's participation in park management activities

#### Performance results 2008–09 (in cooperation with the South Australian Government)

- Advertised annual Marine Mammal Protection Zone closures
- · Agencies undertook land, sea and aerial surveillance and operational patrols. No illegal activity was recorded
- · Monitored permits for commercial fishers
- The Yalata Community provided surveillance and beach clean-ups

#### KRA5: Stakeholders and partnerships

#### Major issue

· Maintain productive relationships with partners

#### Actions

- Negotiate and implement the annual business agreement with South Australia
- Develop compliance monitoring arrangements with the Australian Fisheries Management Authority
- · Keep stakeholders informed of, and involved in, management activities

Performance results 2008–09 (in cooperation with the South Australian Government)

- Renewed the annual business agreement covering research, operations, visitor management, education, and compliance and enforcement
- Continued to raise compliance issues with the Australian Fisheries Management Authority and industry sectors
- Liaised with stakeholders from all sectors through the steering and consultative committees
- Provided advice to the mining and energy sector on requirements for carrying out mining operations in the park
- · Liaised with other areas of the department on conservation of the Australian sea-lion

#### KRA6: Business management

#### Major issue

• Community understanding and appreciation of the park's values

#### Actions

- · Review and implement a communications plan
- Disseminate the management plan and interpretive material

#### Performance results 2008–09 (in cooperation with the South Australian Government)

- · Reviewed and implemented the communications plan
- Informed the media about park activities
- Informed the public about park values and uses, including via state and Australian Government websites
  and the Department of the Environment, Water, Heritage and the Arts information booth at the annual Australian
  Petroleum Production and Exploration Association Conference

# North-west Marine Region

#### environment.gov.au/coasts/mbp/north-west



# **Special features**

The North-west Marine Region covers Commonwealth waters from Kalbarri, south of Shark Bay, to the Western Australian–Northern Territory border. It includes approximately 1.07 million square kilometres of ocean.

A unique combination of biophysical features and ecological processes differentiates the North-west Marine Region from other marine regions around Australia. The region comprises relatively shallow waters with more than 50 per cent of its waters shallower than 500 metres depth. Its oceanography is complex: the Indonesian Throughflow is a dominant influence in the majority of the region, with the Leeuwin Current dominant in the south. Both these currents are significant drivers of the region's ecosystems.

The region's waters are predominantly warm tropical waters with low salinity and are generally nutrient poor. As such, the region is considered to have a generally low level of productivity. However, there are sporadic bursts of higher productivity in parts of the region, which are thought to be associated with specific events.

Despite overall low levels of productivity, the region supports a high biodiversity of tropical marine species, predominantly of Indo-Pacific origin and distribution, due to the influence of the Indonesian Throughflow. However, the region has a low level of endemicity when compared to most other Australian waters, particularly those of the south.

There are 149 EPBC Act listed species that occur within the region. The region contains internationally significant breeding and feeding grounds for a number of threatened and migratory marine animals.

## Marine bioregional planning

The North-West Marine Bioregional Profile was released in November 2008 (see environment.gov.au/coasts/mbp/ north-west).

## **Existing Commonwealth marine reserves**

The North-west Marine Region includes four existing Commonwealth marine reserves. Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve are north-west of Darwin: Mermaid Reef Marine National Nature Reserve north-west of Broome, Western Australia and Ningaloo Marine Park (Commonwealth Waters) which lies off the coast of Western Australia.

The reserves are managed by the department's Marine Division under delegation from the Director of National Parks.

# Ashmore Reef National Nature Reserve

environment.gov.au/coasts/mpa/ashmore



# **Special features**

Ashmore Reef National Nature Reserve, located approximately 830 kilometres north-west of Darwin, is renowned for its high biological diversity and unique marine ecosystems. It contains a variety of marine habitats, including a coral reef system, lagoons, abundant seagrass beds and extensive tidal sand flats, as well as vegetated sand islands.

Ashmore Reef is home to a variety of fish, coral, mollusc and other invertebrate species. Seventeen species of sea snakes have been recorded at Ashmore Reef, which is the highest known diversity and density of sea snakes in the world. The reserve is also an important breeding and feeding habitat for a number of threatened species, including dugong (*Dugong dugon*), green turtles (*Chelonia mydas*), loggerhead turtles (*Caretta caretta*) and hawksbill turtles (*Eretmochelys imbricata*).

The reserve's three islands have a combined area of 112 hectares and support some of the most important seabird rookeries on the North-west Shelf. The reserve is an important staging point for migratory wetland birds, especially waders. More than 93 species of seabirds have been recorded at Ashmore Reef, of which 45 are listed in international agreements for the conservation of birds and their habitats.

Location	Latitude 12°15' South, Longitude 123°05' East	
Area	58,337 hectares	
Proclamation date	28 July 1983	
IUCN category	Category la: 54,991 hectares	
	Category II: 3,346 hectares	
Biogeographic context	IMCRA 4.0 provincial bioregion: Timor Province	
Management plan	Second plan expired 25 June 2009; a new plan will be developed at the conclusion of the marine bioregional planning process for the North-west Marine Region	
Other significant management documents	Australian Government memorandum of understanding with Indonesia	
Financial	Operating	\$348,149*
	Capital	Not applicable
	Revenue	Not applicable
Visitors/users	76 Indonesian vessels; 9 recreational vessels (yachts, catamarans)(a)	
Permits	1 commercial journalism; 1 scientific (bird research)	

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

(a) These figures are taken from the records of vessels boarded by Customs officers while present in the reserve, as at 30 June 2008.

International conventions and agreements		
Wetlands (Ramsar) Convention	The entire reserve is listed	
Migratory Species (Bonn) Convention	28 of the 105 Australian listed species	
China–Australia Migratory Birds Agreement	44 of 81 listed species	
Japan–Australia Migratory Birds Agreement	45 of 77 listed species	
Korea-Australia Migratory Birds Agreement	35 of 59 listed species	
Other agreements	Under a memorandum of understanding with Indonesia, traditional Indonesian fishers are allowed access to an area that includes the reserve	

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	2 vulnerable 51 migratory 104 marine	
	Recovery plans	1 being implemented: marine turtles	
Listed flora	None		
Heritage	On Commonwealth Heritage List		

Numbers of native species recorded(a)					
Mammals	Birds	Reptiles	Fish	Invertebrates	Plants
1	93	19	810	1,371	44

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined. It is likely to currently underestimate species numbers.

## Management arrangements

The reserve is managed by the department's Marine Division under delegation from the Director of National Parks. On-site management and surveillance are provided through formal arrangements with a number of other government agencies.

The reserve's management plan expired on 25 June 2009. Since then the reserve has been managed under interim arrangements which are consistent with the expired management plan. These arrangements will continue until a new management plan is developed at the conclusion of the marine bioregional planning process for the North-west Marine Region.

The Australian Customs and Border Protection Service carried out on-site management of the reserve and has maintained a permanent enforcement presence since April 2008. Regular surveillance flights over Ashmore were conducted and Departmental staff visited the reserve in October 2008 and May 2009 to implement and assess reserve management activities.

## Monitoring

Results from the final stage of a three-part sea snake monitoring program by Charles Darwin University, which began in November 2005, were received in November 2008. The program reported a general decline in sea snake diversity and density at Ashmore Reef, which continued throughout the life of the monitoring program. Although the reason for the decline remains unknown it is speculated that a change in the physical or chemical environment at the reserve has caused the decline.

A water quality monitoring program was established in 2009. The program records regular measurements of nine water quality parameters to allow changes over time to be detected. It is expected that the results will be used to further investigate the decline in sea snakes at the reserve.

A marine survey was undertaken in May 2009 by James Cook University to assess the abundance and diversity of small and large fishes, hard and soft corals, holothurians (sea cucumbers), trochus, *Tridacna* clams and marine megafauna. Preliminary results indicate that coral cover has increased since 2005but the densities of sharks, pelagic fishes, trochus, holothurians and *Tridacna* clams remain low. Final results and analysis are expected in 2009–10.

# Future challenges

Major challenges are:

- identifying the reasons for the decline in sea snake abundance and diversity
- managing potential introduced species
- maintaining a permanent compliance presence at the reserve
- managing for the potential impact of climate change, including coral bleaching events and loss of niche habitats and associated species.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Illegal fishing
- Coral bleaching and species loss
- Introduction of pest species

#### Actions

- Enforce access and fishing restrictions
- Collaborate with other Australian Government agencies in working with Indonesian officials and fishers to improve management of the MoU Box fishery
- · Encourage and facilitate research and monitoring of the reef and island environments
- Manage threats identified in the Marine and Terrestrial Introduced Species Prevention and Management Strategy (2004)
- Monitor and remove weeds and marine debris from the reserve
- Implement quarantine, bilge and ballast water protocols

#### Performance results 2008–09

- The Customs vessel Ashmore Guardian continued its near-permanent compliance and management presence
   at the reserve
- Customs officers enforced access and fishing restrictions. Officers provided information to 75 fishing vessels in the area and advised crews of restrictions. Suspected illegal activities were investigated and warnings issued
- Analysed data from the 2009 marine survey. Preliminary results indicate an increase in coral cover since 2005 while the densities of trochus, holothurians, Tridacna clams, sharks and pelagic fish remain low
- · Continued collection and analysis of marine debris
- Collated sea surface temperature data for the past seven years into a video animations to enable the identification of temperature trends

#### KRA4: Visitor management and park use

#### Major issue

· Damage to the reef from anchoring vessels

#### Actions

- Maintain moorings
- Monitor visitation

#### Performance results 2008–09

- Conducted maintenance on the moorings installed at Ashmore Reef to ensure they remain safe for visitor use
- Customs officers monitored visitors' use of moorings
- Distributed information about appropriate mooring use via a brochure and the Department's website
- Published a new brochure, also available on the website, on the reserve's interim management arrangements, values and rules. Produced a brochure in Bahasa explaining the rules of the reserve

#### KRA5: Stakeholders and partnerships

#### Major issues

- Illegal foreign fishing
- Effective working and liaison arrangements with the management service provider, the Australian Customs and Border Protection Service

#### Actions

- Collaborate with Australian Government agencies involved in revising and implementing an integrated management approach for Indonesian fishing in the MoU Box
- · Maintain the close working relationship with Customs

#### Performance results 2008–09

- Consulted with the Department of Agriculture, Fisheries and Forestry to address overfishing issues in the MoU Box on a regional and cooperative basis
- Held regular meetings and consultation with Customs
- Provided warden training for Customs officers
- Developed a memorandum of agreement with Customs for their operations at the reserve

# **Cartier Island Marine Reserve**

environment.gov.au/coasts/mpa/cartier



# Special features

Cartier Island Marine Reserve is located in the Indian Ocean, approximately 790 kilometres north-west of Darwin and approximately 45 kilometres south-east from Ashmore Reef. The reserve contains a variety of marine habitats including a coral reef system, a sand island and extensive tidal sand flats.

The reserve is home to a variety of fish, coral, sponge, echinoderm, mollusc and other invertebrate species. Its varied habitats support an unusually high diversity and density of sea snakes, some of which are endemic to the region. The reserve supports populations of feeding, breeding and nesting sea turtles and may also support dugongs (*Dugong dugon*).

Location	Latitude 12°32' South, Longitude 123°33' East			
Area	17,238 hectares			
Proclamation date	7 June 2000			
IUCN category	Category la			
Biogeographic context	IMCRA 4.0 provincial bioregion: Timor Province			
Management plan	First plan expired 25 June 2009; a new plan will be developed at the conclusion of the marine bioregional planning process for the North-west Marine Region			
Other significant management documents	Australian Government Memorandum of Understanding with Indonesia; Standard Operating Procedures (included in an operations manual) for Australian Customs and Border Protection Service officers operating at the reserve			
Financial	Operating	Not applicable*		
	Capital	Not applicable		
	Revenue	Not applicable		
Visitors/users	Researchers (marine survey), Departmental officers (2 patrols), commercial tourists, Customs officers (routine patrols)			
Permits	1 commercial tourism			

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements			
Migratory Species (Bonn) Convention	1 of 105 listed Australian species		
Other international agreements	Under a Memorandum of Understanding with Indonesia, traditional		
	Indonesian fishers are allowed access to an area that includes the		
	reserve		

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	8 marine	
	Recovery plans	1 being implemented: marine turtles	
Listed flora	None		

Numbers of native species recorded(a)					
Mammals	Birds	Reptiles	Fish	Invertebrates	Plants
1	Unknown	17	810	1,371	0

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined. It is likely to currently underestimate species numbers.

#### Management arrangements

The reserve is managed by the department's Marine Division under delegation from the Director of National Parks. On-site management and surveillance are provided through formal arrangements with a number of other government agencies.

The reserve's management plan expired on 25 June 2009. Since then the reserve has been managed under interim arrangements which are consistent with the expired management plan. These arrangements will continue until a new management plan is developed at the conclusion of the marine bioregional planning process in the North-west Marine Region.

Cartier Island and Ashmore Reef reserves are managed together, being approximately 45 kilometres apart. The Australian Customs and Border Protection Service has a permanently stationed enforcement vessel at Ashmore Reef that assists with on-site management. Compliance and enforcement activities were supported by regular surveillance flights over the Cartier Island Marine Reserve, and departmental staff visited the reserve in October 2008 and May 2009 to implement and assess reserve management activities.

