

Information Sheet on EAA Flyway Network Sites (SIS) – 2017 version

Available for download from <http://www.eaaflyway.net/about/the-flyway/flyway-site-network/>

Categories approved by Second Meeting of the Partners of the East Asian-Australasian Flyway Partnership in Beijing, China 13-14 November 2007 - Report (Minutes) Agenda Item 3.13

Notes for compilers:

1. The management body intending to nominate a site for inclusion in the East Asian - Australasian Flyway Site Network is requested to complete a Site Information Sheet. The Site Information Sheet will provide the basic information of the site and detail how the site meets the criteria for inclusion in the Flyway Site Network. When there is a new nomination or an SIS update, the following sections with an asterisk (*), from Questions 1-14 and Question 30, must be filled or updated at least so that it can justify the international importance of the habitat for migratory waterbirds.
2. The Site Information Sheet is based on the Ramsar Information Sheet. If the site proposed for the Flyway Site Network is an existing Ramsar site then the documentation process can be simplified.
3. Once completed, the Site Information Sheet (and accompanying map(s)) should be submitted to the Flyway Partnership Secretariat. Compilers should provide an electronic (MS Word) copy of the Information Sheet and, where possible, digital versions (e.g. shapefile) of all maps.

1. Name and contact details of the compiler of this form*:

Full name: Dr Mark Carey

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EAAF SITE CODE FOR OFFICE USE ONLY:

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2. Date this sheet was completed*:

July 2016

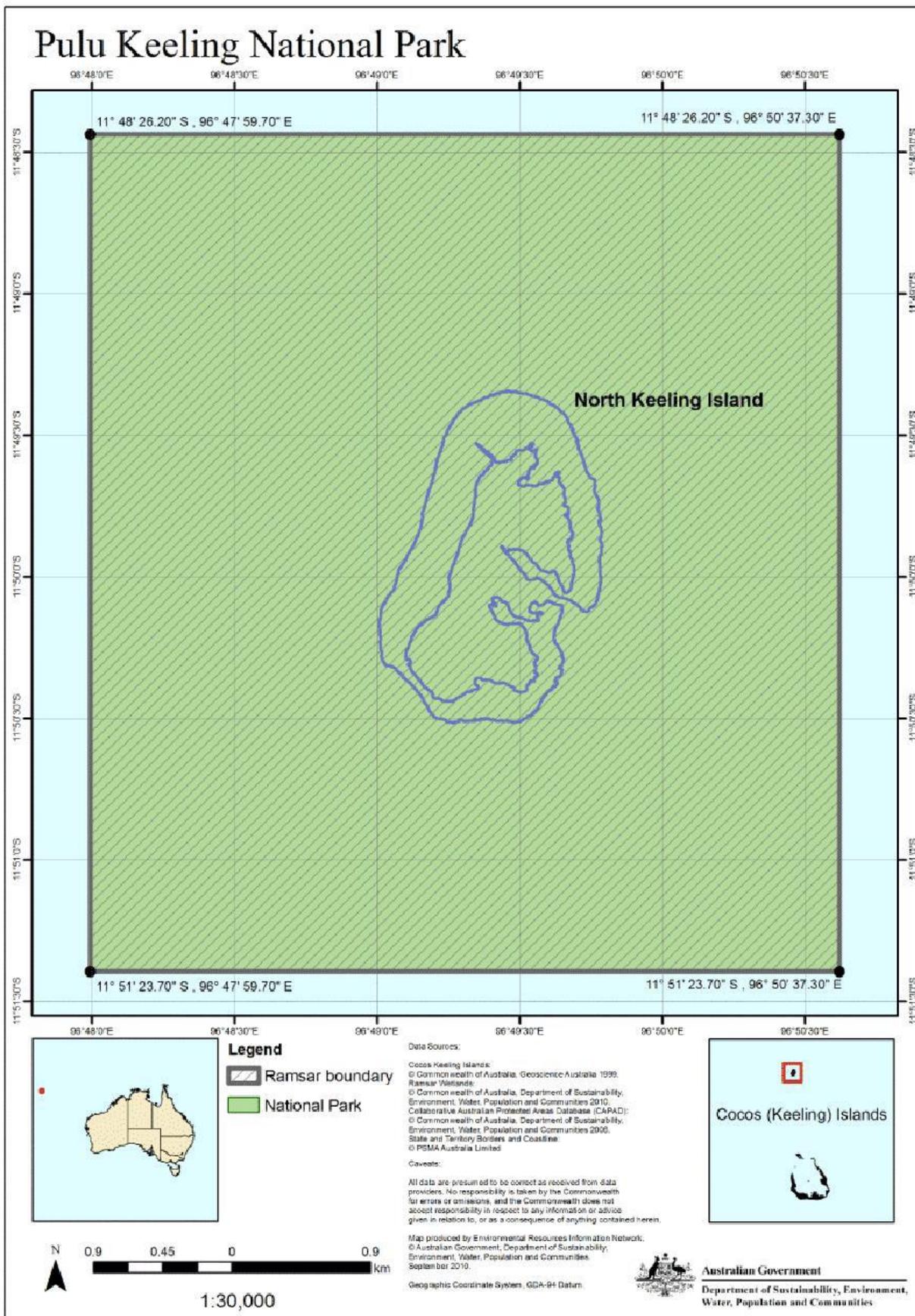
3. Country*:

