



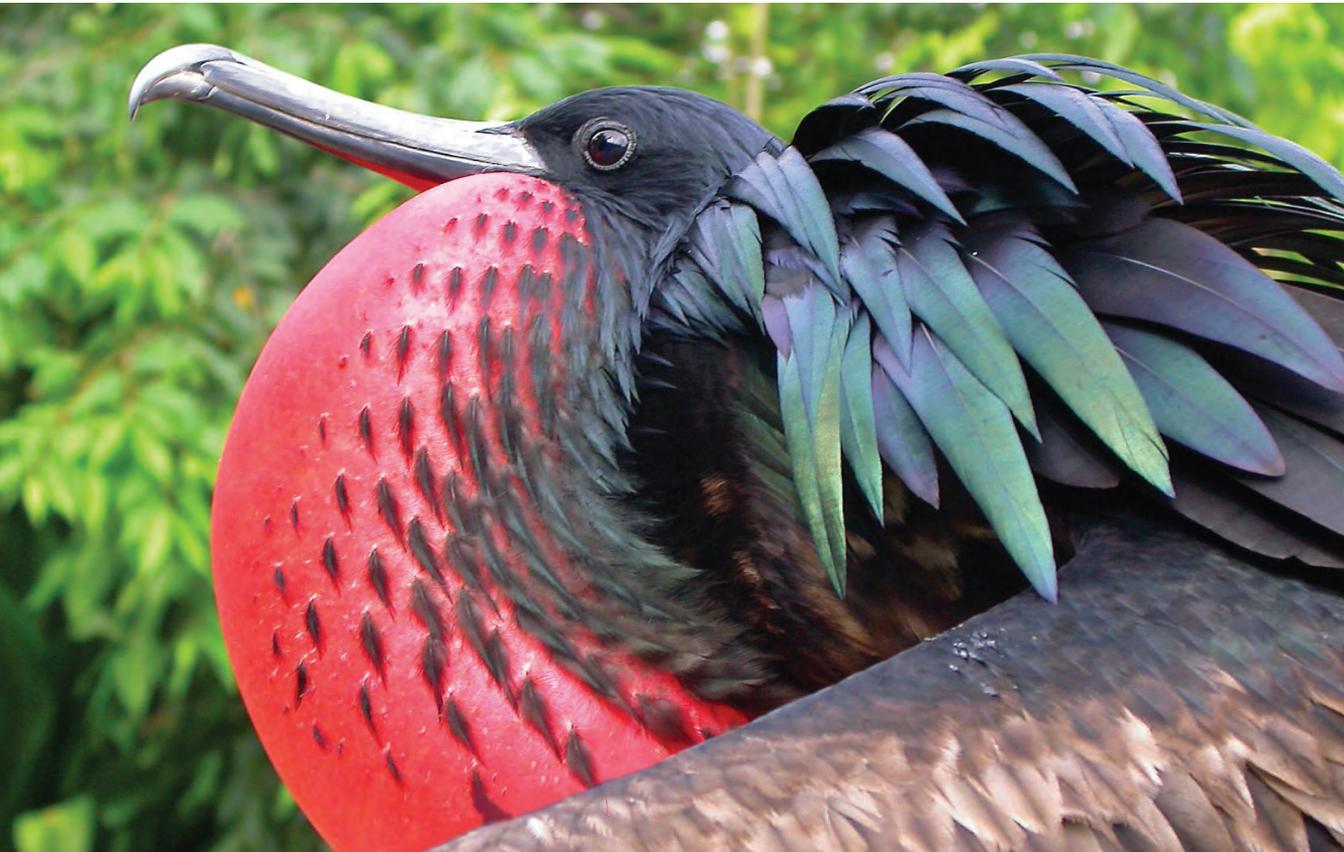
Australian Government
Director of National Parks



Christmas Island National Park



M A N A G E M E N T P L A N 2 0 1 4 - 2 0 2 4



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This management plan sets out how it is proposed the park will be managed for the next ten years.

A copy of this plan is available online at www.environment.gov.au/publications.

Credits

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Christmas Island National Park



M A N A G E M E N T P L A N 2 0 1 4 - 2 0 2 4

Foreword

Christmas Island is a spectacular oceanic island that rises abruptly from the tropical waters of the eastern Indian Ocean. Its landscape is mostly covered with tropical rainforest and the rugged limestone karst terrain supports ecosystems and species of international conservation and scientific significance. Christmas Island National Park covers approximately 85 square kilometres (63 per cent) of Christmas Island's land area as well as an important adjacent marine area.

The park provides habitat for endangered, vulnerable, threatened and migratory species as well as endemic species, including seabirds and a diverse array of land crabs. Red crabs (*Gecarcoidea natalis*) are a keystone species responsible for maintaining the structure and species composition of the island's rainforest vegetation and are renowned world wide for their annual breeding migration, which begins in the early wet season when millions of crabs migrate from the rainforest down to the sea. The park's Hosnies Spring and The Dales are Wetlands of International Importance under the Ramsar Convention. The marine zone of the park supports over 600 fish species, including migratory whale sharks (*Rhincodon typus*), and other species such as threatened green (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricata*). Like many other oceanic islands, Christmas Island's ecosystems and native species under major threat, particularly from non-native invasive plant and animal species.

Christmas Island's natural heritage is complemented by the island's rich, vibrant and living cultural heritage, reflected by the many cultural and religious festivals and celebrations that are held throughout the year.

Park visitors have opportunities to participate in unique and inspirational nature-based recreational activities such as scuba diving, snorkelling, bushwalking and nature study, including observing sea and land birds, land crabs and marine species.

This management plan sets out how the Christmas Island National Park will be managed over the next ten years to protect and conserve its values. It will help identify actions to address threats to the park's natural heritage values and support appropriate visitor use of the park. Implementation of this plan will require collaboration with and the support of the Christmas Island community and stakeholders. I look forward to working with the community and stakeholders both on and off the island to support island-wide conservation action to improve the protection and enjoyment of the unique and spectacular island environment.



Peter Cochrane
Director of National Parks

Acknowledgements

The Director of National Parks is grateful to staff of the Department of the Environment and to the many individuals and organisations that contributed to the preparation of this management plan. In particular the Director acknowledges Christmas Island organisations and community members; natural heritage researchers; the Shire of Christmas Island and the Western Australian and Australian Government agencies that provided information and assistance or submitted comments during the development of this management plan.

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Vision and executive summary



Vision and executive summary

Vision

Christmas Island National Park is internationally recognised for its conservation, scientific and nature-based tourism values and as a place where:

- natural environments and native species are protected, conserved and restored
- visitors have inspirational, unique and rewarding experiences
- stakeholders and the community are engaged in and value the park's conservation.

Executive summary

Introduction

Christmas Island is an isolated oceanic island, approximately 135 square kilometres in area, located in the eastern Indian Ocean. It rises steeply from the sea floor from depths of 5,000 metres. The island geology consists of porous limestone derived from ancient coral reefs overlaying volcanic basaltic rock. A uniquely structured tropical rainforest covers most of the island. About one quarter of the island has been cleared for mining and settlement purposes since 1888. Many endemic species and subspecies are found on Christmas Island.

Christmas Island National Park covers approximately 85 square kilometres (63 per cent) of the island's land area. In addition to this terrestrial zone the park includes a marine zone extending 50 metres seaward of the low water mark and incorporates much of the island's fringing coral reef system. The park also includes subterranean/cave and wetland ecosystems.

The park is established for the following purposes:

- the preservation of the area in its natural condition
- the appropriate use, appreciation and enjoyment of the area by the public.

Natural, scientific, and recreational values of the park

Christmas Island National Park is the only declared nature conservation area on Christmas Island, and fulfils an important role preserving examples of the natural features of the island. These features include:

- the majority of the island's uniquely structured and largely intact tropical rainforest habitat
- unique wildlife, including 254 endemic taxa and 165 taxa occurring nowhere else in Australia, and 110 species listed as threatened, migratory or marine under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- nesting colonies of large populations of diverse Indian Ocean seabirds
- diverse and abundant populations of land crabs
- largely intact fringing coral reefs and waters which support a suite of marine species with over 600 fish species, as well as hybrid fish

- significant geomorphological features including the island's terraces and cave systems, including anchialine cave systems (caves containing a subterranean water body with connections to the ocean) which provide habitat for fauna. Anchialine cave systems occur at only one other known locality in Australia
- scenic land and seascapes that provide a sense of wilderness and impressive soundscapes
- The Dales and Hosnies Spring wetlands which are listed as Wetlands of International Importance under the Ramsar Convention
- opportunities for ecological studies of the long-term processes of dispersal, immigration, adaptation, colonisation, predation and extinction and how these events influence species
- contributions to the island's economy by helping to support commercial tourism activities and businesses
- provision of ecological services and products for the community such as the provision of potable water.

Management of the park

The Director of National Parks is responsible for managing Commonwealth reserves that are established under the EPBC Act, including Christmas Island National Park, and does so in accordance with management plans that are prepared in accordance with the Act.

This plan sets out how the park and its natural and cultural values will be managed, protected and conserved for a period of ten years. The park is assigned by this plan to International Union for Conservation of Nature (IUCN) category II (national park) and will be managed mainly for ecosystem protection and recreation in accordance with relevant Australian IUCN reserve management principles (Appendix A).

Natural heritage management

Park management will focus on maintaining landscapes and seascapes and their associated ecosystems and natural processes as near as possible to their natural state. However, as with all isolated oceanic islands, Christmas Island's flora and fauna is particularly vulnerable to introductions of and colonisation by invasive species such as yellow crazy ants (*Anoplolepis gracilipes*), feral cats, rats and weeds. A major priority of this plan is to identify and manage the impacts of threatening processes to minimise impacts on park values, ecosystem functions, processes and services and on native species.

Significant efforts will continue to be made to monitor the park environment including population trends for threatened and other significant and keystone native species.

Ecosystem rehabilitation will continue, within designated high priority areas previously subject to phosphate mining, in order to increase viable habitat for native flora and fauna such as the Abbott's booby (*Papasula abbotti*), forest birds and red crabs.

There may be an opportunity to expand the area of land and sea that is included within the park. Subject to public consultation, Australian Government priorities (in relation to environmental, economic and social considerations) and the requirements of the EPBC Act, the Director will seek to extend the area of the park to include other areas of high conservation value.

These areas may include previously uncleared rainforest, successfully rehabilitated sites (that provide habitat for native species) and other high conservation value areas identified through scientific studies, including adjacent marine areas.

If areas are added to the park they will be managed in accordance with relevant provisions of this plan.

Two wetlands within the park, The Dales and Hosnies Spring, are listed on the Ramsar Convention and are managed in accordance with the Ramsar requirements for Wetlands of International Importance. The park and adjacent areas are listed on the Commonwealth Heritage List and are managed consistently with the relevant management principles under the EPBC Act (s.341Y).

This plan outlines environmental research priorities that will help increase understanding of the island's natural environment which will aid in management and conservation of the island's terrestrial and marine environments.

Climate change may affect all aspects of the park including the park's natural environment, visitor use, and maintenance of facilities and infrastructure. Based on the latest scientific information available, management activities will be adapted where possible to help reduce the impacts of climate change on park values.

Cultural heritage management

There are sites of historic and cultural heritage significance within the park. These include actively used Chinese temples. It is important to describe and recognise the values of these sites and to enable associated cultural activities to continue provided they do not impact on the park's natural values.

Use and appreciation of the park

The park's terrestrial and marine environments and the diverse range of native species they support are major attractions for visitors to the island. Visitors to the park can participate in a range of nature-based recreational activities including wildlife observation, nature photography, scuba diving, fishing, boating, snorkelling, bushwalking and scenic walks and drives.

Increasing visitor understanding and appreciation of the park's values is an important part of improving the visitor experience. This plan seeks to enhance visitor understanding and appreciation of the park and promote visitor use that will not impact on the natural environment or place visitors at risk.

Appropriately designed and sited infrastructure will aid in mitigating impacts by visitors on the park's values and enhance visitor access, enjoyment and safety in the park. Incidents affecting people's safety will be managed appropriately under standard emergency management procedures.

Commercial tourism activities that have minimal impacts on the park will be encouraged. People wishing to conduct commercial activities in the park require a permit.

Stakeholders and partnerships

Developing and maintaining good working relationships and partnerships with key stakeholders—including the community, non-government organisations, private industry, research institutions and governments—will be critical in the implementation of this plan. Where possible, the Director will engage in effective partnerships that support island-wide conservation, natural heritage research and nature-based tourism initiatives that will provide benefits to the park as well as socio-economic and scientific benefits for partners, stakeholders and residents.

Business management

The EPBC Act prohibits certain activities being undertaken in the park except in accordance with a management plan. New activities not described or foreseen in this plan will need to be assessed to determine whether they might impact on the park. Provision has been made in the plan to enable the Director to take or authorise action in response to proposed new activities and issues not currently specified in the plan.

Before the next management plan is prepared, this plan will be evaluated to determine how effective and efficient it was in achieving its intended aims.

Vision and executive summary in Bahasa Malay

Visi dan ringkasan eksekutif

Visi

Taman Negara Pulau Krismas diiktiraf di peringkat antarabangsa atas nilai pemuliharaan, saintifik dan pelancongan alamnya, sebagai tempat di mana:

- per sekitaran semula jadi dan spesis asli dilindungi, dipulihara dan dipulihkan
- pelawat menikmati pengalaman yang mempesona, unik dan memuaskan
- pihak berkepentingan dan masyarakat terlibat dan menghargai pemuliharaannya.

Ringkasan eksekutif

Pengenalan

Pulau Krismas merupakan pulau terpencil, kira-kira 135 kilometer persegi luasnya, di tengah Lautan Hindia timur. Pulau ini muncul tegak dari dasar laut, yang berada sedalam 5,000 meter. Geologi pulau ini mengandungi batu kapur berliang, yang terjadi daripada terumbu karang zaman silam yang melapisi batuan basalt gunung berapi. Hutan hujan tropika dengan struktur yang unik meliputi hampir seluruh pulau. Kira-kira suku bahagian pulau telah dibuka untuk perlombongan dan petempatan sejak 1888. Banyak spesis dan subspecies yang endemik ditemui di Pulau Krismas.

Taman Negara Pulau Krismas meliputi kira-kira 85 kilometer persegi (63 peratus) daripada keluasan pulau. Selain zon daratan, taman ini juga termasuk zon lautan selebar 50 meter ke laut dari tikas air surut dan merangkumi sebahagian besar sistem terumbu karang di sekeliling pulau. Taman ini juga termasuk ekosistem bawah tanah/gua dan tanah lembap.

Taman diwujudkan untuk tujuan berikut:

- pemeliharaan kawasan ini dalam keadaan semula jadinya
- penggunaan, penghayatan dan kenikmatan kawasan ini secara wajar oleh orang ramai.

Nilai semula jadi, saintifik dan rekreasi taman

Taman Negara Pulau Krismas merupakan satu-satunya kawasan pemuliharaan semula jadi di Pulau Krismas, dan memenuhi peranan penting memelihara ciri-ciri semula jadi pulau ini. Ciri-ciri ini termasuk:

- sebahagian besar habitat hutan hujan tropika yang unik strukturnya dan masih utuh
- hidupan liar yang unik, termasuk 254 takson endemik dan 165 yang tidak wujud di tempat lain di Australia, serta 110 spesis yang disenaraikan terancam, berhijrah atau spesis laut di bawah Akta Perlindungan dan Biodiversiti 1999 (Akta EPBC)
- begitu banyak koloni burung bersarang daripada beraneka jenis burung laut Lautan Hindi
- populasi kertah (ketam darat) yang besar dan beraneka

- terumbu karang yang sebahagian besarnya masih utuh dan perairan yang menyokong berbagai spesies laut termasuk 600 spesies ikan, serta ikan hibrid
- ciri-ciri geomorfologi penting yang meliputi sistem teres dan gua pulau ini, termasuk sistem gua ankialin (gua yang mengandungi takungan air bawah tanah yang dihubungkan dengan laut) yang menyediakan habitat untuk fauna. Hanya satu lokasi lain di Australia yang diketahui mempunyai sistem gua ankialin
- rupa bumi dan laut yang indah, menyajikan suasana liar dan gema alam yang mengagumkan
- tanah lembap The Dales dan Hosnies Spring yang disenaraikan sebagai Tanah Lembap Berkepentingan Antarabangsa di bawah Konvensyen Ramsar
- peluang pengajian ekologi tentang proses penyuraian, penghijrahan, penyesuaian, pengkolonian, pemangsa dan kepupusan spesies serta bagaimana peristiwa-peristiwa ini menjejaskan spesies
- sumbangan kepada ekonomi pulau ini, dengan menyokong aktiviti dan usaha niaga pelancongan komersial
- menyediakan perkhidmatan dan produk ekologi untuk masyarakat, misalnya bekalan air minum.

Pengurusan taman

Pengarah Taman Negara bertanggungjawab menguruskan semua rizab hutan Persekutuan Australia di bawah Akta EPBC, termasuk Taman Negara Pulau Krismas, mengikut pelan pengurusan yang disusun sejajar dengan Akta.

Pelan ini membentangkan cara taman serta nilai semula jadi dan budayanya harus diuruskan, dilindungi dan dipulihara selama sepuluh tahun. Menurut pelan ini, taman ini diberikan Kategori II (taman negara) Kesatuan Pemuliharaan Alam Antarabangsa (IUCN) dan diuruskan terutamanya untuk perlindungan ekosistem dan rekreasi sejajar dengan prinsip pengurusan rizab hutan IUCN Australia (Lampiran A).

Pengurusan warisan semula jadi

Pengurusan taman ditumpukan pada pemeliharaan rupa bumi dan laut serta ekosistem berkaitan dan proses alam, seberapa hampir dengan keadaan semula jadinya. Namun, seperti di setiap pulau lain yang terpencil di lautan, flora dan fauna Pulau Krismas amat rentan terhadap pencerobohan spesies luar seperti semut kuning (*Anoplolepis gracilipes*), kucing liar, tikus dan rumpai. Keutamaan tertinggi pelan ialah mengenal pasti dan mengendalikan pelbagai proses yang mengancam, demi mengurangkan kesan atas nilai, fungsi ekosistem, proses dan perkhidmatan taman serta spesies asli.

Usaha-usaha utama akan tetap dilakukan bagi memantau persekitaran taman, termasuk populasi spesies terancam dan spesies asli lain yang penting.

Pemulihan ekosistem akan diteruskan, di kawasan keutamaan yang dulu merupakan lombong fosfat, demi meningkatkan habitat yang lestari untuk flora dan fauna asli seperti burung booby Abbott (*Papasula abbotti*), burung hutan dan ketam merah.

Kita mungkin berpeluang meluaskan kawasan tanah dan laut yang termasuk dalam taman ini. Bergantung pada pandangan orang ramai, keutamaan Kerajaan Australia (dari segi alam sekitar, ekonomi dan sosial), serta kehendak Akta EPBC, Pengarah akan memohon untuk meluaskan kawasan taman, meliputi kawasan bernilai pemuliharaan tinggi yang lain.

Kawasan tersebut mungkin termasuk hutan hujan yang belum dibuka, tapak yang berjaya dipulihkan (menyediakan habitat untuk spesis asli) dan kawasan bernilai pemuliharaan tinggi yang lain, termasuk kawasan laut bersebelahan.

Jika taman ini diluaskan, kawasan-kawasan baru akan diuruskan mengikut peruntukan pelan yang relevan.

Dua tanah lembap di taman ini, The Dales dan Hosnies Spring, disenaraikan dalam Konvensyen Ramsar dan diuruskan sejajar dengan kehendak Ramsar bagi Tanah Lembap Berkepentingan Antarabangsa. Taman ini dan kawasan bersebelahan disenaraikan dalam Senarai Warisan Persekutuan Australia dan diuruskan sejajar dengan prinsip pengurusan yang relevan di bawah Akta EPBC (s.341Y).

Pelan ini menetapkan keutamaan penyelidikan alam sekitar yang dapat meningkatkan kefahaman tentang persekitaran semula jadi pulau ini yang dapat membantu pengurusan dan pemuliharaannya.

Perubahan iklim mungkin menjejaskan semua aspek taman termasuk persekitaran semula jadi, penggunaannya oleh pelawat, serta penyenggaraan kemudahan dan infrastruktur. Berdasarkan maklumat saintifik terbaru, aktiviti pengurusan akan disesuaikan seberapa dapat bagi membantu mengurangkan impak perubahan iklim terhadap nilai taman.

Pengurusan warisan budaya

Taman ini mengandungi tapak-tapak sejarah dan warisan budaya yang penting. Tapak-tapak ini termasuk kuil Cina yang masih digunakan. Nilai budaya tapak-tapak ini wajar diperihalkan dan diiktiraf, sementara aktiviti budayanya wajar diteruskan selagi tidak menjejaskan nilai semula jadi taman ini.

Penggunaan dan penghayatan taman

Persekitaran darat dan laut taman ini serta keragaman spesis aslinya merupakan daya tarikan penting bagi pelawat. Pelawat dapat menyertai berbagai aktiviti rekreasi alam, termasuk memerhatikan hidupan liar, fotografi alam, menyelam skuba, memancing, berperahu, snorkel, meredah hutan, berjalan kaki dan bersiar dengan kereta.

Kefahaman dan penghayatan taman yang lebih tinggi merupakan aspek penting dalam usaha meningkatkan pengalaman pelawat. Pelan ini berusaha meningkatkan kefahaman dan penghayatan pelawat serta menggalakkan mereka menggunakan taman tanpa menjejaskan persekitaran alam atau menimbulkan risiko pada diri sendiri.

Infrastruktur dengan reka bentuk dan kedudukan yang wajar dapat membantu mengurangkan kesan pelawat pada nilai-nilai taman dan meningkatkan akses, kenikmatan dan keselamatan pelawat di taman. Apa jua kejadian yang menjejaskan keselamatan orang ramai akan diuruskan sewajarnya mengikut prosedur pengurusan kecemasan standard.

Aktiviti pelancongan komersial yang kurang kesan pada taman akan digalakkan. Mereka yang mahu melakukan aktiviti komersial di taman ini memerlukan permit.

Pihak berkepentingan dan rakan kongsi

Membangunkan dan mengekalkan hubungan kerja yang baik dengan pihak berkepentingan dan rakan kongsi utama — termasuk komuniti, organisasi bukan kerajaan, industri swasta, institusi penyelidikan dan kerajaan — merupakan tunjang bagi pelaksanaan pelan ini. Seberapa dapat, Pengarah akan bekerjasama dengan pihak tertentu bagi menyokong pemuliharaan seluruh pulau, penyelidikan warisan alam dan inisiatif pelancongan alam yang bermanfaat bagi taman ini serta membawa faedah sosio-ekonomi dan sains bagi para rakan kongsi, pihak berkepentingan dan pelajar.

Pengurusan perniagaan

Akta EPBC melarang sesetengah aktiviti di taman, kecuali dilakukan sejajar dengan pelan pengurusan. Aktiviti baru yang tidak diperihalkan atau diramalkan dalam pelan harus dinilai dari segi kesannya pada taman. Peruntukan telah dibuat dalam pelan supaya Pengarah dapat mengambil atau membenarkan tindakan terhadap aktiviti yang baru diusulkan dan isu yang belum ditetapkan dalam pelan.

Sebelum pelan pengurusan seterusnya dirumuskan, pelan ini akan dinilai untuk menentukan keberkesanan dan kecekapannya dalam mencapai sasaran yang dimaksudkan.

Vision and executive summary in Mandarin

愿景和执行摘要

愿景

圣诞岛国家公园因其环境保护、科学和自然旅游价值而得到全世界的公认，在这个地方：

- 自然环境和本地物种得到保护、保育和生态恢复
- 游客从独一无二的经历中得到启发和收获
- 利益相关方和社区参与并重视公园的保护。

执行摘要

引言

圣诞岛是一座位于东印度洋中的大洋洲孤岛，面积约135平方公里。它由从5,000米深的海床陡然上升形成。岛屿的地质情况由多孔石灰岩组成，其源自覆盖在火山玄武岩上的古珊瑚礁。岛上大部分由结构独特的热带雨林覆盖。自1888年起，岛上已有大约四分之一被开辟出来，供采矿和定居的用途。人们在圣诞岛上找到了很多特有的物种和亚种。

圣诞岛国家公园占全岛约85平方公里(63%)的陆地面积。除了这片陆地区域外，公园还包括向海上延伸50米的低潮位海洋区域，包括岛屿的很多外围珊瑚礁系统。公园还包括地下/洞穴和湿地生态系统。

公园的建立出于以下目的：

- 该地区的自然条件保护
- 公众对该地区的适当使用、欣赏和享受。

公园的自然、科学和休闲价值

圣诞岛国家公园是圣诞岛上唯一被列为自然保育区的区域，对于保存岛屿的自然特征起到重要的作用。这些特征包括：

- 岛屿上大部分结构独特和基本完好的热带雨林栖息地
- 独特的野生动物，包括254种地方性物种、165个在澳大利亚其他地方找不到的生物分类，和110个根据《环境保护和生物多样性保护法1999》（EPBC法）被列为受威胁的迁徙性或海洋物种
- 大量各种各样印度洋海鸟的栖息地
- 各种各样为数众多的地蟹

- 基本完好的外围珊瑚礁和水域，孕育着一系列的海洋物种，包括超过600种鱼类及杂交鱼
- 显著的地貌特征，如岛上的梯田和洞穴系统，其中包括海蚀洞系统（即含有与海洋连接的地下水体的洞穴），为动物提供栖息地。在澳大利亚境内，只有在这里和另一个已知地域才找得到海蚀洞系统。
- 风景秀丽的土地和海洋景观，给人一种旷野的感觉，并组成一幅让人难忘的声音景观
- Dales和Hosnies Spring湿地，根据国际湿地公约被列为国际重要湿地
- 有机会对生物扩散、迁移、适应、移植、捕猎和灭绝的长期过程，以及它们对物种的影响进行生态研究。
- 透过帮助商业旅游活动与商家，促进岛屿的经济
- 为社区提供生态服务及产品，如提供饮用水等。

公园的管理

国家公园总监的责任是管理根据“EPBC法”而建立的联邦保育地区，包括圣诞岛国家公园，而管理应依照按该法制定的管理计划来进行。

此计划列明了10年内将如何管理、保护和保育公园及其自然和文化价值。此计划把本公园划为国际自然保护联盟（IUCN）第二类别（国家公园），管理重点将为保护生态系统，和按照澳大利亚自然保护联盟有关保护区的管理原则（附录A）作休闲用途。

自然遗产管理

公园管理的重点将会是把陆地和海洋景观及其相关联的生态系统和自然过程尽可能保持在他们的自然状态。然而，如其他孤岛一样，圣诞岛的动植物特别容易受到黄色疯狂蚂蚁（学名Anoplolepis gracilipes）、野猫、老鼠和杂草等入侵性物种的引入和移植。此计划的主要优先事项是识别和管理这些威胁过程，把其对公园价值、生态系统的功能、过程、服务及对本地物种的影响降至最低。

工作人员将继续竭力监控园区环境，包括受威胁物种及其他重要本地物种的数量趋势。

我们将继续在之前受磷矿开采影响的指定优先领域进行生态系统恢复，以增加本土动植物如粉嘴鲹鸟（学名Papasula abbotti）、森林鸟类和红蟹可用的栖息地。

公园所含的陆地和海洋范围有可能会扩大。基于公众谘询、澳大利亚政府优先事项（关于环境、经济和社会等因素考量）和 EPBC法的要求，总监将寻求将园区面积扩展至其他高保育价值的区域。

这些区域可能包括以前未清除的热带雨林，生态恢复成功的地点（能为当地物种提供栖息地）和其他通过科学研究找出的高保护价值地区，包括相邻的海洋区域。

如果有区域被纳入公园，这些区域将根据本计划的相关规定进行管理。

公园内的两个湿地：Dales和Hosnies Spring湿地是国际湿地公约列出的湿地，根据国际湿地公约中对国际重要湿地的规定管理。公园和邻近地区都已被列入联邦遗产名录，并持续以EPBC法的相关管理原则（s.341Y）进行管理。

此计划概述了环境研究的重点，这将帮助我们进一步了解岛上的自然环境，进而有助于管理和保护岛上的陆地和海洋环境。

气候变化可能影响公园的各方面，其中包括公园的自然环境、游客使用以及场所和基础设施的维护。当可行时，我们将根据最新可供利用的科学信息调整管理活动，帮助减低气候变化对公园价值的影响。

文化遗产管理

公园内有具历史意义和文化遗产意义的地点。当中包括仍在使用的中式庙宇。描述和承认这些地点的价值，并在不影响公园自然价值的前提下让有关的文化活动继续进行，是非常重要的。

公园的使用和欣赏

公园的陆地和海洋环境和它们所孕育的各种各样本土物种，是吸引游客到岛上的主要原因。公园的访客可以参加一系列以自然为基础的休闲活动，包括观察野生动物、自然摄影、潜水、钓鱼、划船、浮潜、丛林健行，或散步或开车欣赏秀丽的风景。

提升游客对公园价值的理解和欣赏，是改善游客体验的一个重要部分。此计划旨在加强游客对公园的理解和欣赏，并鼓励更多游客以不影响自然环境且确保游客安全的方式使用公园。

恰当地设计和选址的基础设施将有助于减轻游客对公园价值的影响，让游客更易进入、更愉快、更安全。若出现影响人们安全的事故，我们将根据标准的应急管理程序作出适当处理。

我们将鼓励对公园影响甚微的商业旅游活动。人们若希望在公园进行商业活动，就必须得到许可。

利益相关方和合作关系

发展和保持同重要利益相关方(包括社区、非政府组织、私营行业、研究机构和政府)的良好合作和伙伴关系对于本计划的实施来说将会至关重要。如果可行，总监将建立有效的合作伙伴关系，支持全岛性的保育、自然遗产研究和以自然为本的旅游举措。这不仅仅会为公园带来好处，也会为合作伙伴、利益相关者和居民带来社会经济和科学利益。

商业管理

除非符合管理计划，EPBC法禁止在公园中进行某些活动。此计划中未描述或预见的新活动将需要进行评估，以确定是否可能对公园造成影响。计划中已作出规定，让总监能够响应当前未在计划中规定的新活动和问题而采取或授权行动。

在制定出下一个管理计划前，将对本计划进行评估，以确定其在实现预期目标方面的效果和效率如何。

A description of Christmas Island



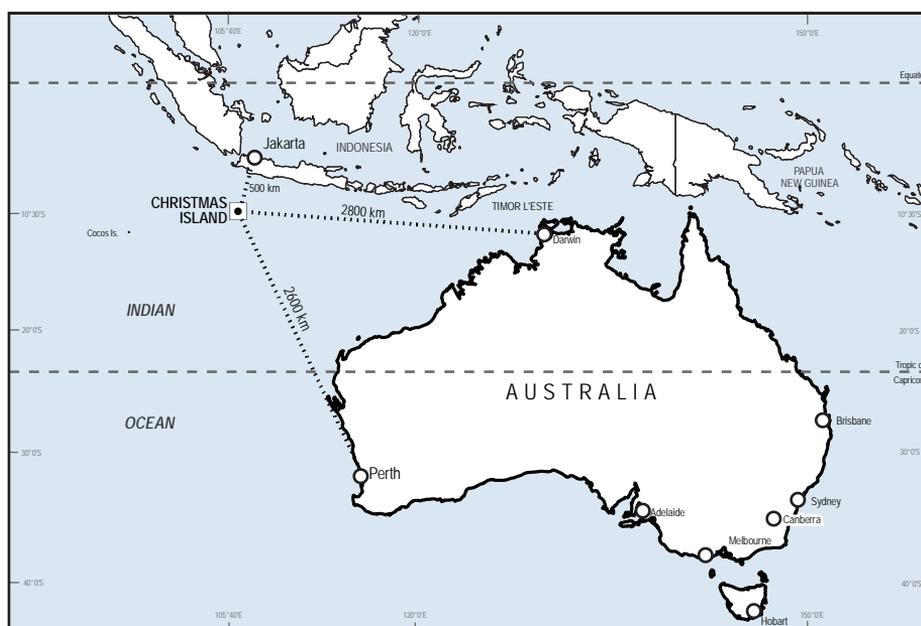
A description of Christmas Island

Location and area

The Territory of Christmas Island is located in the Indian Ocean approximately 2,800 kilometres west of Darwin, 2,600 kilometres north-west of Perth and 500 kilometres south of Jakarta, the capital of Indonesia (Map 1).