## Monitoring

Results from the final stage of a three-part sea snake monitoring program by Charles Darwin University, which began in November 2005, were received in November 2008. Unlike Ashmore Reef, the program reported that sea snake diversity and density at Cartier Island was similar to that recorded in previous surveys.

Monitoring to date has shown that the major threats to the reserve are from illegal foreign fishing and climatic disturbances such as cyclones and coral bleaching.

A marine survey was undertaken in May 2009 by James Cook University to assess the abundance and diversity of small and large fishes, hard and soft corals, holothurians (sea cucumbers), trochus, *Tridacna* clams and marine mega-fauna. Preliminary results indicate that coral cover has increased significantly since 2005 but the densities of sharks, pelagic fishes, trochus, holothurians and *Tridacna* clams remain low. Final results are expected in 2009–10.

## **Future challenges**

Major challenges are:

- compliance and enforcement in this remote location
- managing for the potential impacts of climate change.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Illegal access
- Overfishing

#### Actions

- Enforce access and fishing restrictions
- Liaise with the Department of Agriculture, Fisheries and Forestry and Indonesian officials to improve management of the MoU Box fishery
- Encourage and facilitate reef research and monitoring

#### Performance results 2008–09

- The Customs vessel Ashmore Guardian continued to protect the reserve by implementing compliance and enforcement measures and on-site management
- Customs officers enforced access and fishing restrictions. Officers approached all fishing vessels in the area and advised crews of restrictions. Suspected illegal activities were investigated and warnings issued
- Collated sea surface temperature data for the past seven years into a video animation to enable the identification of temperature trends
- Analysed data from the marine survey. Preliminary results indicate an increase in coral cover since 2005; however the densities of trochus, holothurians, Tridacna clams, sharks and pelagic fish remain low
- · Continued to collect and analyse marine debris

#### KRA5: Stakeholders and partnerships

#### Major issues

- Illegal foreign fishing
- Effective working and liaison arrangements with the management service provider, the Australian Customs and Border Protection Service

#### Actions

- Collaborate with Australian Government agencies involved in revising and implementing an integrated management approach for Indonesian fishing in the MoU Box
- · Maintain the close working relationship with Customs

#### Performance results 2008–09

- Consulted with the Department of Agriculture, Fisheries and Forestry to address overfishing issues in the MoU Box on a regional and cooperative basis
- Held regular meetings and consultation with Customs
- Provided warden training for Customs officers
- Published a new brochure, also available on the website, on the reserve's interim management arrangements, values and rules
- Developed a memorandum of agreement with Customs for their operations at the reserve
## Mermaid Reef Marine National Nature Reserve

environment.gov.au/coasts/mpa/mermaid



## Special features

Mermaid Reef is the most north-easterly of three shelf-edge reefs in the Rowley Shoals, located approximately 300 kilometres north-west of Broome, Western Australia. No land is exposed above the high water mark at Mermaid Reef, which places it under Australian Government jurisdiction.

Clerke Reef and Imperieuse Reef, the two southerly reefs of the Rowley Shoals, have permanent land above the high water mark and form part of the Rowley Shoals Marine Park, declared under Western Australian legislation.

The three reefs of the Rowley Shoals are the most perfect geological examples of shelf-edge reefs in Australian waters. Each reef includes spectacular and unusual underwater topography and life forms that have attracted divers from around the world.

Many coral and fish species that inhabit the shoals are at the limit of their distribution. The coral and fish communities of the Rowley Shoals are unique in their relative abundance of species.

Location	Latitude 17°06' South, Longitude 119°38' East	
Area	53,987 hectares	
Proclamation date	21 March 1991	
IUCN category	Category la	
Biogeographic context	IMCRA 4.0 provincial bioregion: Northwest Transition	
Management plan	First plan expired 16 May 2007; a new plan will be developed at the conclusion of the marine bioregional planning process for the North-west Marine Region	
Other significant management documents	Service level agreement and annual business agreements with the Western Australian Department of Fisheries and Western Australian Department of Environment and Conservation	
Financial	Operating	\$132,029*
	Capital	Not applicable
	Revenue	Not applicable
Visitors/users	250–350	
Permits	3 commercial tour operators, 3 scientific research	

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements		
Migratory Species (Bonn) Convention	17 of 105 Australian listed species	
China-Australia Migratory Birds Agreement	13 of 81 listed species	
Japan–Australia Migratory Birds Agreement	11 of 77 listed species	
Korea-Australia Migratory Birds Agreement	11 of 59 listed species	

Environment Protection and Biodiversity Conservation Act 1999		
Listed fauna	Species	2 endangered 7 vulnerable 13 migratory 48 marine
	Recovery plans	3 being implemented: great white shark (Carcharodon carcharias); marine turtles; humpback whale (Megaptera novaeangliae)
Listed flora	None	
Heritage	On Commonwealth Heritage List (part of reserve only)	

Numbers of native species recorded(a)					
Mammals	Birds	Reptiles	Fish	Invertebrates	Plants
13	19	18	Over 390	Over 633	No land plants

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined. It is likely to currently underestimate species numbers.

### Management arrangements

The Mermaid Reef Marine National Nature Reserve is managed under a service level agreement and annual business agreements between the Director of National Parks, the WA Department of Environment and Conservation and the WA Department of Fisheries. The WA agencies implement management actions on behalf of the Director of National Parks. The Australian Customs and Border Protection Service provide regular aerial surveillance of the reserve. Departmental staff visited the reserve in July and October 2008 and June 2009 to implement and assess reserve management activities.

The first management plan expired on 16 May 2007 and since then the reserve has been managed under interim arrangements which are consistent with the expired management plan. These arrangements will continue until a new management plan is developed at the conclusion of the marine bioregional planning process in the North-west Marine Region.

## Monitoring

Monitoring to date has shown that the major threats to Mermaid Reef are from climatic disturbances, such as cyclones and coral bleaching, and human impacts, such as anchoring and pollution. Fishing has also been identified as a potential pressure on Mermaid Reef. Regular surveillance is conducted to monitor for such activities.

A volunteer monitoring program, ReserveWatch, was launched at the reserve in June 2009. This program asks reserve visitors to report their observations on habitat condition and human impacts to management. Results from the program's first season are expected in January 2010 (see case study on page 111).

## **Future challenges**

Major challenges are:

- reviewing the need for navigation aids for shipping and near the Mermaid Reef visitor moorings
- · improving visitors' understanding of the reserve's conservation values and management requirements
- managing for the potential impacts of climate change.

## Report on performance by key result areas

#### KRA 1: Natural heritage management

#### Major issues

• Preventing anchor damage

- Monitoring the reserve's condition
- Monitoring and compliance issues related to illegal fishing

#### Actions

- Maintain moorings
- Maintain surveillance
- Encourage and facilitate research and monitoring at the reserve
- Assess the need for specific moorings for dive sites
- · Monitor and remove marine debris from the reserve

#### Performance results 2008–09

- Conducted maintenance on the four visitor moorings in the Mermaid Reef lagoon in July 2008 and June 2009
- Reduced the size of the anchorage area
- Launched ReserveWatch, a volunteer monitoring program, to assist management with monitoring of habitat condition and human impacts at the reserve
- Collated sea surface temperature data for the past seven years to enable the identification of temperature trends
- Began an assessment of the need for dive site moorings at the reserve. Results are expected in 2009–10
- · Surveillance activities reported no illegal fishing
- · Continued collection and analysis of marine debris

#### KRA4: Visitor management and park use

#### Major issues

- · Need for visitors to understand and comply with reserve values and uses
- · Need for improved reporting by commercial users

#### Action

• Progress work related to visitor access to the reserve

#### Performance results 2008–09

- Revised the visitor survey so as to collect relevant information from visitors about their experience in the reserve
- Published a new brochure, also available on the website, on the reserve's interim management arrangements, values and rules
- Launched the ReserveWatch volunteer monitoring program

#### KRA5: Stakeholders and partnerships

#### Major issues

- Effective management of the reserve by the management service providers (WA Department of Environment and Conservation and WA Department of Fisheries)
- Industry stewardship of the reserve to support management

#### Actions

- Attend annual Marine Commercial Tour Operators workshop
- Manage and maintain an effective relationship with the WA Department of Environment and Conservation
   and WA Department of Fisheries

- Implemented annual business agreements with WA partner agencies
- Participated in two workshops that included Rowley Shoals commercial tourism approval holders and Rowley Shoals Marine Park managers

ReserveWatch – visitors helping management at Mermaid Reef



A pilot program launched at Mermaid Reef in June 2009 aims to use visitors' observations to monitor the state of remote tropical reef Commonwealth marine reserves.

Mermaid Reef Marine National Nature Reserve is located approximately 300 kilometres offshore from Broome, Western Australia and is visited by around 300 tourists from September to December each year to enjoy the spectacular diving opportunities on offer in this pristine environment.

ReserveWatch is a volunteer monitoring program that will use baseline reef condition monitoring to≈increase public awareness, education and engagement and to provide early warning of impacts in these remote marine reserves.

Extensive surveying of reef condition in these areas is very expensive. ReserveWatch will invite reserve users, such as tour operators and tourists, compliance officers and scientific researchers, to assist management by reporting on their observations made while undertaking their normal activities.  A white-tipped shark lurks in the shadows of Mermaid Reef

Observations on habitat condition, coral breakage, presence or absence of predators and disease, coral bleaching, marine debris and megafauna will be recorded and used to improve understanding of reserve use and condition. These observations will alert management to issues earlier than might otherwise be the case and enable a quicker response.

The information exchange will be two

way: by providing regular feedback and data summaries to participants, management agencies will also encourage involvement and increase visitors' knowledge of the reserves.

Results from the program's first season are expected in January 2010.

While ReserveWatch will initially focus on coral reef Commonwealth marine reserves, the program has been designed to adapt easily to meet the needs of other Commonwealth marine reserves.



## Ningaloo Marine Park (Commonwealth Waters)

environment.gov.au/coasts/mpa/ningaloo



## **Special features**

The Ningaloo Reef is a tropical reef system adjacent to an arid part of the continental land mass of Western Australia. In places it is as close as 20 metres to the coastline. These characteristics are among those that make Ningaloo unique among the tropical reefs off the northern coast of Australia.

Ningaloo Marine Park (Commonwealth Waters) protects the deep-water environment fringing the reef, including the open waters and seabeds of the continental slope and shelf. The reef supports a wide variety of biological communities, with the range of coral cover and species changing within short distances.

Ningaloo Marine Park is made up of state waters, extending from the Western Australian coastline out to three nautical miles, and Commonwealth waters from

the limit of the state jurisdiction out to the seaward boundary of Ningaloo Marine Park.

The reef is an important area for marine mammals, particularly whales. Green turtles (*Chelonia mydas*) are very common all along the coast, with several breeding rookeries. Of particular interest is the presence of the whale shark (*Rhincodon typus*), the world's biggest fish species. Ningaloo Marine Park is one of the few places around the world where whale sharks regularly occur. They aggregate in the park around March–April each year and feed on plankton, small fish or squid until June–July.

Location	Latitude 21°51′ South, Longitude 113°52′ East	
Area	243,513 hectares	
Proclamation dates	7 May 1987, 21 July 1992, 14 August 2003	
IUCN category	Category II	
Biogeographic context	IMCRA 4.0 provincial bioregions: Northwest Province, Central Western Transition, Central Western Shelf and Northwest Shelf Province	
Management plan	Second plan expires 2 July 2009	
Other significant management documents	Service level agreement and annual business agreements with the Western Australian Department of Fisheries and Western Australian Department of Environment and Conservation	
Financial	Operating	\$147,969*
	Capital	Not applicable
	Revenue	Not applicable
Visitors/users	Not available	
Permits	2 commercial tourism	

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements		
Migratory Species (Bonn) Convention	3 of 105 listed Australian species	
China-Australia Migratory Birds Agreement	4 of 81 listed species	
Japan-Australia Migratory Birds Agreement	4 of 77 listed species	
Korea-Australia Migratory Birds Agreement	1 of 59 listed species	

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	1 endangered 9 migratory 19 marine	
	Recovery plans	3 being implemented: great white shark ( <i>Carcharodon carcharias</i> ); marine turtles; whale shark ( <i>Rhincodon typus</i> )	
Listed flora	None		
Heritage	On Commonwealth Heritage List		

Numbers of native species recorded(a)				
Mammals	Birds	Reptiles	Fish	Plants
Unknown	22	Unknown	54	0

(a) Species numbers are from a recent species inventory based on documented sightings in the park and adjacent areas. The inventory is still new and is continuing to be updated and refined. It is likely to currently underestimate species numbers

#### Management arrangements

Ningaloo Marine Park (Commonwealth Waters) is managed under a service level agreement and annual business agreements between the Director of National Parks, the WA Department of Environment and Conservation and the WA Department of Fisheries. The WA agencies implement management actions on behalf of the Director of National Parks. The Australian Customs and Border Protection Service provides regular aerial surveillance of the park. Departmental staff visited the park in May 2009 to implement and assess reserve management activities.

## Monitoring

The WA Marine Science Institution is conducting a number of research projects on Ningaloo Marine Park. Whilst to date the majority of projects have been undertaken largely in the state waters of the park, sampling for one project has extended into Commonwealth waters and is expected to provide information on the deep-water sponge communities in Commonwealth waters in 2009–10.