Australia

4. Name of the Flyway Network site*:

Pulu Keeling National Park

5. Map of site*:



6. Geographical coordinates (latitude/longitude, in decimal degrees)*:

Latitude: 11°49' S Longitude: 96° 49' E

7. Elevation*:

Sea level to 3 m

8. Area*:

2603 ha

9. General overview of the site*:

The Pulu Keeling National Park Ramsar site (hereafter PKNP) is a coral atoll comprising of approximately 213 hectares of land, including the enclosed central lagoon, and 2390 hectares of surrounding coral reef and sea. At the time of listing, the centre of the atoll contained a single, tidal lagoon with a narrow connection to the Indian Ocean on the eastern side. Natural processes have since closed this connection. The site is significant for the number of migratory seabirds it supports including large breeding colonies of Red-footed Booby (*Sula sula*) and Lesser Frigatebirds (*Fregata ariel*). An endemic species of Buff-banded Rail (*Gallirallus philippensis andrewsi*) is a resident within the Ramsar site. Fish and marine invertebrate fauna are abundant and while there are few endemic species present, the fish fauna is considered unique due to the mixing of Indian and Pacific Ocean species which are at the edge of their distributions (Hobbs and Salmond 2008).

10. Justification of Flyway Site Network criteria*:

The PKNP Ramsar site supports 13 species of waterbird listed as migratory under Australia's bilateral international treaties (Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)). The site is also important for two species of migratory turtles, the Green Turtle (*Chelonia mydas*) and the Hawksbill Turtle (*Eretmochelys imbricate*). The site also supports breeding of Green Turtles (Whiting 2006).

The PKNP Ramsar site regularly supports more than 30,000 pairs of Red-footed Booby (*Sula sula*) (6% of the global population); up to 15,000 Common Noddy (*Anous stolidus*) (1.5% flyway population) and 3,000 Greater (*Fregata minor*) and 3,000 Lesser (*Fregata ariel*) Frigatebirds pairs (3% of the global population) (Stokes et al. 1984). White-tailed Tropicbirds (*Phaethon lepturus*) are common, nesting in moderate numbers in hollows of mature *pisona* trees. An additional 12 species of waterbird have been observed breeding on the island in lesser numbers including Brown Booby (*Sula leucogaster*), Masked Booby (*Sula dactylatra*), terns and tropicbirds.