The island covers an area of approximately 135 square kilometres and has 73 kilometres of coastline; Christmas Island National Park covers approximately 85 square kilometres (63 per cent) of its land mass (Map 2). The park includes a marine area where the terrestrial area of the park adjoins the sea, the marine area extends 50 metres beyond the low water line. The park's marine area covers approximately 2.1 square kilometres and the Territory of Christmas Island waters extend 12 nautical miles from the island's shore.

Map 1: Location of Christmas Island



Climate

Christmas Island lies at the southern edge of the equatorial low pressure belt that moves north and south of the equator during the year, providing a tropical, equatorial, oceanic climate with wet and dry seasons. The wet season is generally from December to April when the north-west monsoon prevails. Passing cyclones and high ocean swells developing from low pressure systems from the north sometimes affect the island during the wet season. For the rest of the year south-east trade winds bring slightly lower temperatures and humidity with less rain.

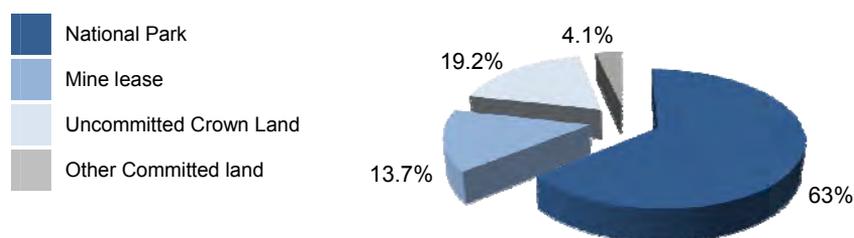
Mean annual rainfall is approximately 2,000 millimetres. The daytime temperature is generally between 27 and 29°C and the overnight temperature approximately 24°C with little temperature variation throughout the year. Relative humidity is generally constant at 80 per cent to 90 per cent throughout the year.

Governance and land tenure

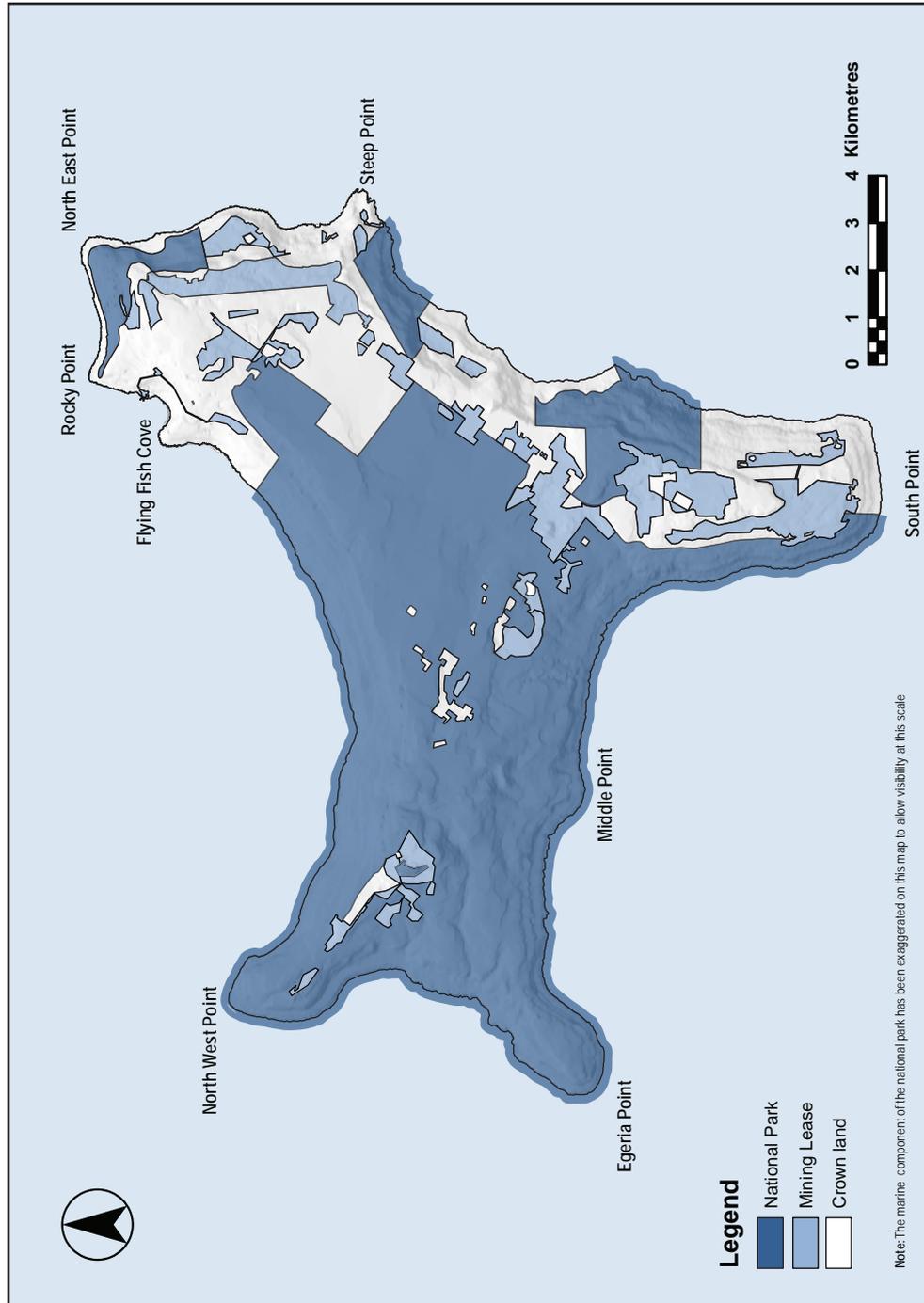
Christmas Island has been an external Territory of the Commonwealth of Australia since 1958. At the time of preparing this plan, the *Christmas Island Act 1958* provides the legislative basis for the Territory's administrative legislative and judicial system and is administered by the Department responsible for the administration of that Act (at the time of preparing this plan the Department of Infrastructure and Regional Development). The Minister for Infrastructure and Regional Development is responsible for the State-level services in the Territory. These services are provided through service delivery arrangements with the Western Australian Government, under contract or directly by the Australian Government. A range of Commonwealth services are provided by on-island agencies including Parks Australia, the Department of Agriculture, the Australian Federal Police and the Department of Immigration and Border Protection. Since 1992, the *Christmas Island Act 1958* has also provided for the application of a range of laws of Western Australia. In 1993 the Shire of Christmas Island was formed with similar responsibilities to local governments on mainland Australia. A representation of each land tenure and major uses is shown in Figure 1 and their locations are shown in Map 2. Major land managers, owners and/or lease holders are the Director of National Parks; Territory Administration; the Shire of Christmas Island; Phosphate Resources Ltd (PRL); and the Department of Immigration and Border Protection. There are also small private (e.g. commercial and residential) land holdings.

There is potential for new developments and economic activities on Christmas Island to emerge in coming years, such as new tourism infrastructure and economic activities related to hospitality, research and education. The vast majority of these activities and developments are likely to be located outside of the park and subject to the Shire's Local Planning Strategy/Town Planning Strategy. Some potential activities may be proposed for establishment within the park boundary, such as commercial tours, camping facilities or low impact eco-accommodation, and will be subject to the terms of this management plan and the provisions of the EPBC Act.

Figure 1: Land tenure and uses on Christmas Island



Map 2: Land tenure and park boundaries



People and community

Most Christmas Island residents were born in Australia or Malaysia and are of Chinese, Australian/European or Malaysian descent. English is widely spoken but many residents speak Malay, Mandarin, Cantonese or other languages. The presence of Chinese temples (Buddhist, Taoist and Confucian), a Catholic church, a Muslim mosque and a Baha'i centre and the many religious and cultural festivals observed during the year illustrate the island's religious diversity.

In 2011 the resident population of Christmas Island was recorded as 2,072 people. The population at the time of preparing this plan is considered to be higher due to substantial but fluctuating numbers of asylum seekers and people employed in detention management activities. An increased population on Christmas Island may provide some benefits to the local economy and community, as well as provide opportunities to promote greater awareness of the natural values of the park and the island. However, an increased population on the island may have an ongoing detrimental impact on the natural values and water resources of the park and the island generally, if not effectively managed and mitigated.

In 2011 the Shire of Christmas Island prepared the *Our Future: Christmas Island 2018 Plan*. The 2018 Plan articulates a vision and shared community directions and priorities for the future of Christmas Island across a broad range of themes, namely: land use planning; infrastructure planning; economic diversification; community capacity and well being; governance and institutional capacity; and protecting the natural environment. This plan will help support several community directions and priorities identified in the Shire's 2018 Plan, particularly in relation to protecting the park's natural environment and the sustainable development of nature-based tourism within the park.

History of Christmas Island

The first recorded sighting of Christmas Island was made by John Milward on board the *Thomas* in 1615. It was named on 25 December 1643 by Captain William Mynors of the *Royal Mary*. Mynors could not find an anchorage and so did not land. The first recorded landing was in 1688 by a crew from the British buccaneer vessel, *Cygnets*, who were sent ashore by William Dampier for water and timber. From Dampier's description it seems that this landing was near the Dales. Although several landings were made over the next 69 years, it was not until 1857 that an attempt was made by the crew of the *Amethyst* to explore the island. Their venture was limited by the inland cliffs and dense jungle.

The first extensive exploration was in 1887, when a small party from HMS *Egeria* reached the summit of Murray Hill. It was this party that collected the phosphate rock specimens that were to determine the future of the island over the next century. The naturalist, Mr Joseph Jackson Lister, was onboard the *Egeria* and made extensive collections of plants, animals and minerals. The subsequent analysis of some of these samples by John Murray, a Scottish scientist, found rock comprising almost pure phosphate of lime.

In 1888 Christmas Island was declared part of the British dominion. The decision to claim Christmas Island was as a result of pressure from George Clunies-Ross (from the Cocos (Keeling) Islands) keen for rights to cut timber, and John Murray who was keen to mine phosphate. Six months after Christmas Island became a British dominion, Andrew Clunies-Ross with a party of Cocos Malays settled at Flying Fish Cove. In 1891 George Clunies-Ross and Murray were granted a joint lease of the island and in 1897 formed the Christmas Island Phosphate Company.

In 1897, Dr Charles William Andrews of the British Museum was commissioned by John Murray to undertake a ten month study of the island's natural history prior to starting mining. Andrews did a comparative study when he returned in 1908. His monograph remains the classic scientific reference on the island's natural history.

Mining commenced in 1898 and in 1900 the first phosphate shipments were made. Mining continued up until World War II, ceased during the war, and resumed in 1946—it has continued since except for 1988 to 1989. After the war, the lease and assets of the Christmas Island Phosphate Company were sold to the Australian and New Zealand governments. In 1949 the Christmas Island Phosphate Commission was formed by the governments. More mine workers were employed from Malaysia, Singapore and the Cocos (Keeling) Islands and established strong religious and cultural practices which continue today. Mining was increasingly mechanised but working conditions remained poor. This led to the formation in 1975 of the Union of Christmas Island Workers, which successfully campaigned for improved working conditions.

On 1 January 1958 Christmas Island, which had until then been administered as part of the Colony of Singapore, became a separate colony of Great Britain. On 1 October 1958, sovereignty was transferred to Australia.

In 1967 the British Phosphate Commission sponsored Dr Bryan Nelson, an ornithologist, to study the status of Abbott's booby. The report he produced triggered world wide interest in the conservation of the species (Gray 1995).

In 1980 Mr Bill Sweetland was commissioned to investigate the future of phosphate mining. From 1981 to 1987 mining was conducted by the government-owned Phosphate Mining Company of Christmas Island and Phosphate Mining Corporation of Christmas Island. In 1987 the Australian government ceased mining and began winding up the corporation. Mining resumed in 1990 when a mining lease was issued to Phosphate Resources Limited, trading as Christmas Island Phosphates. Those operations continue under a mining lease.

History of Christmas Island National Park

Environmental impacts of mining became of concern in the 1970s with a particular focus on the Abbott's booby (*Papasula abbotti*), a rare seabird that only nests on Christmas Island (and which is now listed as endangered under the EPBC Act). In 1974, the House of Representatives Standing Committee on Environment and Conservation examined impacts of mining and other activities on the island's flora and fauna, to examine the adequacy of attempts to rehabilitate the forest post-mining, and to advise on further measures required to protect the environment. One of the Committee's recommendations was that a conservation area be reserved. On 21 February 1980 Christmas Island National Park was proclaimed under the *National Parks and Wildlife Conservation Act 1975*. The park at that time comprised the entire south-west corner of the island.

The 1983 Senate inquiry, *The Preservation of the Abbott's Booby on Christmas Island*, recommended investigating extending the park. Stages two and three of Christmas Island National Park were proclaimed on 31 January 1986.

On 20 December 1989 a further proclamation consolidated the previous three stages and further extended the boundaries of the park. The extension included additional areas of freshwater mangroves and other unique vegetation; much of the island's remaining undisturbed rainforest; crucial habitat for species such as Abbott's booby, Christmas Island frigatebird (*Fregata andrewsi*), the endemic blue crab (*Discoplax celeste*) and red crabs; and the sea area extending 50 metres offshore from the park's terrestrial boundaries.

Park values

The descriptions below provide a brief summary of the Park's values and Sections 4 to 6 describe these values in more detail.

Natural heritage values

Christmas Island's ecology is considered to be unique due to its assemblage of endemic flora and fauna, which has evolved over millions of years of evolutionary isolation and the dominance of large populations of land crabs and seabirds. The natural vegetation on Christmas Island includes large areas of tropical rainforest. The terrestrial fauna of Christmas Island is dominated by land crabs (which depend on the ocean for their larval development). The land crabs are the dominant consumers on the forest floor, and play a major role in determining the structure and function of the tropical rainforest on Christmas Island. The diversity and abundance of land crabs are striking features of the invertebrate fauna, not matched on any other island in the world. Most of the naturally occurring terrestrial vertebrates, including all the resident land birds and three of the resident sea birds (Abbott's booby, Christmas Island frigatebird and golden bosunbird (*Phaethon lepturus fulvus*)), are endemic.

The island's unique native species and ecosystems are of international significance but they are also highly vulnerable to environmental change, particularly from invasive species, climate change and habitat clearing, fragmentation and degradation.

Landscape values

Christmas Island's naturally stepped terraced landscape rises from the ocean to a height of 361 metres. Except in areas cleared for mining and settlement, the island is primarily covered by rainforest that grows in soils formed on top of a limestone capping over the peak of a volcanic seamount that formed around 60 million years ago. The island has geologically significant subterranean cave systems, including anchialine cave systems (a subterranean water body with connections to the ocean) which provide habitat for endemic fauna, and its geological features are significant for illustrating geological and evolutionary processes.

Terrestrial vegetation

About 75 per cent of Christmas Island's original native rainforest vegetation remains, most of which occurs in the park. Christmas Island's rainforest vegetation is characterised by a unique and distinctive structure and assemblage of plants. The distinctiveness of the vegetation results mainly from biological influences (particularly land crabs), geological history and geographic isolation over millions of years.

Christmas Island's rainforest has affinities with Asian and Australian plant species and the island's uniquely structured rainforests originate from vegetation types that are widely distributed in tropical latitudes. The forest vegetation contains endemic threatened plant species, as well as relict populations of mangrove species isolated during the island's tectonic uplift.

Unlike many remote tropical islands, significant portions of Christmas Island's rainforest vegetation, most of which is protected in the park, has persisted despite mining on the island and activities associated with human settlement, including the introduction of many invasive species. The park therefore assumes an ever-increasing conservation importance.

Terrestrial fauna

The island's terrestrial fauna is dominated by ecologically important and diverse species of terrestrial and semi-terrestrial crabs. The island's red crabs are keystone species that dominate and scavenge the forest floor, influencing the structure and species composition of the island's rainforest vegetation. Their annual breeding migration from the rainforest to the sea begins in the early wet season and is one of the world's most remarkable wildlife events. The island also supports the world's largest population of the world's biggest land crab, the robber crab (*Birgus latro*).

Christmas Island is one of the world's significant seabird islands. More than 100 migrant and vagrant species have been recorded, including nine resident breeding seabird species (with three of these being endemic or endemic subspecies) and 23 vagrant/non-breeding seabirds. The Abbott's booby and the Christmas Island frigatebird have their only extant nesting habitat in the world on Christmas Island. There are seven endemic land birds, including the threatened Christmas Island hawk-owl (*Ninox natalis*), Christmas Island thrush (*Turdus poliocephalus erythropleurus*), Christmas Island goshawk (*Accipiter hiogaster natalis*) and Christmas Island emerald dove (*Chalcophaps indica natalis*).

The island is also important for other terrestrial fauna species. Of the six recorded native reptile species five are endemic, although these have declined to the point of near extinction. Five native endemic land mammals have been recorded. The bulldog rat (*Rattus nativitatus*) and Maclear's rat (*Rattus macleari*) are extinct and the Christmas Island shrew (*Crocidura attenuata trichura*) is likely to be extinct. The Christmas Island pipistrelle (*Pipistrellus murrayi*) was once widespread but is now presumed extinct. This endemism highlights the importance of the island but also the vulnerability of endemic island species.

The cave fauna is of international significance due to the presence of a number of rare and endemic species that also provide evidence of evolutionary processes on the island.

Marine and coastal ecosystems and species

The island's largely intact fringing coral reefs and waters support a suite of marine species typical of Indian Ocean tropical reefs. The recorded marine species diversity includes 88 coral species and over 600 fish species, including the whale shark (*Rhincodon typus*) and several other shark species, as well as hybrid fish. Two marine turtles listed as vulnerable under the EPBC Act, the green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*), are found in the park's waters and green turtles occasionally nest on Dolly Beach.

International conservation value

The park provides and protects critical habitat for several internationally and EPBC Act listed endemic and/or threatened species such as land and seabirds, including most of the remaining breeding population habitat for the Abbott's booby.

Christmas Island is listed as an 'Endemic Bird Area' by Birdlife International. These areas harbour a high concentration of endemic bird species, and are regarded as being of the highest priority for the global conservation of bird biodiversity.

Australia is a signatory to several international agreements for the conservation of migratory species and their habitats. Agreements that are relevant to Christmas Island are the Convention on Biological Diversity, the China, Japan and Republic of Korea Migratory Birds Agreements with Australia (CAMBA, JAMBA and ROKAMBA), the Migratory Species (Bonn) Convention. Species occurring under these agreements are listed species under the EPBC Act.

The Dales and Hosnies Spring are listed under the Ramsar Convention as Wetlands of International Importance and are therefore listed and protected under the EPBC Act. The Dales is a system of seven watercourses that contain a number of wetland types. It also exhibits unusual water-related limestone deposition features, including a 'flowstone' formation that is usually found underground. Hosnies Spring is an area of shallow freshwater springs on a shore terrace that is 24 to 37 metres above sea level. It contains a unique stand of mangroves that have persisted for around 120,000 years.

Scientific values

Oceanic islands like Christmas Island have played an important part in the development and study of ecological theories, particularly the theory of island biogeography. As a relatively well preserved oceanic island, Christmas Island's unique ecology and endemic species provide invaluable opportunities to observe and study ecological interactions and processes of species dispersal, immigration, competition and adaptation. Opportunities include studies of endemic sea and land birds and the role of land crabs in shaping and maintaining the island's rainforests. Such studies have enormous potential for unravelling the intricacies of island ecology and contributing to documenting and conserving the island's biodiversity values, including by increasing national and international awareness of conservation values and issues on Christmas Island.

Some of the park's conservation programs, including the rainforest rehabilitation and crazy ant management programs are also of scientific and technical interest and value in their own right.

Cultural and community values

Christmas Island residents use the park for a range of purposes. Residents participate in activities such as walking and running events (as well as the visitor activities described below). Some residents fish or collect fruit and seeds from introduced food plants (such as chilli, lime, papaya and pumpkin), which were planted or spread during the island's settlement and before the land they were planted on was incorporated into the park.

There are two Chinese temples and other sites in the park where religious ceremonies are held. These buildings, buildings at Grants Well, and the building known as The Pink House research station have heritage values that may warrant specific protection.

Visitor use and educational values

The park is readily accessible and provides exceptional opportunities for the study and enjoyment of nature. Visitors to the park can experience its unique rainforests and wetlands; viewing of the annual red crab breeding migration; a large variety and number of seabirds; and spectacular and scenic land and seascapes. The island's tranquil setting and memorable soundscapes provide opportunities for wilderness-type experiences, sightseeing, quiet use, enjoyment and inspiration and a range of recreational opportunities, such as walking, scuba diving and bird watching. Island events such as Birdweek attract visitors from Australia and overseas to enjoy the natural values of the park and the island.

Professional photographers and film makers occasionally visit Christmas Island to produce wildlife publications and documentaries, which promote the park's natural and educational values.

Economic value

The park presents opportunities for the development of eco-tourism and specialised tourism operations which accord with the purpose and significance of the park.

Several nature-based tourist and visitor attractions on Christmas Island are centred on the park. The park helps support on- and off-island tour businesses including diving/boating, land-based tours and bird watching tours. Other businesses provide tourists and other visitors, including researchers, with services and products such as accommodation, hire vehicles and food. The value of the park as an eco-tourism destination is not fully realised and through appropriate sustainable tourism development, the park can make a greater contribution to the island's economy while protecting the park's values.

The park also directly employs a number of island residents and purchases goods and services from local businesses.

Ecosystem services

The ecological services used by human society that are provided by natural ecosystems are known as ecosystem services. The park's terrestrial and marine ecosystems provide a number of ecosystem services and products that benefit the Christmas Island community. Key ecosystem services include a catchment for much of the island's water supply; regulation of the local climate; spiritual and well-being benefits from recreational activities; and connection to the natural environment.

Management Plan for Christmas Island National Park



Part 1 - Introduction

1. Background

Part 1 of this plan outlines the context in which the management plan for Christmas Island National Park was prepared. It describes previous plans and the legislative requirements and international agreements which underpin the content of the plan.

1.1 Previous management plan and audit

This will be the fourth management plan for Christmas Island National Park. The third plan came into operation on 13 March 2002 and ceased to have effect on 13 March 2009. At the time the third plan was prepared the EPBC Act provided for management plans for Commonwealth reserves to have effect for seven years. The EPBC Act now provides for management plans to have effect for ten years.

Prior to preparing this plan an audit of the third plan for the park was conducted to assess its effectiveness and to provide recommendations to assist with the preparation of this plan. The audit (DNP 2008f) highlighted a number of issues, including that the status of some of the park's native fauna (in particular the Christmas Island pipistrelle and native reptiles) were in decline.

A summary of the audit is provided in Appendix B. The complete audit document is available online at: environment.gov.au/parks/publications/christmas/pubs/christmas-tech-audit-02-09.pdf.

1.2 Structure of this management plan

The structure of this plan reflects the Parks Australia Strategic Planning and Performance Assessment Framework, a set of priorities based on Australian Government policy and legislative requirements for the protected area estate that is the responsibility of the Director of National Parks.

The plan has been developed against the following key result areas:

- Natural heritage management (see Section 4)
- Cultural heritage management (see Section 5)
- Use and appreciation of protected areas (see Section 6)
- Stakeholders and partnerships (see Section 7)
- Business management (see Section 8)
- Biodiversity science, knowledge management and use (see Sections 4 and 8.7).

Appendix C details outcomes for the key result areas, which are also used in the periodic State of the Parks report and the Director of National Parks' Annual Report to the Australian Parliament.

1.3 Planning process

Section 366 of the EPBC Act requires that the Director of National Parks prepare management plans for each Commonwealth reserve. Section 368 of the Act requires the Director to seek comments on this plan from members of the public and the relevant state or territory government. In response to the notice seeking public comments on the draft management plan, 11 public submissions were received and the content of these submissions was considered when finalising this plan.

Stakeholders were also consulted during the preparation of this plan and included tourism stakeholders and operators; Australian and Western Australian government departments and agencies; the Shire of Christmas Island; researchers; residents/community groups; and non-government organisations.

1.4 Interactions with other plans and documents

At the time of preparing this plan there were recovery plans covering 10 of Christmas Island's listed species prepared under the EPBC Act. A new regional (multi species) recovery plan for Christmas Island is being prepared under the EPBC Act to incorporate all existing recovery plans into a single regional recovery plan. The primary purpose of a recovery plan is to provide the research and management actions necessary to stop the decline of, and support the recovery of, threatened species so that the chances of their long-term survival in nature are maximised. Once in place, the regional recovery plan will provide more detailed information and actions that will support and inform the implementation of the natural heritage/biodiversity management and research actions in this plan. Although this management plan recognises the need to work with stakeholders in relation to relevant off-park/cross tenure issues, this plan only applies to the park, and therefore the actions are confined to the park. However, as many threats, especially invasive species and traffic impacts on land crabs, cross or affect various land tenures (e.g. Crown Land, national park), the regional recovery plan will help to address cross tenure threats to biodiversity.

In 2009 the Commonwealth Minister for the Environment formed a scientific Expert Working Group (EWG), primarily in response to the decline of the Christmas Island pipistrelle, to provide the Minister with advice about biodiversity conservation on Christmas Island. The EWG's final 2010 report made 32 broad-ranging recommendations aimed at reversing the decline of biodiversity and in 2011 a whole-of-government response to the Expert Working Group was prepared (Australian Government 2011). Many of the natural heritage and research actions in this plan are aimed at progressing recommendations made by the EWG and the whole of Commonwealth government response to the EWG report. In addition, the EWG report provided information that has been used in and that will help inform this plan's implementation.

In 2010 Ecological Character Descriptions (ECDs) were prepared for The Dales (Butcher & Hale 2010) and Hosnies Spring (Hale & Butcher 2010) Ramsar sites. The ECDs describe, and aim to assist with monitoring and maintaining the ecological character of The Dales and Hosnies Spring, and this management plan includes actions to support these aims.

The Christmas Island Local Planning Strategy (LPS) is prepared by the Shire of Christmas Island (the Shire). The LPS sets out the long-term planning directions for the local government, applies Western Australian State and regional planning policies and provides the rationale for the zones and other provisions of the Town Planning Scheme (TPS). The TPS governs the way land may be used and developed through land use zoning and defines what developments are acceptable (from a town planning perspective) within these designated zones. While they apply to different land tenures, there may be some common linkages between the LPS/TPS and this management plan and may help to inform each other's implementation. For instance each plan has information and actions that relate to sustainable tourism development and cross land tenure land management issues, such as water resource use, roads (including red crab protection measures) and cross tenure invasive species management issues.