The Australian Institute of Marine Science, in a consortium with Australian and United States research organisations, extended a project begun in 2004–05. It uses satellite tracking tags to collate data on the range and behaviour of whale shark individuals from the Commonwealth and state waters of Ningaloo Marine Park.

## Future challenges

Major challenges are:

- mapping habitats adequately
- maintaining consistency between Australian Government and state government planning and, where possible, management processes
- managing for the potential impacts of climate change

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- · Limited information about the Commonwealth waters of the park
- Lack of information on the distribution, migration, behaviour and abundance of key species including whale sharks
- Lack of information on the effects of human and commercial interactions on the park's key attributes
- · Potential listing of Ningaloo Marine Park on the National Heritage and World Heritage lists

#### Actions

- · Continue whale shark monitoring in both Commonwealth and state waters
- Engage in the National Heritage and World Heritage listing processes
- Monitor and remove marine debris from the park

#### Performance results 2008–09

- Continued a study of the behaviour and migration habits of whale sharks travelling to Ningaloo Marine Park
- Collated sea surface temperature data for the past seven years to enable the identification of temperature trends
- Continued a volunteer monitoring program that monitors marine turtles in the park
- · Continued to collect and analyse marine debris

#### KRA4: Visitor management and park use

#### Major issues

- · Reports of commercial fishers entering Commonwealth waters and fishing illegally
- · Effective management of commercial tours
- · Communication and enforcement of the Regulations under the EPBC Act

#### Actions

- · Monitor illegal entry to Commonwealth waters via aerial and sea surveillance
- · Ensure commercial tour operators comply with permits and conditions

#### Performance results 2008–09

- Continued engagement with state partners (WA Department of Environment and Conservation and WA Department of Fisheries) with regard to roles and cooperative arrangements for compliance and enforcement activities
- · Issued permits for commercial tour operators
- · Conducted regular surveillance by air and sea
- Distributed an information brochure, also available on the website, on the park's management arrangements and rules. A brochure explaining the interim management arrangements, to take effect from 2 July 2009, was also produced and distributed in June 2009

#### KRA5: Stakeholders and partnerships

#### Major issues

- · Maintaining productive relationships with partners
- Negotiating complementary management regimes with partner agencies to best manage the adjoining
   Commonwealth and state marine parks

#### Actions

- Develop and implement a work plan under the annual business agreement to manage the Ningaloo Marine Park
- · Keep stakeholders informed of and involved in management activities
- Provide fisheries staff with warden training for compliance purposes in accordance with the EPBC Act

- · Negotiated and implemented workplans under service level agreements
- · Maintained productive working arrangements with state agencies

#### **KRA6: Business management**

#### Major issue

• Need to effectively manage contracts with service providers

#### Actions

- Negotiate and implement annual business agreements
- · Manage contracts with service providers

- Negotiated and implemented the annual business agreement with WA Department of Environment and Conservation covering compliance and enforcement, management intervention and visitor infrastructure, research and monitoring, public participation, and education
- Negotiated and implemented the annual business agreement with the WA Department of Fisheries covering education, compliance and enforcement, visitor management, and training

## **East Marine Region**

#### environment.gov.au/coasts/mbp/east



## Special features

The East Marine Region covers 2,400,000 square kilometres of the Coral and Tasman seas. It includes all Commonwealth waters on the eastern side of Australia from the tip of Cape York to just north of the New South Wales–Victoria border at Bermagui, as well as the waters around Norfolk Island and Lord Howe Island. The region excludes the state waters of Queensland and New South Wales and the Great Barrier Reef Marine Park. Offshore it is bounded by the outer limit of Australia's Exclusive Economic Zone (200 nautical miles).

The region is characterised by deep-water pelagic tropical and subtropical marine ecosystems. It is home to globally significant populations of internationally threatened species. The region is dominated by the East Australian Current, the largest ocean current close to the coast of Australia. The variability of the East Australian Current both season-to-season and year-to-year has a significant influence on biological productivity. Phytoplankton and fish distributions are linked to the current. Generally waters of the region are low in nutrients; upwellings created by currents and gyres interact with islands and seamounts and are significant for biological productivity.

## Marine bioregional planning

The first stage of the bioregional planning process was completed on 19 May 2009 with the minister's release of the East Bioregional Profile. The bioregional profile includes detailed information about the region's key habitats, species, natural processes, conservation and heritage values, and human uses (see environment.gov.au/coasts/mbp/publications/east/bioregional-profile.html).

The next stage of the planning process is the development of the draft East Marine Bioregional Plan. The draft plan will include a proposed network of marine protected areas that builds on the existing network of Commonwealth marine reserves in the East Marine Region.

### **Existing Commonwealth marine reserves**

The East Marine Region includes six existing Commonwealth marine reserves. Coringa–Herald National Nature Reserve and Lihou Reef National Nature Reserve lie off the Queensland coast; Elizabeth and Middleton Reefs Marine National Nature Reserve, the Solitary Islands Marine Reserve (Commonwealth Waters), Lord Howe Island Marine Park (Commonwealth Waters) and the Cod Grounds Commonwealth Marine Reserve lie off the coast of New South Wales.

The reserves are managed by the department's Marine Division under delegation from the Director of National Parks.

Two existing Commonwealth marine reserves in the region are currently managed under interim management arrangements that allow activities to be conducted that otherwise would be prohibited under the EPBC Act: the Solitary Islands Marine Reserve (Commonwealth Waters) Management Plan 2001 expired on 4 April 2008; and the first management plan for the Cod Grounds Commonwealth Marine Reserve is under development. The Lord Howe Island Marine Park (Commonwealth Waters) Management Plan will expire in September 2009, and the park will be managed under interim arrangements, along with the Solitary Islands Marine Reserve (Commonwealth Waters), until new management plans are developed, following the completion of the marine bioregional planning process.

## Establishment of the Coral Sea Conservation Zone

The Coral Sea Conservation Zone established under the EPBC Act was announced by the Minister on 19 May 2009 with the release of the East Bioregional Profile. The Coral Sea Conservation Zone lies within the East Marine Region and covers approximately 972,000 square kilometres of Australian waters and seabed east of the Great Barrier Reef Marine Park, out to the edge of Australia's Exclusive Economic Zone.

The existing Coral Sea National Nature Reserves – Coringa-Herald and Lihou Reef reserves – and the Great Barrier Reef Marine Park are not included in the conservation zone.

The East Bioregional Profile shows that the environmental significance of the Coral Sea lies in its diverse array of coral reefs, atolls, deep sea plains and canyons, and the extent to which the region's natural and heritage values have remained relatively undisturbed by direct human impact.

The Coral Sea Conservation Zone will protect this environmentally significant area from increasing pressures while it is being assessed for more permanent protection via the marine bioregional planning process. The conservation zone will have no additional regulatory impact on most activities in the Coral Sea, such as commercial and recreational fishing, or cruise and merchant shipping. However, some commercial activities and scientific research activities will require a permit.

For more information on the Coral Sea Conservation Zone, see environment.gov.au/coasts/coral-sea.html

## **Cod Grounds Commonwealth Marine Reserve**

environment.gov.au/coasts/mpa/cod-grounds



## Special features

The Cod Grounds Commonwealth Marine Reserve was declared to protect important habitat of the critically endangered grey nurse shark (*Carcharias taurus*). The east coast population of the grey nurse shark is listed as critically endangered under the EPBC Act and is at high risk of extinction due to its low reproduction rate and fishing-related mortality.

The Cod Grounds reef is the most northerly of a series of reefs extending south and south-west located off Laurieton in northern New South Wales. The Cod Grounds is the shallowest reef in the series and has steeper slopes. The reef provides prime habitat for grey nurse sharks, which are observed in aggregations just above the seabed in or near the deep sandy-bottomed gutters between the pinnacles. Sharks are observed at the Cod Grounds throughout the year in varying

numbers, with over 80 sharks sighted at any one time. The Cod Grounds supports several prey species of the grey nurse shark, including jewfish, tailor, yellowtail kingfish, small sharks and squid.

The Cod Grounds Commonwealth Marine Reserve was declared a Sanctuary Zone as recommended by the Recovery Plan for the Grey Nurse Shark, as it provides critical feeding and reproduction habitat for grey nurse sharks. Under the Cod Grounds management arrangements all fishing is prohibited.

Location	Latitude 31°40′52″ South, Longitude 152°54′37″ East. The reserve comprises a 1,000 metre radius from this point	
Area	314 hectares	
Proclamation date	10 May 2007	
IUCN category	Category la	
Biogeographic context	IMCRA 4.0 provincial bioregion: Central Eastern Shelf Tra	insition
Management plan	Interim management arrangements are in place until a management plan is developed	
Other significant management documents	Annual business agreement between the Australian and New South Wales governments (NSW Department of Primary Industries) to deliver compliance and enforcement	
Financial	Operating	\$188,289*
	Capital	Not applicable
	Revenue	Not applicable
Visitors	20 commercial recreational dive trips and 8 research trips recorded	
Permits/ approvals	1 commercial dive operator approval; 1 research approval; 2 research permits	

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	A full species list has not yet been compiled although the critically endangered grey nurse shark ( <i>Carcharias taurus</i> ) and vulnerable white shark ( <i>Carcharodon carcharias</i> ) are known to occur. The vulnerable humpback whale ( <i>Megaptera novaeangliae</i> ) is likely to pass through the reserve on its annual migration	
	Recovery plans	3 being implemented: grey nurse shark ( <i>Carcharias taurus</i> ); white shark ( <i>Carcharodon carcharias</i> ); humpback whale ( <i>Megaptera novaeangliae</i> )	
Listed flora	None		

#### Management arrangements

The reserve is managed by the Department's Marine Division under delegation from the Director of National Parks. On-site management and surveillance is provided through formal arrangements with a number of other government agencies.

The Cod Grounds Commonwealth Marine Reserve has been assigned to IUCN Category Ia, 'strict nature reserve', which means that the Cod Grounds are to be managed primarily for scientific research and environmental monitoring.

The NSW Department of Primary Industries undertakes compliance and enforcement under an annual business agreement between the Australian and New South Wales governments.

Interim management arrangements will remain in force until the management plan for the reserve is approved. Development of the plan is underway and is expected to be finalised in the second half of 2009.

## Monitoring

Grey nurse shark numbers are being monitored at the Cod Grounds as part of a broader study into the distribution and population of the species along the east coast of Australia. Reports with a tally of grey nurse sharks sighted on each dive undertaken in the reserve, required under the approval, were received from the reserve's only approved commercial dive tour operator. Numbers vary from zero to over 80 sharks sighted on any one dive.

A baseline biodiversity survey was undertaken in the Cod Grounds by the Tasmanian Aquaculture and Fisheries Institute in May 2009. Results of the survey will be published in late 2009.

The Port Macquarie Underwater Research Group undertook dives to monitor and photograph species with the aim of identifying major species occurring in the reserve.

Fieldwork was completed for the 2008–09 component of an ongoing project collecting data on sea temperatures and grey nurse sharks via a listening station and temperature data loggers.

## **Future challenges**

Major challenges are:

- managing public access to the reserve
- educating the public on the reserve's values and why these particular management arrangements have been implemented
- · developing and implementing an effective compliance and enforcement strategy
- developing the management plan.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Monitoring grey nurse shark habitats and populations
- · Obtaining baseline information on the reserve's habitats

#### Actions

- Implement interim management arrangements to manage user impact on conservation values
- · Undertake habitat mapping and classification
- Retrieve and replace equipment collecting data on sea temperatures and grey nurse sharks

#### Performance results 2008–09

- Completed the 2008–09 baseline biodiversity survey component
- Completed the 2008–09 component of the ongoing project collecting data on sea temperatures and grey nurse sharks via temperature data loggers and a shark listening station
- Undertook regular grey nurse shark counts
- · Managed user impact on the reserve's environment via interim management arrangements

#### KRA4: Visitor management and reserve use

#### Major issues

- Managing visitor access and activities
- · Keeping visitors informed of management arrangements
- Possible illegal fishing
- Pollution and marine debris

#### Actions

- Enforce the fishing prohibition
- Assess applications for access and research approvals
- · Implement interim management arrangements
- Undertake regular compliance and monitoring patrols
- Distribute brochures and information on the reserve

- The NSW Department of Primary Industries conducted 36 surface compliance and enforcement patrols under the annual business agreement
- NSW officers gave information and advice to fishers operating close to and within the reserve
- NSW officers detected two recreational fishing vessels fishing inside the reserve and the Department undertook follow-up enforcement action
- Received reports on activities undertaken in the reserve (required under the approval) from the reserve's only approved commercial dive tour operator

#### KRA5: Stakeholders and partnerships

#### Major issues

- · Ensuring ongoing engagement with the community, key groups and government agencies
- Establishing complementary management arrangements with NSW state government and Australian Government agencies
- Developing the management plan
- Informing the community about interim management arrangements including a total ban on fishing in the reserve

#### Actions

- Develop the annual business agreement with the NSW state government to undertake compliance activities in the reserve
- · Consult with key stakeholders and industry bodies
- Initiate development of the management plan
- Inform the community on the interim management arrangements

- Entered into the annual business agreement with the NSW Department of Primary Industries to undertake sea patrols within the reserve
- Consulted with stakeholders and the community about the development of the management plan
- Advised the local dive operator, researchers and NSW state agencies on the status of reserve values under the interim management arrangements

## **Coringa–Herald National Nature Reserve**

environment.gov.au/coasts/mpa/coringa



## **Special features**

Coringa–Herald National Nature Reserve has six islets and cays of which all except one are vegetated. The vegetation is mainly tropical shoreline plants of the Indo-Pacific region. However the reserve also includes the only forested cays in the Coral Sea Islands Territory. The *Pisonia grandis* forest ecosystem, which occurs on two islets in the reserve, has significant conservation value. The forested islets are important habitat for species of resident birds and also migratory seabirds that gather there from an extensive oceanic area to breed.