Several species of migratory shorebird have been recorded feeding and roosting on the lagoon shoreline. The significance of the island as a staging point for migratory shorebirds is not known. Species recorded on the island include Ruddy Turnstone (*Arenaria interpres*), Sharp-tailed Sandpiper (*Calidris acuminata*), Sanderling (*Calidris alba*), Greater Sand Plover (*Charadrius leschenaultia*; listed endangered under the

EPBC Act), Oriental Plover (*Chlidonias leucoptera*), Pin-tailed Snipe (*Gallinago stenura*), Oriental Pratincole (*Glareola maldivarium*), Little Curlew (*Numenius minutes*), Whimbrel (*Numenius phaeopus*), Pacific Golden Plover (*Pluvialis fulva*), Grey Plover (*Pluvialis squatarola*), Common Greenshank (*Tringa nebularia*) and Common Redshank (*Tringa tetanus*).

The Cocos buff-banded rail (*Gallirallus philippensis andrewsi*) is significant as the only endemic bird in the Cocos (Keeling) Islands and is listed as endangered on the EPBC Act. It is often sighted on North Keeling Island and occurs in all habitats. It frequently forages along the lagoon shore, eating crustacea, which are abundant in the seagrass deposited along the tide line.

11. Wetland Types*:

- B -- **Marine subtidal aquatic beds**; includes kelp beds, sea-grass beds, tropical marine meadows.
- C -- **Coral reefs**.
- D -- **Rocky marine shores**; includes rocky offshore islands, sea cliffs.
- E - **Sand, shingle or pebble shores**; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.

12. Jurisdiction*:

Commonwealth of Australia

13. Management authority*:

Director of National Parks
Parks Australia
Department of the Environment and Energy
GPO Box 787, Canberra, ACT, 2601
Australia

14. Bibliographical references*:

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15. Physical features of the site:

The PKNP Ramsar site lies within the moist tropical climatic zone of the Indian Ocean. The general climatic pattern is warm to hot temperatures and high rainfall occurring year round. Rainfall, on average, occurs year round with highest monthly average rainfall in April (256 mm) and lowest in October (82 millimetres). Annual average rainfall at the Cocos (Keeling) Islands is in the order of 2 000 millimetres per year. Temperatures are warm to hot year round, with little seasonal variation. Maximum monthly temperatures are between 28 and 30 degrees Celsius and average minimum temperatures between 24 and 25 degrees Celsius.

The Cocos (Keeling) Islands are located in an area subject to tropical cyclones. Twenty-seven tropical cyclones were recorded in the vicinity of the Cocos (Keeling) Islands between 1955 and 2005; four of which caused destructive winds gusts of at least of 125 kilometres per hour (Doreen January 1968, Annie November 1973, Pedro November 1989 and Harriet February 1992). On average this equates to a tropical cyclone every two years and one causing destructive winds every 12.5 years.

The Island within the PKNP Ramsar site is approximately two kilometres long and 1.3 kilometres wide, and at the time of listing had a shallow (less than 2 metre deep) lagoon occupying the centre. The lagoon was connected to the Indian Ocean by a single channel on the south eastern shore (Woodroffe and McLean 1994). In 2005, the lagoon entrance within the Ramsar site closed (as a result of natural forces of deposition) which has lead to significant changes within this habitat. The Island is young in geological terms, with coral conglomerate from the surrounding reef radiocarbon dated at approximately 3 000 to 4 000 years before present (Woodroffe and McLean 1994).

The island is comprised mostly of calcareous sand and rubble of coral origin, with a broad sandy beach along the north shore. The lagoon sediments are predominantly composed of sands and sandy mud, with a broad intertidal sand area near the connection to the Indian Ocean. There are areas of beach rock and shingle along the eastern and southern shore and areas of coral conglomerate platform. A reef crest surrounds the island on all but the north-western shore (Woodroffe and McLean 1994).

16. Physical features of the catchment area:

The Cocos (Keeling) Islands are an Australian territory comprising twenty-seven coral islands with a total land area of approximately 14 square kilometres. There are 26 islands in the southern atoll of which two, Home Island and West Island, are inhabited. North Keeling Island (the PKNP Ramsar site) is located 24 kilometres to the north. The atolls have developed on top of old volcanic seamounts, rising from a depth of 5 000 metres in the north-eastern Indian Ocean (Bunce, 1988).