2. Introductory provisions

2.1 Short title

This management plan may be cited as the Christmas Island National Park Management Plan.

2.2 Commencement and termination

This management plan will come into operation following approval by the Minister under s.370 of the EPBC Act, on a date specified by the Minister or the beginning of the day after it is registered under the *Legislative Instruments Act 2003*, whichever is later, and will cease to have effect ten years after commencement, unless revoked sooner or replaced with a new plan.

2.3 Interpretation (including acronyms)

In this plan:

Anchialine means habitats comprising bodies of inland waters under marine tidal influence, usually salinity stratified waters with restricted exposure to the open air and with extensive connections with subterranean waters showing marine and terrestrial influences and typically occurring in limestone or volcanic coasts

Australian Government means the Government of the Commonwealth of Australia

Bonn Convention means the Convention on the Conservation of Migratory Species of Wild Animals

Biodiversity Monitoring Program means the 2003–2007 biodiversity monitoring program funded by the Department of Finance and carried out by the Director

CAMBA means the Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment

Christmas Island Act means the *Christmas Island Act 1958*, and includes reference to any Act amending, repealing or replacing the Christmas Island Act

Christmas Island National Park means the area declared as a national park by that name under the NPWC Act and continued under the EPBC Act by the *Environmental Reform (Consequential Provisions) Act 1999*

CITES means the Convention on International Trade in Endangered Species of Wild Fauna and Flora

Commonwealth reserve means a reserve established under Division 4 of Part 15 of the EPBC Act

CSIRO means the Commonwealth Scientific and Industrial Research Organisation

Department means the Australian Government Department responsible for the administration of the EPBC Act (at the time of preparing this plan the Department of the Environment)

Director means the Director of National Parks under s.514A of the EPBC Act, and includes Parks Australia and any person to whom the Director has delegated powers and functions under the EPBC Act in relation to Christmas Island National Park

Endemic means native plant and animal species that have a restricted geographical distribution; for the purposes of this plan it means species that are found only on Christmas Island

Ecological community means an assemblage of interdependent plant and animal species interacting with one another in a particular area

Ecosystem means an ecological community together with the physical non-living environment interacting as a functional unit

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999*, including Regulations under the Act, and includes reference to any Act amending, repealing or replacing the EPBC Act

EPBC Regulations or the Regulations means the *Environment Protection and Biodiversity Conservation Regulations 2000* and includes reference to any Regulations amending, repealing or replacing the EPBC Regulations

Island or the island means the Territory of Christmas Island located in the Indian Ocean unless otherwise stated

IUCN means the International Union for Conservation of Nature

JAMBA means the Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment

Keystone species means those species which play a critical role in the function of an ecological community and, if lost or removed, cause significant changes in ecosystem structure and function

Landscape means an area of land composed of interacting ecosystems that are repeated in a similar form throughout the area; it includes living and non-living natural aspects as well as human influenced and human made aspects

Management plan or plan means this management plan for Christmas Island National Park, unless otherwise stated

Management principles means the Australian IUCN reserve management principles set out in Schedule 8 of the EPBC Regulations (see Appendix A)

Megalops means the second larval life stage in the development of most crabs. In this stage the legs and abdominal appendages appear for the first time and the young crabs begin to resemble an adult crab.

Minister means the Minister administering the EPBC Act

NPWC Act means the former *National Parks and Wildlife Conservation Act 1975* and the Regulations under that Act (repealed and replaced by the EPBC Act in 2000)

Park or the park means Christmas Island National Park

Parks Australia means that part of the Department that assists the Director in performing the Director's functions under the EPBC Act

Parks Australia staff or Park staff means staff who are employees of the Department assigned to assist the Director of National Parks

Park values means the values described in the Commonwealth Heritage listing of Christmas Island Natural Areas (see Appendix G), the park values section of this plan (see A Description of Christmas Island) and Sections 4 to 8 of this plan

Ramsar Convention means the Convention on Wetlands of International Importance

Ride means to ride a non-motorised vehicle such as a pedal-powered bicycle

ROKAMBA means the Agreement between the Government of Australia and the Government of the Republic of Korea for the Protection of Migratory Birds and their Environment

Seascape means an area of sea composed of interacting ecosystems that are repeated in a similar form throughout an area; it includes living and non-living natural aspects as well as human influenced and human made aspects

Significant species means native terrestrial species listed as threatened under the EPBC Act, migratory EPBC species, species which have an important role in the ecosystem, and species of conservation concern (those which have a substantial decline or small natural endemic population size), endemic vertebrates, and/or species in which there is a high level of community interest

Territory Administration means the Australian Government Department responsible for administering the Christmas Island Act (at the time of preparing this plan the Department of Infrastructure and Regional Development)

Track for walking or riding means a track for walking or riding that has been provided by the Director in accordance with EPBC subregulation 12.55(2)

Vehicle access road has the meaning given by the EPBC Regulations namely, a road in a Commonwealth reserve that:

- (a) is a sealed road; and
- (b) does not have a sign displayed on or near it indicating that it is prohibited to use motor vehicles on the road at that time

Vehicle access track has the meaning given by the EPBC Regulations namely a road in a Commonwealth reserve that:

- (a) is an unsealed road; and
- (b) has a sign, erected by the Director, with the words 'Vehicle Access Track' displayed at the point or points that motor vehicles would normally access the track; and
- (c) there are no signs displayed on the track indicating that it is prohibited to use motor vehicles on the track at that time.

2.4 Legislative context

2.4.1 EPBC Act

Objects of the Act

The objectives of the EPBC Act as set out in Part 1 of the Act are:

- (a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and
- (b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and
- (c) to promote the conservation of biodiversity; and
- (ca) to provide for the protection and conservation of heritage; and
- (d) to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and
- (e) to assist in the co-operative implementation of Australia's international environmental responsibilities; and
- (f) to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and
- (g) to promote the use of indigenous people's knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge.

Establishment and purposes of the national park

The park was declared under the *National Parks and Wildlife Conservation Act 1975* (NPWC Act) in four stages between 1980 and 1989. The NPWC Act was replaced by the EPBC Act in July 2000. The park continues as a Commonwealth reserve under the EPBC Act pursuant to the *Environmental Reform (Consequential Provisions) Act 1999*, which deems the park to have been declared for the following purposes:

- the preservation of the area in its natural condition
- the encouragement and regulation of the appropriate use, appreciation and enjoyment of the area by the public.

Director of National Parks

The Director is a corporation under the EPBC Act (s.514A) and a Commonwealth authority for the purposes of the *Commonwealth Authorities and Companies Act 1997*. The corporation is controlled by the person appointed by the Governor-General to the office that is also called the Director of National Parks (s.514F of the EPBC Act).

The functions of the Director (s.514B) include the administration, management and control of the park. The Director generally has power to do all things necessary or convenient for performing the Director's functions (s.514C). The Director has a number of specified powers under the EPBC Act and EPBC Regulations, including the power to prohibit or control some activities and to issue permits for activities that are otherwise prohibited. The Director performs functions and exercises powers in accordance with this management plan.

Management plans

The EPBC Act requires the Director to prepare management plans for the park. The management plan and the Director's powers in relation to its implementation only apply to the park. Nevertheless, this plan identifies the need for the Director to work with a range of stakeholders, for instance, to address issues such as cross tenure conservation issues (e.g. invasive species control) and nature-based tourism activities. However, this plan cannot oblige other parties to support or enable the actions identified in this plan to occur outside of the park.

When prepared, management plans are given to the Minister for approval in accordance with the EPBC Act. A management plan is a 'legislative instrument' for the purposes of the *Legislative Instruments Act 2003* and must be registered under that Act. Following registration the plan is tabled in each House of the Commonwealth Parliament and may be disallowed by either House on a motion moved within 15 sitting days of each House after tabling.

A management plan for a Commonwealth reserve has effect for ten years, subject to being revoked or amended earlier by another management plan for the reserve.

See Section 2.5 in relation to EPBC Act requirements for a management plan.

Control of actions in Commonwealth reserves

The EPBC Act (ss.354 and 354A) prohibits certain actions being taken in Commonwealth reserves except in accordance with a management plan. These actions are:

- kill, injure, take, trade, keep or move a member of a native species; or
- damage heritage; or
- carry on an excavation; or
- erect a building or other structure; or
- carry out works; or
- take an action for commercial purposes.

The EPBC Act (ss.355 and 355A) also prohibits mining operations being taken in Commonwealth reserves except in accordance with a management plan.

The EPBC Regulations control, or allow the Director to control, a range of activities in Commonwealth reserves, such as camping, use of vehicles and vessels, littering, commercial activities and research. The Director applies the Regulations subject to and in accordance with the EPBC Act and management plans. The Regulations do not apply to the Director or to wardens or rangers appointed under the EPBC Act. Activities that are prohibited or restricted by the EPBC Regulations may be carried on if they are authorised by a permit issued by the Director and/or they are carried on in accordance with a management plan or if another exception prescribed by r.12.06(1) of the Regulations applies.

Access to biological resources in Commonwealth areas is regulated under Part 8A of the EPBC Regulations. Access to biological resources is also covered by ss.354 and 354A of the EPBC Act if the resources are members of a native species and/or if access is for commercial purposes.

Environmental impact assessment

Actions that are likely to have a significant impact on 'matters of national environmental significance' are subject to the referral, assessment and approval provisions of Chapters 2 to 4 of the EPBC Act (irrespective of where the action is taken).

At the time of preparing this plan, the matters of national environmental significance identified in the EPBC Act are:

- World Heritage listed properties
- National Heritage places
- Ramsar Wetlands of International Importance
- nationally listed threatened species and ecological communities
- listed migratory species
- nuclear actions (including uranium mining)
- Commonwealth marine areas
- Great Barrier Reef Marine Park.

The referral, assessment and approval provisions also apply to actions on Commonwealth land that are likely to have a significant impact on the environment and to actions taken outside Commonwealth land that are likely to have a significant impact on the environment on Commonwealth land. The park is Commonwealth land for the purposes of the EPBC Act.

Responsibility for compliance with the assessment and approval provisions of the EPBC Act lies with persons taking relevant 'controlled' actions. A person proposing to take an action that the person thinks may be or is a controlled action should refer the proposal to the Minister for the Minister's decision whether or not the action is a controlled action. The Director of National Parks may also refer proposed actions to the Minister.

Wildlife protection

The EPBC Act also contains provisions (Part 13) that prohibit and regulate actions in relation to listed threatened species and ecological communities, listed migratory species, cetaceans (whales and dolphins) and listed marine species. Appendix D to this plan identifies species in the park that are listed as threatened under the EPBC Act at the time of preparing this plan. Appendix E identifies migratory and marine species that are listed under the EPBC Act and under international conventions, treaties and agreements at the time of preparing this plan.

Actions taken in a Commonwealth reserve in accordance with a management plan in relation to members of species listed under Part 13 of the EPBC Act are exempt from prohibitions that would otherwise apply under Part 13.

Part 9 of the EPBC Regulations provides for the protection and conservation of biodiversity in Commonwealth areas outside the park (i.e. all land outside the park), and prohibits and/or regulates actions affecting members of native species specified in Schedule 12 to the Regulations, and their habitat.

Heritage protection

The majority of Christmas Island including the park, adjacent areas and the ocean and sea floor surrounding Christmas Island within 500 metres of the low water mark, is listed in the Commonwealth Heritage List. Other sites on the island with cultural and historic heritage values are separately entered in the list.

In terms of National and Commonwealth Heritage listed places, the EPBC Act heritage protection provisions (ss.324A to 324ZH) relevantly provide:

- for the establishment and maintenance of a National Heritage List and a Commonwealth Heritage List, criteria and values for inclusion in either list and management principles for places that are included in the two lists
- that Commonwealth agencies must not take action that is likely to have an adverse impact on the heritage values of a place included in either list unless there is no feasible and prudent alternative to taking the action, and all measures that can reasonably be taken to mitigate the impact of the action on those values are taken
- that Commonwealth agencies that own or control places must:
 - i. make a written plan to protect and manage the Commonwealth Heritage values of each of its Commonwealth Heritage places
 - ii. prepare a written heritage strategy for managing those places and conserve their Commonwealth Heritage values, addressing any matters required by the EPBC Regulations, and consistent with Commonwealth Heritage management principles
 - iii. identify Commonwealth Heritage values for each place, and produce a register that sets out the Commonwealth Heritage values (if any) for each place (and do so within the time frame set out in their heritage statements)

The prescriptions within this management plan are consistent with Commonwealth Heritage management principles (Schedule 7B of the EPBC Regulations) and other relevant obligations under the EPBC Act for protecting and conserving the heritage values for which the park has been listed.

Penalties

Civil and/or criminal penalties may be imposed for breaches of the Act.

2.4.2 WA legislation or Christmas Island ordinances legislation

In addition to legislation referred to elsewhere in this plan other Commonwealth Acts, and Territories Ordinances made under the Christmas Island Act are relevant either directly or indirectly to the management of the park, including:

- *Administrative Ordinance 1968*
- *Casino Control Amendment Ordinance 2003*
- *Casino Legislation Ordinance 2005*
- *Customs Amendment Ordinance 2005*
- *Importation of Dogs and Cats Ordinance 1973*
- *Lands Ordinance 1987.*

At the commencement of this plan a range of Western Australian laws are applied to Christmas Island under the Christmas Island Act as laws of the Territory, and administered by the government of Western Australia under arrangements with the Territory Administration. The applied laws include:

- *Agriculture and Related Resources Protection Act 1976*
- *Animal Welfare Act 2002*
- *Dog Act 1976*
- *Environmental Protection Act 1986*
- *Firearms Act 1973*
- *Fish Resources Management Act 1994*
- *Health Act 1911*
- *Litter Act 1979*
- *Marine and Harbours Act 1981*
- *Mining Act 1978*
- *Plant Diseases Act 1914*
- *Road Traffic Act 1974*
- *Soil and Land Conservation Act 1945*
- *Spear-guns Control Act 1955.*

2.5 Purpose, content and matters to be taken into account in a management plan

The purpose of this management plan is to describe the philosophy and direction for the management of the park for the next ten years in accordance with the EPBC Act. The plan outlines and identifies the park's values and how they are to be protected, conserved, presented, promoted and further described. It enables management to proceed in an orderly way, provides a framework for management decisions and reconciling competing interests, and identifies priorities for the allocation of available resources.

Under s.367(1) of the EPBC Act, a management plan for a Commonwealth reserve must provide for the protection and conservation of the reserve. In particular, each management plan must:

- (a) assign the reserve to an IUCN protected area category (whether or not a proclamation has assigned the reserve or a zone of the reserve to that IUCN category); and
- (b) state how the reserve, or each zone of the reserve, is to be managed; and
- (c) state how the natural features of the reserve, or of each zone of the reserve, are to be protected and conserved; and
- (d) if the Director holds land or seabed included in the reserve under lease—be consistent with the Director's obligations under the lease; and
- (e) specify any limitation or prohibition on the exercise of a power, or performance of a function, under the EPBC Act in or in relation to the reserve; and
- (f) specify any mining operation, major excavation or other works that may be carried on in the reserve, and the conditions under which it may be carried on; and
- (g) specify any other operation or activity that may be carried on in the reserve; and

- (h) indicate generally the activities that are to be prohibited or regulated in the reserve, and the means of prohibiting or regulating them; and
- (i) indicate how the plan takes account of Australia's obligations under each agreement with one or more other countries that is relevant to the reserve (including the World Heritage Convention and the Ramsar Convention, if appropriate); and
- (j) if the reserve includes a National Heritage place:
 - i. not be inconsistent with the National Heritage management principles; and
 - ii. address the matters prescribed by regulations made for the purposes of paragraph 324S(4)(a); and
- (k) if the reserve includes a Commonwealth Heritage place:
 - i. not be inconsistent with the Commonwealth Heritage management principles; and
 - ii. address the matters prescribed by regulations made for the purposes of paragraph 341S(4)(a).

In preparing a management plan the EPBC Act (s.368) also requires account to be taken of various matters. In respect to the Christmas Island National Park these matters include:

- the regulation of the use of the park for the purpose for which it was declared
- the protection of the special features of the park, including objects and sites of biological, historical, paleontological, archaeological, geological and geographical interest
- the protection, conservation and management of biodiversity and heritage within the park
- the protection of the park against damage
- Australia's obligations under agreements between Australia and one or more other countries relevant to the protection and conservation of biodiversity and heritage.

2.6 IUCN category and zoning

A management plan must assign a Commonwealth reserve to an IUCN protected area category. The categories are prescribed by the EPBC Regulations and correspond to the protected area categories identified by the IUCN:

IUCN category number	Protected area category
Ia S	strict nature reserve
Ib W	wilderness area
II Na	national park
III Na	cultural monument
IV Habi	habitat/species management area
V Pr	protected landscape/seascape
VI	Managed resource protected area

A management plan may divide a Commonwealth reserve into zones and assign each zone to an IUCN category. The category to which a zone is assigned may differ from the category to which the reserve as a whole is assigned (s.367(2)).

The provisions of a management plan must not be inconsistent with the management principles for the IUCN category to which the reserve or zone of the reserve is assigned (s.367(3)). See Section 3 for information on the park's IUCN category.

2.7 International agreements

This management plan must take account of Australia's obligations under relevant international agreements. The following agreements are relevant to the park and are taken into account in this management plan.

Convention on Wetlands of International Importance (Ramsar Convention)

The Ramsar Convention is an international agreement which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention aims to stop the world from losing wetlands and to conserve those that remain. There are now more than 150 contracting parties to the convention throughout the world.

Sites are selected for the List of Wetlands of International Importance under the Ramsar Convention because of ecological, botanical, zoological, limnological or hydrological importance. The Hosnies Spring site was listed in 1990 and The Dales was listed in 2002 (see Appendix F for Ramsar information sheets for these sites, and the Ecological Character Descriptions (Hale & Butcher 2010; Butcher & Hale 2010)).

Australian Ramsar management principles are prescribed by the EPBC Regulations.

China–Australia Migratory Bird Agreement (CAMBA)

CAMBA provides for China and Australia to cooperate in the protection of migratory birds listed in the annex to the agreement and of their environment, and requires each country to take appropriate measures to preserve and enhance the environment of migratory bird species listed under the agreement. Species on the CAMBA list are listed as migratory species under the EPBC Act (Appendix E).

Japan–Australia Migratory Bird Agreement (JAMBA)

JAMBA provides for Japan and Australia to cooperate in taking measures for the management and protection of migratory birds, birds in danger of extinction, and the management and protection of their environments, and requires each country to take appropriate measures to preserve and enhance the environment of birds protected under the provisions of the agreement. Species on the JAMBA list are listed as migratory species under the EPBC Act (Appendix E).

Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

ROKAMBA provides for the Republic of Korea and Australia to cooperate in taking measures for the management and protection of migratory birds and their habitat by providing a forum for the exchange of information, support for training activities and collaboration on migratory bird research and monitoring activities. Species on the ROKAMBA list are listed as migratory species under the EPBC Act (Appendix E).

Bonn Convention

The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range. Parties to this convention work together to conserve migratory species and their habitat.

Species that are listed under the Bonn Convention, CAMBA and JAMBA are listed migratory species under Part 13 of the EPBC Act (Appendix E).

Convention on Biological Diversity

The Convention's objectives are:

- the conservation of the world's biological diversity
- to promote the sustainable use of the components of biological diversity
- to provide for the fair and equitable sharing of benefits from the utilisation of genetic resources, including providing appropriate access to genetic resources and the appropriate transfer of relevant technologies taking into account all rights over those resources and technologies, and by appropriate funding (UNEP 1994).

The EPBC Act is the primary legislative instrument for implementing the Biodiversity Convention in Australia.

The Nagoya Protocol

In October 2010 the Conference of Parties to the Convention on Biological Diversity adopted the '*Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization*', also known as the Nagoya Protocol. Australia signed the protocol in January 2012, and is committed to its full implementation and ratification.

The protocol establishes a legally-binding framework for access to genetic resources for research activities, sharing the benefits from their use or the use of associated Traditional Knowledge. Access to biological resources in Commonwealth areas such as the park is regulated under the EPBC Act and EPBC Regulations (see also Section 8.7, Research and monitoring).

Part 2 - How Christmas Island National Park will be managed

3. IUCN category

Performance indicator for IUCN category is:

- Degree to which the park is managed in accordance with this plan (as determined by section 8.9)

3.1 Assigning the park to an IUCN category

Our aim

Manage the park to protect its natural values while providing for appropriate uses.

Background

The International Union for the Conservation of Nature (IUCN) defines a protected area as 'a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values'.

As noted in Section 2.6, the EPBC Act requires a Commonwealth reserve to be assigned to an IUCN protected area category. The EPBC Regulations (Schedule 8) prescribe the Australian IUCN reserve management principles for each of the seven Australian IUCN categories.

The purposes for which the park is declared and the vision of this plan are consistent with the park being managed in accordance with the management principles for the IUCN category national park (category II). For Christmas Island National Park it is not necessary to assign zones to areas within the park. The last management plan assigned the park to IUCN category II.

Issue

The EPBC Act requires that the park is assigned to an appropriate IUCN category and is managed in accordance with its assigned IUCN category.

What we are going to do

Policies

- 3.1.1 The park is assigned to IUCN protected area category II, national park.
- 3.1.2 The park will be managed in accordance with the Australian IUCN reserve management principles applicable to that category (see Appendix A which details which sections of the management plan address each principle).

4. Natural heritage management

Performance indicators for natural heritage management are:

- The extent, structure and species composition of native vegetation communities are maintained
- High priority areas are rehabilitated with native flora that is self-sustaining seven to ten years after planting
- Populations of threatened and significant terrestrial native species and red crabs are maintained or increase
- Populations and impacts of cats, rats and invasive weeds are reduced and crazy ant supercolonies cease to form
- No new marine or terrestrial invasive species become established
- Ramsar wetlands continue to support ecologically characteristic species including blue, robber and red crabs, mangroves (Hosnies Spring) and Tahitian chestnuts (The Dales)
- The abundance and diversity of coral reefs and coral reef fish are maintained
- Level of understanding of likely climate change impacts on park values and the extent that feasible adaptation responses are implemented

4.1 Landscape

Our aim

Maintain the natural landscape and its ecological integrity

Background

Christmas Island's landscape is composed of limestone landforms, with coastal and inland cliff terraces and largely covered with tropical rainforest vegetation. Approximately 63 per cent of the island's landscape is included in the park. Although the island retains most of its original rainforest vegetation, approximately 25 per cent of the island's original landscape and vegetation has been cleared for mining and associated infrastructure (e.g. buildings and roads) since the island's settlement in 1888, creating a fragmented landscape. The impacts of invasive species are recognised as the greatest current threat to Christmas Island's biodiversity. Settlement introduced many invasive species and the associated landscape disturbance and fragmentation not only reduced flora and fauna habitat, but also helped to increase the spread and impacts of some invasive species (especially weeds) which have been deliberately or inadvertently introduced from other places since settlement.

Geology and geomorphology

Christmas Island is the peak of a basaltic volcanic seamount which rises steeply from the ocean floor 5,000 metres below. The highest point on the island, Murray Hill, is 361 metres above sea level. The island has undergone a series of geological uplifts and successive layers of coral reefs were formed over the basaltic volcanic core at each stage of uplifting. This has led to development of a near-continuous limestone cap. Successive uplifting events led to the excavation of new cliffs by the ocean, forming stepped terraces and inland cliffs.

The most recent geological evidence suggests that the volcanic seamount appeared at the ocean's surface between 60 and 80 million years ago, forming an atoll (Grimes 2001). The island is believed to be on a tectonic plate moving northwards 7 to 8 centimetres a year, and likely to have travelled about 700 kilometres north of where it first emerged. The lowest shore terrace is the most recent and was probably formed about 124,000 years ago (Veeh 1985, Woodroffe 1988a). Most of the coast consists of sheer rocky cliffs 10 to 20 metres high, often undercut, interspersed with a few sand and coral rubble beaches. Behind the coastal cliffs is the shore terrace, which varies from 50 to 200 metres in width. Inland cliffs and terraces occur between the shore terrace and the plateau. The first inland cliff encircles most of the island and varies in height from 75 to 200 metres. The second major terrace sits above the first inland cliff and features a series of small cliffs and scree-slopes to a third terrace of variable width. A final cliff or steep slope scattered with limestone blocks leads to the central plateau. The central plateau has a southerly tilt and an elevation generally between 180 and 240 metres.

Karst, subterranean and groundwater ecosystems

Limestone karst landforms and subterranean cave systems are significant geological features of Christmas Island that also provide habitat for unique subterranean fauna including endemic species. Subterranean ecosystems are diverse and include at least 95 known karst features including 42 caves, comprising terrestrial, aquatic/freshwater, marine and anchialine habitats (a subterranean water body with connections to the ocean), one of only two anchialine systems known in Australia (Humphries et al. 2001, Grimes 2001, Davie et al. 2012).

There is little to no runoff as rain water infiltrates where it falls, recharges groundwater systems and/or flows to the ocean. There are only a few surface drainage systems. Examples include The Dales, Hosnies Spring, and Ross Hill Gardens. At these and other smaller sites, freshwater springs emerge at the interface between the limestone and less porous basalt. Surface water then flows over the volcanic rock base until reaching the ocean or returning underground where limestone occurs again. Groundwater taken from the park at Jedda Cave provides much of the island's water supply.

Soils

The majority of Christmas Island's soils are classified as phosphatic. These were most likely derived from marine sediments (both organic and inorganic) before the island rose above the sea surface, and from seabird guano reacting with limestone (Trueman 1965, Gray 1995). These soils are deepest on the central plateau, becoming progressively thinner towards the lower terraces. Soil depth influences the type of vegetation growing in a particular area and Section 4.2 (Terrestrial vegetation) provides a description of major vegetation types and their relationship with soil depth. Remaining substrates are mostly derived from weathered parent materials including limestone (terra rossa soils) or volcanic basalt (krasnozems soils). Soils derived from basaltic extrusive rocks occur in fault zones or areas of past volcanic activity. The soils are usually neutral to slightly alkaline (pH 7.0–8.0).

In terms of phosphate content, the soils with the highest P₂O₅ (diphosphorus dioxide) concentrations occur deepest in the profile at the boundary with the limestone substrate. The highest grade ore, locally referred to as 'A-grade' material, is cream to white in colour. 'B-grade' material is light brown, whilst 'C-grade' soils are reddish brown and sometimes referred to as 'overburden'. C grade soil stockpiles may be recovered for land rehabilitation purposes as per the mining lease conditions.

Landscape impacts and values

Human land uses such as mining and settlement activities have had significant impacts on the island's landscape and its ecosystems, as have invasive species. Global climate change will affect the island's landscape, ecosystems and native species. These effects may include increasing the impacts of existing threats, such as creating conditions more favourable to invasive species (e.g. crazy ants and weeds); structural and compositional changes to the island's rainforests; loss of beaches; or hydrological changes such as reduced groundwater recharge.

Despite the impacts on the island's landscape, Christmas Island's natural areas (within and outside the park) retain sufficient conservation significance to be inscribed in the Commonwealth Heritage List (see Appendix G).

Areas like Margaret Knoll and the Blowholes provide visitors with spectacular panoramic views of the island's landscapes and seascapes making them valuable visitor destinations.

Interactions between landscapes and seascapes

There are a number of ecological interactions between the island's landscapes and seascapes. For example, the surrounding ocean influences the island's weather, by moderating the island's climate and provides moisture laden air which is forced up by the island's steep terrain, cooling and condensing as it rises, resulting in the island's high rainfall. Seabirds are dependent on fish and other marine life for food, while the island's terrestrial environment provides critical nesting habitat. Land crabs migrate to the ocean to spawn (release their eggs) and the crab larvae grow through several larval stages in the ocean before emerging on to land and maturing into crabs. Marine turtles that nest on the island's beaches spend nearly their entire life cycle in the ocean. Better understanding the interactions between terrestrial and marine ecosystems is essential for helping to maintain park values and the actions needed to do this are outlined in Sections 4.5 and 8.7.

Ecosystem services

The ecological services used by human societies provided by ecosystems, for example, provision of potable water and air, and pollination of crop plants are known as ecosystem services.

The park provides a number of ecosystem services that are used by and benefit the Christmas Island community and visitors. These services include the provision of much of the island's water supply; regulation of the local climate; pollination to maintain island biodiversity; spiritual and well-being benefits from recreational opportunities; and connection to the natural environment.

EPBC legislative provisions relevant to landscape

Sections 354 and 354A of the EPBC Act prohibit certain actions being taken in the park except in accordance with this plan, including actions affecting members of native species, damaging heritage, excavation, construction and other works. Sections 355 and 355A of the Act prohibit mining operations except in accordance with this plan.

Part 12 of the EPBC Regulations regulates certain activities in Commonwealth reserves including several activities (e.g. r.12.11 excavating, building and works) that could, if not well managed, impact on the park's landscape values. Activities under Part 12 may not be carried out unless provided for by, and carried out in accordance with, this plan (or authorised by a permit or under certain other conditions).

This Section should be read in conjunction with Sections 4.2, 4.3, 4.4, 4.5, 4.6 and 8.7.

Issues

- There is a need to better understand, manage and conserve the park's landscape as a whole system and as part of the wider landscape of the island.
- Human activities may be affecting or changing the park's landscape beyond natural evolutionary rates of change.
- Landscape change is inevitable. Some threats and their impacts may not be able to be controlled or mitigated to the extent necessary to retain all existing park values.