The terrestrial beach habitat throughout the reserve is important breeding habitat for the green turtle (*Chelonia mydas*). The reef habitats support benthic (bottom-dwelling) flora and fauna that are distinct from those of the Great Barrier Reef. Dolphins and whales occur in the area.

The Coringa Islets were named after the *Coringa Packet*, a sailing ship wrecked off Chilcott Islet in 1945. The remains of the *Coringa Packet* have been declared an historic shipwreck.

Location	Latitude 16°59' South, Longitude 149°45' East			
Area	885,249 hectares			
Proclamation date	16 August 1982			
IUCN category	Category la	Category la		
Biogeographic context	IMCRA 4.0 provincial bioregion: Northeast Province			
Management plan	Second plan expired 4 September 2008			
Financial	Operating \$210,888*			
	Capital	Not applicable		
	Revenue	Not applicable		
Visitors/users	3 research and monitoring trips			
Permits/approvals	None			

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements		
Wetlands (Ramsar) Convention	Entire reserve is listed	
Migratory Species (Bonn) Convention	8 of 105 listed Australian species	
China-Australia Migratory Birds Agreement	14 of 81 listed species	
Japan-Australia Migratory Birds Agreement	15 of 77 listed species	
Korea-Australia Migratory Birds Agreement	8 of 59 listed species	

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	2 endangered 8 vulnerable 16 migratory 51 marine	
	Recovery plans	2 being implemented: marine turtles; great white shark (Carcharodon carcharias)	
Listed flora	None		

Numbers of native species recorded <sup>(a)</sup>					
Mammals	Birds	Reptiles	Fish	Invertebrates	Plants
30	27	5	Over 342	Over 1,000	16

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined. It is likely to currently underestimate species numbers.

## Management arrangements

The reserve is managed by the department's Marine Division under delegation from the Director of National Parks. On-site management and surveillance is provided through formal arrangements with a number of other government agencies.

The Bureau of Meteorology provides weather forecasting services and storage facilities for an emergency helicopter fuel cache to cover possible emergency evacuation from the reserve. Coastwatch provides aerial surveillance. Customs provides surface compliance and enforcement, and support for research and monitoring activities in the reserve.

The second management plan for the reserve expired on 4 September 2008. The next management plan will be developed following the conclusion of the bioregional planning process for the East Marine Region. In the meantime, the reserve will be managed through interim arrangements under the EPBC Act.

## Monitoring

Seabird monitoring continued with the assistance of a volunteer program that has run continuously since 1991. The long-term and now regionally significant dataset provides valuable information about these species.

Monitoring the impacts of insect pests continued through on-ground activity and aerial photography. Pest scale insects and hawkmoth remain under control and vegetation appears to be healthy.

The results of vegetation monitoring since 2006 were summarised in a final report and a field guide to flora in the reserve. The report gives a comprehensive assessment of the reserve's flora and, combined with the floral guide, provides a detailed baseline to which future monitoring can be compared.

Subsurface sea temperature loggers continued to operate as part of a large ongoing temperature monitoring program.

A remote sensing project continued following a successful pilot project last year. The project uses satellite imagery to map and classify habitats and detect changes over the long term.

## Future challenges

Major challenges are:

- logistics, costs and occupational health and safety issues associated with managing such an isolated reserve
- maintaining the health of the Pisonia forest ecosystem including controlling pest insects
- understanding and managing the impacts of climate change, including coral bleaching events and loss of niche habitats and associated species.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- · Impacts associated with human use including possible illegal fishing and the introduction of pest species
- Measuring reef health including the effects of coral bleaching
- Impacts of existing pest insects and climate change on the Pisonia forest ecosystem

#### Actions

- Enforce the fishing prohibition
- Continue the strategic reef monitoring program
- · Continue to monitor insect pests and respond as necessary
- Acquire aerial images to monitor vegetation

#### Performance results 2008–09

- Detected no measurable permanent deforestation of Pisonia by insect pests. Departmental staff visited the reserve to monitor defoliation and forest health
- Removed marine debris
- Engaged researchers to continue the seabird monitoring program on North East Herald Cay

#### KRA4: Visitor management and park use

#### Major issue

· Introduction of pest species by visitors to the reserve

#### Actions

- Distribute the information brochure
- Maintain the website
- Maintain information signs on the cays and islets in the reserve

#### Performance results 2008–09

- Distributed the information brochure to reserve users including researchers and commercial tour operators. The brochure details effective quarantine measures to be undertaken by visitors to the reserve and why these practices are so important. The brochure is also available on the department's website
- Updated the website to reflect the interim management arrangements following expiration of the second management plan

#### KRA5: Stakeholders and partnerships

#### Major issues

- · Lack of awareness among stakeholders of reserve management prescriptions
- Maintaining effective operational relationships with partners

#### Actions

- · Consult stakeholders and partner agencies and provide regular information on important issues
- Distribute the reserve information brochure
- Distribute information to stakeholders regarding reserve management arrangements

#### Performance results 2008–09

- Liaised with Coastwatch, the Bureau of Meteorology, Department of Defence, Department of Infrastructure, Transport, Regional Development and Local Government, relevant researchers and tour operators
- Distributed a letter to stakeholders regarding the expiration of the second management plan for the reserve and the introduction of interim management arrangements

#### **KRA6: Business management**

#### Major issue

• Occupational health and safety risk to personnel associated with working in an isolated reserve

#### Action

· Continue to refine and implement measures identified through the activity safety analysis

#### Performance results 2008–09

• Conducted a detailed activity safety analysis before each trip to the reserve. Successfully implemented risk control measures and contingency and communication plans developed during this process

## Elizabeth and Middleton Reefs Marine National Nature Reserve

environment.gov.au/coasts/mpa/elizabeth



## Special features

Elizabeth and Middleton Reefs Marine National Nature Reserve is located 160 kilometres north of Lord Howe Island in a transition area between tropical and temperate climates. Both reefs rise independently from deep oceanic water and are the southern-most openocean platform reefs in the world.

Isolation and exposure to convergent tropical and temperate ocean currents and climates have given the reefs a distinct and diverse assemblage of marine species including a number of endemic species. Many species are near the northern or southern limit of their distribution.

The reserve supports two of the few known populations of the black cod (*Epinephelus daemelii*), once common along the New South Wales coast but now considered rare. The reserve also has high numbers of Galapagos

reef sharks (*Carcharhinus galapagensis*) which suggests the reefs are an important nursery area for this species. Apart from at Lord Howe Island, the Galapagos reef shark has not been recorded in any other Australian reef system.

The reserve is a feeding ground for green turtles (*Chelonia mydas*) and marine mammals such as bottlenose dolphins (*Tursiops truncatus*) and short-finned pilot whales (*Globicephala macrochynchus*).

The reserve has a rich maritime history with over 30 vessels being wrecked on the reefs over the past 200 years. The most prominent of these is the *Runic*, a 13,500 tonne meat freighter that ran aground on Middleton Reef in 1961. Although it is rapidly breaking up, the wreck is still visible for several nautical miles.

Location	Latitude 29°42' South, Longitude 159°05' East		
Area	187,726 hectares		
Proclamation date	23 December 1987		
IUCN category	Category la overall comprising: Sanctuary Zone Category la (143,146 hectares) Habitat Protection Zone Category II (44,580 hectares)		
Biogeographic context	IMCRA 4.0 provincial bioregion: Lord Howe Province		
Management plan	Second plan expires 22 March 2013		
Financial	Operating \$99,934*		
	Capital	Not applicable	
	Revenue Not applicable		
Visitors	Not recorded, numbers low		
Permits	11 recreational		

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements		
Wetlands (Ramsar) Convention	Entire reserve is listed	
Migratory Species (Bonn) Convention	2 of 105 listed Australian species	
China-Australia Migratory Birds Agreement	3 of 81 listed species	
Japan–Australia Migratory Birds Agreement	6 of 77 listed species	
Korea-Australia Migratory Birds Agreement	3 of 59 species	

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	1 vulnerable	
		8 migratory	
		13 marine	
	Recovery plans	1 being implemented: marine turtles	
Listed flora	None		

Numbers of native species recorded <sup>(a)</sup>					
Mammals	Birds	Reptiles	Fish	Invertebrates	Flora
2	10	2	407	586	19

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined; it is likely to currently underestimate species numbers.

#### Management arrangements

The reserve is managed by the Department's Marine Division under delegation from the Director of National Parks. On-site management and surveillance is provided through formal arrangements with a number of other government agencies.

Coastwatch made regular surveillance flights and Department officers undertook an annual compliance and research and monitoring patrol to the reefs in October 2008.

## Monitoring

The reef systems at the reserve have been surveyed regularly since 1987. The last comprehensive survey was conducted in 2006 and a rapid survey was carried out in February 2007. In October 2008 the data loggers installed in 2006 as part of a cross-reserve project to collect data on reef temperature and water conditions were replaced and the condition of the reefs was assessed visually. The data loggers record water temperature to help assess the effects of temperature on the reefs. Researchers undertook ground-truthing (to enable calibration of remote-sensing data) as part of a habitat classification project using satellite imagery.

The reserve is generally in good health with little coral bleaching and very little evidence of crown-of-thorns starfish *(Acanthaster planci)* activity. The number of black cod appears to be stable and high numbers of Galapagos sharks were observed during recent surveys.

## **Future challenges**

Major challenges are:

- developing and implementing a regular biological monitoring program with standard methodology.
- monitoring for possible illegal activities in the area.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issue

• Monitoring reef health and populations of large vertebrates (black cod, Galapagos shark)

#### Actions

- Enforce fishing restrictions
- Implement management plan prescriptions
- Undertake biological monitoring

#### Performance results 2008–09

- Research projects on black cod and Galapagos shark genetics were completed
- Ground-truthing for satellite imagery habitat classification was undertaken. The process relates satellite images to real features and materials on the ground
- Completed the 2008–09 component of the ongoing project collecting data on sea temperatures via temperature data loggers. Data loggers installed in 2006 were replaced

#### KRA2: Cultural heritage management

#### Major issue

• Possible interference with shipwrecks

#### Actions

- Enforce shipwreck protection strategies
- · Implement management plan prescriptions
- Inspect the condition of shipwrecks

#### Performance results 2008–09

- Coastwatch flights and the annual compliance and enforcement and research and monitoring patrol conducted in October 2008 detected no interference with shipwrecks
- Assessed the condition of a number of shipwrecks during the annual patrol

#### KRA4: Visitor management and reserve use

#### Major issues

- Managing visitor access and activities
- · Keeping visitors informed of management arrangements
- Possible illegal fishing
- Pollution and marine debris

#### Actions

- Enforce fishing restrictions
- · Issue permits for visitor access and recreational fishing
- Implement management plan prescriptions
- Undertake regular compliance and monitoring patrols
- · Distribute brochures and information on the reserve

#### Performance results 2008–09

- Coastwatch flights detected no illegal fishing
- Detected no illegal activity and no pollution during the annual patrol
- · Issued permits for visitor access and recreational fishing

#### KRA5: Stakeholders and partnerships

#### Major issue

• Maintaining good relationships with Coastwatch, researchers, the Lord Howe Island community who visit the reserve, and New South Wales Government agencies who implement day-to-day management under the annual business agreement

#### Action

• Ensure relationships with partners are productive

#### Performance results 2008–09

Liaised with Coastwatch, scientists, tour operators, the Lord Howe Island community and New South Wales
 Government agencies

## Lihou Reef National Nature Reserve

environment.gov.au/coasts/mpa/lihou



## Special features

Lihou Reef National Nature Reserve and its associated sandy coral cays and islets comprise the largest reef structure in the Coral Sea. The reef habitats support benthic (bottom-dwelling) flora and fauna that are distinct from those of the Great Barrier Reef. A diverse range of marine organisms has been recorded in the reserve. The green turtle (*Chelonia mydas*) breeds in the reserve and a number of cetacean species (whales and dolphins) use the area.

Seven cays/islets in the reserve are vegetated, mainly by widespread tropical shoreline plants of the Indo-Pacific region. The reserve also contains extensive and regionally significant seabird colonies. The buff-banded rail (*Gallirallus philippensis*) is the only landbird species that breeds in the reserve.

Several well-documented shipwrecks, and a number of wrecks whose origins are not yet known, are located on Lihou Reef.