17. Hydrological values:

18. General ecological features:

At the time of listing as a Ramsar site there were three main marine habitat types at the site, although the closure of the lagoon has limited this to the following two:

- Coral reefs - conglomerate reef platforms within the PKNP Ramsar site are composed of cemented coral shingle and rubble accumulated over the past 3 000 – 4 000 years (Woodroffe et al. 1994). Fossilised Porite (Boulder Coral) and Acropora (Staghorn corals) have been found within the reef flats and crests indicating the roles of these species in the construction of the coral atoll (Woodroffe et al. 1994). Corals on the reef flat are within shallow water and may be exposed at low tide, providing a high light and temperature environment. Conversely the corals on the crest and the seaward side are exposed to greater wave action, but lower temperature and light environments. The coral reef surrounding the site supports an abundance of fish and invertebrates including corals, molluscs and decapod crustaceans. Over 193 species of fish have been recorded from within the site, most of which are either cosmopolitan or common in the Indo-Pacific region.
- Rocky and sandy shores - Much of the shore of the PKNP Ramsar site (outside the lagoon) is comprised of shingle, rubble and beach rock (Woodroffe and McLean 1994). The sand beaches, which are important habitat for nesting turtles, are mostly confined to the northern area of the atoll, where the reef crest is absent.

Aquatic vascular vegetation was limited to a single species of seagrass (*Thalassia hemprichii*), which occurred within the lagoon area. This no longer occurs at the site, following the closure of the lagoon.

Terrestrial vegetation provides nesting and roosting habitat for waterbirds using the Ramsar site, which supports breeding of 15 species of seabird. Terrestrial vegetation is dominated by coconut (*Cocos nucifera*) and pisonia (*Pisonia grandis*) forest, which tower 30 metres above the ground. Octopus bush shrubland lines the eastern shore with a more diverse community of shrubs and saltmarsh herblands along the shore of the lagoon. The most diverse communities are located on the sandy spits adjacent to the lagoon entrance (Williams 1994). Thirty-three species of native vascular plant have been recorded within the Ramsar site (Director of National Parks 2004).

19. Noteworthy flora:

The forests of PKNP Ramsar site provide an example of the original vegetation for the region with many of the plant species no longer found on the other 26 islands in the Cocos group (Woodroffe 1994). The island still has extensive stands of ironwood (*Cordia subcordata*), which apparently once formed extensive stands of forest on the southern atoll but has now been reduced to a few small clumps because its wood was sought after for building (Bunce, 1988). The Cocos sub-species of pandanus (*Pandanus tectorius cocosensis*), which is only localised in occurrence, is considered endemic to the Cocos (Keeling) Islands (Williams, 1990).

20. Noteworthy fauna:

The PKNP Ramsar site supports a number of species that are no longer found within the southern atoll. This includes a number of waterbirds as well as fish and invertebrate species. This is mostly due to the isolation of the Ramsar site compared to the southern atoll and the protection of biota from harvest and use by the National Park status (Stokes 1994).

A total of 24 species of waterbird have been recorded within the PKNP Ramsar site (Appendix 1). This includes 15 species that are listed under international migratory agreements CAMBA (13), JAMBA (13) and ROKAMBA (7) and all species recorded are listed under the EPBC Act. There is one species that is considered threatened at the national and international levels:

- the Cocos buff-banded rail (*Gallirallus philippensis andrewsi*) listed as endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and is restricted to the PKNP Ramsar Site (Director of National Parks 2004); and

The site is a significant seabird colony with, significant breeding of Red-footed Booby (*Sula sula*), Greater Frigatebirds (*Fregata minor*), Lesser Frigatebirds (*Fregata ariel*) and the Common Noddy (*Anous stolidus*). An additional 12 species of waterbird have been observed breeding on the island in lesser numbers including Brown Booby (*Sula leucogaster*), Masked Booby (*Sula dactylatra*), terns and tropicbirds.