What we are going to do

Policies

- 4.1.1 Impacts on the values and integrity of the park's landscape including visitor experience values (also see Section 8.1) will be avoided or minimised.
- 4.1.2 Rock and gravel may be extracted and transported from the existing quarry site in the park in accordance with a licence or permit issued by Director.
- 4.1.3 The Director may use or authorise (whether by permit, contract, lease, letter or licence) others to use chemicals for purposes authorised by this plan, such as invasive species management, subject to Section 8.7.8 (i).
- 4.1.4 The Director may take actions or authorise (whether by permit, contract, lease, letter or licence) others to take actions to remove phosphate stockpiles inside the park for rehabilitation purposes consistent with this plan.
- 4.1.5 The Director may bring into the park or authorise (whether by permit, contract, lease, letter or licence) actions by others to bring into the park landscaping materials including soil, gravel, sand and organic materials for road or site construction, road maintenance or propagation and rehabilitation activities.
- 4.1.6 The transit of rock, gravel, sand and/or soil through the park, including the transit of material and equipment associated with mining operations, will not require a permit if the Director is satisfied the activity, or class of activity, will not impact upon the natural and cultural values of the park and approves the activity being carried out in writing.
- 4.1.7 If the landscape changes in ways that threaten landscape or ecosystem values or otherwise beyond levels of acceptable change, the Director, in consultation with relevant stakeholders, will identify further monitoring requirements and will decide whether protection, rehabilitation or adaptation measures can and will be implemented (also see Sections 4.6 and 8.7).
- 4.1.8 Land and sea access to caves will be managed to enable access for management and permitted research purposes. Subject to the above and Section 6.2.12, permits under r.12.17 to enter a cave may be issued.
- 4.1.9 Cave, karst and groundwater systems will be managed to increase understanding of their values, ecological processes and potential threats and to minimise risks of negative environmental impacts (also see Sections 6.2.12, 6.2.18 and 8.7.8 (g)).

Actions

- 4.1.10 Work with relevant stakeholders, particularly the island's major land managers and/or holders, to adopt integrated approaches to the conservation and management of the park's natural landscape and its ecosystems. This may include through the implementation of a regional (multi species) recovery plan (also see Sections 4.2.12, 7.1.4 and 8.7.8).

- 4.1.11 Assess and monitor, and where possible mitigate, human impacts on landscape values, such as groundwater systems and clearing native vegetation for road works (also see Sections 8.1 and 8.7.8 (a)).
- 4.1.12 In consultation with stakeholders, develop a water extraction agreement to ensure the sustainability of groundwater extraction from the park.

4.2 Terrestrial vegetation

Our aim

Maintain the ecological integrity of vegetation communities

Background

About 75 per cent of Christmas Island's original native rainforest vegetation remains, most of which occurs in the national park. Christmas Island's rainforest vegetation is characterised by a unique and distinctive structure and assemblage of plants. The distinctiveness of the vegetation results from climatic and biological influences (particularly land crabs) and the island's geological and geographical remoteness and isolation. The rainforest vegetation provides critical habitat for a range of animal groups including land crabs, land birds, seabirds, reptiles and insects. The island's vegetation is comprised of approximately 242 naturally occurring species that were present before human settlement, and about half of the island's species are not known to occur anywhere else in Australia or its territories.

Description

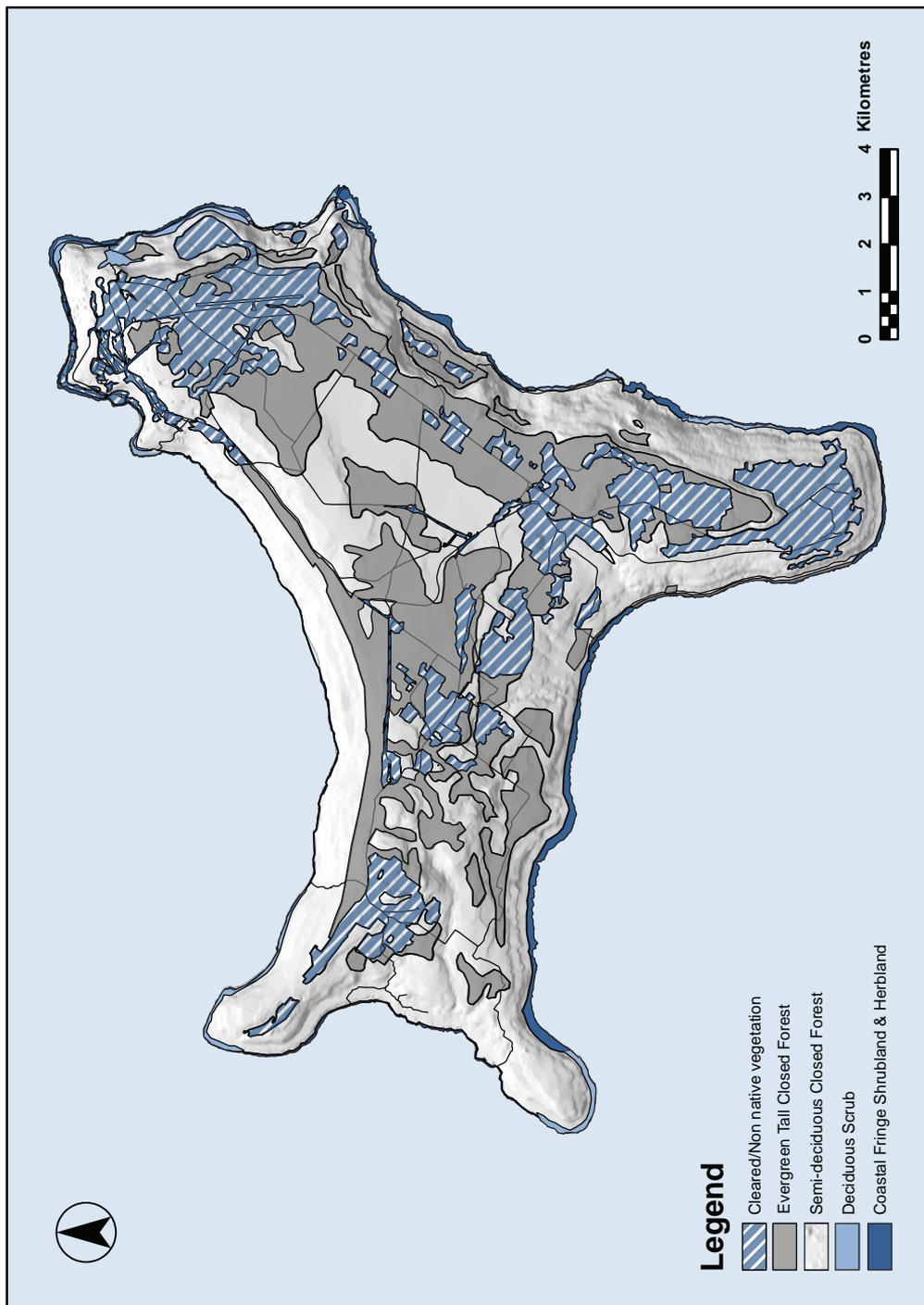
Christmas Island's vegetation has been described in *Flora of Australia Vol 50* (Du Puy 1993) and by several authors. The most recent classification of the island's vegetation (Claussen 2005) identifies four primary vegetation types (Map 3):

- Evergreen tall closed forest occurs in areas with deep soils on the plateau but is also found on deep soil terraces. This forest has an uneven canopy up to 40 metres, with emergent trees to 50 metres, including *Syzygium nervosum*, *Planchonella nitida* and lantern fruit (*Hernandia ovigera*).
- Semi-deciduous closed forest occurs on shallower soils and is common on terraces and slopes and on shallow soil plateau areas. The canopy is 15 to 30 metres high with occasional emergent trees up to 35 metres. The canopy is closed in the wet season but opens to varying degrees in the dry season as many species are deciduous.
- Deciduous scrub is restricted to areas with less soil on terraces, steep slopes and inland cliffs. The canopy is usually semi-even at about 10 metres high with emergent trees to 15 metres and is composed of trees, shrubs and vines. Nearer the coast the vegetation is lower, evergreen, windswept and dominated by salt tolerant pandanus and *scaevola*.
- Herbland is the least common vegetation type and exists occasionally between the scrub and the coastal cliffs in more exposed areas. A few species of low growing herbs, sedges and grasses dominate.

Some significant features of the island's vegetation are:

- Many species occur in different habitats from those where they normally grow in other countries, for example, Indonesia and Malaysia. Many species also exhibit larger forms than elsewhere, which contributes to the unique structure of the island's forest vegetation.
- The diversity and composition of species making up the island's forest is relatively low. This largely reflects the island's geological and geographical isolation and remoteness (lessening the probability of species colonisation), the lack of large areas of freshwater ecosystems and the ecological role of land crabs. Red crabs are the dominant forest seed and seedling consumers and have a large impact on the island's rainforest structure, processes, species diversity and species composition.

Map 3: Native vegetation



- There are at least 20 endemic plant species, including *Pandanus elatus*, the Arenga palm (*Arenga listeri*) and the threatened Christmas Island spleenwort (*Asplenium listeri*).
- There are relict populations of three species that were left isolated with the island's tectonic uplift: coastal mangrove species *Bruguiera gymnorhiza* and *Bruguiera sexangula* at Hosnies Spring and a cycad, *Cycas rumphii*. There are three fern species listed as threatened under the EPBC Act: *Tectaria devexa* var. *minor*, *Pneumatopteris truncata* and the endemic Christmas Island spleenwort.

Invasive plant species

Oceanic islands often have a greater percentage of their vegetation as introduced or exotic plants than mainland areas (Simberloff 1995) and oceanic island ecosystems are particularly vulnerable to the impacts of introduced plant species.

Christmas Island demonstrates this, as over 50 per cent of the island's present flora species have been accidentally or deliberately introduced since settlement. Some of these introduced species are listed by land management agencies in other locations as invasive weeds. On Christmas Island, some native understorey and canopy species have been replaced and excluded by competition, shading or chemical suppression (allelopathy). This has affected the integrity of the forest ecosystem function, structure and species composition. There has also been loss of fauna species habitat, for example shore terrace nesting habitat for red-tailed tropicbirds (*Phaethon rubricauda westralis*) and brown boobies (*Sula leucogaster plotus*), through the spread of the invasive vine *Antigonon leptopus*. The vine also threatens nesting trees for the Christmas Island frigatebird, as does *Leucaena leucocephala* which has formed thick stands around nesting habitat. Impacts on many other species are yet to be quantified but invasive plants are likely to have negative impacts on native vegetation and a range of animal species. Some other invasive plant species of concern are *Clausena excavata*, *Delonix regia*, *Mikania micrantha*, *Muntingia calabura*, *Manihot glazvooii*, *Psidium* spp., *Tecoma stans*, *Tithonia diversifolia*, *Centrosema pubescens*, *Calopogonium* spp., *Macroptilium atropurpureum*, *Aleurites moluccana* and *Cordia curassavica*.

Approximately 25 per cent of the island's native vegetation has been cleared since the island was settled, providing opportunities for introduced plants to establish and spread. Most introduced species, with notable exceptions being *Clausena excavata*, *Delonix regia* and *Aleurites moluccana*, have not yet invaded undisturbed rainforest vegetation. The planting of food plants such as chilli, lime, papaya and pumpkin following settlement, has resulted in their spread over the island. The Director considers the non-commercial collection of food plants to be an appropriate use of the park, providing collection has no negative impact on the park, and these species do not further invade the park.

Biosecurity

In 2000, the Department of Agriculture, Forestry and Fisheries Biosecurity Northern Australia Quarantine Strategy (NAQS) surveyed the island and found a number of NAQS target or highly invasive plants that are a threat to the Australian mainland.

There has been an Australian Government Department of Agriculture presence on the island since 1994 and in 2004 quarantine legislation (*Quarantine (Christmas Island) Proclamation 2004*) came into force under the *Quarantine Act 1908*. This legislation allows the import of some plant species by permit. The Director and the Department of Agriculture work cooperatively to help reduce the risk of or address potential off-island invasive species threats.

In 2009, the Minister established an Expert Working Group (EWG) to review threats to biodiversity on Christmas Island and provide recommendations for conservation measures. Amongst other findings in their final report, the EWG identified biosecurity threats as one of the major continuing threats to the island's ecosystems and native species and the need for biosecurity management to be upgraded as a high priority in order to help reduce biodiversity threats.

Christmas Island Minesite to Forest Rehabilitation Program

Clearing native vegetation for mining and settlement purposes has fragmented the island's original rainforest vegetation and reduced habitat for native species, including the Abbott's booby. Clearing of nesting habitat not only caused direct habitat losses for the Abbott's booby (as well as other native species) but also increased wind turbulence downwind of existing nesting sites in the surrounding rainforests, resulting in the disturbance and displacement of unfledged Abbott's booby chicks from their nest and high mortality rates. While clearing of the island's primary tall evergreen rainforest vegetation for mining no longer occurs, clearing of secondary native vegetation (i.e. regrowth on previously worked phosphate stockpiles) may also impact on nesting success, although the impacts of these activities on the Abbott's booby depends on the proximity and orientation of the vegetation clearing.

To reduce windshear and the impacts of wind turbulence on the Abbott's booby, forest rehabilitation in mine clearings adjacent to original rainforest vegetation commenced in 1989 through the Christmas Island Rainforest Rehabilitation Program (CIRRP). The CIRRP was later renamed as the Christmas Island Minesite to Forest Rehabilitation Program (CIMFR). Conduct of the program (at the commencement of this plan) is based on methods recommended by the Centre for Mined Land Rehabilitation in Queensland. The aim of the program is to rehabilitate old minesites adjacent to original rainforest, where rehabilitation is feasible and cost effective. Priority sites for rehabilitation are primarily those closest to high densities of Abbott's booby nests; the program also has broader ecosystem and native species recovery objectives and benefits, including rehabilitating habitat for red crabs and forest birds.

Rehabilitation occurs on former mine fields that have been cleared of their original rainforest vegetation as a result of previous mining activities. The program involves significant earthworks to replace soils in mined areas; removing exotic plants; propagating tree species native to the island; tree planting and fertilising; follow-up exotic plant control; and monitoring rehabilitated sites to assess the effectiveness of rehabilitation. The program is funded by a conservation levy paid to the Territory Administration by Phosphate Resources Limited under its mining lease and operates under a Memorandum of Understanding (MoU) between the Director and the Territory Administration; a long-term forest rehabilitation plan was prepared under this MoU in 2012.

EPBC legislative provisions relevant to terrestrial vegetation

Under ss.354 and 354A of the EPBC Act a person may not kill, injure, take, trade, keep or move a member of a native species except in accordance with a management plan. The EPBC Regulations (r.12.20) also prohibit taking animals and plants into the park, and cultivating plants (r.12.21) in the park. Under the EPBC Regulations (r.12.19A) a person may not kill, injure, take, trade, keep or move a member of a non-native species except in accordance with a management plan.

This Section should be read in conjunction with Sections 4.1, 4.3, 4.4, 4.6 and 8.7.

Issues

- There is a high risk of new invasive species arriving and establishing on the island.
- Threats to rainforest vegetation, habitats and species need to be managed and controlled, particularly invasive species.
- Monitoring changes in native and introduced vegetation distribution and abundance needs to be undertaken at a sufficiently detailed scale.

What we are going to do

Policies

- 4.2.1 The Director may take actions or authorise (whether by permit, contract, lease, letter or licence) actions by other persons to clear plants (including plants listed under Part 13 of the EPBC Act) for one or more of the following reasons:
- (a) management purposes including maintaining roads, tracks and infrastructure
 - (b) protecting, conserving, restoring and managing biodiversity and heritage, including implementing the CIMFR
 - (c) emergency or safety reasons
 - (d) other activities assessed and approved under Section 8.1 of this plan (also see Section 8.2.5).
- 4.2.2 The Director may take actions or authorise (whether by permit, contract, lease, letter or licence) actions by other persons concerning plants, including species listed under Part 13 of the EPBC Act or Regulations, that are otherwise prohibited by the EPBC Act where they are necessary to implement this plan, or where they are otherwise necessary for preserving or protecting the park, protecting or conserving biodiversity, or protecting persons or property in the park.
- 4.2.3 Subject to risk assessments and required approvals including from the Department of Agriculture, the Director may introduce, or issue a permit for the introduction of, non-native species into the park for conservation purposes, for example, for use in the biological control of one or more invasive species.
- 4.2.4 As far as practicable and subject to available resources, implement relevant recovery plans and threat abatement plans for EPBC listed and other significant native species.
- 4.2.5 Non-commercial collection of non-native food plants from the park will be allowed, and will not require a permit, provided the Director is satisfied the activity does not pose a threat to the park's values. Non-native food plants may not be propagated or cultivated in the park.
- 4.2.6 The rehabilitation of former mine sites will be continued utilising funding from the mining lease conservation levy and, where necessary, from other sources to continue to remediate the impacts of past mining activity on relinquished mine leases.

Actions

- 4.2.7 Implement strategies to minimise the impacts of weeds on the park's natural heritage values through:
- (a) assessing risks to significant conservation assets including Ramsar wetlands, EPBC Act listed and/or endemic species and subspecies and/or their habitat and original/relatively undisturbed rainforest vegetation.
 - (b) controlling invasive weed species, giving priority to controlling species at risk of threatening ecosystem function and/or significant conservation assets
 - (c) monitoring the spread of invasive weed species and effectiveness of control measures (also see Section 8.7.8 (d)) and adjusting control strategies accordingly
 - (d) working with stakeholders to manage high priority weeds across different land tenures (also see 7.1).
- 4.2.8 Work with relevant stakeholders, particularly the Department of Agriculture, to support, develop, coordinate and implement strategies that:
- (a) assess the risks and reduce the likelihood of invasive (flora and fauna) species entering and establishing in the island's terrestrial and marine areas—this will include assessing particular introduction pathways and invasive species
 - (b) enable rapid responses to eradicate invasive species that may enter the island and/or park.
- 4.2.9 Subject to the availability of funds, and so far as practicable, continue to rehabilitate former minesites by:
- (a) conducting earthworks to replace soils removed by mining
 - (b) restoring native rainforest habitat and species
 - (c) controlling weeds on rehabilitation sites and adjacent to areas of high conservation value (particularly areas of evergreen tall closed forest habitat for EPBC Act listed and significant species, including the Abbott's booby, forest birds and terrestrial crabs—particularly red crabs)
 - (d) monitoring and evaluating rehabilitation success
 - (e) securing long-term continued external funding (also see Section 8.7.8 (b)).
- 4.2.10 Monitor the park's and island's vegetation, including threatened species, using fine-scale habitat mapping and vegetation change mapping. Monitor threats, particularly invasive species (also see Sections 8.7.8 (a) and 4.6).
- 4.2.11 Assess the need for and feasibility of establishing *ex situ* cultivation of threatened or otherwise significant flora species, and support efforts to establish such ancillary conservation measures if warranted.

These policies and actions should be read in conjunction with Sections 4.3.1 to 4.3.13.

4.3 Terrestrial animals

Our aim

Maintain or increase populations of significant native species

Background

Native animal species

Christmas Island's biodiversity is of international significance, with several threatened and/or protected species listed under the EPBC Act, including endemic native animal species and native animal species that are not found elsewhere in Australia. As an isolated oceanic island, Christmas Island's native fauna is characterised by species that disperse via wind, ocean currents or flight.

The island is one of the world's significant seabird islands. More than 100 migrant and vagrant species have been recorded, including nine resident breeding seabird species (with three of these being endemic) and 23 vagrant/non-breeding seabirds. It is also an example of a relatively undisturbed seabird breeding island when compared to many other Indian Ocean islands. Species include the threatened and endemic Abbott's booby and Christmas Island frigatebird.

There are 14 resident (native, introduced and self-colonising) land bird species, including three endemic species and four endemic subspecies:

- Christmas Island emerald dove (*Chalcophaps indica natalis*)
- Christmas Island Frigatebird (*Fregata andrewsi*)
- Christmas Island goshawk (*Accipiter hiogaster natalis*)
- Christmas Island hawk-owl (*Ninox natalis*)
- Christmas Island imperial pigeon (*Ducula whartoni*)
- Christmas Island thrush (*Turdus poliocephalus erythropleurus*)
- Christmas Island white-eye (*Zosterops natalis*).

All forest birds have a role in the island's ecology—as seed dispersers and/or pollinators of forest plant species.

Five native endemic land mammals have been recorded. The bulldog rat and Maclear's rat are extinct and the Christmas Island shrew is likely to be extinct. The Christmas Island pipistrelle is an endemic micro-bat species that was once common but is now presumed extinct. The Christmas Island flying-fox (*Pteropus melanotus natalis*) was relatively widespread and common, but has declined in recent years. Its role as a pollinator and disperser of seeds for many indigenous trees makes it a major keystone species in the maintenance of Christmas Island's forest ecosystems.

There are six recorded species of native terrestrial reptiles, with five endemic species, all of which are in decline and highly threatened. Three species, the Lister's gecko (*Lepidodactylus listeri*), the blue-tailed skink (*Cryptoblepharus egeriae*) and the forest skink (*Emoia nativitatis*), may already be close to extinction in the wild. For these species, a captive breeding program is underway with the goal to release individuals back into the wild once threatening processes have been understood and mitigated. Limited records have also been found for the Christmas Island blind snake (*Ramphotyphlops exocoeti*). The abundance and distribution of the giant gecko (*Cyrtodactylus sadleiri*) has also declined, but small, localised populations still exist.

Most of the island's described insect species also occur in tropical areas to the north, but they include a number of endemics from several groups. More than 1,300 land species were identified by CSIRO in 1990 (CSIRO Division of Entomology 1990).

The diversity and abundance of land crabs is un-matched on any other island. The annual red crab breeding migration is one of the world's most spectacular animal migrations and red crabs have a major role in the ecology of the island as they are the dominant fauna species. Red crabs scavenge the forest floor and recycle nutrients, influencing rainforest species recruitment, distribution and structure. Robber crabs, while fewer in number, are conspicuous and Christmas Island's population is the largest in the world. The endemic blue crab (*Discoplax celeste*) is restricted to the island's wetlands and contributes to defining their ecological character. Although still poorly studied and known, the island's cave and subterranean habitats include freshwater, marine and anchialine (a subterranean water body with connections to the sea) and terrestrial habitats. These habitats contain a diverse range of fauna species including a number of rare and endemic species. Subterranean fauna includes of a range of cave-dwelling species, including one of only two known blind scorpions in Australia, stygofauna (subterranean fauna living in freshwater-filled voids) and anchialine fauna. The high degree of endemism and the ancient lineages of several species highlight the global conservation significance of Christmas Island's subterranean fauna.

Two new species of endemic crabs were discovered during surveys of anchialine caves in January 2010 and March 2011: *Orcovita orchardorum* and *O. hicksi*. These are the first records for this genus to be discovered in the Indian Ocean and Australia (Davie & Ng 2012).

Introduced species

In 2009 the Commonwealth Minister for the Environment formed a scientific Expert Working Group (EWG), primarily in response to the decline of the Christmas Island pipistrelle, to provide the Minister with advice about biodiversity decline on Christmas Island. A key EWG finding, as outlined in their final 2010 report (Expert Working Group 2010), was that existing (and the introduction of additional) invasive species posed the greatest threat to Christmas Island's biodiversity. Crazy ants are recognised as the most significant and pervasive key threatening process affecting biodiversity on the island, as reflected by the listing under the EPBC Act (in 2005) of the *Loss of biodiversity and ecosystem integrity following invasion by the Yellow Crazy Ant (Anoplolepis gracilipes) on Christmas Island*, and as identified by the Expert Working Group. Crazy ants were introduced sometime between 1915 and 1934. Since the 1990s they have formed high density, multi-queen supercolonies at many places over the island. Supercolonies pose a direct threat to red crabs (and other land crabs) and therefore indirectly affect rainforest vegetation recruitment, distribution and structure and may have other direct or indirect impacts on other native animal species. Removal of red crabs is also shown to increase the distribution and abundance of other invasive species, including weeds and giant African land snails (*Achatina fulica*).

A key issue, in addition to their impacts on adult crabs, is the impacts of crazy ants on red crab recruitment, through the loss of megalops/developing red crabs during their journey from the sea to the island's rainforest. At this early stage in their development, the megalops are particularly vulnerable to the impacts of crazy ants. Because of their impacts on the island's biodiversity and ecosystem condition, the control of crazy ants is a management priority.

There are a number of other introduced invertebrate species that are likely to impact on native species including the giant African land snail and giant centipede (*Scolopendra morsitans*).

Five reptile species have been introduced since settlement, including the wolf snake (*Lycodon aulicus capucinus*) which may be implicated in the decline of native fauna species. Other introduced reptile species may also prey on or compete with native animal species and may act as vectors for disease and pathogens.

The national Threat Abatement Plan for Predation by Feral Cats (DEWHA 2008b, prepared under the EPBC Act), identifies feral cats (*Felis catus*) as a serious threat to Australia's native wildlife. Cats are numerous and widespread across the island and studies show that they pose a significant threat to a number of native species including reptiles and ground nesting seabirds, particularly nesting red-tailed tropicbirds.

There are also introduced black rats (*Rattus rattus*) and house mice (*Mus musculus*). Rodents have been implicated in the decline of species such as ground nesting birds on other islands. In 2006, *Predation by exotic rats on Australian offshore islands of less than 1,000 square kilometres (100,000 hectares)* was listed as a key threatening process under the EPBC Act.

The impacts of pathogens and diseases on the island's species are poorly understood. However, disease may be implicated in the decline of the bulldog rat and Maclear's rat in the late 1890s to early 1900s (Wyatt et al. 2008) and the more recent decline of native reptile species.

Management programs

The Director has implemented crazy ant management programs since the late 1990s. Many of these programs have been developed with La Trobe and Monash Universities under the advice of the Crazy Ant Scientific Advisory Panel whose membership includes eminent scientists with knowledge in relevant fields. To date, crazy ant control has largely focused on aerial baiting of crazy ant super-colonies in 2002 (2,500 hectares baited); 2009 (784 hectares) and 2012 (1,062 hectares). An island-wide survey monitoring program (IWS) is conducted regularly, to primarily map the area of crazy ant supercolonies, provide an estimate of the red crab population and to collect data on the distribution and presence of native and invasive species. The results of the IWS from 2001 to 2009 showed that red crabs had declined over this period however the 2011 IWS showed a slight recovery of the red crab population, to an estimated 45 million crabs. In 2009 the Director contracted La Trobe University to undertake a three-year project to research the potential of indirect biological control of crazy ants (also see Section 8.7).

In 2010 the Shire introduced new by-laws for pet cat ownership, including the prohibition of imports of additional cats onto the island and compulsory de-sexing. Following the introduction of these by-laws, in 2011 a collaborative cat control program commenced on the island, initiated by the Director and the Shire.

The program also involves the resources of the Territory Administration, Department of Immigration and Border Protection and Christmas Island Phosphates, and is undertaken on the ground by the Western Australian Department of Parks and Wildlife, establishing cross tenure control of feral cats and rats in settled, light industrial and some forest areas. This program resulted in removal of over 500 cats since the program began in 2010. Working with stakeholders to continue the cross tenure control of feral cats and rats is a major priority of this plan.

Based on and in response to the advice of the Expert Working Group, instigation of a captive breeding program for the Christmas Island pipistrelle was attempted by members of the Australasian Bat Society with support from the Director. However, no bats were caught despite considerable effort. In 2009, the Director increased efforts to conserve the island's native reptiles including the establishment of a captive breeding program, increased monitoring and investigation of threatening processes.

These and other recent population declines have resulted in a number of Christmas Island's terrestrial endemic fauna and flora species being listed as threatened under the EPBC Act and ten of these species are the subject of EPBC Act recovery plans. At the time of preparing this plan, a regional (multi species) recovery plan was being prepared for Christmas Island that will cover all EPBC listed threatened fauna and flora species, as well as other significant species including red crabs. The recovery plan will supplement the implementation of this management plan by providing more details about individual native species, as well as specific threats and the management and research actions required for their recovery. The recovery plan will also address actions required for the recovery of native species that need to occur across different land tenures, particularly invasive species management, whereas the actions of this plan only apply to the park.

The Director, with local stakeholders, implements strategies to reduce the numbers of red crabs killed by vehicles during their early wet season breeding migration. In 2005–06, 425,000 red crabs were estimated to have been killed by vehicles. Specially designed crab underpasses and fences have been constructed on some roads along main crab migration routes to channel crabs safely under the road. In addition, some roads in the park are closed during the migration. Furthermore, from 2010 to 2012 over 2,000 robber crabs were recorded as being killed from vehicles. Community education, liaison and support are critical for helping to protect red crabs and robber crabs from traffic impacts.

EPBC legislative provisions relevant to terrestrial animals

Under ss.354 and 354A of the EPBC Act, a person may not kill, injure, take, trade, keep or move a member of a native species except in accordance with a management plan. In accordance with r.12.19, taking animals or plants into the park is prohibited except for assistance animals used by a person with a disability and for management purposes.

Part 9 of the EPBC Regulations provides for the protection and conservation of biodiversity in Commonwealth areas outside the park, and prohibits and/or regulates actions affecting members of native species specified in Schedule 12 to the Regulations, and their habitat.