Location	Latitude 17°21' South, Longitude 151°44' East		
Area	843,670 hectares		
Proclamation date	16 August 1982		
IUCN category	Category la		
Biogeographic context	IMCRA 4.0 provincial bioregion: Northeast Province		
Management plan	Second plan expired 4 September 2008		
Financial	Operating	Not applicable*	
	Capital	Not applicable	
	Revenue	Not applicable	
Visitors/users	Bureau of Meteorology; recreational yachts		
Approvals	1 research		

<sup>4</sup> In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements			
Wetlands (Ramsar) Convention	Entire reserve is listed		
Migratory Species (Bonn) Convention)	6 of 105 Australian listed species		
China-Australia Migratory Birds Agreement	13 of 81 listed species		
Japan–Australia Migratory Birds Agreement	15 of 77 listed species		
Korea-Australia Migratory Birds Agreement	9 of 59 species		

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	2 endangered 8 vulnerable 17 migratory 51 marine	
	Recovery plans	2 being implemented: marine turtles; great white shark (Carcharodon carcharias)	
Listed flora	None		

#### Numbers of native species recorded

numbers of numbers feedback					
Mammals	Birds	Reptiles	Fish	Invertebrates	Plants
30	24	5	Over 342	Over 1,000	7

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined. It is likely to currently underestimate species numbers.

#### Management arrangements

The reserve is managed by the Department's Marine Division under delegation from the Director of National Parks. On-site management and surveillance is provided through formal arrangements with a number of other government agencies.

Coastwatch provides regular aerial surveillance of the reserve. The Bureau of Meteorology collects and replaces temperature data loggers during their annual visits. The bureau also provides storage for an emergency helicopter fuel cache to cover emergency evacuation from the reserve.

The second management plan for the reserve expired on 4 September 2008. The next management plan will be developed following the conclusion of the bioregional planning process for the East Marine Region. In the meantime, the reserve will be managed through interim arrangements under the EPBC Act.

## Monitoring

A research and monitoring trip was undertaken in December 2008. The Australian Institute of Marine Science has installed data loggers to monitor seawater temperature for the Department, and these were replaced in December 2008.

## Future challenges

Major challenges are:

- logistics, costs and occupational health and safety issues associated with managing such an isolated reserve
- understanding and managing the impacts of climate change, including coral bleaching events and loss of niche habitats and associated species.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Impacts associated with human use including possible illegal fishing and the introduction of pest species
- · Measuring reef health including the effects of coral bleaching
- The reserve's isolation means ongoing, on-ground monitoring remains logistically difficult

#### Actions

- Enforce the fishing prohibition
- Continue the strategic reef monitoring program
- Establish terrestrial monitoring of vegetation and insects on the cays and islets

#### Performance results 2008–09

- Undertook research and monitoring at the reserve in December 2008. This included marine and terrestrial surveys and remote sensing
- The marine survey found coral cover has increased since the 2004 survey. It also found few signs of coral bleaching
- The terrestrial survey of the vegetated cays established a baseline set of data for vegetation and insects
- A remote sensing team ground-truthed satellite imagery data

#### KRA4: Visitor management and park use

#### Major issues

- Lack of awareness among stakeholders of reserve management prescriptions and the quarantine risks of introducing species
- Ensuring relationships with key partners remain on an effective operational basis
- Introduction of pest species by visitors to the reserve

#### Actions

- Distribute the information brochure
- Maintain website information
- · Continue to promote and maintain partnerships with other agencies to assist with activity monitoring

#### Performance results 2008–09

• Distributed the reserve information brochure to stakeholders. The brochure details effective quarantine measures to be undertaken by visitors to the reserve and the importance of these practices. The brochure is also available on the Department's website

#### KRA5: Stakeholders and partnerships

#### Major issues

- · Lack of awareness among stakeholders of reserve management prescriptions
- · Maintaining effective operational relationships with partners

#### Actions

- Consult key stakeholders and partners and provide regular information on important issues
- Distribute the reserve information brochure
- · Continue to promote and maintain partnerships with other agencies to assist with monitoring

#### Performance results 2008–09

- Liaised with Coastwatch, the Bureau of Meteorology and the Department of Infrastructure, Transport, Regional Development and Local Government
- Distributed the reserve information brochure to stakeholders

#### KRA6: Business management

#### Major issue

• Occupational health and safety risk to personnel from working in an isolated reserve

#### Action

- Continue to refine and implement measures identified through the activity safety analysis process
- Performance results 2008–09
- Implemented all activity control measures identified through the activity safety analysis process for future activities within the reserve
- Undertook fieldwork in support of the December 2008 research and monitoring trip without incident

## Lord Howe Island Marine Park (Commonwealth Waters)

environment.gov.au/coasts/mpa/lordhowe



## Special features

Lord Howe Island Marine Park (Commonwealth Waters) protects and conserves the complex, vulnerable and regionally unique set of deep-sea structures, benthic habitats and flora and fauna associated with the Lord Howe Island seamount system.

The marine park ensures that natural resources important for food, income and recreation for the Lord Howe Island community are protected and used in an ecologically sustainable manner.

Location	Latitude 31°47′ South, Longitude 159°09′ East		
Area	300,287 hectares		
Proclamation date	21 June 2000		
IUCN category	Category IV overall comprising:		
	Category la 96,166 hectares		
	Category IV 204,121 hectares		
Biogeographic context	IMCRA 4.0 provincial bioregion: Lord Howe Province		
Management plan	The first plan expires 24 September 2009		
Other significant	Service level agreement and subsidiary annual business agreement between Australian and New South Wales		
management documents	governments		
Financial	Operating	\$152,024*	
	Capital	Not applicable	
	Revenue	Not applicable	
Visitors/users	Not known		
Permits/approvals	9 commercial permits		

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements		
China-Australia Migratory Birds Agreement	1 of 81 listed species	
Japan–Australia Migratory Birds Agreement	4 of 77 species	
Korea-Australia Migratory Birds Agreement	4 of 59 species	

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	3 endangered 10 vulnerable 15 migratory 20 marine	
	Recovery plans	2 being implemented: albatross (Diomeda spp. and Thalassarche spp.) and giant petrels (Macronectes spp.); marine turtles	
Listed flora	None		
Heritage	On National Heritage List; on UNESCO World Heritage List		

Numbers of native species recorded <sup>(a)</sup>				
Mammals	Birds	Reptiles	Fish	Plants
Unknown	11	Unknown	42	Unknown

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined; it is likely to currently underestimate species numbers.

#### Management arrangements

The NSW Marine Parks Authority manages the Commonwealth marine park under a service level agreement.

The Lord Howe Island Steering Committee provides a forum for cooperative planning and management of the adjacent state and Commonwealth parks. The Lord Howe Island Marine Park Advisory Committee enables stakeholder groups to provide advice on the management of both parks to the managing agencies.

The Australian Customs and Border Protection Service periodically conducts Coastwatch flights over the Lord Howe Island area and reports on vessel activity, including possible breaches of zoning regulations. Surface surveillance is undertaken by the New South Wales Marine Parks Authority.

### Monitoring

Data on fish catch effort by charter fishing vessels operating under permit in the Lord Howe Island Commonwealth Marine Park continue to be logged and collated on an annual basis.

Eight temperature data loggers were installed to monitor seawater temperature for the Department as part of an ongoing cross-reserve water temperature monitoring program.

A baited remote underwater video survey was commenced and will build on information about benthic fish assemblages in deep water habitats collected in 2004.

The Department contributed to research on the flesh-footed shearwater (*Puffinus carneipes*), repeating a previous population survey. The research aims to assess whether numbers are continuing to decline.

## Future challenges

Major challenges are:

- · minimising the negative impacts of climate change
- implementing a strategic monitoring program, following baseline and fish catch data collection
- monitoring the area for possible illegal activities.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Ensuring compliance with the management plan
- · Review the management plan in preparation for developing the second management plan

#### Actions

- Enforce fishing restrictions
- Train and authorise enforcement staff
- Review the management plan in preparation for developing the second management plan

#### Performance results 2008–09

- Shore-based and vessel-based surveillance revealed no illegal fishing activity in the park
- The NSW marine park manager and ranger continued as wardens under the EPBC Act
- Began to review the management plan with a desk-top survey of scientific research conducted in the area. An assessment of the natural values of the state and Commonwealth waters of the park is under way

#### KRA5: Stakeholders and partnerships

#### Major issues

- Maintaining cooperation with the Lord Howe Island community and NSW Marine Parks Authority for effective day-to-day management of the park
- Community support for the management plan
- Developing a community consultation program for reviewing the management plan and developing the second plan

#### Action

• Take an active role on the advisory and steering committees for the state and Commonwealth marine parks. The department is now represented on the Lord Howe Island Marine Park Advisory Committee

#### Performance results 2008–09

• Two steering committee meetings and one advisory committee meeting were held

#### KRA6: Business management

#### Major issues

- Continuing assistance from the NSW Marine Parks Authority and NSW Department of Climate Change
- Investigating cooperative arrangements for joint community consultation on state and Australian Government reviews of zoning and management plans with the NSW Department of Climate Change

#### Action

• Negotiate and implement the annual business agreement with the NSW Marine Parks Authority

- · Negotiated and implemented the annual business agreement
- Took the first steps towards a joint community consultation program with the NSW Department of Climate Change for zoning and management plan reviews

## Solitary Islands Marine Reserve (Commonwealth Waters)

environment.gov.au/coasts/mpa/solitary



## Special features

The Solitary Islands Marine Reserve (Commonwealth Waters) and the adjacent Solitary Islands Marine Park (State Waters) are located in a mixing zone between tropical and temperate environments. Many species in the reserve are at, or close to, the northern or southern extent of their geographic range.

The reserve is home to a number of species that are listed as endangered or vulnerable under state or Commonwealth legislation or international agreements. These include several dolphin species, humpback whales (*Megaptera novaengliae*), grey nurse sharks (*Carcharias taurus*), black cod (*Epinephelus daemelii*), Bleekers devil fish (*Paraplesiops bleekeri*), and numerous seabird species. An area known as Pimpernel Rock forms part of the critical habitat for the grey nurse shark which aggregates there.

Location	Latitude 29°48' South, Longitude 153°22' East				
Area	15,233 hectares				
Proclamation date	3 March 1993				
IUCN category	Category VI overall comprising:				
	Category la 79 hectares				
	Category IV 3,746 hectares				
	Category VI 11,408 hectares				
Biogeographic context	IMCRA 4.0 provincial bioregion: Central Eastern Shelf Transition				
Management plan	The first plan expired 3 April 2008. Interim management arrangements are in place				
Other significant management documents	Service level agreement and subsidiary annual business agreement between the Australian and New South Wales governments				
Financial	Operating \$231,553*				
	Capital	Not applicable			
	Revenue	Not applicable			
Visitors	Not known				
Permits	3 recreational diving; 1 research				
Approvals (issued under interim management arrangements)	68 commercial fishing, 6 commercial tour operator				

\* In addition, \$1,231,529 was spent across the 25 marine reserves managed by the Marine Division of the Department on behalf of the Director of National Parks. The expenditure covered professional services, permits and performance assessment systems, training, communications, workshops and conference attendance, surveillance and enforcement activities.

International conventions and agreements			
Migratory Species (Bonn) Convention	12 of 105 listed species		
China-Australia Migratory Birds Agreement	9 of 81 listed species		
Japan-Australia Migratory Birds Agreement	12 of 77 listed species		
Korea-Australia Migratory Birds Agreement	5 of 59 listed species		

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species	4 endangered 7 vulnerable 24 migratory 38 marine	
	Recovery plans	2 being implemented: marine turtles; grey nurse shark (Carcharias taurus)	
Listed flora	None		

Numbers of native species recorded <sup>(a)</sup>					
Mammals	Birds	Reptiles	Fish	Invertebrates	
25	37	6	Over 263(b)	90	

(a) Species numbers are from a recent species inventory based on documented sightings in the reserve and adjacent areas. The inventory is still new and is continuing to be updated and refined; it is likely to currently underestimate species numbers.

(b) Fish species number is from a list of species identified in the Solitary Islands Marine Park (State Waters) component of the reserve by the Solitary Islands Underwater Research Group.

### Management arrangements

The NSW Marine Parks Authority conducts on-site day-to-day management of the reserve for the Australian Government under an annual business agreement.

The Solitary Islands Marine Park Advisory Committee oversees management and planning arrangements, and enables stakeholders to contribute to planning for both the adjacent state park and the Commonwealth reserve. The department is represented on the committee.

The management plan review is being finalised. Results from the review are expected to include recommendations for the next management plan that will come into effect when the bioregional planning process is completed. Interim management arrangements are now in force to allow activities permitted under the expired management plan to continue.

## Monitoring

The NSW Marine Parks Authority and CSIRO continued to monitor grey nurse shark movements between aggregation sites in the reserve including Pimpernel Rock.

Ongoing research was conducted to identify fish biodiversity patterns in deep reef habitats and to explore the representation of fish assemblages.

An additional 12 square kilometres of swath-mapping was undertaken to determine habitats and the seafloor composition to inform state park and Commonwealth reserve management and to guide future benthic studies. Over the two years of the project, 46 per cent of the Sanctuary Zone and the Habitat Protection Zone in Commonwealth waters have been swath-mapped.

The NSW Marine Parks Authority continued to remove and monitor debris at Pimpernel Rock.