The site supports at least 26 species of crabs, including several species of hermit crabs (terrestrial and aquatic), the red spider crab (*Schizophrys aspera*) and swimmer crabs (*Thalamitoides quadridens*). Of note is the presence of the coconut or robber crab (*Birgus latro*) which was formerly abundant on the

southern atoll, but now rare or absent (Bunce 1988) and a small number of red crabs (*Gecarcoidea natalis*) the only known population outside Christmas Island (Director of National Parks 2004).

The site supports a single endemic angelfish (*Centropyge jocularis*), which is known only from Christmas Island and the Cocos (Keeling) Islands (Director of National Parks 2004). Although endemism is low, there is evidence of hybridisation of a number of species within the bioregion, which contributes to the uniqueness of the community (Hobbs and Salmond 2008).

The site provides foraging habitat for the hawksbill turtle and breeding habitat for the green turtle, both of which are listed as vulnerable under national threatened species legislation.

21. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc.

Distinguish between historical/archaeological/religious significance and current socio-economic values:

The site has remained largely uninhabited, with the exception of visits for short periods from the southern atoll residents for timber and nut collecting as well as bird hunting (Bunce 1988). In 1914 the German warship the SMS Emden ran aground at Pulu Keeling following an encounter with the HMS Sydney. The salvage of the vessel from October 1915 to January 1916 by islanders probably represents the longest period of settlement within the Ramsar Site (Woodroffe and McLean 1994). Despite further salvage of the vessel by a professional Japanese salvage company in the 1950s, parts of the wreck remain on the reef of the southern shore and are protected by Australia's *Historic Shipwrecks Act 1976*.

The PKNP site is important to the local Cocos Malay community both economically and spiritually. The pristine nature of the site attracts tourists and special interest groups that must be transported to and from the island and accommodated on the southern atoll (camping is forbidden in the Ramsar site). This provides a valuable source of income for local residents of the southern atoll (Director of National Parks 2004). In addition, the site features in traditional stories, including that of the penunggu, the female guardian of the island, who lives in an area surrounding the landing place on Pulu Keeling and protects the atoll (Bunce 1988).

Cocos residents are allowed to fish recreationally within the site by trolling, with a valid permit.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

Describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

22. Land tenure/ownership:

a) within the Flyway Network site:

The entire PKNP Ramsar site is a declared Commonwealth National Park on lease from the Cocos (Keeling) Shire Council to the Director of National Parks.

b) in the surrounding area:

Territorial waters belong to the Commonwealth of Australia.

23. Current land (including water) use:

a) within the Flyway Network site:

National Park

b) in the surroundings/catchment:

Only two of the southern atoll islands are permanently inhabited. The primary land use on these islands used to be (until 1987) the production of copra through the cultivation of Cocos palms.

24. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Flyway Network site:

Hunting of seabirds - once a common practice in the Cocos (Keeling) Islands (Bunce 1988).

Although hunting within the PKNP Ramsar site is now prohibited, poaching may continue to pose a threat to seabird populations (Director of National Parks 2004). It is estimated that between 2 000 and 3 000 birds are illegally taken from the Ramsar site each year and in some years this may be as much as 10 000 (Baker et al. 2004).

Yellow crazy ants (*Anoplolepis gracilipes*) - occur within the Ramsar site in areas of *pisonia* forest (Neville et al. 2008). Listed as one of the top 100 worst invasive alien species in the world by the Global Invasive Species Database (2009). No super colonies have been recorded on the site and it is possible that growth and population expansion may be limited in the absence of Homoptera insect populations (Global Invasive Species Database 2009). Impacts from yellow crazy ants include both mortality of prey items (such as the red crab on Christmas Island), as well as defoliation of the forest, through the combined action of ants and scale insects (Hill et al. 2003). Within the Ramsar site this would have flow on ecological effects on nesting bird species such as the Red-footed booby, which rely on the forest habitat for breeding.

b) in the surrounding area:

Climate change predictions for the Cocos (Keeling) Islands indicate an increase in sea level, sea surface temperature and intensity of tropical storms. An increase in sea level could result in an increase in submerged areas and intertidal sands at the expense of terrestrial vegetation. Tropical cyclones, with strong winds also have the potential to cause direct physical damage to the vegetation at the site. There are examples in the recent past of tropical cyclones causing extensive damage to the *pisonia* trees, which in turn resulted in declines in Red-footed booby (Baker et al. 2004). To date, vegetation and seabirds have recovered from the effects of tropical cyclones in the intervals between intense storms (Baker and Cunningham 2007). However, an increase in the frequency of category 4 and 5 tropical cyclones may reduce the potential for recovery and lead to sustained changes in vegetation and the seabirds that rely on the vegetation for nesting and roosting.