Part 13 of the EPBC Act provides for the conservation of biodiversity including listed species and communities. Where species and communities may be impacted by an action, these actions must comply with Part 13 of the Act and if approved will require a Part 13 permit. However, this provision does not apply to the Director carrying out actions identified in or conducted in accordance with this plan.

Part 13 of the EPBC Act provides for the Minister to list ecological communities and native species as threatened. Part 13A of the EPBC Act and Part 9A of the EPBC Regulations prohibit and/or regulate the international movement of wildlife specimens for scientific purposes.

This Section should be read in conjunction with Sections 4.1, 4.2, 4.4, 4.6 and 8.7.

Issues

- The population status of several native species is poorly known.
- Some native species populations are in decline, mostly due to the impact of invasive species.

- The reasons for decline in some species are not entirely known and the relative impact of some threatening processes has not been fully assessed, particularly in relation to impacts upon reptiles and the flying-fox.
- There is a need to reduce threats causing the declines to native species, particularly through invasive species control, both within and outside the park.
- A regional (multi species) recovery plan is being prepared concurrently with this plan that incorporates adaptive management principles. To support the recovery of EPBC listed species, this management plan needs to enable new, additional and appropriate conservation actions that may not be specifically described within this plan.

What we are going to do

Policies

- 4.3.1 Determine priorities for actions to conserve native plant and animal species based on:
- (a) the conservation status, significance or biodiversity value of the target species with high priority placed on significant species as defined in Section 2.3
 - (b) consideration of the risks of taking no action
 - (c) the likelihood that proposed actions will have ecosystem or multiple species benefits
 - (d) the likelihood that proposed actions will achieve their conservation aims, particularly in relation to the reduction of threatening processes and the recovery of significant species
 - (e) cost benefit and effectiveness of implementing proposed actions.
- 4.3.2 If EPBC Act listed, endemic, keystone or otherwise threatened or significant species are in decline to a level that may threaten their conservation status, the Director will:
- (a) assess the likelihood of mitigating known threats and, if feasible, implement threat mitigation strategies
 - (b) if threats are not known, determine (so far as possible) the threats and appropriate mitigation measures
 - (c) if threats are not known or not likely to be mitigated for some time, assess the feasibility and effectiveness of implementing interventionist programs, such as captive breeding, that have the long-term aim of conserving the species in their natural environment (also see Section 8.7.8).

- 4.3.3 The Director may take actions or authorise (whether by permit, contract, lease, letter or licence) actions by other persons concerning animal species, including species listed under Part 13 of the EPBC Act, that are otherwise prohibited by the EPBC Act or Regulations where they are necessary to implement this plan, or where they are otherwise necessary for preserving or protecting the park, protecting or conserving biodiversity, or protecting persons or property in the park.
- 4.3.4 As far as practicable, implement relevant recovery plans and threat abatement plans for listed threatened species.

Actions

- 4.3.5 Implement and/or (with the approval of relevant land managers) contribute to off-park/cross tenure conservation actions, particularly threat mitigation and species population monitoring, for conserving ecosystems and native species, particularly EPBC Act listed and other threatened species including red crabs and other keystone species.
- 4.3.6 Implement strategies to reduce human impacts on native species, particularly vehicle impacts on red crabs during their migration and robber crabs (also see Section 4.5).
- 4.3.7 Assess and monitor threats to native species. This will include the risk of invasive species which are currently considered a low threat becoming a greater threat (also see Sections 4.2.11 and 8.7.8).
- 4.3.8 Assess threats and impacts of pathogens and disease on native species and if possible implement feasible threat mitigation responses (also see Sections 4.2.11 and 8.7.8 (h)).
- 4.3.9 Subject to available resources, continue to implement the crazy ant control program. This will include baiting until other alternative effective control methods are developed; investigating alternative control methods, particularly completing the biological control research; subject to an assessment of the results of the research and relevant approvals, implement a biological control program or other effective control methods; and monitor the impacts of crazy ants on ecosystem condition and on red crabs and other native species.
- 4.3.10 Work cooperatively with relevant stakeholders and land managers to continue to progressively and adaptively implement a cross tenure cat and rat management program, including assessing the ecological interactions between cats and their prey species, particularly rats.
- 4.3.11 Assess the impacts of other invasive species and implement threat mitigation actions where possible and necessary (also see Sections 4.2.11 and 8.7.8(d)).
- 4.3.12 Maintain and adaptively develop conservation programs for terrestrial reptiles under threat from extinction in the wild.
- 4.3.13 Subject to Sections 4.3.1 and 4.3.2, investigate the need for and where feasible implement interventionist programs, such as captive breeding and propagation, for conserving threatened species that are in decline, for example terrestrial reptiles and the flying-fox.

These policies and actions should be read in conjunction with those under Section 4.2.

4.4 Ramsar wetlands and other freshwater wetlands

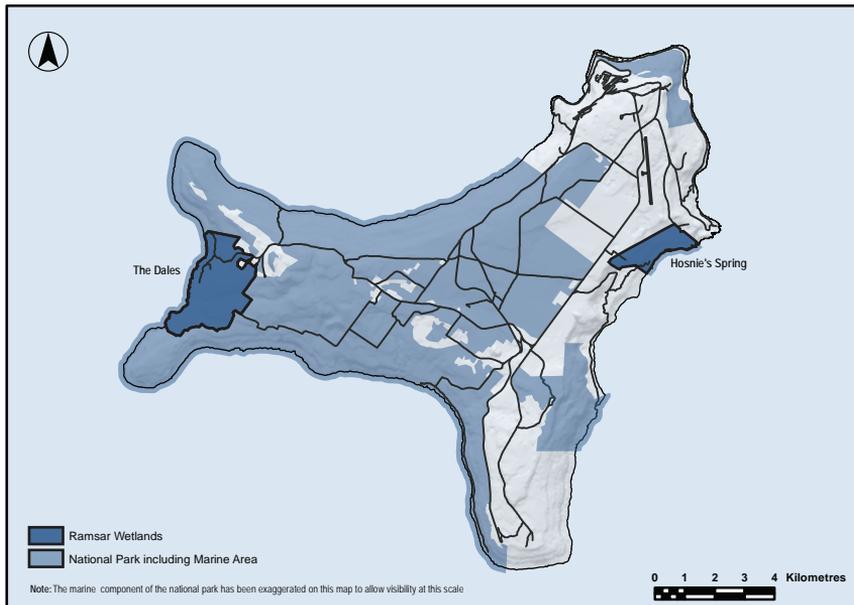
Our aim

Maintain the ecological character of Ramsar and other freshwater wetlands

Background

As described in Section 4.1, Christmas Island's landscape has a lack of surface water catchment and retention that in turn would normally feed into streams and rivers. There are however several perennial streams that are spring fed from water percolating through the substrate including those at Dolly Beach, the Ravine, Ross Hill Gardens, Jones Spring, Waterfall, Freshwater Spring, The Dales and Hosnies Spring. The Dales and Hosnies Spring are listed under the Ramsar Convention, and protected under the EPBC Act, as Wetlands of International Importance (see Map 4).

Map 4: Ramsar wetlands



At the time of listing, Hosnies Spring met three of the Ramsar criteria (Hale & Butcher 2010):

- Criterion 1d: it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region
- Criterion 2a: it supports an appreciable assemblage of rare, vulnerable or unusual endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species
- Criterion 2d: it is of special value for one or more endemic plant or animal species or communities

The Ramsar criteria have since changed, and Appendix F reflects the updated criteria. At the time of listing, The Dales met five Ramsar criteria (Butcher & Hale 2010):

Criterion 1:	A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region
Criterion 2:	A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities
Criterion 3:	A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular region
Criterion 4:	A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions
Criterion 8:	A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

The conservation values of other streams and springs are not well described but are likely to be similarly significant as the Ramsar listed wetlands as they support a similar suite of native species, such as endemic blue crabs which are restricted to freshwater habitats (i.e. streams and springs), as well as red and robber crabs and endemic forest birds.

The Dales

The Dales Ramsar site includes a series of seven watercourses, of which three support permanent springs and four support intermittent streams. The Dales are surrounded predominantly by semi-deciduous forest. On the seaward side at the edge of the shore terrace there is a line of coastal shrubland which merges with sea cliffs and rocky marine shores. The site extends seaward 50 metres and includes part of a narrow, shallow, sloping reef. Mixed amongst the terrestrial and marine environments are a range of karst features, highly representative of the geology of Christmas Island. The combination of this variety of habitats and the presence of permanent surface water provides a habitat which supports a wide diversity of endemic and threatened species.

Migrating red crabs pass through the area on their annual breeding migration and the area supports a resident population of red crabs and other terrestrial crabs including the robber crab. The site provides critical habitat for blue crabs that are dependent upon the freshwater streams for their reproductive cycle. The Dales supports a diverse community of tree species and epiphytes. At Hugh's Dale, and in parts of Anderson Dale and Sydney's Dale, there are mono-specific stands of Tahitian chestnut (*Inocarpus fagifer*) and the rare epiphytic ribbon fern (*Ophioglossum pendulum*). The endemic arenga palm (*Arenga listeri*) and endemic Ridley's orchid (*Brachypeza archytas*) are common in The Dales. *Terminalia catappa* grows to an unusually large size on Christmas Island and several large specimens occur in The Dales. A number of endemic fauna species occur within The Dales including the Abbott's booby, blue crabs and forest birds. Christmas

Island's only native freshwater fish, the brown gudgeon (*Eleotris fusca*) is also found in the streams at The Dales.

Hosnies Spring

Hosnies Spring Ramsar site is an area of permanent, shallow freshwater wetland, fed by a natural spring system located approximately 30 metres above sea level and 120 metres inland of the seaward cliff. A stand of mangroves grows in the wetland, including *Bruguiera gymnorhiza* and *B. sexangula*, estimated to have persisted for 120,000 years. The margins of the wetland are well defined, with limestone cliffs to the north and west and a sharp transition to deciduous scrub with hibiscus and pandanus to the south. The area that surrounds the wetland site is predominantly rainforest, characterised by a 20 to 30 metre tall canopy of evergreen and deciduous tree species such as *Pisonia grandis* and *Barringtonia racemosa* and a conspicuous lack of herb and shrub layers. There is a narrow band of coastal scrub with hardy species such as *Scaevola taccada* at the seaward margin of the shore terrace, with an unvegetated area of limestone pinnacles at the top of the sea cliff. The cliff descends some 17 metres almost vertically to the rocky marine shore below. The Ramsar site extends 50 metres seaward of the low water mark and includes areas of shallow coral reef.

Hosnies Spring is remarkable for a number of reasons. Firstly, it is one of the few permanent freshwater areas on Christmas Island. Secondly, the mangroves occur at an elevation not recorded anywhere else in the world. Thirdly, the age of the mangrove stand is extraordinary and finally, the individual trees are very large. The site also supports endemic and other significant fauna species including land crabs (in particular red, robber and blue crabs), sea and forest birds and the Christmas Island flying-fox.

In 2010, Ecological Character Descriptions for The Dales (Butcher & Hale 2010) and Hosnies Spring (Hale & Butcher 2010) were prepared under the National Framework and Guidance for Describing the Ecological Character of Australia's Ramsar Wetlands. These descriptions form a baseline reference to describe each site and to guide activities for maintaining and monitoring the ecological character of The Dales and Hosnies Spring.

Issues

- There is a need to monitor and maintain the ecological character of Ramsar sites and other wetlands.
- There is a need to mitigate the impacts of threats that may affect the ecological character of listed Ramsar sites and other wetlands.

What we are going to do

Policies

- 4.4.1 Applicable policies and actions from this plan (particularly from Sections 4.1, 4.2, 4.3, 4.6, 8.1 and 8.7.8) will be applied to managing The Dales and Hosnies Spring and other wetlands in the park.
- 4.4.2 Visitation to Hosnies Spring will be managed to:
- (a) maintain the site's ecological character
 - (b) maintain the site as a low level use and limited access site
 - (c) provide a limited number of visitors with a wilderness experience to visit a unique wetland that is largely undisturbed by humans
 - (d) provide and maintain limited facilities and infrastructure critical for conserving the wetland site's ecological character and for visitor safety.

- 4.4.3 Visitation to The Dales will be managed to:
- (a) maintain the site's ecological character
 - (b) maintain the site as an accessible and iconic destination
 - (c) provide visitors with interpretation and educational opportunities to enhance understanding and quiet appreciation of the site
 - (d) provide and maintain facilities and infrastructure to enable access to appropriate areas and to protect and promote the site's ecological character and visitor safety.

Actions

- 4.4.4 Monitor and maintain the ecological character of the Ramsar listed wetlands, Hosnies Spring and The Dales. This includes reducing or mitigating the impacts of potential threats, such as invasive species, unmanaged and unrestricted visitor use, contaminants that may affect water quality and monitoring potential threats.
- 4.4.5 Monitor and mitigate threats that may impact on (non-Ramsar listed) wetlands.

4.5 Marine and coastal ecosystems and species

Our aim

Maintain the ecological integrity of marine ecosystems

Background

The park's marine zone was established when the park was extended in 1989. Approximately 42 kilometres of the island shoreline that adjoins the park's land areas, to 50 metres seaward of the low water mark, is included in the park. This covers an area of approximately 2.1 square kilometres (see Map 4). Christmas Island's Territorial waters extend 12 nautical miles from the island's shore.

The park's predominantly intact fringing reefs and adjacent waters support a number of marine and coastal ecosystems and species, including over 600 fish species, with most being typical of the Indian Ocean region. Although species diversity is lower than at some other places in the Indian Ocean region, the marine biodiversity of Christmas Island's waters is globally unique and the coral reef ecosystems are comparatively intact and less threatened (e.g. by fishing pressures, habitat loss/degradation) than in many other places in the region. The island's location, in a biogeographic zone where Indian Ocean and Pacific Ocean species come into contact with each other, has resulted in more hybrid reef fishes than any other location in the world (Hobbs et al. 2008).

The island has more than 50 reef fish species that are not found anywhere else in Australia (although some species may also occur at the neighbouring Cocos Islands). The island's waters also provide habitat for several EPBC listed and/or protected species including whale sharks, which generally visit the island's waters between November and April, dolphins and green and hawksbill turtles. The waters surrounding the island are also critical for the survival of the island's land crabs, including tens of millions of red crabs, as they release their eggs into the sea as part of their breeding life cycle, as well as for foraging seabirds.

Ecosystems

The park's marine and coastal ecosystems include:

- **Shore rock platforms:** These occur at many locations around the island, more extensively on the western coastline between North West Point and Egeria Point. There are also tidal rock pools which are maintained by wave splash and tidal surge.
- **Beaches:** These are formed of sand and of coral and shell rubble, often with limestone outcrops. Dolly and West White Beaches are the two largest beaches in the park and island, while Dolly and Greta Beaches hold sufficient sand to provide habitat for hermit and ghost crabs and to enable green turtles to dig nests.
- **Shallow coral reef shelves:** The subsurface marine habitat immediately surrounding the island consists of a relatively narrow and shallow coral reef shelf about 20 to 100 metres wide in approximately six to 20 metres of water depth. There are caves in some of the island's rocky sea cliffs that adjoin the coral reef shelves. Coral reef shelves also contain areas of sand and rubble.

- Mid and deep water marine: The shallow coral reef shelves drop off steeply to the island's mid and deep water marine habitats which include outer reef seaward slopes, vertical walls and oceanic waters. The marine boundary of the park extends 50 metres seaward from the low water mark, which means that the park has no true deep water habitats but some outer reef slopes and vertical walls fall within the park's waters.

Use of the marine area

Several companies conduct diving, boating or sportsfishing tours within the park's and/or Territory's marine areas and many residents participate in recreational boating and fishing activities, which are important aspects of life for many island residents. The Director supports the development of management objectives which reflect broad community interests in the recreational and cultural use of the park, as far as these are consistent with conserving the park's ecosystems and species and with the EPBC Act and this plan.

At the time of preparing this plan the Western Australian Department of Fisheries has undertaken management responsibilities for the Territory's waters under a service delivery agreement with the Territory Administration. The Territory's waters (to 12 nautical miles) are managed in accordance with any applied Western Australian Fisheries laws, which may be applied in the marine part of the park by the Director to the extent they can operate concurrently with the EPBC Act, Regulations and this plan. The Department of Fisheries undertook extensive community consultation from 2006 to 2011 and (at the time this plan was prepared) Christmas Island specific recreational fishing rules were being progressed to legislation. The fishing rules aim to recognise the island's unique nature and the strong cultural links and subsistence reliance of the community on the marine resources, whilst raising awareness of the need for sustainable fishing.

As part of the Department of Fisheries management arrangements, two commercial fishing operators are permitted to fish in Christmas Island's Territorial waters (excluding the park's waters as commercial fishing is not permitted—see Section 6.3.4). These operators primarily target a range of pelagic finfish species including tuna (*Thunnus* sp.) and wahoo (*Acanthocybium solandri*), and some demersal species such as ruby snapper (*Etelis carbunculus*).

Public boat ramps are provided at Flying Fish Cove and Ethel Beach. Both of these are outside the park.

Conservation values of Commonwealth waters

In 2009, the department commissioned a study by CSIRO and Geoscience Australia titled *Conservation values in Commonwealth waters of the Christmas and Cocos (Keeling) Island remote territories* (Brewer 2009). The study's objective was to provide a summary of available information about the region's marine environments and biodiversity, especially where relevant to the National Representative System of Marine Protected Areas identification criteria.

The study found that the region's marine environments, including Christmas Island's Territorial waters, were unique and there were many ecological systems, particularly deep water systems below scuba diving depth, that are poorly understood.

Issues

- Greater knowledge is required about marine ecosystems and species including threats, interactions between marine and terrestrial ecosystems and species, and the distribution and abundance of species, particularly species of conservation significance or that may be under threat.
- Identifying, preventing, monitoring and mitigating threats. Threats may include over-fishing, changing ocean conditions, coral disease and bleaching, pollution and invasive species.
- The marine environment surrounding the island and its ecological processes need to be managed and conserved as a whole ecological system.

What we are going to do

Policies

- 4.5.1 The Director will work with other government agencies, the community and other stakeholders to conserve and manage the marine environment and its values.

Actions

- 4.5.2 Map the ecosystems of the park's, and where possible the island's, marine environment.
- 4.5.3 Assess threats to marine ecosystems and species (including biosecurity/invasive species and land-based threats) and work with stakeholders to develop and implement threat mitigation measures (also see Section 4.2.11).
- 4.5.4 Monitor the park's marine ecosystems, particularly coral reefs, and their species distribution, abundance and threats, including invasive species. This may also include monitoring species of significant conservation value (such as EPBC Act listed, hybrid and ecological indicator species), monitoring species under threat (such as those taken for human consumption) and at risk of local extinction, and monitoring water quality.
- 4.5.5 Take action, where feasible, to reduce threats to the marine environment, such as promoting responsible boating and fishing practices and potentially the installation of moorings at sensitive coral reef sites.

Also see Sections 6.2.13-17, 6.3.4 and 8.7.8 (e) and (f).

4.6 Climate change

Our aim

Gain a better understanding of climate change impacts on park values and adapt management actions in response.

Background

In recent years, climate change and its implications have emerged as a key issue for biodiversity and environmental management on a global scale. Small oceanic islands are particularly vulnerable to the effects of climate change.

In 2008 a discussion paper, *The impacts and management implications of climate change for the Australian Government's protected areas* (Hyder Consulting 2008), was prepared for the Australian Government Department of the Environment, Water, Heritage and the Arts and the Department of Climate Change. Amongst other findings, this discussion paper highlighted that climate change could impact on a wide range of issues affecting park management.

The *Parks Australia Climate Change Strategic Overview 2009-2014* was finalised in June 2009 (Director of National Parks 2009c). The key objectives of the strategic overview are:

- To understand the implications of climate change
- To implement adaptation measures to maximise the resilience of our reserves
- To reduce the carbon footprint of our reserves
- To work with communities, industries and stakeholders to mitigate and adapt to climate change
- To communicate the implications of, and our management response to, climate change.

In 2010, the Attorney-General's Department released the report *Indian Ocean Territory Climate Change Risk Assessment* (AECOM 2010), which identified the projected impacts of climate change on Christmas Island and the Cocos-Keeling Islands. Some of the potential impacts of climate change on Christmas Island's natural heritage in the report were:

- potential for increased forest fire susceptibility, particularly on drier coastal terraces and semi-deciduous forest
- loss of beach areas and habitat
- increased coral bleaching and reef damage
- possible decline of red crab abundance due to changes in seasonal onset of wet season and reduction in rainfall.

A climate change strategy for the park was finalised in 2011 (Director of National Parks 2011) that recommends the preliminary adaptation, mitigation and communication actions that are required to manage the consequences of climate change and reduce the carbon footprint of the park. Climate change is a long-term issue and the strategy is an incremental 'first step' to what must be a long-term and enduring response.

Issues

- Climate change is likely to affect many aspects of the park including water resources, infrastructure management, human safety, visitor use of the park and particularly biodiversity, as climate change may increase or compound the effects of existing biodiversity threats, such as invasive species.
- Up-to-date and expert information is needed in order to assess the potential impacts and risks of climate change, and feasible adaptation and mitigation measures.
- Some impacts of climate change may not be able to be mitigated.

What we are going to do

Policies

- 4.6.1 The Director will work with stakeholders and encourage, and where feasible support, research and investigations into potential climate change impacts, and the development of mitigation and adaptive responses.

Actions

- 4.6.2 Develop priorities for and support further research into the impacts of climate change on the park and use this information to refine and implement decisions about acceptable change, and mitigation and adaptation measures.
- 4.6.3 Implement and as required review the climate change strategy in order to identify appropriate changes to park management programs in response to improved understanding of climate change and its impacts.
- 4.6.4 Where feasible, adapt management priorities and programs in response to improved understanding of climate change impacts. This may include:
- (a) ecosystem and species monitoring and management, for example vegetation, wetland, red crab and coral reef conservation (such as through the management of fish takes and invasive species control programs)
 - (b) identification of acceptable levels of ecosystem and species change in response to climate change predictions
 - (c) emergency response considerations, including forest fire management and risk reduction.

Also see Section 4.1.7.

5. Cultural heritage management

Performance indicators for cultural heritage management are:

- The values of historic sites are described
- Level of human impact on historic site values

5.1 Cultural heritage site management

Our aim

Describe and protect the values of historic and cultural sites

Background

There are a number of historic sites on Christmas Island associated with mining and settlement history that are listed under the EPBC Act as Commonwealth Heritage places. There are also other sites of historic and cultural value, such as the island's cemeteries, that may not be listed under the EPBC Act. Some of these sites are within the park, for instance, the Pink House research station, Grants Well and Chinese temples.

Chinese temples are located at Grants Well and the LB 4 lookout area, but these temples are not maintained by the Director. These, as well as some other sites in the park, are actively used by residents for religious and cultural purposes. The Director supports the use of existing sites by island residents, where such use does not negatively impact on the park's values. Any new development proposals for the establishment of cultural sites, such as temples, require assessment in accordance with Section 8.1 of this plan. Visitors wishing to enter the temples should contact the temple managers.

Sections 354 and 354A of the EPBC Act prohibit actions that damage heritage unless carried out in accordance with a management plan.

Issues

- There are historic and cultural sites in the park of heritage value and not all sites and their values have been described.
- Some uses of historic and cultural sites may potentially have a negative impact on park values.

What we are going to do

Actions

- 5.1.1 As far as practicable, work with relevant experts and stakeholders, including the Territory Administration, the Shire of Christmas Island and the community (e.g. temple managers) to develop a heritage site inventory to help describe and record the values of cultural and historic sites within the park.
- 5.1.2 Work with relevant stakeholders to manage cultural and historic sites to protect their values, and to minimise the impacts of visitation and use on surrounding park values.

6. Visitor and park use management

Performance indicators for visitor and park use management are:

- Level of visitor satisfaction with nature-based visitation experience opportunities
- Procedures and systems are developed to monitor and manage visitor use of the park
- Level, trends and types of incidents involving visitor safety
- Level of understanding of and support for protecting the park's and island's natural values

6.1 Tourism

Our aims

- Provide opportunities for high quality, safe, rewarding, educational and diverse nature-based recreational experiences
- Contribute to the island's socio-economic and environmental sustainability
- Ensure nature-based tourism activities have minimal impact on the park's natural values

Background

The park is readily accessible and provides exceptional opportunities for the study and enjoyment of nature. Its unspoiled rainforests and wetlands; variety and number of seabirds; extensive populations of terrestrial crabs visible throughout the year, the red crab breeding migration and spectacular and scenic land and sea scapes (and memorable soundscapes), provide opportunities for unique wilderness-type experiences. The island's tranquil setting is also ideal for a range of nature-based tourism and recreational opportunities, such as walking, sightseeing, scuba diving and bird watching. Events such as Birdweek, which has become an annual tourism event on Christmas Island, attract visitors to the island and the park. The park presents opportunities for the development of eco-tourism and specialised tourism operations which accord with the purpose and significance of the park. Well managed and sustainable tourism activities can provide rewarding, inspiring and educational experiences for tourists and help support tourism enterprises and the island's economy. The economic value of the park as an eco-tourism destination is not fully realised, as current visitor levels and returns from tourism (i.e. yields) are relatively low. Through appropriate and sustainable tourism development, the park can make a greater contribution to the island's economy, while protecting the park's values. Sustainable tourism can also make a significant contribution to responsibly promoting and gaining public and community support for protecting the park's values.

The Director works closely with the Christmas Island Tourism Association and other stakeholders to develop sustainable tourism, such as through responsibly promoting the park's and island's natural values, as well as other tourism related issues.

In 2008, the Attorney General's Department funded preparation of the *Christmas Island Destination Development Report* (Planning for People 2008). Christmas Island businesses, organisations and community groups as well as the Director contributed to the report. The report explored ways to increase the island's tourism attraction with a focus on low volume, high yield tourism contributing to Christmas Island's sustainable economic development.

In 2012 the Director supported the production of a documentary, initiated by the Christmas Island Tourism Association and produced by Australian Geographic, which showcased the island's natural values and attractions. A key part of the aim of this documentary, funded by the Territory Administration, was to help attract the experience seeker tourism market segment. Christmas Island is ideally placed to target and attract experience seekers, as they seek out unique tourism experiences and generally return higher yields than many other tourism market segments. The categories of park visitors and some of the activities they may participate in are described further in Section 6.2.

The EPBC Act and Regulations contain a number of provisions relevant to tourism and visitor use of the park, which operate subject to the policies and actions in this plan. These provisions are addressed in Sections 6.2 to 6.4 of this plan. Under s.356A of the EPBC Act, subject to approval of the Minister, the Director may determine or impose charges in relation to Commonwealth reserves, including charges for entering or using a Commonwealth reserve and using services or facilities provided by the Director.

Issues

- There is a need for a diversity of high quality nature-based visitor experiences and the development of sustainable tourism that does not detract from the park's values or visitor safety.
- Effective communication needs to be maintained with the tourism industry in relation to park management issues that may affect, or be affected by, tourism.

What we are going to do

Policies

- 6.1.1 Tourism development and visitor use of the park will be managed so that these activities and opportunities for high quality nature based tourism experiences:
 - (a) are compatible with IUCN category II, national park (see Section 3.1)
 - (b) provide high quality, safe, rewarding, educational and diverse nature, wildlife and wilderness focused recreational experiences
 - (c) support sustainable socio-economic outcomes for Christmas Island
 - (d) do not negatively impact on the park's values.
- 6.1.2 The tourism industry and park visitors will be consulted, and their views taken into account, in relation to park management issues that may affect tourism and visitor use of the park. The Director will develop and maintain consultative and partnership approaches with tourism and other relevant stakeholders.
- 6.1.3 Where appropriate and possible, island-wide approaches will be taken to developing and managing tourism and associated infrastructure.
- 6.1.4 The activities outlined in Section 6.2 of this plan may generally be conducted in the park (subject to the policies and actions under Section 6.2 and this plan).
- 6.1.5 Subject to the policies and actions of this plan, unobtrusive low impact accommodation developments, aimed at providing high quality nature-based visitor experiences may be considered and approved for construction and operation in the park (also see Sections 4.2.1, 8.2 and 8.7.8 (j) and (k)).

Actions

- 6.1.6 Consult and work with tourism stakeholders with the aim of increasing the number, diversity and quality of sustainable nature-based visitor experience opportunities in the park, and to facilitate commercial tourism operations in the park. (Also see 6.2.24, 6.3 and 7.1)
- 6.1.7 Assess tourism proposals in accordance with Section 8.1.
- 6.1.8 Assess and invite interest in the development and operation of unobtrusive low impact accommodation developments, initially preparing expression of interest guidelines.
- 6.1.9 Monitor the impact of any accommodation and tourism businesses operating in the park and work with their operators to ensure impacts on park values are acceptable.

6.2 Visitor experiences, activities and access

Our aim

Visitors have opportunities for safe, inspirational and rewarding experiences that have minimal impact on park values

Background

Park visitors include members of the Christmas Island community; family and friends of island residents; visiting business people, government employees and contractors; the media; educational groups and researchers; and Australian and international tourists.

In the park, visitors may participate in sightseeing, bushwalking, scuba diving, fishing/boating, scenic drives, photography, observing wildlife, including endemic, sea and forest birds, the red crab migration and marine species such as whale sharks and dolphins (dolphin viewing must be conducted in accordance with the Australian National Guidelines for Whale and Dolphin Watching (Department of Environment and Heritage 2005b)). Visitor destinations such as Margaret Knoll and the Blowholes provide visitors with spectacular panoramic views of the island's landscapes and seascapes making them inspirational and highly valuable visitor destinations.