## **Future challenges**

Major challenges are:

- managing the reserve under the interim management arrangements
- consulting with stakeholders and the NSW Marine Parks Authority on future management arrangements, including the bioregional planning process for the East Marine Region.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issue

· Potential illegal activities threatening conservation values

#### Actions

- Enforce fishing restrictions
- Monitor anchor sites at Pimpernel Rock

Performance results 2008–09 (in cooperation with New South Wales Government)

- The NSW Marine Parks Authority provided surface support to Coastwatch surveillance and conducted 26 surface compliance and enforcement patrols
- NSW officers conducted targeted operations in response to intelligence received, particularly for the Pimpernel Rock Sanctuary Zone. Two fishing vessels were detected fishing inside the reserve and enforcement action was taken. One illegal fisher was successfully prosecuted and fined

#### KRA4: Visitor management and park use

#### Major issues

- · Managing impacts from visitor activities in the Sanctuary Zone
- Managing impacts from commercial fishing under approvals in the Habitat Protection Zone

#### Actions

- Conduct surface patrols and manage commercial fishing approvals
- Communicate reserve values and provide information to users
- Communicate with user groups to discuss the implementation of the approvals regime

#### Performance results 2008–09 (in cooperation with New South Wales Government)

- The NSW Marine Parks Authority provided surveillance support through regular surface patrols
- Issued 68 commercial fishing approvals and six commercial tourism approvals, indicating a high response rate from users
- Employed a temporary education officer to implement the communications strategy

#### KRA5: Stakeholders and partnerships

#### Major issue

• Ongoing engagement with the community and with state and Australian Government representatives

#### Actions

- Develop an annual business agreement with the NSW Department of Climate Change to provide management, communication, compliance and research services in the reserve
- Participate in Solitary Islands Marine Park Advisory Committee meetings
- Conduct community consultation and stakeholder meetings as part of the planning process for the East Marine Region
- Performance results 2008–09 (in cooperation with New South Wales Government)
- · Signed and implemented the annual business agreement
- · Conducted management, communication, compliance and research activities
- Participated in advisory committee meetings
- Gave presentations and met with all identified stakeholder groups at various locations and times to update them
  on the bioregional planning process

## Heard Island and McDonald Islands Marine Reserve

#### heardisland.aq



## Special features

The Heard Island and McDonald Islands Marine Reserve includes the Territory of Heard Island and McDonald Islands, which extends to 12 nautical miles from shore, plus an additional marine area which extends in parts to the 200 nautical mile boundary of Australia's Exclusive Economic Zone boundary. The reserve is approximately 4,099 kilometres south-west of Perth.

Heard Island and McDonald Islands is the only major subantarctic island group believed to contain no species directly introduced by humans. Its terrestrial and marine ecology and oceanographic conditions are quite distinct from other Southern Ocean islands, including Australia's Macquarie Island.

The islands and surrounding waters provide crucial

breeding habitat for many birds and marine mammals. Eleven of the species breeding or foraging in the marine reserve are listed as threatened under the Agreement on the Conservation of Albatrosses and Petrels; and three species are listed as endangered and 14 species as vulnerable under the EPBC Act. Two species, the Heard Island sheathbill *(Chionis minor nasicornis)* and the Heard Island cormorant *(Phalacrocorax atriceps)*, are endemic to the reserve.

The terrestrial environment contains permanent glaciers, Australia's only active volcanoes, and Australia's highest mountain (Mawson Peak 2,750 metres) outside the Australian Antarctic Territory. Heard Island contains significant cultural relics and heritage sites from 19th and early 20th century sealing activities and from the first Australian Antarctic research expeditions.

The marine environment surrounding the islands features diverse and distinctive benthic habitats that support a range of slow growing and vulnerable species including corals, sponges, barnacles and echinoderms. The waters of the reserve also include prime foraging areas for a number of land-based marine predators, and provide nursery areas for fish, including commercially harvested species. Areas of highly productive nutrient-rich waters in the reserve, created by the confluence of key oceanographic fronts such as the Antarctic Polar Front, are believed to provide feeding grounds for cetaceans.

Location	53°05′ South, 73°30′ East			
Area	6,465,845 hectares			
Proclamation date	16 October 2002			
IUCN category	Category la			
Biogeographic context	Subantarctic area IMCRA 4.0 provincial bioregion: Kerguelen Province			
Management plan	First plan expires 10 August 2012			
Other significant management documents	Australia's Antarctic Science Program: Science Strategy 2004–05 to 2008–09			
Financial	Operating	\$620,400		
	Capital	Not applicable		
	Revenue	Not applicable		
Visitors	48 <sup>(a)</sup>			
Permits	3			

(a) 44 Australian Antarctic Program expeditioners, 4 ships' crew. Excludes landings from fisheries surveillance patrols, the details of which are protected

International conventions and agreements	
World Heritage Convention	The Territory of Heard Island and McDonald Islands is listed under natural criteria (i) and (ii), recognising its outstanding natural values
Migratory Species (Bonn) Convention	12 of the 105 listed Australian species
China-Australia Migratory Birds Agreement	1 of the 81 listed species
Japan-Australia Migratory Birds Agreement	4 of the 77 listed species
Korea-Australia Migratory Birds Agreement	1 of the 59 listed species
Convention on the Conservation of Antarctic Marine Living Resources	The territorial sea and Exclusive Economic Zone lie within the convention area
Agreement on the Conservation of Albatrosses and Petrels	11 of 26 species
Treaty between the Government of Australia and the Government of the French Republic on Cooperation in the Maritime Areas adjacent to the French Southern and Antarctic Territories, Heard Island and the McDonald Islands	The treaty provides for cooperation between Australia and France to combat illegal fishing and conduct scientific research in the adjacent territorial seas and Exclusive Economic Zones

Environment Protection and Biodiversity Conservation Act 1999			
Listed fauna	Species <sup>(a)</sup>	1 endangered 10 vulnerable 14 migratory 51 marine	
	Recovery plan	1 being implemented: albatross ( <i>Diomeda</i> spp. and <i>Thalassarche</i> spp.) and giant petrels ( <i>Macronectes</i> spp.)	
Listed flora	None		
Heritage	On National Heritage List and World Heritage List		

(a) Breeding and non-breeding species other than cetaceans

Numbers of native species recorded					
Mammals	Birds	Reptiles	Fish	Invertebrates	Plants
7 (a)	47 (b)	0	34 (c)	169 (d)	262 (e)

(a) 3 breeding, 4 non-breeding seal species (b) 19 breeding, 28 non-breeding (c) Recorded from nearshore waters (less than 12 nautical miles) (d) Terrestrial and freshwater (e) 12 vascular plants, 62 bryophytes, 71 lichens, 100 terrestrial algae, 17 marine macro-algae

#### Management arrangements

The reserve is managed by the department's Australian Antarctic Division under delegation from the Director of National Parks.

## Monitoring

Research and monitoring priorities are:

- research that increases understanding of the reserve's values and provides for ongoing reporting on the condition of the reserve's values, as required under legislation and national and international agreements
- research to determine whether the current reserve area sufficiently represents the region's marine habitats and is effective in achieving the purposes for which the reserve was declared
- research and monitoring to further understanding of the impacts of human activities in and around the reserve on the reserve's values, and to contribute to developing management strategies
- research and monitoring that will help address emerging management issues consistent with the provisions of the management plan.

The Australian Antarctic Division began a project to develop techniques to use satellite imagery to detect changes in features on Heard Island.

Other projects focused on gathering quantitative data on the distribution, abundance and species composition of benthic invertebrate communities in the region. These data will inform future management options for the proposed Conservation Zone adjacent to the Reserve.

Division staff visited the reserve in December 2008; this was the first visit since 2004. Work included helicopter-mounted photographic surveys, bathymetric soundings, maintenance of refuges and servicing an automatic weather station. Landing sites included Long Beach, Atlas Cove, Red Island, Spit Point and Winston Lagoon. Poor visibility prevented staff conducting wildlife surveys off the coast of the McDonald Islands.

## Future challenges

The major challenge continues to be funding and mounting expeditions to the reserve for research and monitoring, maintaining field huts, and removing waste.

## Report on performance by key result areas

#### KRA1: Natural heritage management

#### Major issues

- Monitoring changes to the landscape and the status of populations of species breeding in the reserve
- Preventing introductions and controlling or eradicating non-native species
- Ensuring the reserve provides sufficient protection for the region's biodiversity

#### Actions

- Use remotely sensed data to assess environmental change
- Verify visitors' compliance with quarantine requirements
- Obtain specialist assistance in quarantine management, and the potential control or eradication of species of concern
- Facilitate the collection and analysis of data to support decisions on the management of the Conservation Zone

#### Performance results 2008–09

- Developed techniques to enhance the analysis of satellite imagery
- Inspectors appointed under the Environment Protection and Management Ordinance 1987 ensured that visitors complied with cleaning requirements
- Quarantine Tasmania provided advice on pre-departure quarantine measures
- Completed a scientific assessment of the values of the Conservation Zone. The assessment will help inform decisions on future reserve boundaries

#### KRA2: Cultural heritage management

#### Major issue

• The potential degradation or loss of cultural heritage on Heard Island

#### Actions

- · Monitor the extent of the degradation or loss of cultural heritage
- Ensure visitors understand the nature of offences under the Environment Protection and Management Ordinance 1987 and Regulations under the EPBC Act

- Customs, Australian Fisheries Management Authority, and Australian Antarctic Division staff re-photographed
   artefacts and structures
- Briefed permit holders and island visitors in accordance with management plan requirements

#### KRA4: Visitor management and reserve use

#### Major issue

· Facilitating environmentally appropriate visitor access

#### Action

 Ensure permits are issued in a timely fashion and visitors are briefed in accordance with management plan requirements

#### Performance results 2008–09

- · Issued all permits within ten working days of applications being received
- · Briefed permit holders and island visitors in accordance with management plan requirements

#### KRA5: Stakeholders and partnerships

#### Major issues

- Engaging the community in the management of the reserve
- Communicating the reserve's values to the Australian and global public

#### Action

• Progress strategies for communicating information on reserve management issues

#### Performance results 2008–09

- Consulted government agencies, industry and conservation groups on the management of the fishery adjacent to the reserve
- Consulted tourist operators on developments in the management of operations in the Antarctic and sub-Antarctic region

#### **KRA6: Business management**

#### Major issue

• Implementing the management plan

#### Actions

- Encourage compliance through education and self-regulation
- · Identify management plan implementation priorities and allocate resources accordingly
- Review the Environment Protection and Management Ordinance 1987 and repeal redundant provisions

- Began investigation of a compliance incident, involving an incursion into the reserve
- Completed a scientific assessment of the values of the Conservation Zone
- Completed a revision of the Environment Protection and Management Ordinance 1987



## Figure 4: Overlay of images to detect variations in vegetation density over time

One obvious challenge in managing the subantarctic Heard Island and McDonald Islands Marine Reserve is its remote location, 4,000 kilometres south-west of Western Australia.

Regular on-site monitoring is difficult and expensive, and these practical constraints are acknowledged in the Heard Island and McDonald Islands Marine Reserve Management Plan, which promotes the development of practical, cost-effective and lowimpact remote monitoring techniques.

Monitoring is essential as research on Heard Island has shown that local climatic conditions are continuing to change, and these changes are having an effect on the island's environment. Between 2000 and 2004, for example, Brown Glacier on the island's east coast lost eight million cubic metres of ice a year, compared to the 50-year average of three million cubic metres a year. In some coastal areas that were previously ice covered, there are now large areas of bare ground and lagoons.

The Australian Antarctic Division is responsible for the World Heritage listed Territory of Heard Island and McDonald Islands and manages the Heard Island and McDonald Islands Marine Reserve under delegation from the Director of National Parks.

The Division recently began a project to use satellite imagery to detect changes in features on Heard Island. The project involves a team of scientific and technical experts from the Australian Antarctic Data Centre and the University of Tasmania.

# Monitoring Heard Island remotely

The project utilises high resolution satellite images, such as from the WorldView-1 and QuickBird earth imaging satellites. These satellites detect the nearinfrared light wavelengths reflected by vegetation, allowing different land cover types, such as bare rock and plant communities, to be identified.

The satellite images must be corrected for spatial distortions arising from topographical variations (such as mountains and gullies) in the earth's surface and the tilt of the satellite as it passes over these features. This 'orthorectification' is done with the help of a digital elevation model showing the terrain in 3D, on-ground photos and global positioning system data previously collected.

Once corrected, important features such as the coastline, glacial extent, vegetation and lagoons are manually digitised in a geographic information system. The eventual aim is to automate this time-consuming process using pattern-recognition software. Object characteristics such as light properties, shape, size, texture and context can then be used to classify the object into a meaningful class and produce up-to-date maps. This so-called 'object-based image analysis' approach aims to simulate the way humans visually analyse imagery.

The project also involves developing automated techniques to identify changes in the coastline, glacial extent, and vegetation cover. Preliminary results show that there has been an increase in vegetation between 1991 and 2006. Comparing QuickBird images from 2003 and 2006 revealed that detailed changes in vegetation communities can be automatically identified and mapped.

Figure 4 was produced by overlaying the change detections from caparing a 1991 SPOT image and a 2006 QuickBird image (with only the 1991 SPOT image appearing in the background). Significant changes in vegetation appear in red The white arrow indicates an area of vegetation increase on the Stephenson moraine. Figures 2 and 3 compare vegetation in this area between 1987 and 2004, as observed in the field – note the increase in cushion plant cover in the foreground of the 2004 photo.
#### Figure 5: Stephenson moraine 1987



By completion of the year-long project the Division plans to have used the orthorectified images to update topographic maps of the island, to map the coastline, human footprint, glacial extent and lagoons and to map detectable changes in these features.