An increase in sea surface temperature could have significant impacts to the reef and coral communities within the Ramsar site. Although no coral bleaching or disease has been recorded in the Ramsar site to date (Commonwealth of Australia 2005a); white syndrome, or coral bleaching, has been linked to increased water temperature in other parts of the world.

25. Conservation measures taken:

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Flyway Network site:

The Director of National Parks, assisted by Parks Australia within the Australian Government Department of the Environment and Energy is responsible under the *Environmental Protection and Biodiversity Act 1999* for managing the park in accordance with the Management Plan.

Parks Australia has an office on West Island of the Southern Atoll with a second office being operated on a part-time basis on Home Island. Currently Parks Australia has a staff of two. As well as managing Pulu Keeling National Park, Parks Australia is responsible for the application of Part 9 of the Environment Protection and Biodiversity Conservation Regulations 2000, on protected species within the Cocos (Keeling) Island Territory.

Parks Australia also manage a special protected area on Direction Island called the "Rip". This is a small section of reef with a strong tidal current from the narrow connection between the lagoon and the ocean, which is abundant with fish and coral and has a high conservation value. It was declared to protect all wildlife from any adverse impacts related to human activities.

The Cocos community are involved closely in the management of the park through their representation on the Pulu Keeling National Park Community Management Committee. This Committee consists of ten members, six of whom represent the Cocos Malay community, the Director of National Parks (or his representative), and three people from West Island.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ; Ib ; II ; III ; IV ; V ; VI

c) Does an officially approved management plan exist; and is it being implemented?:

The Director of National Parks, assisted by Parks Australia within the Australian Government Department of the Environment and Energy is responsible under the *Environmental Protection and Biodiversity Act 1999* for managing the park in accordance with the Management Plan.

d) Describe any other current management practices:

There are a number of on-ground activities that have been implemented within the Ramsar site, including monitoring of important species and communities such as Red-footed booby, Cocos buff-banded rail and green turtles, as well as monitoring of significant threats such as yellow crazy ants and weed species. In addition, some weed control has been implemented.

26. Conservation measures proposed but not yet implemented:

Further research and adaptive management for weed control and crazy ant management are proposed for the near future (Parks Australia pers. comm.).

27. Current scientific research and facilities:

The remote nature of the PKNP Ramsar site and its near pristine nature provide a rare opportunity in the Indian Ocean to collect baseline information on coral reef and atoll ecology. The Ramsar site was surveyed by the Western Australian Museum in the late 1980s including fish, birds, vegetation, and marine invertebrates (Woodroffe and Berry 1994). However, difficulty of access meant that not all studies conducted on the southern atoll were undertaken in the Ramsar site (e.g. marine habitat surveys). Access remains a barrier to extensive research today, with landings requiring a swim of 100 m across the reef with equipment (Director of National Parks 2004). Despite this, annual surveys of Red-footed booby have been conducted since 1986; turtle monitoring has been conducted on green and hawksbill turtles (Whiting 2006; Whiting et al. 2008) and a reef condition monitoring site has been established (Commonwealth of Australia 2005a).

28. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

The management plan for the PKNP Ramsar site contains a number of key communication messages and a program for implementing community education. Key CEPA messages include:

- The Ramsar values of the site and the importance of the Ramsar site as a habitat for breeding seabirds.
- The significance of the site in maintaining biodiversity in the region, particularly in light of the reduced biodiversity in the Southern Atoll.
- The threats that hunting, fishing and inappropriate recreational activities pose to the ecological character of the site.
- The threat of yellow crazy ants and the impact they could have on the sites values.
- Climate change, the potential impacts on the benefits and services of the Ramsar site and the ways in which additional pressures from activities such as boating, fishing and hunting can exacerbate the effects of climate change on marine and tropical environments.
- The importance of cooperative management of site involving the local community on maintaining the ecological character of the PKNP Ramsar site.