Christmas Island attracts national and international photographers and filmmakers because of the island's unique natural values and features e.g. a major documentary produced in 2012 by Australian Geographic. Such productions help to showcase these values and features, as well as help to promote the need to support their protection and conservation.

During the life of this plan it is possible that increasing numbers of visitors may want to be involved in volunteer programs associated with park-based conservation or research programs (also see Section 7.1.5).

Some recreational opportunities and activities sought by residents may be different from those sought by off-island tourists and visitors, for example collecting fruit and seeds from introduced food plants and walking and running events.

Visitor facilities provided to date include viewing platforms at the Blowholes, Margaret Knoll and Martin Point; boardwalks at The Dales and Pink House; steps at Dolly and Winifred Beaches; and a network of roads and walking tracks of various standards. Interpretive signs are provided at many visitor sites. During the life of the third plan the Director prepared a report which described and classified the park's walking tracks and the Attorney-General's Department funded preparation of an island-wide walking track plan. There are no formal camping areas established in the park but requests for bush style camping are occasionally received and granted in some situations, such as for schools conducting environmental and/or outdoor education activities for small groups of students.

During their annual migration red crabs often make their way across public roads and tracks within the park and across the island. Whilst considerable efforts are made to redirect crabs using road underpasses or overpasses, it is sometimes necessary to close public roads in the park to ensure safe passage of the migrating crabs.

Visiting any natural environment involves safety risks. Some activities in the park involve safety risks due to access, weather and terrain conditions and the difficulty of being rescued should an accident occur. Visitors may become lost or be injured, for example when bushwalking or boating. Visitor safety incidents are reported, reviewed and managed through the Director's Risk Management Policy. Responding to incidents is addressed in Section 8.4.

EPBC legislative provisions relevant to visitor experiences, activities and access

The EPBC Act and Regulations (rr.12.10 to 12.58) contain a number of provisions that are related to visitor activities and uses of the park and which operate subject to the policies and actions in this plan, including:

- Regulations 12.41 and 12.42 regulate the use of vehicles in Commonwealth reserves and enable the Director to control the use of vehicle access roads and vehicle access tracks.
- Regulation 12.55 restricts park visitors to walking or riding only on a vehicle access road or vehicle access track or a track for walking or riding provided by the Director; and subject to any prohibitions or restrictions by the Director under the Regulations.
- Regulation 12.58 prohibits the landing and take-off of aircraft in the park except in areas that the Director determines may be used for that purpose (or in an emergency).
- Regulation 12.23 enables the Director to restrict entry to areas in the park on a temporary or permanent basis while Regulation 12.23A enables the Director to prohibit or restrict activities or classes of activities within all or part of a Commonwealth reserve. In addition, the Director may implement temporary or long-term closures of areas in the park if an activity or access has the potential to impact on park values, or poses a risk to public safety or if required for management purposes. In these circumstances every effort is made to inform visitors and tour operators as soon as possible.
- Regulation 12.18 prohibits the use of spearguns in Commonwealth reserves and other weapons and devices, including any device that can be used, or is designed, for taking an animal other than a hook and a line for catching a fish or a hand-held net designed to land a fish caught on a hook and a line.
- Regulation 12.17 prohibits a person from entering a cave, interfering with anything within a cave and from releasing substances into waters which flow through a cave.
- Regulation 12.26 prohibits a person from carrying out an adventurous activity in the park. Adventurous activities are defined in subregulation (1) as climbing, abseiling on, or jumping from, a rock face; bungee jumping or BASE-jumping; hang gliding or paragliding; or an activity determined by the Director under subregulation (4) to be an adventurous activity.

Issues

- There is a need to provide for a range of appropriate visitor use and access opportunities while protecting park values and minimising risks to visitor safety.
- Parts of the park may need to be closed for conservation or management purposes including temporary closure of roads and tracks during the red crab migration.
- If not well managed, significant increases in visitor numbers or new visitor activities may impact on park values and infrastructure or visitor enjoyment and use of the park.

What we are going to do

Policies

- 6.2.1 Visitor activities and access to sites will be managed to protect park values, maximise visitor safety and enhance visitor experience.

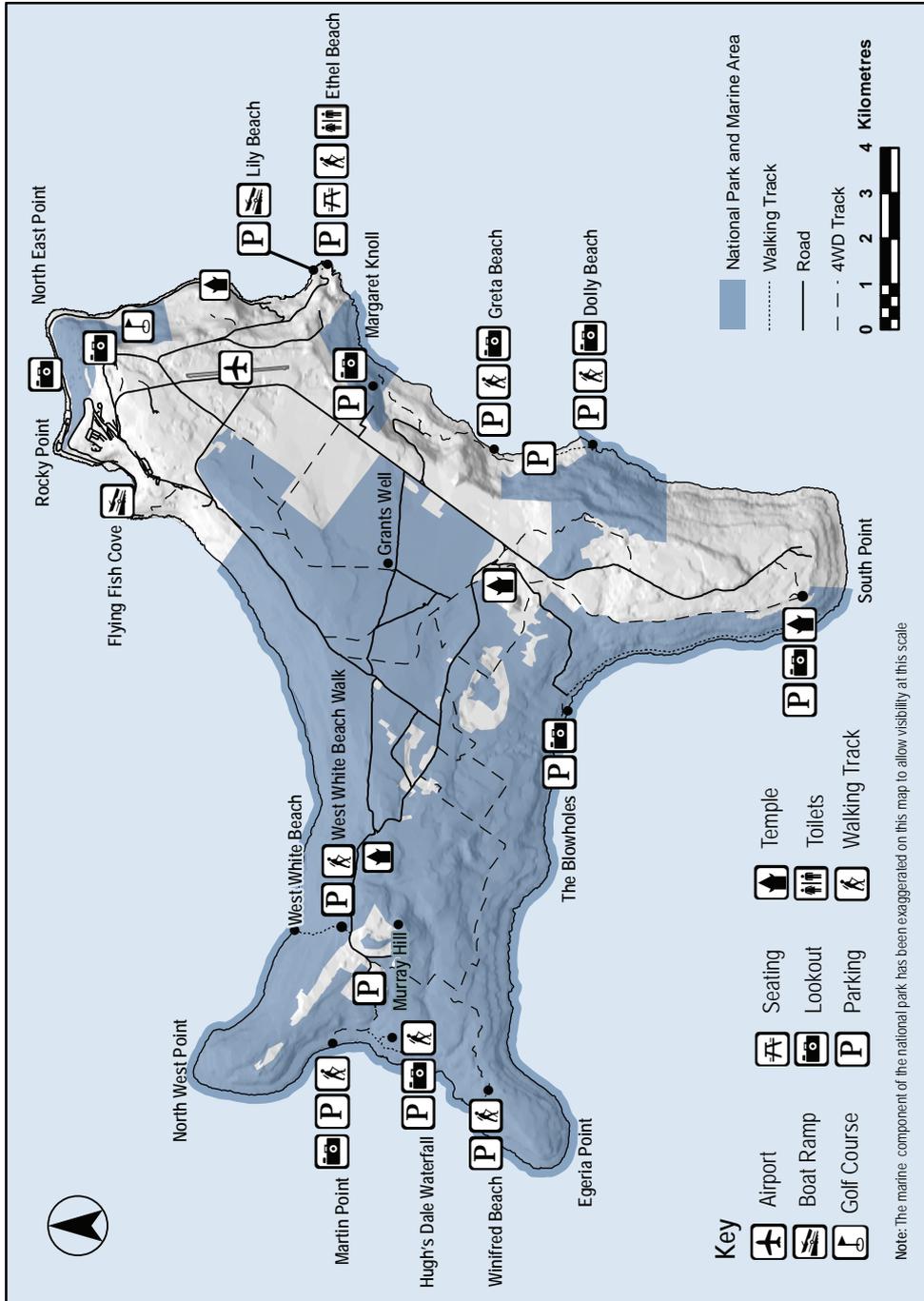
- 6.2.2 In accordance with the EPBC Regulations, temporary or long-term prohibitions, restrictions or determinations may be made for public safety, conservation and management purposes. Determinations may restrict or regulate certain activities; may restrict or regulate access to areas of the park including tracks, roads and marine areas; or may apply to specific groups, for example large groups visiting sensitive sites.
- 6.2.3 Except for management, emergency and permitted research purposes, vehicles including bicycles will be restricted to vehicle access roads and tracks unless approved by the Director.
- 6.2.4 To ensure the enjoyment of visitors is not disturbed by certain recreational activities and to reduce risk to visitor safety, staff and the values of the park, the Director will prohibit the following activities in accordance with r.12.23A: jet skiing, water skiing and parasailing.
- 6.2.5 Landing of aircraft is not allowed other than for emergency, management and permitted research purposes.
- 6.2.6 Firearms, nets, snares, traps, chainsaws and other devices covered by r.12.18 may be transported through the park in a vehicle or a vessel provided the devices are stowed in a vehicle or vessel and do not leave that vehicle or vessel.
- 6.2.7 Adventurous activities covered by r.12.26 will not normally be permitted. Applications to conduct adventurous activities may be considered if the activities do not impact on the park's values and do not pose unacceptable risks to visitor safety.
- 6.2.8 In addition to activities described in r.12.26 (1), the Director may make a determination under r.12.26(4) to prohibit other activities if they are considered to pose an unacceptable risk to public safety or park values.
- 6.2.9 The Director may determine camping areas in the park (under r.12.28(3)) and may provide facilities within these areas.
- 6.2.10 The Director may issue permits for camping outside the determined camping areas where the Director is satisfied the activity can be conducted safely and without impacting the values of the site.
- 6.2.11 Where a camping area is determined under Section 6.2.9 the Director may make determinations under r.12.28(4) relating to the use of a camping area or part of a camping area.
- 6.2.12 Land and sea access to caves will be managed to:
- (a) minimise threats to the natural values of cave systems
 - (b) permit limited opportunities for commercial caving activities provided operators have industry accreditation for the activity being conducted
 - (c) reduce risks to visitor safety including consideration of incident management issues
 - (d) not generally promote or permit recreational cave access unless visitor safety issues and impacts on the natural values of cave systems are satisfactorily addressed.
- Subject to the above, permits under r.12.17 to enter a cave may be issued (also see Section 4.1.8).

- 6.2.13 Recreational fishing, including as part of commercial tours, may be carried out in the park subject to other policies in this section of the plan.
- 6.2.14 Spear fishing must not be carried out in the park.
- 6.2.15 Determinations may be made under r.12.35 to prohibit or regulate recreational fishing in the park or parts of the park.
- 6.2.16 Where consistent with this plan and the conservation of marine species, laws relating to recreational fishing in waters of the Territory outside the park will be adopted to the extent practicable by determinations under r.12.35.
- 6.2.17 Determinations may be made under r.12.56 relating to vessel use.
- 6.2.18 Permits under r.12.31 will not generally be required for non-commercial public gatherings of more than 15 people unless the gathering may, if unmanaged, negatively impact on park values or visitor safety, enjoyment and use of the park. Each case will be assessed in accordance with Section 8.1.

Actions

- 6.2.19 Assess, set, publicise and review standards for all tracks for walking and associated infrastructure and manage tracks and infrastructure to relevant standards.
- 6.2.20 Provide, maintain and develop infrastructure for visitor use, including roads, lookouts and boardwalks, to appropriate and safe standards (also see Section 8.2).
- 6.2.21 Monitor, assess and manage visitor use of the park and associated impacts on park values and visitor sites (see Map 5). If impacts threaten park values implement strategies to reduce visitor impacts (also see Section 8.7.8(k)).
- 6.2.22 Conduct assessments of risks to visitor safety, including visitor site and facility inspections, and implement appropriate management and risk reduction measures (also see Section 8.2).
- 6.2.23 Continue to work with Christmas Island stakeholders to support island-wide approaches to minimising human impacts on land crabs, particularly minimising vehicle impacts on robber crabs and red crabs, especially during their annual migration (also see Section 4.3.6).
- 6.2.24 Develop and implement strategies, for instance by preparing a visitor experience plan, to identify opportunities to increase the quality, types and number of nature-based visitor experiences (and any associated infrastructure needs), while protecting park values and visitor safety. This will include consideration of camping and unobtrusive low impact accommodation opportunities (also see Section 6.1) and ways of enhancing visitor experiences in relation to observing native wildlife species, such as seabirds and red crabs during their annual migration.
- 6.2.25 Implement strategies that provide for appropriate recreational, visitor and research uses of the marine environment while conserving marine ecosystems and resources. These strategies may include installing moorings, making determinations for visitor activities, making determinations for fishing such as bag limits, and setting guidelines for interacting with marine species such as whale sharks and dolphins.
- 6.2.26 Conduct visitor surveys at least once every three years to provide information on visitor satisfaction, visitor service quality, expectations and standards and potential areas for improvement.

Map 5: Visitor sites



6.3 Commercial operations

Our aim

Ensure commercial tourism activities:

- promote understanding and appreciation of park values
- provide visitors with opportunities for safe and rewarding experiences
- have minimal impact on park values.

Background

High quality and well managed commercial tours can help visitors maximise their enjoyment and understanding of the park, reduce risks to their safety and protect the park. Tourism also supports the island's socio-economic development by providing opportunities for tour operators and other businesses to provide services, including guiding, accommodation and catering.

Several Christmas Island tour operators provide sea- or land-based tours and there are also some off-island tour operators who conduct tours for special interest groups such as bird watchers. Commercial tour activities in the park include scuba diving, snorkelling, sportsfishing, sightseeing, walking and nature study, including observing sea and land birds, land crabs and marine species.

Filmmakers, photographers and journalists from Australia and around the world come to Christmas Island to make films or write stories about the island's natural heritage values. Well managed, such activities can greatly contribute to increasing understanding and promoting the island's natural heritage values. EPBC r.12.38 prohibits deriving commercial gain from images captured in the park, unless permitted by the Director.

Under ss.354 and 354A of the EPBC Act commercial activities may only be carried out in accordance with this plan.

Issues

- The development of a diversity of quality commercial tourism experiences that provide for an understanding and appreciation of natural and cultural values of the park.
- The need to minimise risks to visitor safety and mitigate impacts on park values.

What we are going to do

Policies

- 6.3.1 Commercial tours and other commercial operations may be carried out in the park if consistent with this plan and in accordance with a permit, lease or licence issued by the Director.
- 6.3.2 The Director may issue permits for commercial tour activities which are consistent with Section 6.1 and provided tour operators meet industry and/or park-determined standards applicable to the proposed tour activities.
- 6.3.3 Uptake of and compliance with industry tour operator accreditation will be encouraged. Consideration will be given to using incentives to encourage uptake. Incentives may include extended permit tenure, exclusive use of sites or exclusive rights to conduct activities.

- 6.3.4 Commercial fishing or the taking of any marine species for sale will not be allowed in the park but commercial fishing boats (including associated equipment) may transit through the park (also see section 4.5).

Actions

- 6.3.5 Monitor tour operations for compliance with permit conditions and respond accordingly.
- 6.3.6 Provide interpretive materials and information for commercial tour operators, including information about the park's and island's natural values.

Also see Sections 6.1 and 6.2.

6.4 Visitor information, education and interpretation

Our aim

Visitors appreciate and understand park values and minimise their impacts on park values

Background

Well prepared and presented interpretive information about the park's values and programs, combined with visitor activity opportunities, can add to the quality of the visitor experience. Through education, visitors can assist in the protection of the park's natural and cultural values and help promote the need to support the protection and conservation of park values.

Pre-visit information about the park is critical for assisting the tourism industry to responsibly and effectively promote and market Christmas Island as a unique and memorable nature-based tourism destination.

Visitors can obtain information about the park's and island's natural and cultural values from:

- pre-visit information provided by the tourism industry, stakeholders and commercial operators
- the Christmas Island Tourism Association
- media including films and magazine or newspaper articles
- the Parks Australia website, social media and publications which include brochures on the island's natural heritage including land crabs, seabirds and marine species
- other publications, including natural history documents and relevant research reports, on-site interpretive, directional and regulatory signage
- park staff.

On-site interpretive signs are located at visitor destinations at The Dales, Martins Point, Margaret Knoll and the Blowholes. Regulatory and compliance signs are provided at selected locations including roads closed for the red crab migration. Directional signage is provided on the park's and island's roads and walking tracks. A significant factor and cost is the need to produce some information for island residents in the Bahasa Malay and Mandarin languages.

Issue

- Information provided to visitors needs to help them understand, appreciate and protect the park's values and to maximise their safety and compliance with park regulations.

What we are going to do

Policies

- 6.4.1 Educational and interpretive information will be provided by a range of means to assist with:
- (a) increasing appreciation and understanding of the park's and Christmas Island's natural (terrestrial and marine) values

- (b) promoting park and conservation management issues, such as threatened and invasive species and how visitors can help protect park values
 - (c) increasing visitor safety in terrestrial and marine environments and compliance with EPBC Regulations and this plan (also see Section 8.3).
- 6.4.2 On-site interpretive and educational information will be provided at some visitor locations (such as high use sites). In some cases no information will be provided to enable wilderness type experiences.
- 6.4.3 Island-wide approaches with common standards and styles will be used when developing interpretive materials, information and infrastructure.
- 6.4.4 Information on priority issues will be produced in English, Bahasa Malay and Mandarin.
- 6.4.5 Fees may be charged for publications, talks/tours or other visitor services provided by park staff.

Actions

- 6.4.6 Continue to provide and maintain directional signs and markers on walking tracks to the standards to be set under Section 6.2.19.
- 6.4.7 C ontinue to provide and maintain directional signs on roads.
- 6.4.8 Upgrade on-site interpretive, educational and directional information and signs.
- 6.4.9 Continue to produce and supply information through a variety of media for visitors.
- 6.4.10 Continue to implement communication and educational programs and strategies for visitors (including tourists and residents) and other stakeholders (also see Section 7.1).
- 6.4.11 Continue to provide accurate information for the media.
- 6.4.12 Continue to work with stakeholders, including the Christmas Island Tourism Association and the Shire and Territory Administration, to support the responsible promotion, marketing and understanding of the park's and Christmas Island's natural, cultural and historical values. This may include the development of a visitor interpretive and information centre.
- 6.4.13 D evelop tour guide interpretation materials in collaboration with relevant stakeholders (see Section 6.3.6).
- 6.4.14 C ontinue to develop and implement structured school-based educational programs to raise awareness of the park's and island's natural values and associated management issues.

7. Stakeholders and partnerships

Performance indicators for stakeholders and partnerships are:

- Satisfaction by park management with the contribution made by the community and other stakeholders to the conservation and management of the park
- Community and other stakeholder satisfaction with their engagement by and with the park and its staff
- The degree of mutual benefit resulting from stakeholder and community engagement

7.1 Community, stakeholders and partnerships

Our aim

The community and other stakeholders are engaged in and contribute to the conservation and management of the park

Background

The Director liaises and/or works with a broad range of community groups, government and non-government organisations and other stakeholders to address park and cross tenure conservation management issues, nature-based tourism and other issues of mutual interest. On the island these include but are not limited to island residents, the Territory Administration, Department of Immigration and Border Protection, Department of Agriculture, Phosphate Resources Limited, Australian Federal Police, Shire of Christmas Island, Christmas Island Tourism Association and Christmas Island District High School, as well as a number of community groups and volunteer/not for profit organisations, including emergency services.

Off-island stakeholders with interests in the park's management include researchers, conservation organisations, tourism businesses (including wholesalers and tour operators) and Australian and Western Australian government agencies and departments.

Schedule 8 of the EPBC Regulations describes the Australian IUCN reserve management principles (see Appendix A and Section 3.1). The first principle (community participation) states that management arrangements for Commonwealth reserves should, to the extent practicable, provide for broad and meaningful participation by the community, public organisations and private interests in designing and carrying out the functions of the park.

Issues

- Many park management conservation and tourism issues can only be effectively addressed through cross tenure and whole-of-government/island-wide approaches.
- Many stakeholders and the community want to be consulted about, contribute to and learn more about the park's management and the island's conservation issues.

What we are going to do

Policies

- 7.1.1 Productive and effective working relationships will be maintained with the community and other stakeholders.

- 7.1.2 Commonwealth Government agencies will be encouraged to perform functions and exercise their powers in relation to the park in a manner consistent with this plan.

Actions

- 7.1.3 Share information with the community and other stakeholders in relation to park and island-wide conservation issues and other issues of mutual interest. This may include:
- (a) establishing or participating in consultative and advisory groups or forums
 - (b) establishing or participating in awareness raising and information sharing forums
 - (c) consulting the community and other stakeholders in relation to specific issues.
- 7.1.4 Work with relevant stakeholders and organisations to develop partnerships and whole-of-government approaches for implementing this plan and addressing island-wide conservation issues and other issues of mutual interest (also see Sections 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 6.1 and 8.7).
- 7.1.5 Implement strategies to increase community and stakeholder involvement in contributing to the management of the park, including employing island residents and developing and supporting appropriate volunteer activities.

8. Business management

Performance indicators for business management are:

- Impact assessment procedures are developed and proposals assessed in accordance with the procedures
- Capital works and infrastructure are maintained to safe and functional standards
- Efficiency of resource use increases
- Extent to which this plan's research and monitoring priorities are implemented
- Extent to which this plans legislative requirements and obligations are met

8.1 Decision making and assessment of proposals

Our aim

The likely impacts of proposed actions on park values are properly identified and considered before decisions are made.

Background

Many activities proposed to be undertaken in the park by the Director and/or external proponents need to be assessed for their potential impacts before a decision can be made on whether the proposal should be approved. Considerations include impacts on the park's natural environment and on visitor enjoyment and use of the park.

Some proposed actions in the park may be 'controlled actions' under the EPBC Act. Controlled actions require assessment and approval by the Minister because they are likely to have a significant impact on a matter of national environmental significance (such as EPBC Act listed species or Ramsar wetlands) or on the environment generally (see Section 2.4). The EPBC Act defines the environment as including:

- (a) ecosystems and their constituent parts, including people and communities; and
- (b) natural and physical resources; and
- (c) the qualities and characteristics of locations, places and areas; and
- (d) heritage values of places; and
- (e) social, economic and cultural aspects of a thing mentioned in paragraph (a), (b), (c) or (d).

Proposed actions that do not trigger the EPBC Act assessment and approval provisions may still have impacts that require assessment before a decision can be made on whether the action should proceed.

The Director makes decisions on whether or not proposals should be approved using the park's impact assessment procedures.

Issues

- If proposed actions are not properly assessed, there is a risk of significant impacts to the park's environment, values, management and use.
- There is a need for transparent, clear and consistent impact assessment procedures.
- Impact assessment procedures may require significant resources to implement adequately.

What we are going to do

Policies

- 8.1.1 The potential impacts of all proposed actions in the park will be considered, and where necessary assessed, in accordance with Table 1, the assessment matters and considerations outlined in Table 2 and the following prescriptions.
- 8.1.2 Public/stakeholder consultation may be conducted when proposals are assessed (also see Section 7.1.3).
- 8.1.3 Assessment of proposed activities that are not controlled actions may be carried out by park staff, proponents of the proposed activity, or independent experts.
- 8.1.4 Subject to the EPBC Act, the Director may recover from proponents the costs associated with administering, assessing, managing and monitoring of proposals in the park and/or work with proponents to facilitate contributions from approved commercial activities to support the conservation of park values.

Action

- 8.1.5 Develop and as needed review impact assessment procedures for the park in accordance with Tables 1 and 2.

Table 1: Decision-making processes and impact assessment procedures

Category	Examples	Decision-making process and impact assessment requirements
Category 1		
Actions considered likely to have no impact, or no more than a negligible impact, on the park's environment and values (see Table 2)	<p>Minor capital works (e.g. new minor infrastructure, maintenance, replacement, repairing or improving existing infrastructure in its present form)</p> <p>Regular/routine ongoing operations to implement prescriptions in this plan (e.g. weed control, road maintenance, walking track maintenance)</p> <p>Issuing permits for activities outlined in and in accordance with this plan (e.g. tour operator, research)</p>	<p>If the Director or their delegate considers that the proposed action is consistent with this plan:</p> <ul style="list-style-type: none"> • if needed, consult with relevant/ affected stakeholders • formal impact assessment not usually required • decision is made by an appropriate officer <p>If the proposed action is not considered consistent with this plan the action will not generally be permitted or may be assessed as a Category 2 proposal</p>
Category 2		
Actions considered likely to have more than a negligible impact, but not a significant impact, on the park's environment and values (see Table 2)	<p>Moderate capital works (e.g. new infrastructure or moderate expansion/upgrade of existing infrastructure)</p> <p>Rehabilitation of heavily eroded sites (including forest rehabilitation)</p> <p>Management/research programs for listed species requiring active intervention (e.g. capture, moving, tagging)</p> <p>Developments for approved existing tourism activities that do not require major works</p> <p>New operations or developments to implement policies and actions in this plan</p>	<p>If the Director or their delegate considers that the proposed action is consistent with this plan:</p> <ul style="list-style-type: none"> • if needed, consult with relevant/ affected stakeholders • impact assessment by park staff or external expert using impact assessment procedures in Table 2 • decision is made by an appropriate officer <p>If the proposed action is not considered consistent with this plan the action will not generally be permitted or may be assessed as a Category 3 proposal</p>
Category 3		
Actions considered likely to have a significant impact on the park's environment and values	<p>Major capital works (e.g. new major infrastructure or significant expansion/upgrade of existing infrastructure)</p> <p>Major new operations or developments to implement this plan</p> <p>New types of commercial activities not enabled under this plan</p>	<p>If the Director or their delegate considers that the proposed action may or may not be consistent with this plan:</p> <ul style="list-style-type: none"> • Director will consider whether action should be referred for consideration as a 'controlled action' under the EPBC Act • if action referred and Minister decides it is a controlled action the action is assessed under the EPBC Act • if action not referred, or referred and Minister decides it is not a controlled action, assessment as for Category 2

Note: Non-controlled activities related to EPBC Act listed species may also require approval under the EPBC Act.

Table 2: Impact assessment procedures: matters and considerations

Matters for assessment	Considerations include, but not limited to
1. IUCN category	
(a) IUCN category II, national park	<ul style="list-style-type: none"> • Consistency with IUCN category II, national park principles
2. Environmental context	
<p>(a) Components or features of the environment in the area where the action will take place</p> <p>(b) Components or features of the environment likely to be impacted</p> <p>(c) Is the environment which is likely to be impacted, or are elements of it, sensitive or vulnerable to impacts?</p> <p>(d) The history, current use and condition of the environment which is likely to be impacted</p>	<ul style="list-style-type: none"> • Matters of National Environmental Significance under the EPBC Act • The environment, as defined under the EPBC Act, including listed Commonwealth heritage values • Terrestrial and marine ecosystems, communities, habitats and species and their uniqueness in the park, island and region • Ground and surface water values • Cultural and built features and values • Socio-economic and community values • Tourism, recreational and visitor experience values • Aesthetic/landscape features and values • Scientific values • Infrastructure
3. Potential impacts	
<p>(a) Describe the proposal or action</p> <p>(b) What are the predicted adverse impacts associated with the action?</p> <p>(c) How severe are the potential impacts?</p> <p>(d) What is the extent of uncertainty about potential impacts?</p>	<ul style="list-style-type: none"> • Impacts on considerations above including short-term, long-term, off-site, cumulative, indirect and compounding impacts • Describe action components, activities, stages, scale, intensity and any associated infrastructure • Energy use and climate change impact considerations • Human health and safety
4. Impact avoidance and mitigation	
<p>(a) Will any measures to avoid or mitigate impacts ensure, with a high degree of certainty, that impacts are not significant?</p> <p>(b) What certainty is there that avoidance and mitigation measures will be implemented and sustained?</p>	<ul style="list-style-type: none"> • Consider timing, duration and frequency of actions/activities • Include any alternative sites for actions • Design factors and considerations • Are there any acceptable impact off-set actions?
5. Significance of impacts	
<p>(a) Considering all the matters above, is the action likely to have a significant impact on the environment?</p>	<ul style="list-style-type: none"> • If yes, the Director will consider whether action should be referred for Ministerial consideration under the EPBC Act

8.2 Capital works and infrastructure

Our aim

Ensure capital works and infrastructure:

- are safe, fit for their purpose, functional and cost effective to construct and maintain
- have minimal or no significant impacts on park values
- enable visitor and management access to the park.

Background

Capital works and infrastructure in the park include visitor access facilities (e.g. lookouts/viewing platforms, boardwalks and walking tracks) and management facilities (such as storage sheds/workshops, a nursery, Park Headquarters and the Pink House research station). Most of the capital works and infrastructure developments during the life of the third plan were associated with maintaining, upgrading or replacing existing facilities. Some public utilities not managed by the Director, such as water drawing facilities at Jedda Cave, electricity infrastructure, telecommunications infrastructure, the Geoscience Australia seismic monitoring station and services to the Immigration Detention Centre are sited in or traverse the park.

The island's road and vehicle track network was originally developed for mining purposes. When the park was declared many of these roads became incorporated into the park and now provide access for visitors and management purposes. The roads outside the park are managed by the Shire of Christmas Island under an agreement with the Territory Administration, and the Director and the Shire liaise and co-operate in relation to public road management in the park. Roads and tracks in the park require regular maintenance to clear fallen trees and/or to repair eroded surfaces. Under r.12.42 of the EPBC Regulations the Director may regulate use of vehicle access roads and tracks within the park, for example by closing roads during the annual red crab migration.