Multimedia products – such as interactive tours and animations in Google Earth – are also being developed to publicly display the information and boost the Division's efforts to present Heard Island to the community (Figure 7). At the end of the

Figure 7: 3D view of Heard Island appearing in Google Earth

#### Figure 6: Stephenson moraine 2004



project, the results will be published on the Heard Island and McDonald Islands website with downloadable Google Earth scenes and animations.

The project will also have relevance for remote monitoring of the Australian Antarctic Division's other areas of management and research interest.

The above 3D view of Heard Island in Google Earth is comprised of WorldView-1 satellite imagery, in black and white, and IKONOS imagery of the eastern part of the island. The WorldView-1 image, acquired on 23 March 2008, covers the whole island at 50 cm resolution. The IKONOS image was acquired during



the last Australian Antarctic Division expedition to the island in January 2004. While the IKONOS image only covers the eastern portion of the island, its multispectral bands enable land cover classification and change detection. The red colour represents high spectral reflectance in the near-infrared part of the spectrum, which is indicative of vegetation.

# APPENDIX A – PORTFOLIO BUDGET STATEMENT REPORTING – 2008–09

#### **KEY RESULT AREA 1 – NATURAL HERITAGE MANAGEMENT**

PBS Target - Maintenance of viable populations of selected significant species

Park managers have nominated 35 species across all terrestrial reserves to determine whether viable populations of selected significant species have been maintained. Of the selected species, the populations of 4 species (11.4%) are increasing; 12 species (34.3%) are remaining steady; 8 species (22.9%) are decreasing; and 11 species (31.4%) are data deficient

#### **Booderee National Park**

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Eastern bristlebird Dasyornis brachypterus	Endangered	Monitoring programs for distribution and abundance in place since 2004.	Controlling fox populations and preserving suitable bristlebird habitat.	Numbers have been steadily increasing since the last major wildfire in 2003.	<ul> <li>Numbers rising</li> </ul>
Sooty oystercatcher Haemotopus fuliginosus	No	Monitoring programs for distribution and abundance in place since 2004.	Controlling fox population and protecting Bowen Island nesting sites. Public education programs.	Numbers have been stable for the life of the program. Ongoing nesting activity has been observed.	Numbers steady
Pied oystercatcher Haematopus longirostris	No	Monitoring programs for distribution and abundance in place since 2004.	Controlling fox populations. Working with other land management agencies to control threats posed by vehicles. Public education programs.	Numbers have been stable for the life of the program.	Numbers steady
Little penguin <i>Eudyptula minor</i>	Marine	Irregular counts of beach landings. Irregular monitoring of chick mortality.	Maintained native plantings to re-establish penguin nesting habitat on Bowen Island.	This is a stable and very healthy population displaying exceptionally high breeding success.	▶ Numbers steady
Long-nosed bandicoot <i>Perameles nasuta</i>	No	Monitoring program for bandicoots and primary food source (invertebrates) in place since 2003.	Controlling fox populations.	Populations peaked in 2005–2006 before declining in 2008–2009. This is considered to be representative of trends in recovering bandicoot populations.	▶ Numbers steady
Green and golden bell frog <i>Litoria aurea</i>	Vulnerable	Call back monitoring of breeding sites since 1996. PhD research project of all frogs has been underway since 2007.	Fire management to minimise impact of frog habitat	For the fourth year running, the species has not been recorded in the park	✓ Numbers falling

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Giant burrowing frog Heleioporus australiacus	Vulnerable	Call back monitoring of breeding sites since 1996. PhD research project of all frogs has been underway since 2007.	Fire management to minimise impact of frog habitat	Numbers have been stable for the life of the program.	Numbers steady

## **Christmas Island National Park**

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Christmas Island pipistrelle <i>Pipistrellus murrayi</i>	Critically Endangered	Continuous monitoring of pipistrelle call activity. Monitoring of roost trees to determine potential predators.	Undertook feasibility of captive breeding program. Expert Working Group assessment of threats to the Island's biodiversity, including the pipistrelle.	Species in severe decline with threat of extinction.	→ Numbers falling
Blue-tailed skink Cryptoblepharus egeriae	No	Survey of native reptile fauna conducted in May–June 2008 and ongoing monitoring.	Undertook feasibility of captive breeding program. Initial commencement of captive breeding program.	Reptile species, including the blue-tailed skink are undergoing a rapid population decline.	✓ Numbers falling
Red crab Gecarcoidea natalis	No	Biennial biodiversity survey of burrow counts to determine density. Survey has used consistent methodology since 2001. Last survey occurred in 2007.	Continued crazy ant management program, including planning for an aerial baiting program and commencement of an indirect biological control research project. Continued red crab management program including traffic management, road infrastructure development and education.	Population numbers appear to have remained steady from 2001 to 2007. Current population estimate of 50 million.	► Numbers steady
Abbott's booby Papasula abbotti	Endangered; Marine; Migratory	Aerial nest count survey last conducted in 2002. Next survey to be undertaken in 2009. External researcher currently investigating some aspects of population ecology.	Continuation of the Christmas Island Mine-site to Forest Rehabilitation Programme (CIMFR) which focuses on the rehabilitation of Abbott's booby nesting habitat.	Trend is currently unknown. Awaiting results of 2009 survey.	Data deficient

## Kakadu National Park

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Northern quoll Dasyurus hallucatus	Endangered	5 year monitoring of fire plots completed. Additional monitoring through Biodiversity Hotspot Survey and targeted monitoring at the East Alligator Ranger Station. Implemented incidental sighting database to record any sightings or road kills. Intermittent records are being received indicating there are a few areas where this species is persisting albeit in low numbers.	Landscape unit-based fire management to improve habitat quality. Off-shore species relocation program conducted in conjunction with NT Government.	Population decline was evident following arrival of cane toad. Population levels are at low levels yet are stable.	▶ Numbers steady
Northern brown bandicoot Isoodon macrourus	No	5 year monitoring of fire plots completed. Additional monitoring through Biodiversity Hotspot Survey. Implemented incidental sighting database to record any sightings or road kills.	Landscape unit-based fire management to improve habitat quality.	Population declining consistent with pattern of small mammal decline across Northern Australia.	✓ Numbers falling
Northern brush tail possum Trichosurus arnhemensis	No	5 year monitoring of fire plots completed. Additional monitoring through Biodiversity Hotspot Survey. Implemented incidental sighting database to record any sightings or road kills.	Landscape unit-based fire management to improve habitat quality.	Population declining consistent with pattern of small mammal decline across Northern Australia.	✓ Numbers falling
Brush-tailed rabbit-rat Conilurus penicillatus	Vulnerable	5 year monitoring of fire plots completed. Additional monitoring through Biodiversity Hotspot Survey. Implemented incidental sighting database to record any sightings or road kills.	Landscape unit-based fire management to improve habitat quality.	Population declining consistent with pattern of small mammal decline across Northern Australia.	✓ Numbers falling
Black-footed tree-rat Mesembriomys gouldii	No	5 year monitoring of fire plots completed. Additional monitoring through Biodiversity Hotspot Survey. Implemented incidental sighting database to record any sightings or road kills.	Landscape unit-based fire management to improve habitat quality.	Population declining consistent with pattern of small mammal decline across Northern Australia.	✓ Numbers falling

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Pale field rat Rattus tunnneyi	No	5 year monitoring of fire plots completed. Additional monitoring through Biodiversity Hotspot Survey. Implemented incidental sighting database to record any sightings or road kills.	Landscape unit-based fire management to improve habitat quality.	Population declining consistent with pattern of small mammal decline across Northern Australia.	✓ Numbers falling
Flatback turtle Natator depressus	Vulnerable; Marine; Migratory	Continuation of 15 year survey and capture program (annual survey).	-	Monitoring shows population is steady.	Numbers steady
Estuarine crocodile Crocodylus porosus	Marine; Migratory	Continuation of 15 year survey and capture program. Satellite tracking project has underway for 5 years.	_	Crocodile populations in East Alligator River and South Alligator River are healthy and beginning to plateau. Crocodile population in West Alligator River is still increasing. Further information is required to determine population dynamics in the Wildman River.	Numbers steady

## Norfolk Island National Park

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Green parrot <i>Cyanoramphus cookii</i>	Endangered; Migratory	Annual monitoring of assisted breeding nesting sites throughout breeding season (October to April). Monitoring commenced in the 1980's and birth rate data collected since 1986.	Active management of 62 green parrot nesting sites. Discontinued captive breeding program to focus effort on assisted breeding in the wild. Active feral animal control (rats, cats, crimson rosellas).	Current population estimate of 200 individuals. 5% increase over the past year (approx). 300% increase over the past decade (approx).	Numbers rising
Norfolk Island morepork (boobook) owl Ninox novaeseelandiae undulata	Endangered; Migratory	Artificial nesting boxes are monitored annually to record breeding activity (October to January). Also use playback of owl calls to record possible distribution across Norfolk Island.	Installation of 7 new owl nesting boxes bringing total available nesting boxes to 28.	Current population estimate of 40 individuals. No change over past year. Although not well documented, there has been an increase over the past decade. First introduced from NZ in mid 1980's. Steady population numbers may indicate that carrying capacity of existing habitat has been reached.	▶ Numbers steady

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Golden whistler Pachycephala pectoralis xanthoprocta	Vulnerable	No monitoring program at present. Aim to initiate monitoring in 2009–10.	General habitat improvement and feral animal control.	Unable to determine. No trends at present.	Data deficient
Pacific robin Petroica multicolor multicolor	Vulnerable	No monitoring program at present. Aim to initiate monitoring in 2009–10.	General habitat improvement and feral animal control.	Unable to determine. No trends at present.	Data deficient
Wedge-tailed shearwater Puffinus pacificus	Marine; Migratory	No monitoring program at present. Aim to initiate monitoring in 2009–10.	General habitat improvement and feral animal control.	Unable to determine. No trends at present.	Data deficient

# Pulu Keeling National Park

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Red-footed booby <i>Sula sula</i>	Marine; Migratory	Annual fauna survey conducted on North Keeling Island since 1985.	Continued monitoring program. Community education and compliance activities	Analysis of data indicates population remain steady at around 30,000 breeding pairs.	▶ Numbers steady
Cocos buff-banded rail Gallirallus philippensis andrewsi	Endangered	Monitoring commenced in late 1999. Monitoring continued opportunistically when staff visit the park.	Undertook feasibility to re-introduce and establish a second viable population outside the park (southern atoll). Collaborative work with the Cocos Islands Shire and scientists	In 2005, monitoring data was analysed and found that the current population is stable at 1,000 individuals.	▶ Numbers steady

# Ulu<u>r</u>u-Kata Tju<u>t</u>a National Park

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Tjaku <u>r</u> a - Great Desert skink <i>Egernia kintorei</i>	Vulnerable	12th annual <i>Tjakur</i> a survey (Feb–Mar 2009) identified 205 active burrows (containing 63 juveniles and 54 sub adults).	Continued fire management to improve habitat quality. Commenced predator monitoring.	Highest number of active burrows (205) since inception of monitoring (12 years). 18% increase in active burrows over 1 year; 286% increase over 5 years; 97% increase over 10 years. Increase may be due to increase in population or increased search effort (more staff involved in this survey). Next few surveys will clarify trend.	Numbers rising

Species	EPBC Act status	Monitoring	Actions	Trend	Flag
Mala – rufous hare wallaby <i>Lagorchestes hirsutus</i>	Endangered	6th annual mala survey (April 2009) captured 47 individuals (14 tagged).	Continued active management within predator proof enclosure such as mosaic burning (20% regeneration to 80% mature spinifex) and supplementary feeding within enclosure. Released calicivirus within enclosure to manage rabbit population. Undertaking research into range and demography.	24 individuals were released in September 2005. Population estimate as at April 2008 was 74 suggesting an increase of 208% over 3 years.	Numbers rising
Murtja - mulgara <i>Dasycercus blythi</i>	No	10th annual <i>Murtja</i> survey (Nov 2008) captured one adult female. 20 suitable sites were searched for signs of activity. 13 sites had signs present although only 3 sites had current activity.	Continued fire management to improve habitat quality. Collared feral cats to determine whether they are main predator.	Activity level is low and will probably remain so until significant rainfall. Habitat still recovering from 2002 wildfires that burnt 50% of the Park. Capture rate currently too low to determine long term trend. However observation (burrow counts, scat) suggests significant activity.	Data deficient
Southern marsupial mole Notoryctes typhlops	Endangered	Initial survey undertaken in December 2008.	Currently determining habitat preferences.	No baseline data or trends to date.	Data deficient
Striated grasswren Amytornis striatus	No	Initial survey occurred in 1992. Monitoring to recommence in August 2009.	-	Baseline data only. No trends at present.	Data deficient
Common wallaroo / euro <i>Macropus robustus</i>	No	Initial survey to be undertaken in October 2009.	Currently determining habitat preferences and visitor influences on existing populations.	No baseline data or trends to date.	Data deficient
Fat-tailed false antechinus Pseudantechinus macdonnellensis	No	Initial annual survey undertaken in January 2009.	Undertook feral cat monitoring to determine if this is main predator.	No baseline data or trends to date.	Data deficient
Kata Tju <u>t</u> a wanderrie (Eriachne scleranthoides)	No	1st rare flora survey (late 2008) established baseline data on distribution and abundance.	Undertook track maintenance to prevent erosion.	Baseline data only. No trends at present.	Data deficient
Kata Tju <u>t</u> a wattle <i>(Acacia olgana)</i>	No	1st rare flora survey (late 2008) established baseline data on distribution and abundance.	Undertook track maintenance to prevent erosion. Protected <i>Acacia.</i> <i>olgana</i> from fire.	Baseline data only. No trends at present.	Data deficient