29. Current recreation and tourism:

Despite the difficulty of access, the PKNP Ramsar site is valued for recreation and tourism. Licensed tour operators conduct occasional day trips to the site for bird watching, diving, snorkelling and sight seeing. As visitors are not permitted to stay within the Ramsar site overnight, these activities provide a valuable source of income for the residents of the southern atoll in terms of boat operators and accommodation providers (Director of National Parks 2004).

Cocos residents are allowed to fish recreationally within the site by trolling, with a valid permit.

30. Threats*:

Which of the following threats is present historically – when the threat stopped but the effects are still there (H), currently (C) or potentially (P)?

	Historically	Currently	Potentially
Residential and commercial development			
housing and urban areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
commercial and industrial areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
tourism and recreation areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Agriculture and aquaculture			
annual and perennial non-timber crops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
wood and pulp plantations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
livestock farming and ranching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
marine and freshwater aquaculture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy production and mining			
oil and gas drilling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mining and quarrying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
renewable energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transportation and service corridors			
roads and railroads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
utility and service lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
shipping lanes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
flight paths	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Biological resource use			
hunting and collecting terrestrial animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
gathering terrestrial plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
logging and wood harvesting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
fishing and harvesting aquatic resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Human intrusions and disturbance			
recreational activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
war, civil unrest and military exercises	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
work and other activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Natural system modifications

- fire and fire suppression
- dams and water management/use
- other ecosystem modifications

Invasive and other problematic species and genes

- invasive non-native/alien species
- problematic native species
- introduced genetic material

Pollution

- household sewage and urban waste water
- industrial and military effluents
- agricultural and forestry effluents
- garbage and solid waste
- air-borne pollutants
- excess energy

Geological events

- volcanoes
- earthquakes/tsunamis
- avalanches/landslides

Climate change and severe weather

- habitat shifting and alteration
- droughts
- temperature extremes
- storms and flooding

Please write here any additional threats and comments/queries you have on the threats.

Annex 1: Criteria for the inclusion of sites in the Flyway Site Network (from the Partnership Text)

To be considered for inclusion in the Flyway Site Network, this Partnership adopts the following criteria:

- a. Convention on Wetlands (Ramsar, Iran, 1971) criteria for internationally important sites for migratory waterbirds. That is:
 - Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
 - Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.
 - Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

- b. The staging criteria as applied under the Asia - Pacific Migratory Waterbird Conservation Strategy. That is:
 - i. A staging site should be considered internationally important if it regularly supports 0.25% of individuals in a population of one species or subspecies of waterbirds on migration.
 - ii. A staging site should be considered internationally important if it regularly supports 5,000 or more waterbirds at one time during migration.

- c. Under exceptional circumstances a site can be nominated if it supports migratory waterbirds at a level or stage of their life cycle important to the maintenance of flyway populations. Justification of such nominations will be considered by the Partnership on a case by case basis.

Annex 2: Ramsar Classification System for Wetland Type

The codes are based upon the Ramsar Classification System for Wetland Type as approved by Recommendation 4.7 and amended by Resolutions VI.5 and VII.11 of the Conference of the Contracting Parties. The categories listed herein are intended to provide only a very broad framework to aid rapid identification of the main wetland habitats represented at each site.

To assist in identification of the correct Wetland Types to list in section 19 of the RIS, the Secretariat has provided below tabulations for Marine/Coastal Wetlands and Inland Wetlands of some of the characteristics of each Wetland Type.