Under ss.354 and 354A of the EPBC Act the Director and other persons may only excavate, erect a building or other structure, or carry out works in the park in accordance with this plan.

Issues

- There is a need to provide suitable visitor facilities while protecting park values.
- Much of the park's infrastructure requires upgrading or replacement as it is ageing and deteriorating.
- Infrastructure must offer value for money and be maintained to safe, functional and the required standards (including any relevant Australian Standards).
- Ongoing maintenance of park roads needs to be coordinated under a maintenance program.
- Construction and maintenance cost are high due to the island's climate and remoteness.

What we are going to do

Policies

- 8.2.1 The Director may carry out an excavation, erect a building or other structure, or carry out works in the park.
- 8.2.2 Third parties may carry on an excavation, erect a building or other structure, or carry out works in the park to develop and maintain capital works and infrastructure in accordance with Section 8.1 of this plan, and: in accordance with a lease, sublease, or licence granted by the Director (see Section 8.5) or in accordance with a permit or approval issued by the Director.
- 8.2.3 Proponents other than the Director who undertake capital works and infrastructure development should, subject to the EPBC Act and Regulations, meet the cost of any rehabilitation required as a result of the works.
- 8.2.4 New capital works and infrastructure, and alterations, renovations or significant repairs to existing capital works and infrastructure, will comply with all relevant laws, standards and codes of practice and, as far as practicable:
 - (a) incorporate good, cost effective environmental design, including efficient resource use (also see Section 8.6)
 - (b) use low maintenance designs and materials
 - (c) be designed and constructed in ways that minimise impacts on park values and visitor use and take account of climate change considerations (also see Section 4.6).
- 8.2.5 As far as possible, new capital works and infrastructure will use existing roads and tracks or other disturbed sites (also see Section 4.2.1).
- 8.2.6 Timber, including preservative treated timber, may be brought into the park and used for construction purposes.
- 8.2.7 Any material brought into the park for construction purposes must be assessed for its potential to introduce new non-native or invasive species or organisms.
- 8.2.8 Where possible capital works and infrastructure development and maintenance, particularly roads, will be coordinated with other island stakeholders.

Actions

- 8.2.9 Assess capital works and infrastructure proposals in accordance with Section 8.1.
- 8.2.10 Develop and implement a program for constructing capital works and infrastructure and maintaining existing infrastructure to reasonable and safe standards (including any relevant Australian Standards) and to achieve the aims of this plan.
- 8.2.11 Work with stakeholders, particularly the Shire and Territory Administration, to maintain public roads in the park and maintain tracks for visitor access and management purposes. This will include seeking to develop appropriate agreements with stakeholders.
- 8.2.12 Maintain a radio or other suitable communications network appropriate to the park's operational and emergency rescue needs.
- 8.2.13 Maintain the Pink House for management purposes.

8.3 Compliance and enforcement

Our aim

A high level of compliance with the EPBC Act and Regulations and the park use policies in this plan

Background

Encouraging and monitoring compliance with relevant legislation is important for protecting park values, infrastructure and people's safety. In particular the Director is required to comply with the provisions of the EPBC Act, this management plan and other relevant government legislation and policies.

Park or department staff may be appointed by the Minister under the EPBC Act as rangers or wardens, and exercise the powers and functions conferred on them by the Act and the Regulations. In addition, all members and special members of the Australian Federal Police and officers of the Australian Customs and Border Protection Service are *ex officio* wardens; and officers of other Australian, state or territory government agencies may be appointed by the Minister as rangers or wardens.

The Australian Government requires that investigating officers be trained to standards set by the Commonwealth Fraud Control Guidelines and the Australian Government Investigation Standards. Park or department staff not appointed as wardens and rangers cannot exercise these powers but can encourage compliance with park regulations using educational approaches. The Director's Compliance and Enforcement Manual sets out the broad guidelines and procedures for managing compliance issues in Commonwealth reserves.

Assessing and monitoring compliance with the EPBC Act in relation to off-park actions and proposals is not the Director's responsibility. However, the Director may assist other agencies to assess and monitor compliance with the EPBC Act and Regulations in relation to actions and proposals outside the park.

Christmas Island laws, including applied Western Australian laws, apply in the park to the extent they can operate concurrently with the EPBC Act and Regulations and this plan.

Issues

- Cost effective monitoring of visitor and stakeholder compliance with the EPBC Act and Regulations and this management plan.
- Exercise of enforcement powers by park staff must comply with Australian Government legislation, policies and guidelines.

What we are going to do

Policy

- 8.3.1 Compliance and enforcement will be managed in accordance with the Director's and relevant Australian Government compliance policies and procedures.

Actions

- 8.3.2 Develop and implement compliance strategies including assessing non-compliance risks and raising awareness of compliance issues (also see 6.4.1).
- 8.3.3 Undertake compliance and, if needed, enforcement activities in accordance with the Parks Australia Compliance and Enforcement Manual.
- 8.3.4 Continue to provide ongoing compliance and law enforcement training for staff appointed, or likely to be appointed, as rangers or wardens.
- 8.3.5 Monitor and/or provide advice on compliance issues, as they relate to the EPBC Act and Regulations, that occur outside the park and as needed take appropriate actions.
- 8.3.6 Where appropriate, work with relevant state and Australian Government agencies and organisations to address compliance and enforcement issues.

8.4 Incident management

Our aim

Incidents are responded to promptly, effectively and safely

Background

Incidents in the park may potentially affect park values, property or people's safety. Incidents may include vehicle or boating accidents; missing or injured people; damage to park infrastructure or the park's natural environment from natural causes such as cyclones; and accidents such as chemical spills. Incidents that result in destruction of, or damage to, park property or any part of the park environment from deliberate human activity and are prescribed by the EPBC Regulations are managed in accordance with Section 8.3.

As noted in Section 2.4 the Director has the function under the EPBC Act of administering, managing and controlling the park. This gives the Director responsibility in relation to responding to emergencies in the park. Also, the Director has a duty of care for park visitors and staff, and a duty under the *Work Health and Safety Act 2012* to take reasonably practicable steps to protect employees and park visitors from risks to their health and safety.

The Australian Federal Police (AFP) is generally responsible for coordinating land and marine search and rescue operations on Christmas Island. In complex emergencies the Officer in Charge of the AFP performs the role of Territory Controller and coordinates the emergency response in liaison with representatives from relevant agencies, including (if and as needed) the Director, as well as volunteer emergency service agencies. The controller has powers to draw on available resources, wherever they are and whoever controls them.

An Emergency Management Committee is established for the Territory of Christmas Island and has prepared a Territory of Christmas Island Emergency Management Plan. The Emergency Management Plan sets out responsibilities and arrangements for responding to incidents and emergencies. At the time of preparing this plan an emergency management Ordinance is proposed to be made under the *Christmas Island Act 1958* to give legal effect to these arrangements and necessary powers to manage emergency responses.

Issue

- Park staff are required to respond to incidents to address the Director's duty of care obligations and to cooperate in responding to wider incidents and emergencies.

What we are going to do

Policies

- 8.4.1 Incidents will be responded to in accordance with legal obligations and relevant policies and procedures, including procedures agreed to between the Director and emergency response agencies.
- 8.4.2 Subject to the EPBC Act and any relevant government policy, the Director may seek reimbursement or contributions for the cost of responding to incidents.

Actions

- 8.4.3 Develop and update incident management procedures for managing common and potential incidents that may affect people's safety, the environment and property. Ensure that the procedures:
- (a) are consistent with Territory-wide emergency response procedures
 - (b) outline the roles and responsibilities of the Director and other agencies
 - (c) identify training, recording/reporting and debriefing requirements
 - (d) use evidence (e.g. from data and debriefings) to improve procedures and responses.

8.5 Leases, licences and associated occupancy issues

Aim

Leases, licences and associated occupancy issues are managed efficiently and effectively

Background

There are areas of land in the park that were being used or occupied by other persons or agencies for non-park uses at the time when the park was declared. These include power line access to Grants Well, and drawing of water from Jedda Cave for domestic and commercial uses. There are also two Chinese temples located in the park. These occupancies have not generally been formalised.

Since the park was declared some new occupancies have been created for the purposes of public infrastructure, such as telecommunications towers and a seismic monitoring station.

During the life of the plan it may be appropriate to consider and grant subleases and licences of land in the park for other purposes e.g. to new and emerging business enterprises or to utility providers (for areas of land containing cables and pipes for electricity, gas, water or communication services).

Issues

- Leases, subleases, licences and other occupancies need to be defined, negotiated and managed to appropriate standards, including minimising impacts on park values.

What we are going to do

Policies

- 8.5.1 Subject to assessment under Section 8.1, the Director may grant leases and licences relating to land in the park, including, but not restricted to, leases or licences for exclusive-use commercial activities. Certain commercial activities may be subject to the Director's licence policy.
- 8.5.2 Leases and licences will:
- (a) clearly define the area covered by the sublease or licence
 - (b) include provisions for minimising impacts on park values
 - (c) include environmental protection measures including, where necessary, waste management
 - (d) provide for cost-recovery and, if relevant, appropriate financial terms.
- 8.5.3 Decisions about subleases and licences will take into account the impact assessment of the proposal under Section 8.1, Assessment of proposals.
- 8.5.4 Occupancies may be terminated where areas are required for park management purposes, for breach of agreed terms of occupancy, or where the Director considers the occupancy is having an unacceptable impact on the park's values.

Actions

- 8.5.5 Work with occupants to formalise occupancies for which agreements have not been established or formalised.
- 8.5.6 Monitor and take appropriate action to ensure that occupation and use of land in the park have minimal impact on park values.

8.6 Resource use in park operations

Our aim

Minimise the park's ecological footprint as far as practical through the wise use and management of available resources

Background

The Director supports best practice principles for the use of resources and management of waste products in the park. These principles are consistent with the need to conserve the park's natural resources, including groundwater, and with meeting broader commitments to reduce greenhouse gas emissions and waste.

Measures that focus on energy conservation, recycling and waste minimisation are also required to reduce resource use in park operations.

Issues

- Improving understanding of the size and nature of the park's ecological and carbon footprint to allow performance to be measured and improved over time.
- Despite the challenges, such as waste management on a remote island, there is potential to improve waste management (including recycling), water use and energy efficiency of park operations.

What we are going to do

Policies

- 8.6.1 Recycled and renewable resources, and technologies that reduce environmental impacts and energy use, will be used within the park where possible.
- 8.6.2 New infrastructure and equipment will as far as possible aim for maximum energy and water efficiency ratings.

Actions

- 8.6.3 Investigate options for using the best available energy efficient technologies in the development of new infrastructure, and in existing infrastructure where possible.
- 8.6.4 Work with staff, suppliers and contractors to minimise environmental impacts by:
- (a) promoting and implementing best practice environmental work practices and activities in the park
 - (b) reducing the park's ecological footprint including resource use and greenhouse gas emissions; this will include assessing (and where feasible and effective) using island-generated organic waste materials for forest rehabilitation purposes
 - (c) complying with relevant government policy and legislation related to environmental management, including toxic and hazardous waste disposal requirements.

8.7 Research and monitoring

Our aim

Undertake natural heritage research and monitoring to provide:

- improved understanding of marine and terrestrial ecosystem diversity, processes, values, threats and management
- evidence for making and improving conservation management decisions based on an integrated understanding of ecosystem processes and trends.

Background

As a relatively well-preserved oceanic island when compared to many other oceanic islands, Christmas Island's unique ecology and endemic species provide invaluable opportunities to research ecological interactions and processes of species dispersal, immigration, competition and adaptation. Such studies have enormous potential for unravelling the intricacies of island ecology and contributing to conserving the island's biodiversity values. Effective research and monitoring programs can provide valuable evidence for documenting and assessing the status of the park's and island's biodiversity values, as well as for addressing threats to these values, by helping to inform the development, implementation and (as needed) adaption and improvement of conservation management programs.

Natural heritage management research, monitoring and surveys may be carried out by park staff, suitably qualified consultants engaged by the Director and by other organisations (such as universities) and individuals either in collaboration with the Director or acting alone. Research conducted by the Director and other organisations not only provides valuable information for natural heritage conservation purposes, but can be of significant scientific and management value in its own right. This is because the island is a valuable place for studying the ecology of oceanic islands, including invasive species impact, endemic species and evolution/natural selection.

A number of natural heritage monitoring and research projects and studies were conducted or initiated during the life of the third plan. The results and recommendations of these projects have been used to help determine natural heritage management (see Sections 4.1 to 4.6) and research and monitoring priorities (policies and actions) for this plan. These projects included:

- the 2003 to 2007 Biodiversity Monitoring Program (BMP) which aimed to monitor the effects on the island's biodiversity of constructing an immigration reception and processing centre at North West Point. The program was funded by the Department of Finance and carried out by the Director. The BMP also monitored broader aspects of the island's biodiversity and the BMP database contains the most complete list of the endemic flora and fauna of Christmas Island yet compiled. It was also the first attempt to compile a list of species that occur on Christmas Island but nowhere else in Australian jurisdiction
- biophysical monitoring of the Christmas Island Minesite to Forest Rehabilitation Program
- pipistrelle and reptile studies, including population monitoring and surveys
- biennial island-wide surveys to monitor crazy ants (i.e. map the area and distribution of supercolonies) and the distribution and abundance of red crab populations, as well as the distribution and presence of other selected native and invasive species

- a collaborative national project in 2008–09 by the department and the Victorian and Western Australian governments to assess the efficacy of the Curiosity© feral cat bait, which involved trials within the park
- crazy ant research including a three-year project by La Trobe University on biological control of scale insects, which was commissioned by the Director in 2009
- coral reef surveys and stock size estimates of shallow water marine resources
- seabird studies including an investigation into the foraging ecology of the endangered Abbott’s booby and studies to monitor the recruitment success of red-tailed tropicbirds
- land crab studies conducted by several researchers, including robber crab studies and documenting of land crab diversity, which resulted in the discovery of new species to science and reclassification of previously studied species.

As a consequence of research projects and studies conducted during the life of the third plan, which identified serious declines in the status of the pipistrelle bat and native reptiles, the Minister for the Environment, Heritage and the Arts established an Expert Working Group in 2009. The role of the working group was to review threats to biodiversity on Christmas Island, including threats to the pipistrelle. The working group’s final report (Expert Working Group 2010), along with reports and advice from other researchers, have been used to help develop the research priorities in this Section and Sections 4.1 to 4.6.

During the life of the third plan the Director and natural heritage scientists formed the Crazy Ant Scientific Advisory Panel. The panel provides the Director with scientific and technical advice to inform the management of crazy ants and other invasive ant species.

EPBC legislative provisions relevant to research and monitoring

Under r.12.10 of the EPBC Regulations research may not be undertaken in the park unless it is provided for by, and carried out in accordance with, this plan. Research which involves taking, keeping, injuring, killing or moving native species, or is undertaken for commercial purposes, is prohibited by ss.354 and 354A of the Act except where undertaken in accordance with this plan.

Research which involves actions that affect members of species that are protected under Part 13 of the EPBC Act (i.e. listed threatened species, ecological communities, migratory species, marine species, or cetaceans) must also comply with the provisions of Part 13 of the Act unless done in accordance with this plan (also see Section 4.2.7). Any research must also address the relevant EPBC Act requirements relating to listed heritage places including places on the Commonwealth Heritage List and the Register of the National Estate.

Research or other approved activities may involve accessing or taking biological resources of native species. Access to biological resources (also known as bioprospecting or biodiscovery) is the taking of biological resources of native species for research and development on any genetic resources, or biochemical compounds, comprising or contained in samples or specimens of these species.

Access to biological resources in Commonwealth areas such as the park is regulated under Section 301 of the EPBC Act and Part 8A of the EPBC Regulations. Key features of Part 8A in relation to Christmas Island National Park are set out in Table 3.

Table 3: Key features of the EPBC Regulations on bioprospecting as they concern the park

1. Any person who wants to access biological resources must obtain a permit from the Minister.
2. The “access provider” must agree to the taking of biological resources. The access provider for Christmas Island National Park is the Director of National Parks.
3. Where access is sought for commercial purposes or potential commercial purposes:
 - The Director of National Parks must give consent prior to the research being undertaken
 - There must be a benefit-sharing agreement with the Director
 - The benefit-sharing agreement must provide for reasonable benefit sharing arrangements, including protecting, recognising, and valuing any Indigenous people’s knowledge that is to be used.
4. Where access is sought for non-commercial purposes:
 - Written permission must be obtained from the Director of National Parks
 - A statutory declaration must be given to the Director declaring, among other things, that any biological resources taken are not intended to be used for commercial purposes, that a written report will be given to the Director on the results of any research into the biological resources, that samples will not be given to other people (other than voucher specimens to a specified research institution) without permission of the Director and that the person(s) given access will not carry, or allow others to carry out, commercial research or development unless a benefit-sharing arrangement is in place with the Director
 - Public comment on the proposed access must be sought if the proposal is assessed as being likely to have more than negligible environmental impact.

Biological resources are defined by the EPBC Act (s.528) as including genetic resources, organisms, parts of organisms, populations and any other biotic component of an ecosystem with actual or potential use or value for humanity. Genetic resources are defined as any material of plant, animal, microbial or other origin that contains functional units of heredity and that has actual or potential value for humanity. Part 8A of the EPBC Regulations (made under s.301 of the Act) controls access to biological resources in Commonwealth areas including Christmas Island National Park. Access to biological resources is also covered by ss.354 and 354A of the EPBC Act if the resources are members of a native species and/or if access is for commercial purposes.

This Section should be read in conjunction with Sections 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6.

Issues

- Scientifically robust evidence is needed for making sound conservation management decisions.
- Natural heritage values need to be conserved despite the absence of all required evidence.
- There is a need for effective data capture, storage, access and use.

What we are going to do

Policies

- 8.7.1 Research and monitoring will focus on conserving, managing or restoring the park's and island's natural heritage values and be used to help prioritise and, as needed, adapt management actions (also see Section 8.9.4).
- 8.7.2 The Director and permitted organisations or individuals may carry out research and monitoring actions concerning native species, including species listed under Part 13 of the EPBC Act.
- 8.7.3 Permits authorising research and monitoring may be issued for conservation focused research consistent with this plan and with the park's IUCN category (see Section 3.1).
- 8.7.4 Persons carrying out research and monitoring in the park will be required to provide the Director with reports on their work in ways requested by the Director.
- 8.7.5 Access may be provided to biological resources in the park in accordance with Part 8A of the EPBC Act Regulations and with written agreement from the Director.

Actions

- 8.7.6 Where needed, seek independent scientific and other specialist advice, for example through relevant advisory groups, for conserving and managing natural heritage.
- 8.7.7 Work with stakeholders to implement strategies to increase the scope, relevance and quality of research related to the island's natural heritage. This will include working with relevant universities and other research organisations and, potentially, private industry and philanthropic organisations.
- 8.7.8 Conduct and/or support or encourage conservation management research, monitoring and studies that assist with conserving and managing the park's and island's natural heritage, particularly studies on:
 - (a) landscape and ecosystem changes and threats including monitoring and management of biodiversity condition (also see Section 4.1.7)
 - (b) restoration, recovery and adaptive management of ecosystems and their species including rehabilitated minesites and red crab migration routes/habitat (also see Section 4.2.9)
 - (c) populations and the ecology of threatened and otherwise significant species, including but not limited to seabirds and land crabs (particularly but not limited to red and robber crabs) and, as needed, invasive species
 - (d) identification, quantification, monitoring and, as needed, management of threatening processes impacting on ecosystems and threatened species. Give priority to invasive species, including: investigating alternative control methods for crazy ants, particularly completing the biological control research and, subject to an assessment of the results of the research and relevant approvals, trialling biological control or other alternative control methods; and methods for the control of cats and rats, including investigations and monitoring of predator/prey relationships, as well as other invasive species leading or reasonably implicated in the decline of native species (also see Sections 4.3.7 to 4.3.11)

- (e) interactions between marine and terrestrial ecosystems and species including the migration, marine life cycles and recruitment of red crabs and seabird ecology (also see Section 4.5)
 - (f) the status of and threats to marine species and habitats, particularly coral reef ecosystems, including EPBC Act listed and other significant species (also see Section 4.5)
 - (g) Ramsar and other wetland, karst/cave and subterranean fauna values, threats and mitigation measures (also see Sections 4.1.11, 4.4.4 and 4.4.5)
 - (h) impacts of pathogens and disease on native species (also see Section 4.3.8)
 - (i) impacts of chemicals used or likely to be used for conservation and management purposes, particularly chemicals for invasive species control (also see Section 4.1.3)
 - (j) further quantifying the park's economic, social and environmental values, including terrestrial and marine ecosystem services/products and tourism/visitor use values (also see Section 6.1)
 - (k) visitor impacts on park values (also see Section 6.2.20)
 - (l) impacts of climate change, particularly understanding and adapting to the ecological impacts of climate change (also see Section 4.6)
 - (m) priorities identified in relevant recovery plans or associated with such recovery plans.
- 8.7.9 Where possible, facilitate and/or support suitably qualified research organisations or individuals conducting natural heritage research consistent with Section 8.7.8.
- 8.7.10 Record and store research and monitoring data and other information to enable effective access, use, analysis and presentation.

8.8 New activities not otherwise specified in this plan

Our aim

Enable the Director to take actions or authorise others to take actions that are not specified in this plan, where such actions are consistent with this plan.

Background

This plan sets out how the park will be managed for a period of ten years. During that time, circumstances or proposals may arise which are not known or anticipated at the time of preparing this plan. This may require the Director to take actions that are not covered by specific policies and actions in this plan.

EPBC legislative provisions relevant to new activities not otherwise specified in this plan

As noted in Section 2.4, under ss.354 and 354A of the EPBC Act certain types of actions can only be taken if they are authorised by this plan (including acts in relation to native species, works, and actions for commercial purposes). Actions affecting members of species protected under Part 13 of the Act may be taken in accordance with this plan. The plan notes additional requirements relating to the EPBC Act, including requirements for listed heritage sites.

The Director is required by the Act (s.362) to exercise the Director's powers and to perform the Director's functions so as to give effect to the plan. Under s.354 and 354A of the EPBC Act actions must not be taken for commercial purposes in the park unless in accordance with this plan.

Issues

- The Director may need to take and/or authorise appropriate actions that are not specified elsewhere in this plan to deal with issues that were not foreseen at the time this plan was prepared.

What we are going to do

Policies

- 8.8.1 The Director may take actions that are not covered by specific prescriptions in this plan, including actions covered by ss.354 and 354A of the EPBC Act.
- 8.8.2 The Director may authorise (whether by permit, contract, lease or licence) actions by other persons that are not covered by specific prescriptions in this plan, including actions covered by ss.354 and 354A of the EPBC Act or by the EPBC Regulations.
- 8.8.3 Except in case of emergency, the decision-making and evaluation of proposals process prescribed in Section 8.1 of this plan will apply to actions under this Section.

8.9 Management plan implementation and evaluation

Our aim

This plan is effectively and efficiently implemented, monitored and evaluated

Background

The Director's Strategic Planning and Performance Assessment Framework is used to help monitor and improve the management of Commonwealth reserves. A description of key result areas and outcomes relevant to this plan is in Section 1.2 and in Appendix C.

The policies and actions contained in this plan have been developed to achieve the Director's key result area outcomes, this plan's aims and government legislative requirements (including the EPBC Act) that deal with specific attributes and issues related to the management of the park.

It is the responsibility of the Director under s.514B of the EPBC Act to administer, control, protect, conserve and manage biodiversity in Commonwealth reserves. Funds for the management of the park are allocated from the Australian National Parks Fund under the EPBC Act. The principal sources of the fund's money are prescribed by s.514S of the EPBC Act. Under s.356A of the EPBC Act the Director may collect charges for activities undertaken in Commonwealth reserves, subject to the approval of the Minister. As an authority for the purposes of the *Commonwealth Authorities and Companies Act 1997*, the Director is also subject to the requirements of that Act as well as other relevant legislative requirements and government policies. The Director develops, maintains and reviews a range of policies and instructions governing and guiding the work of Parks Australia, including the Chief Executive Instructions, Work, Health and Safety, Compliance and Enforcement, Risk Management and Business Continuity procedures.

Park staff are responsible for management of the park's day-to-day operations and its budget, and manage the park in accordance with the Chief Executive Instructions and policies of the Director, including this plan. In accordance with Australian Government policy, accounts are maintained on an accrual accounting basis and decisions regarding capital works and infrastructure must consider total life cycle costs. Section 514T of the EPBC Act prescribes how the Director may apply the money from the Australian National Parks Fund. Principally, the money must only be used in payment or discharge of the costs, expenses and other obligations incurred by the Director in the performance of the Director's functions.

The Director is assisted in the performance of the Director's functions by Parks Australia, whose staff are departmental employees assigned to assist the Director. The Director has delegated functions and powers under the EPBC Act and the EPBC Regulations to Parks Australia staff. Park staff have individual performance and development plans linked to agreed work plans that focus on implementing the management plan and other priorities of the Director.

Issues

- Monitoring, reporting, prioritising and implementing this plan must be done effectively and responsibly, based on best available evidence and consistent with relevant government policies and requirements.
- The effectiveness of this plan needs to be evaluated before the next plan is prepared.

What we are going to do

Policies

- 8.9.1 Priorities for implementing policies and actions in this plan will be determined by the need to protect and promote park values, ensure safety and ensure cost effectiveness.
- 8.9.2 Park work programs, budgets and expenditure will be linked to implementing this plan and any other priorities as determined by the Director.
- 8.9.3 Park management activities will be carried out in accordance with government legislative, policy and other requirements.
- 8.9.4 Evidence from research and monitoring conducted under this plan will be used to help prioritise and adapt the implementation of management actions.

Actions

- 8.9.5 During the life of this plan regularly review the need and opportunity to impose charges under Section 356A of the EPBC Act. Determine and implement charges where appropriate, subject to approval by the Minister.
- 8.9.6 Develop and implement a Performance Monitoring Plan for the park.
- 8.9.7 Prepare and use an implementation schedule to help monitor, evaluate, report on and (as needed) adaptively improve the plan's implementation, particularly to determine if the plan's aims are being achieved and the status of management actions.
- 8.9.8 Develop, prioritise and implement work programs based on the implementation schedule (and relevant plan policies particularly Sections 8.9.1 to 8.9.4).
- 8.9.9 Report on the plan's implementation and associated expenditure annually, consistent with government legislative, policy and other requirements.
- 8.9.10 Develop and/or review park operational policies and procedures to assist with implementing the plan.
- 8.9.11 Audit the plan's implementation before preparing the next management plan. The audit will include but not be limited to:
 - (a) assessing whether the policies and actions were successfully adopted or implemented and, if not, the reasons why
 - (b) assessing whether the plan's intended aim(s) were achieved and, if not, the reasons why
 - (c) making recommendations for the preparation of the next plan.

Appendices



Appendix A

Australian IUCN reserve management principles in the EPBC Regulations relevant to Christmas Island National Park

EPBC Regulation schedules and management principles	Sections of management plan that address principles
<i>Australian IUCN reserve management principles</i>	
<i>Part 1 - General administrative principles</i>	
1 Community participation	
<p>Management arrangements should, to the extent practicable, provide for broad and meaningful participation by the community, public organisations and private interests in designing and carrying out the functions of the reserve or zone.</p>	7.1, 6.1, 6.3
2 Effective and adaptive management	
<p>Management arrangements should be effective and appropriate to the biodiversity objectives and the socio-economic context of the reserve or zone. They should be adaptive in character to ensure a capacity to respond to uncertainty and change.</p>	4.1, 4.2, 4.3, 4.4, 4.5, 8.4, 8.7, 8.8, 8.9
3 Precautionary principle	
<p>A lack of full scientific certainty should not be used as a reason for postponing measures to prevent degradation of the natural and cultural heritage of a reserve or zone where there is a threat of serious or irreversible damage.</p>	4.1, 4.2, 4.3, 4.4, 4.5, 8.1, 8.4, 8.7
4 Minimum impact	
<p>The integrity of a reserve or zone is best conserved by protecting it from disturbance and threatening processes. Potential adverse impacts on the natural, cultural and social environment and surrounding communities should be minimised as far as practicable.</p>	4.1, 4.2, 4.3, 4.4, 4.5, 6.2, 6.4, 8.1, 8.3, 8.7
5 Ecologically sustainable use	
<p>If resource use is consistent with the management principles that apply to a reserve or zone, it should (if it is carried out) be based on the principle (the principle of ecologically sustainable use) that:</p> <ul style="list-style-type: none"> (a) natural resources should only be used within their capacity to sustain natural processes while maintaining the life-support systems of nature; and (b) the benefit of the use to the present generation should not diminish the potential of the reserve or zone to meet the needs and aspirations of future generations. 	4.1, 4.2, 4.3, 4.4, 4.5, 6.2, 6.3, 8.1, 8.3, 8.7
6 Transparency of decision-making	
<p>The framework and processes for decision-making for the management of the reserve or zone should be transparent. The reasons for making decisions should be publicly available, except to the extent that information, including information that is culturally sensitive or commercial-in-confidence, needs to be treated as confidential.</p>	3.1, 6.1, 6.3, 7.1, 8.1

EPBC Regulation schedules and management principles	Sections of management plan that address principles
<i>Part 2 - Principles for each IUCN category</i>	
3 National park (category II)	
(1) The reserve or zone should be protected and managed to preserve its natural condition according to the following principles.	4.1, 4.2, 4.3, 4.4, 4.5, 6.1, 6.2, 6.3, 6.4, 8.1, 8.3, 8.
(2) Natural and scenic areas of national and international significance should be protected for spiritual, scientific, educational, recreational or tourist purposes.	4.1, 4.2, 4.3, 4.4, 4.5, 6.1, 6.2, 6.4, 6.4, 8.1, 8.2, 8.3, 8.7
(3) Representative examples of physiographic regions, biotic communities, genetic resources, and native species should be perpetuated in as natural a state as possible to provide ecological stability and diversity.	4.1, 4.2, 4.3, 4.4, 4.5, 8.1, 8.4, 8.7
(4) Visitor use should be managed for inspirational, educational, cultural and recreational purposes at a level that will maintain the reserve or zone in a natural or near natural state.	6.1, 6.2, 6.3, 6.4, 8.1
(5) Management should seek to ensure that exploitation or occupation inconsistent with these principles does not occur.	4.1, 4.2, 4.3, 4.4, 4.5, 6.1, 6.2, 6.3, 6.4, 8.1
(6) Respect should be maintained for the ecological, geomorphologic, sacred and aesthetic attributes for which the reserve or zone was assigned to this category.	6.4, 8.3
(7) The needs of indigenous people should be taken into account, including subsistence resource use, to the extent that they do not conflict with these principles.	N/A
(8) The aspirations of traditional owners of land within the reserve or zone, their continuing land management practices, the protection and maintenance of cultural heritage and the benefit the traditional owners derive from enterprises, established in the reserve or zone, consistent with these principles should be recognised and taken into account.	N/A

Appendix B

Summary of results for the Technical Audit of the third management plan for Christmas Island National Park

Prior to preparing this plan an audit of the third management plan for the park was conducted to assess its effectiveness and to provide recommendations to assist with the preparation of this plan. The audit (DNP 2008) assessed the Status and Trend in relation to management performance against the management areas indentified in the previous plan.