PBS Target - No net increase in distribution/abundance of significant invasive species

Park managers have nominated 20 significant invasive species across all terrestrial reserves to identify changes in overall distribution and abundance. Of the selected species, the populations of 6 species (30%) are increasing; 3 species (15%) are remaining steady; 2 species (10%) are decreasing; and 9 species (45%) are data deficient

#### **Booderee National Park**

Species	Monitoring	Actions	Trend	Flag
European red fox <i>Vulpes vulpes</i>	Utilising fauna surveillance cameras, fox bait take and sand plot monitoring to monitor residual fox populations.	Continue to undertake fox control activities with an emphasis on removing residual, bait-shy individual foxes and introducing alternative fox control methods.	Fox numbers very low, but numbers of bait shy individuals may be increasing.	▶ Numbers steady
Bitou bush Chrysanthemoides monilifera	Aerial survey undertaken. Density and distribution mapped and recorded on GIS. Annual aerial spray efficacy mapped and recorded on GIS. Post treatment exclosure trials to assess vegetation recovery.	400 hectares of bitou bush sprayed in June 2009.	70% reduction in area of high density infestation in the past 5 years. Post treatment recovery slow due to high levels of preferential grazing by native species.	✓ Numbers falling

#### **Christmas Island National Park**

Species	Monitoring	Actions	Trend	Flag
Yellow crazy ant Anoplolepis gracilipes	Biennial biodiversity survey to determine supercolony density. Survey has used consistent methodology since 2001. Last survey occurred in 2007.	90 hectares of yellow crazy ant supercolonies treated. Planning for an aerial baiting program in 2009–10 is well under way.	Significant decline in supercolony numbers occurred in 2002 after successful aerial baiting program. Since 2002 supercolonies have slowly increased (but less than pre 2002 levels) leading to the need for an aerial baiting program in 2009.	▲ Numbers rising
False coffee bush <i>Clausena excavata</i>	Initial survey to be conducted as part of 2009 island wide survey.	Weed eradication project undertaken.	No baseline data to date so no trend can be detected. Increasing numbers and distribution under intact rainforest canopy is of significant concern.	Data deficient

Species	Monitoring	Actions	Trend	Flag
Feral cat Felis catus	Determining feral cat numbers is extremely difficult. Still investigating approaches to monitor effectively.	Collaborative work with the Shire of Christmas Island on long term cat management program (including funding of cat de-sexing program). Trial conducted to test effectiveness of cat bait. Toxin successful however bait delivery system was unsuccessful. Trial to be repeated in 2009–10 using a different bait matrix.	No baseline data to date so no trend can be detected. Anecdotal evidence suggests that numbers appear to be rising.	Data deficient

#### Kakadu National Park

Species	Monitoring	Actions	Trend	Flag
Mimosa <i>Mimosa pigra</i>	Mimosa stands have been mapped and there is an annual monitoring program.	Integrated eradication program conducted.	Under control	▶ Numbers steady
Para grass Brachiaria mutica	Ongoing monitoring as part of integrated weed program. Species is subject to several current research projects.	Opportunistic control.	The range of this species is increasing.	<ul> <li>Numbers rising</li> </ul>
Salvinia Salvinia molesta	Ongoing monitoring as part of integrated weed program.	Introduction of biological control agent and minor mechanical and chemical control in key sites.	Extent of salvinia infestations varies greatly between locations and over time.	▶ Numbers steady
Water buffalo <i>Bubalus bubalus</i>	Major survey conducted in 2008–09.	Major control exercise conducted in 2008–09 in addition to ongoing opportunistic control.	Buffalo numbers increasing.	<ul> <li>Numbers rising</li> </ul>
Feral pig Sus scrofa	Major survey conducted in 2008–09.	Major control exercise conducted in 2008–09 in addition to ongoing opportunistic control.	Feral pig numbers are increasing.	Numbers rising

## Norfolk Island National Park

Species	Monitoring	Actions	Trend	Flag
Black rat Rattus rattus	Monthly survey of presence/absence of rats. Trapping and baiting program provides an indication of presence/ absence.	Commenced upgrade of rat stations to modern bait/trap boxes. 1200 kilograms of bait taken by rodents. >250 rats caught in traps.	Unable to determine population size or trends.	Data deficient
Feral cat Felis catus	Trapping program provides an indication of presence/absence. Commenced gut analysis to determine prey composition (e.g. native birds, rats).	25 wild cats controlled in the park.	Unable to quantify population size but capture rates are increasing which may suggest an increase in the feral cat population. Uncertain whether rodent control program on park is impacting on feral cat numbers in the park.	Data deficient
Red guava Psidium cattleianum	No monitoring program at present. Aim to initiate monitoring in 2009–10.	Completed weed control in 5 of the 19 coups identified in the rehabilitation strategy. 5 ha weeds controlled.	Unable to determine. No trends at present.	Data deficient
African olive Olea europaea africana	No monitoring program at present. Aim to initiate monitoring in 2009–10.	Completed weed control in 5 of the 19 coups identified in the rehabilitation strategy. 5 ha weeds controlled.	Unable to determine. No trends at present.	Data deficient

# Pulu Keeling National Park

Species	Monitoring	Actions	Trend	Flag
Yellow crazy ant Anoplolepis gracilipes	Island wide survey conducted in June 2008. Survey methodology will be updated to include detection of "scale insects".	Continued monitoring program. Planning for control programs using chemical. Successful funding application to undertake major invasive species management programs from 2009–11.	Colonies fairly widespread, with some sites recorded at 'supercolony' density.	Numbers rising
Coral berry Rivina humilis	Ongoing mapping activities since 2008.	Successful funding application to undertake major invasive species management programs from 2009–11.	Increased distribution and density observed in western part of the park.	Numbers rising

# Ulu<u>r</u>u-Kata Tju<u>t</u>a National Park

Species	Monitoring	Actions	Trend	Flag
Buffel grass Cenchrus ciliaris	Initial monitoring program commenced in February 2009. A distribution map has been developed for the whole park.	Prioritised buffel grass control activities. Cleared approximately 15 hectares of buffel grass around Ulu <u>r</u> u.	Baseline data only. No trends at present. However distribution has probably increased across the Park (although reduced directly adjacent to Ulu <u>r</u> u).	Data deficient
Feral cat Felis catus	10 satellite tracking collars (lasting 8 months) have been fitted to determine range, microhabitat use and potential prey risk. Currently trialling roadside monitoring of feral cat tracks.	Continued feral cat trapping program.	Unable to establish trend with current monitoring approach.	Data deficient
European wild rabbit Oryctolagus cuniculus	Annual monitoring of active burrows has been undertaken since 1989.	Concentrated control in the <i>mala</i> enclosure. Trialling combination of control methods including release of calicivirus.	Active burrows have reduced significantly since 1989. 93% decrease in active burrows over 18 years.	✓ Numbers falling
European red fox <i>Vulpes vulpes</i>	Monthly vertebrate pest monitoring in borefields area of Park commenced Sept 2008.	Commenced fox baiting trial using fox-specific delivery stations.	Baseline data only. No trends at present.	Data deficient

#### **KEY RESULT AREA 2 – CULTURAL HERITAGE MANAGEMENT**

PBS Target - 100% of key sites, as agreed with traditional owners, inspected and treated as required (Jointly managed parks only)

• All key sites at Kakadu and Uluru-Kata Tjura were inspected as agreed with traditional owners. Various treatments were undertaken as required. An inspection and treatment program is not yet in place at Booderee

#### **KEY RESULT AREA 3 – JOINT MANAGEMENT**

PBS Target - 5% increase in numbers of Indigenous staff and/or contractors providing park services (Jointly managed parks only)

- There was a 3% decrease in the number of Indigenous staff (including intermittent and irregular employees) employed by the jointly managed parks
- While Indigenous contractor numbers were unable to be accurately determined across the jointly managed parks, Wreck Bay Enterprises Ltd (the enterprise arm of the Wreck Bay Aboriginal Community Council) continued to provide cleaning, road maintenance and entry station services to Booderee National Park. In recognition of the Council's desire to assume greater responsibility for delivery of park management functions, proposals were developed for the potential provision of ground maintenance, infrastructure maintenance and visitor centre services. Many Indigenous businesses provided park services at Uluru Kata-Tjuta and Kakadu

#### **KEY RESULT AREA 4 – VISITOR MANAGEMENT**

PBS Target – Reduction in number of risks identified in Risk Watch Lists as 'extreme', 'very high' or 'high'

There was a reduction in the number of risks identified in Risk Watch Lists as 'extreme', 'very high' or 'high'

PBS Target - Greater than 80% of comments received from park users about their visit are positive

 Visitor surveys were undertaken in Uluru-Kata Tjura, Kakadu, Booderee and Norfolk Island. All reserves recorded satisfaction from greater than 80% of park users. Uluru – 95% domestic, 92% international; Kakadu – 94% domestic, 91% international; Booderee – 97%; Norfolk Island – 86%

#### **KEY RESULT AREA 5 – STAKEHOLDERS AND PARTNERSHIPS**

PBS Target - Stakeholders and partners are actively involved during the year

Stakeholders and partners were actively involved and contributed effectively to park management activities. Key stakeholder included national and regional tourism organisations, industry groups, universities, non-government organisations and community groups

Research partnerships continued with a range of organisations such as the Northern Territory Parks and Wildlife Service, CSIRO, Australian Institute of Marine Science, James Cook University, Australian National University, University of Canberra, Charles Darwin University and the Tasmanian Aquaculture and Fisheries Institute

Constructive partnerships in managing Commonwealth reserves continued with: relevant state government agencies, the Department of Defence, the Department of Agriculture, Fisheries and Forestry and the Australian Customs and Border Protection Service

#### **KEY RESULT AREA 6 – BUSINESS MANAGEMENT**

PBS Target - Eight management plans and four implementation schedules in place

- Four terrestrial reserve management plans are in place. Draft management plans are being prepared for Uluru-Kata Tjuta, Booderee, Christmas Island and the ANBG
- Four terrestrial reserve implementation schedules are in place. Implementation schedules are not in place for the reserves with expired management plans

PBS Target – 80% of management prescriptions in management plans subject to technical audits are completed (applies ONLY to those plans that have received a technical audit)

 Technical audits on the implementation of the Christmas Island and Booderee management plans were conducted. For Christmas Island, 63% of management prescriptions in the management plan were fully completed, 36% were partially completed and 1% were not commenced. For Booderee, 95% of prescriptions were fully completed, 4% were partially completed and less than 1% were not commenced

PBS Target – Three parks with climate change strategies in place

- Climate change strategies have been drafted for Kakadu, Booderee and the ANBG. Strategies identify actions
  to address five key objectives:
  - Understanding the implications of climate change
  - Maximising the resilience of our reserves
  - Reducing our carbon footprint
  - Working with communities, industries and stakeholders to mitigate and adapt to climate change
  - Communicating the implications of climate change and our management response

PBS Target - Three actions implemented which reduce greenhouse gas emissions

- Greenhouse gas emissions increased by 4 per cent over the year due to more accurate measurement of waste generation and an increase in the use of diesel powered generators at Uluru-Kata Tjura and more accurate measurement of vehicular diesel usage at Booderee. There has been an 8 per cent decrease in greenhouse gas emissions over the past two years
- While there was an increase in greenhouse gas emissions from stationary sources (e.g. purchased or generated electricity) of 3 per cent, there was a significant reduction in emissions from transport sources of around 21 per cent. Key energy reduction activities undertaken by the parks included:
  - Reducing the vehicle fleet and introducing more fuel efficient vehicles at the ANBG, Booderee and Kakadu
  - Installing energy saving devices such as solar powered irrigation system controllers and 'soft start' airconditioning at the ANBG, automated sensor lights in public areas at Norfolk Island and energy efficient light globes at Kakadu
  - Removal of all off-park electrical equipment such as the radio repeater station at Norfolk Island

Planning and procurement approval has commenced at Ulu<u>r</u>u-Kata Tju<u>t</u>a to provide solar power augmentation for the park headquarters and the cultural centre

#### KEY RESULT AREA 7 – BIODIVERSITY KNOWLEDGE MANAGEMENT

PBS Target - 5% increase in website hits and publications accessed

- The Parks Australia website (environment.gov.au/parks) received 427,415 'unique' visits for the year (an average of 1,171 'unique' visitors per day). There were 79,935 'unique' views of online Parks Australia publications (an average of 219 'unique' views per day). Due to unavoidable changes to the department's web monitoring systems in March 2009, comparisons with the previous year's usage cannot be provided. Comparative data will be available in next year's annual report
- Visitation to the ANBG website (anbg.gov.au) increased by 5% over 2007–08

PBS Target - Commonwealth reserves website re-developed and maintained to a high standard

 Commonwealth reserves website continued to be re-developed and updated with an increase in interactive and rich media elements

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