Marine/Coastal Wetlands

- A -- **Permanent shallow marine waters** in most cases less than six metres deep at low tide; includes sea bays and straits.
- B -- **Marine subtidal aquatic beds**; includes kelp beds, sea-grass beds, tropical marine meadows.
- C -- **Coral reefs.**
- D -- **Rocky marine shores**; includes rocky offshore islands, sea cliffs.
- E -- **Sand, shingle or pebble shores**; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.
- F -- **Estuarine waters**; permanent water of estuaries and estuarine systems of deltas.
- G -- **Intertidal mud, sand or salt flats.**
- H -- **Intertidal marshes**; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.
- I -- **Intertidal forested wetlands**; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.
- J -- **Coastal brackish/saline lagoons**; brackish to saline lagoons with at least one relatively narrow connection to the sea.
- K -- **Coastal freshwater lagoons**; includes freshwater delta lagoons.
- Zk(a) – **Karst and other subterranean hydrological systems**, marine/coastal

Inland Wetlands

- L -- **Permanent inland deltas.**
- M -- **Permanent rivers/streams/creeks**; includes waterfalls.
- N -- **Seasonal/intermittent/irregular rivers/streams/creeks.**
- O -- **Permanent freshwater lakes** (over 8 ha); includes large oxbow lakes.
- P -- **Seasonal/intermittent freshwater lakes** (over 8 ha); includes floodplain lakes.
- Q -- **Permanent saline/brackish/alkaline lakes.**
- R -- **Seasonal/intermittent saline/brackish/alkaline lakes and flats.**

- Sp -- **Permanent saline/brackish/alkaline marshes/pools.**
- Ss -- **Seasonal/intermittent saline/brackish/alkaline marshes/pools.**
- Tp -- **Permanent freshwater marshes/pools;** ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.
- Ts -- **Seasonal/intermittent freshwater marshes/pools on inorganic soils;** includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
- U -- **Non-forested peatlands;** includes shrub or open bogs, swamps, fens.
- Va -- **Alpine wetlands;** includes alpine meadows, temporary waters from snowmelt.
- Vt -- **Tundra wetlands;** includes tundra pools, temporary waters from snowmelt.
- W -- **Shrub-dominated wetlands;** shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.
- Xf -- **Freshwater, tree-dominated wetlands;** includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.
- Xp -- **Forested peatlands;** peat swamp forests.
- Y -- **Freshwater springs; oases.**
- Zg -- **Geothermal wetlands**
- Zk(b) – **Karst and other subterranean hydrological systems, inland**

Note: “**floodplain**” is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forests. Floodplain wetlands are not listed as a specific wetland type herein.

Human-made wetlands

- 1 -- **Aquaculture** (e.g., fish/shrimp) **ponds**
- 2 -- **Ponds;** includes farm ponds, stock ponds, small tanks; (generally below 8 ha).
- 3 -- **Irrigated land;** includes irrigation channels and rice fields.
- 4 -- **Seasonally flooded agricultural land** (including intensively managed or grazed wet meadow or pasture).
- 5 -- **Salt exploitation sites;** salt pans, salines, etc.
- 6 -- **Water storage areas;** reservoirs/barrages/dams/impoundments (generally over 8 ha).
- 7 -- **Excavations;** gravel/brick/clay pits; borrow pits, mining pools.
- 8 -- **Wastewater treatment areas;** sewage farms, settling ponds, oxidation basins, etc.
- 9 -- **Canals and drainage channels, ditches.**
- Zk(c) -- **Karst and other subterranean hydrological systems, human-made**

Annex 3: IUCN Protected Areas Categories System

IUCN protected area management categories classify protected areas according to their management objectives. The categories are recognised by international bodies such as the United Nations and by many national governments as the global standard for defining and recording protected areas and as such are increasingly being incorporated into government legislation.

Ia Strict Nature Reserve

Category Ia are strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphical features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values.

Ib Wilderness Area

Category Ib protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.

II National Park

Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.

III Natural Monument or Feature

Category III protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.

IV Habitat/Species Management Area

Category IV protected areas aim to protect particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.

V Protected Landscape/ Seascape

A protected area where the interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.

VI Protected area with sustainable use of natural resources

Category VI protected areas conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems.