The complete audit document can be accessed from:

www.environment.gov.au/parks/publications/christmas/pubs/christmas-tech-audit-02-09.pdf

A summary of the audit results is provided below.

Terrestrial vegetation

Status – Healthy Trend - Stable



Rationale - No new clearing in the park occurred, disturbed areas continued to be revegetated and weeds were generally restricted to disturbed areas. However, there were insufficient resources to implement actions in threatened plant species recovery plans.

Terrestrial animals

Status – Critical Trend - Getting worse



Rationale - Priority was given to crazy ant control with promising results, although this invasive species remains of major concern and collaborative cross tenure cat control commenced. Causes of decline and impacts on some species (particularly the pipistrelle bat and reptiles) is the subject of research and of considerable concern as several EPBC listed species remain at risk of extinction. No new invasive animal species were known to have been introduced.

Marine Zone

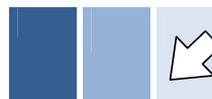
Status – Healthy Trend - Stable



Rationale - The condition of the marine environment is exceptional. Reefs were impacted by storm events but this was beyond the control of the park.

Access

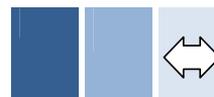
Status - Healthy Trend - Getting worse



Rationale - The present requirement for visitor infrastructure remains relatively low but there was deterioration of roads and walking trails/boardwalks with limited and declining maintenance funds, which may compromise visitor safety.

Tourism

Status - Healthy Trend - Stable



Rationale - visitation remained low and visitors continue to experience unique and exceptional nature-based experiences. Their impacts on the park appear to be sustainable at current levels.

Interpretation

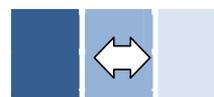
Status - Healthy Trend - Stable



Rationale - The Park has a good range of education materials (e.g. brochures, signs at lookouts) which suits the type and number of visitors.

Research

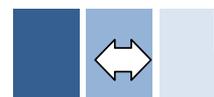
Status - Concerned Trend - Stable



Rationale - The Park attracts an excellent range of highly qualified/experienced researchers, who produce good quality research material. Research findings need to better inform and adapt management actions, which is time critical.

Administration

Status - Concerned Trend – Stable



Rationale - The Park attracted qualified staff capable of implementing the management plan. An implementation plan needs to be prepared for the management plan, and annual implementation plans prepared and reported on. Management processes should be adapted to ensure proposed actions are implemented within the timeframe of the plan.

Occupancies

Status – Healthy Trend – Stable



Rationale - There are no indications of significant damage to the Park by existing lease holders or occupants. Current uses are not inconsistent with park objectives.

Parks Extensions

Status – Healthy Trend – Stable



Rationale - It appears the biogeography of the park may support its biological diversity, but a continued coordinated approach to management issues such as invasive species management across the island is required.

Key:	Status is critical	Trend improving
	Status is of concern	Trend stable
	Status is healthy	Trend declining

Appendix C

Key result area outcomes relevant to Christmas Island National Park

The following key result area outcomes developed by the Director of National Parks are relevant to Christmas Island National Park.

Natural heritage management

- Natural values for which the Commonwealth reserves were declared and/or recognised have been maintained.
- Populations of EPBC Act listed threatened species and their habitats have been conserved.

Cultural heritage management

- Cultural heritage values, both Indigenous and non-Indigenous, for which the parks were declared and are recognised have been protected and conserved.
- Living cultural traditions are being maintained.
- The impacts of threats to cultural values have been minimised.
- Wide awareness and appreciation that parks are managed and presented as living cultural landscapes and seascapes has been achieved.

Use and appreciation of protected areas

- Visitors to Commonwealth reserves enjoy inspirational, satisfying and safe experiences.
- Visitor impacts (on reserve management, values, the environment and other visitors) are within acceptable levels.
- Public awareness and appreciation of the values of Commonwealth reserves has been enhanced.
- Commercial operators provide a high quality service to park visitors.

Stakeholders and partnerships

- Volunteers contribute to area management based on clearly defined roles.
- Stakeholders e.g. neighbours, state agencies and park user groups, are involved in, and contribute effectively to, park management activities.
- Commercial and other partnership opportunities are encouraged and evaluated.

Business management

- Planning and decision-making are based on best available information, legislative obligations, Parks Australia policy and social justice principles.
- Financial and business management is based on better practice and government requirements.
- High levels of staff expertise and performance are recognised and valued.
- Obligations under the EPBC Act and Regulations relating to management of Commonwealth reserves are complied with.
- Ministerial directions and other obligations are complied with.

Biodiversity science, knowledge management and use

- Providing high quality, comprehensive and current information to the Australian community
- Undertaking research designed to engage with end users and support evidence-based decision making by environmental managers and policy makers
- Make effective use of research investment in Commonwealth reserves.

Appendix D

EPBC Act listed threatened species occurring in Christmas Island National Park

Common name	Scientific name	Status
MAMMALS		
Christmas Island shrew	<i>Crocidura attenuata trichura</i>	EN
Humpback whale	<i>Megaptera novaeangliae</i>	VU
Christmas Island pipistrelle	<i>Pipistrellus murrayi</i>	CR
Maclear's rat	<i>Rattus macleari</i>	EX
Bulldog rat	<i>Rattus nativitatis</i>	EX
BIRDS		
Abbott's booby	<i>Papasula abbotti</i>	EN
Christmas Island emerald dove	<i>Chalcophaps indica natalis</i>	EN
Christmas Island frigatebird	<i>Fregata andrewsi</i>	VU
Christmas Island goshawk	<i>Accipiter hiogaster natalis</i>	EN
Christmas Island hawk-owl	<i>Ninox natalis</i>	VU
Christmas Island thrush	<i>Turdus poliocephalus erythropleurus</i>	EN
REPTILES		
Christmas Island blind snake	<i>Ramphotyphlops exocoeti</i>	VU
Green turtle	<i>Chelonia mydas</i>	VU
Hawksbill turtle	<i>Eretmochelys imbricata</i>	VU
Lister's gecko	<i>Lepidodactylus listeri</i>	VU
FISH		
Whale shark	<i>Rhincodon typus</i>	VU
VASCULAR PLANTS		
Christmas Island spleenwort	<i>Asplenium listeri</i>	CR
A fern	<i>Pneumatopteris truncata</i>	CR
A fern	<i>Tectaria devexa</i> var. <i>minor</i>	EN

EN: endangered

CR: critically endangered

EX: extinct

VU: vulnerable

Appendix E

EPBC Act listed marine and migratory species occurring in Christmas Island National Park

Common name	Scientific name	EPBC Act marine	EPBC Act migratory	JAMBA	CAMBA	ROKAMBA	BONN
MAMMALS							
Humpback whale	<i>Megaptera novaeangliae</i>		✓				✓
Long-snouted spinner dolphin	<i>Stenella longirostris</i> (E. tropical Pacific/SE Asian pops)		✓				✓
BIRDS							
Abbott's booby	<i>Papasula abbotti</i> = <i>Sula abbotti</i>	✓	✓	✓			
Antarctic prion	<i>Pachyptila desolata</i>	✓					
Australian pelican	<i>Pelecanus conspicillatus</i>	✓					
Australian pratincole	<i>Stiltia isabella</i>	✓					
Arctic jaeger	<i>Stercorarius parasiticus</i>		✓	✓		✓	
Baillon's crane	<i>Porzana pusilla</i>	✓					
Barn swallow	<i>Hirundo rustica</i>	✓	✓	✓	✓	✓	
Bar-tailed godwit	<i>Limosa lapponica</i>	✓	✓	✓	✓	✓	✓
Black-winged stilt	<i>Himantopus himantopus</i>	✓					
Brown booby	<i>Sula leucogaster</i>	✓	✓	✓	✓	✓	
Brown goshawk	<i>Accipiter fasciatus</i>	✓					
Bulwer's petrel	<i>Bulweria bulwerii</i>	✓					
Cattle egret	<i>Ardea ibis</i> = <i>Bubulcus ibis</i>	✓	✓	✓	✓		
Christmas Island frigatebird	<i>Fregata andrewsi</i>	✓	✓		✓		
Common greenshank, greenshank	<i>Tringa nebularia</i>	✓	✓	✓	✓	✓	✓
Common koel	<i>Eudynamis scolopacea</i>	✓					

Common name	Scientific name	EPBC Act marine	EPBC Act migratory	JAMBA	CAMBA	ROKAMBA	BONN
Common noddy	<i>Anous stolidus</i>	✓	✓	✓	✓		
Common sandpiper	<i>Actitis hypoleucos</i> = <i>Tringa hypoleucos</i>	✓	✓	✓	✓	✓	✓
Common tern	<i>Sterna hirundo</i>	✓	✓	✓	✓	✓	
Crested tern	<i>Thalasseus bergii</i> = <i>Sterna bergii</i>	✓					
Curlew sandpiper	<i>Calidris ferruginea</i>	✓	✓	✓	✓	✓	
Dollarbird	<i>Eurystomus orientalis</i>	✓					
Eastern reef egret	<i>Egretta sacra</i>	✓	✓				
Fork-tailed swift	<i>Apus pacificus</i>	✓	✓	✓	✓	✓	
Garganey	<i>Anas querquedula</i>	✓	✓	✓	✓	✓	✓
Glossy ibis	<i>Plegadis falcinellus</i>	✓	✓		✓		✓
Great egret	<i>Ardea alba</i> = <i>Egretta alba</i>	✓	✓	✓	✓		
Great frigatebird	<i>Fregata minor</i>	✓	✓	✓	✓		
Great knot	<i>Calidris tenuirostris</i>	✓	✓	✓	✓	✓	
Great skua	<i>Stercorarius skua</i> = <i>Catharacta skua</i>	✓					
Greater sand plover	<i>Charadrius leschenaultii</i>	✓	✓	✓	✓	✓	
Grey phalarope	<i>Phalaropus fulicarius</i>		✓	✓	✓		
Grey plover	<i>Pluvialis squatarola</i>	✓	✓	✓	✓	✓	
Grey wagtail	<i>Motacilla cinerea</i>	✓	✓		✓	✓	
Grey-tailed tattler	<i>Tringa brevipes</i> = <i>Heteroscelus brevipes</i>	✓	✓	✓	✓	✓	✓
Least frigatebird	<i>Fregata ariel</i>	✓	✓	✓	✓	✓	
Little curlew	<i>Numenius minutus</i>	✓	✓	✓	✓	✓	✓
Little egret	<i>Egretta garzetta</i>	✓					
Little ringed plover	<i>Charadrius dubius</i>	✓	✓				
Little tern	<i>Sterna albibrons</i>	✓	✓	✓	✓	✓	
Malay night heron	<i>Gorsachius melanolophus</i>	✓					

Common name	Scientific name	EPBC Act marine	EPBC Act migratory	JAMBA	CAMBA	ROKAMBA	BONN
Marsh sandpiper, little greenshank	<i>Tringa stagnatilis</i>	✓	✓	✓	✓	✓	✓
Mongolian plover = lesser sand plover	<i>Charadrius mongolus</i>	✓	✓	✓	✓	✓	✓
Nankeen kestrel	<i>Falco cenchroides</i>	✓					
Nankeen night heron	<i>Nycticorax caledonicus</i>	✓					
Oriental cuckoo	<i>Cuculus optatus</i> = <i>Cuculus saturatus</i>	✓	✓	✓	✓	✓	
Oriental plover	<i>Charadrius veredus</i> = <i>C. asiaticus veredus</i>	✓	✓	✓		✓	✓
Oriental pratincole	<i>Glareola maldivarum</i>	✓	✓	✓	✓	✓	
Oriental reed-warbler	<i>Acrocephalus orientalis</i>	✓	✓		✓	✓	
Pacific (= lesser) golden plover	<i>Pluvialis fulva</i>	✓	✓	✓	✓	✓	✓
Pallid cuckoo	<i>Cuculus pallidus</i>	✓					
Pied imperial-pigeon	<i>Ducula bicolor</i>	✓					
Pin-tailed snipe	<i>Gallinago stenura</i>	✓	✓	✓	✓	✓	✓
Red-footed booby	<i>Sula sula</i>	✓	✓	✓	✓		
Red-necked phalarope	<i>Phalaropus lobatus</i>	✓	✓	✓	✓	✓	✓
Red-necked stint	<i>Calidris ruficollis</i>	✓	✓	✓	✓	✓	✓
Red-rumped swallow	<i>Cecropis daurica</i> = <i>Hirundo daurica</i>	✓	✓			✓	
Red-tailed tropicbird	<i>Phaethon rubricauda</i>	✓					
Richard's pipit	<i>Anthus richardi</i> = <i>Anthus novaeseelandiae</i>	✓					
Ruddy turnstone	<i>Arenaria interpres</i>	✓	✓	✓	✓	✓	✓
Sacred kingfisher	<i>Todiramphus sanctus</i>	✓					
Sanderling	<i>Calidris alba</i> = <i>Crocethia alba</i>	✓	✓	✓	✓	✓	✓
Sharp-tailed sandpiper	<i>Calidris acuminata</i>	✓	✓	✓	✓	✓	✓
Sooty tern	<i>Onychoprion fuscatus</i> = <i>Sterna fuscatai</i>	✓					

Common name	Scientific name	EPBC Act marine	EPBC Act migratory	JAMBA	CAMBA	ROKAMBA	BONN
Swinhoe's snipe	<i>Gallinago megala</i>	✓	✓	✓	✓	✓	✓
Terek sandpiper	<i>Xenus cinereus</i>	✓	✓	✓	✓	✓	✓
Tree martin	<i>Petrochelidon nigricans</i> = <i>Hirundo nigricans</i>	✓					
Wedge-tailed shearwater	<i>Puffinus pacificus</i>	✓	✓	✓			
Whimbrel	<i>Numenius phaeopus</i>	✓	✓	✓	✓	✓	✓
Whiskered tern	<i>Chlidonias hybridus</i>	✓					
White tern	<i>Gygis alba</i>	✓					
White-tailed tropicbird	<i>Phaethon lepturus</i>	✓	✓	✓	✓		
White wagtail	<i>Motacilla alba</i>	✓	✓		✓		
White-bellied sea-eagle	<i>Haliaeetus leucogaster</i>	✓	✓		✓		
White-throated needletail = Spine-tailed swift	<i>Hirundapus caudacutus</i>	✓	✓	✓	✓	✓	
White-winged black tern	<i>Chlidonias leucopterus</i>	✓	✓	✓	✓	✓	
Wood sandpiper	<i>Tringa glareola</i>	✓	✓	✓	✓	✓	✓
Yellow wagtail	<i>Motacilla flava</i>	✓	✓	✓	✓	✓	
REPTILES							
Green turtle	<i>Chelonia mydas</i>	✓	✓				✓
Hawksbill turtle	<i>Eretmochelys imbricata</i>	✓	✓				✓
Yellow-bellied sea snake	<i>Pelamis platurus</i>	✓					
FISH							
Bluestripe pipefish	<i>Doryramphus excisus</i>	✓					
Fijian pipefish	<i>Corythoichthys amplexus</i>	✓					
Ornate ghost pipefish	<i>Solenostomus paradoxus</i>	✓					
Redstripe pipefish	<i>Doryramphus baldwini</i>	✓					
Reef-top pipefish	<i>Corythoichthys haematopterus</i>	✓					

Common name	Scientific name	EPBC Act marine	EPBC Act migratory	JAMBA	CAMBA	ROKAMBA	BONN
Robust ghost pipefish	<i>Solenostomus cyanopterus</i>	✓					
Roughridge pipefish	<i>Cosmocampus banneri</i>	✓					
Schultz's pipefish	<i>Corythoichthys schultzi</i>	✓					
Sculptured pipefish	<i>Choeroichthys sculptus</i>	✓					
Short-bodied pipefish	<i>Choeroichthys brachysoma</i>	✓					
Thorn-tailed pipefish = pygmy pipefish	<i>Micrognathus brevisrostris pygmaeus</i>	✓					
Whale shark	<i>Rhincodon typus</i>		✓				✓
Yellow-banded pipefish	<i>Corythoichthys flavofasciatus</i>	✓					

JAMBA – Japan-Australia Migratory Bird Agreement

CAMBA – China-Australia Migratory Bird Agreement

ROKAMBA – Korea-Australia Migratory Bird Agreement

Bonn – Bonn Convention

Appendix F

Ramsar information sheets from the Australian Wetlands Database

The Dales - Ramsar Site 1225;(WI Site 5AU063)

Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

1. Name and address of the compiler of this form:

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

June 2011

3. Country:

Australia

4. Name of the Ramsar site:

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

The Dales

This site was formerly listed on the Ramsar list as “The Dales”, Christmas Island.

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

- a) Designation of a new Ramsar site ; or
b) Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged:

or

If the site boundary has changed:

- i) the boundary has been delineated more accurately ; or
ii) the boundary has been extended ; or
iii) the boundary has been restricted**

and/or

If the site area has changed:

- i) the area has been measured more accurately ; or
- ii) the area has been extended ; or
- iii) the area has been reduced**

** **Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

There has been no major change to the ecological character of the Ramsar site since the previous Ramsar Information Sheet

Two criteria have had their justification modified. A large number of threatened terrestrial species were used as justification for meeting criterion 2 in the previous RIS. Only wetland dependent species are listed in this version of the RIS and include: Abbott's booby (*Papasula abbotti*) and Christmas Island frigatebird (*Fregata andrewsi*).

The justification for meeting criterion 8 has been changed since the previous version of the Ramsar Information Sheet. Re-examination of the evidence to support this criterion has revealed that the site meets this criterion on the basis of supplying a food resource for Whale Sharks (*Rhincodon typus*).

Although prior RISs indicated that The Dales had an area of 57 hectares, this appears to have been a calculation error and should be 580 hectares. This updated area reflects the original intent of the Ramsar site's nomination and matches the boundary originally given to The Dales.

7. Map of site:

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

- i) a **hard copy** (required for inclusion of site in the Ramsar List): ;
- ii) an **electronic format** (e.g. a JPEG or ArcView image) ;
- iii) a **GIS file providing geo-referenced site boundary vectors and attribute tables** .

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The Dales Ramsar site is on the western side of Christmas Island.

The boundary commences on the western boundary of Christmas Island National Park, as proclaimed on 14th December 1989, at the point nearest to 105°32' 43.130"E, 10° 29' 47.416" S (marked as point A on the map at Figure 1). The boundary follows the National Park boundary in a generally northerly direction to the point on the Christmas Island National Park boundary nearest to 105° 33' 24.239" E, 10° 28' 10.746" S (point B). The boundary heads inland to Martin Point Lookout and follows the northern edge of the Martin Point Lookout walking track until it joins the Dales Rd. From the northern most point of the junction of the Martin Point Lookout track and the Dales Rd (point C) the boundary follows a direct line to the northern corner of the mining lease on the National Park boundary at the point nearest to 105° 34' 5.189"E, 10° 28' 13.503" S (point D). The boundary then follows the National Park boundary in a generally

southerly direction around the mining lease until the boundary meets Winifred Rd at the point nearest to 105° 34' 24.011" E, 10° 28' 42.177" S (point E). The boundary follows the western edge of Winifred Rd in a generally southern direction until the road forks, and then heads in a generally westerly direction following the northern edge of Winifred Rd to the end of the road at the coast. From the end of the road, the boundary is a straight line extending seaward to the park boundary meeting the boundary at the starting point (point A).

8. Geographical coordinates (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

Latitude: 10°29'S; Longitude: 105°34'E

9. General location:

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

The Dales Ramsar site is located in the Australian Territory of Christmas Island in the Indian Ocean. The site is approximately 2800 kilometres west of Darwin (Northern Territory) and 2,600 kilometres northwest of Perth (Western Australia); within the Christmas Island National Park. The site lies on the central western coast of Christmas Island and is approximately 15 kilometres from the nearest settlement at Drumsite, which is located on the east coast of the island. The western boundary of the Ramsar Site extends 50 metres seaward from the low water mark, and therefore incorporates part of the coastline (corresponds with the western boundary of the National Park).

10. Elevation: (in metres: average and/or maximum & minimum)

Minimum: 0 metres above sea level.

Maximum: 150 metres above sea level.

Average: 25 metres above sea level.

11. Area: (in hectares)

580 hectares

Although prior RISs indicated that The Dales had an area of 57 hectares, this appears to have been a calculation error. The update area reflects the original intent of the Ramsar site's nomination and matches the boundary originally given to The Dales.

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Ramsar Site includes a near-pristine system of seven watercourses, collectively known as "The Dales". The site is located within the Christmas Island National Park and includes permanent and intermittent streams and includes the majority of surface water on the island. The Dales are surrounded predominantly by semi-deciduous forest. On the seaward side at the edge of the shore terrace there is a line of coastal shrubland which merges with sea cliffs and rocky marine shores. The site extends seaward 50 metres and includes part of a narrow, shallow, sloping reef. Mixed amongst the terrestrial and marine environments are a range of karst features, highly representative of the environment of Christmas Island. The presence of surface and subterranean karst features makes the site particularly important, being the first Australian Ramsar site to include such ecosystems. The combination of this variety of habitats and the presence of permanent surface water provide the physical habitat template which supports a wide diversity of endemic and threatened species. The site plays host to the annual mass migration and

spawning of red crabs (*Gecarcoidea natalis*) as well as providing critical habitat for the blue crab (*Discoplax hirtipes*). In total 20 species of land crabs are found within the site, all migrating to the ocean to spawn.

13. Ramsar Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1 • 2 • 3 • 4 • 5 • 6 • 7 8 • 9

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1: *A wetland should be considered internationally important if it contains a representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.*

The Dales are located in the Christmas Island Province bioregion, which encompasses Christmas Island and 277 180 square kilometres of the surrounding Indian Ocean (Heap et al. 2005).

Christmas Island represents the only land mass within the Christmas Island Province bioregion and the wetlands associated with The Dales, particularly the karst system, are unique in a bioregional context. Further information regarding the karst system can be found below in part 16.

Criterion 2: *A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.*

There are two wetland dependent threatened species supported by the wetlands within The Dales Ramsar site:

Common name	Scientific name	IUCN	CITES	CMS	National Status
Abbott's booby	<i>Papasula abbotti</i>	Endangered	Appendix I	-	Endangered, Marine, Migratory
Christmas Island frigatebird	<i>Fregata andrewsi</i>	Critically Endangered	Appendix I	-	Vulnerable, Marine, Migratory

Several other threatened species which are not wetland dependent are also found within The Dales Ramsar site

Common name	Scientific name	IUCN	CITES	CMS	National Status
Mammals					
Christmas Island shrew	<i>Crocidura attenuate trichura</i>	Critically Endangered	-	-	Endangered
Plants					
Lister's palm/ arenga palm	<i>Arenga listeri</i>	Vulnerable	-	-	-
Birds					
Christmas Island imperial pigeon	<i>Ducula whartoni</i> (endemic)	Vulnerable			Vulnerable
Christmas Island emerald dove	<i>Chalcophaps indica natalis</i> (endemic)	-	-	-	Endangered
Christmas Island goshawk	<i>Accipiter fasciatus natalis</i> (endemic)	Endangered	-	-	Vulnerable
Christmas Island hawk-owl	<i>Ninox natalis</i> (endemic)	Vulnerable	Appendix I	-	Endangered
Christmas Island thrush	<i>Turdus poliocephalus erythropleurus</i> (endemic)	-	-	-	Endangered
Christmas Island white-eye	<i>Zosterops natalis</i> (endemic)	Vulnerable	-	-	Vulnerable

Criterion 3: *A wetland should be considered internationally important if it supports populations of plant and/ or animal species important for maintaining the biological diversity of a particular biogeographic region.*

Christmas Island is recognised for its high conservation values and is specifically identified as an area for biodiversity conservation under Part 9 of the EPBC Regulations 2000. All native species on the island, as detailed in Schedule 12 of the Act, are considered protected. Of particular note is the land crab diversity, with Christmas Island supporting the greatest diversity of land crabs on an oceanic island in the world. All 20 species of land crab found on the island (Green 2009) occur within the Ramsar site, with the site particularly important for the blue crab (*Discoplax hirtipes*). In addition The Dales support a 10 hectare mono-dominant stand of Tahitian chestnut (*Inocarpus fagifer*), and is unique in the bioregion (P. Green, Latrobe University pers. comm.). The Dales include most of the habitat types present within the bioregion within the boundary of the site including semi-deciduous forest, coastal shrubland, sea cliffs rocky marine shores and shallow coral reef. Mixed amongst the terrestrial and marine environments are a range of karst features, highly representative of the environment of Christmas Island.

The site supports a number of endemic species like the red crab (*Gecarcoidea natalis*), a damselfish (*Stegastes insularis*), the sage orchid (*Brachypezza archydas*), arenga palm (*Arenga listeri*) and the Christmas Island spleenwort (*Asplenium listeri*). There is a total of eighteen endemic species (see Appendix A) of vascular plants on Christmas Island which may be present on the Ramsar site, however a floristic survey specific to The Dales has not been undertaken.

Criterion 4: *A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.*

The Dales is significant habitat and a migratory route for the red crab (*Gecarvoidea natalis*), the blue crab (*Discoplax hirtipes*) and the robber crab (*Birgus latro*). Blue crabs in particular are reliant on the Ramsar site, as they require freshwater to maintain respiratory function. During the wet season there is sufficient surface water in forests to maintain gill functioning in blue crabs and they can range over large areas of Christmas Island. However, during the dry season they are restricted to permanent freshwater sources, such as that provided by The Dales (Hicks et al. 1984). Their burrows at The Dales intersect the water table, with the bottom part of the burrow underwater (Hicks et al. 1984). In addition the site provides important habitat for land crab spawning, with all 20 species which occur in the site, migrating to the ocean to spawn with their larval stages being marine. The freshwater streams provide critical habitat for the blue crabs as the larvae emerge from the ocean and return inland (Hicks et al. 1984). Within the Ramsar site all the Dales are important migration pathways, but especially Sydney's Dale and No. 1 Dale.

The majority of birds found on Christmas Island are seabirds that live predominantly out at sea, utilising the island for breeding. Abbott's booby only comes ashore to nest and breed. Christmas Island is the only extant breeding colony. The species nests in the canopy of the tall emergent rainforest trees in the western, central and northern portions of the island (Reville et al. 1990; DEH 2004). Within The Dales the nesting sites occur in the vicinity of the eastern and north eastern boundaries. The red-footed booby (*Sula sula*) and the brown booby (*Sula leucogaster plotus*) also nest within the Ramsar site.

Criterion 8: *A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks either within the wetland or elsewhere, depend.*

The mass spawning and development of the larvae of the red crab (*Gecarvoidea natalis*) corresponds to the arrival and aggregation of juvenile whale sharks (*Rhincodon typus*) off shore of Christmas Island. Meekan et al. (2009) published results confirming whale sharks are feeding on the immature stages of the red crab. The offshore waters are believed to provide an important habitat and feeding area for the whale shark.

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Christmas Island Province

b) biogeographic regionalisation scheme (include reference citation):

IMCRA v4 (Commonwealth of Australia 2006)

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Christmas Island 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. Annual average rainfall at Christmas Island is in the order of 2,000 millimetres per year. The site is located in an area subject to tropical cyclones. Thirteen tropical cyclones were recorded in the vicinity of Christmas Island between 1972 and 2005. On average this equates to a tropical cyclone every two and a half years.

Christmas Island is dominated by a karstic landscape and drainage system with significant karst features both on the surface and underground. Cave formations typically occur at the basalt and limestone and sea and freshwater interfaces (Humphreys and Eberhard 2001). Anchialine caves at the current and ancient shoreline levels, formed by erosion from sea wave action, can extend considerable distances inland. Anchialine karst caves begin at the coast where the groundwater meets the sea, but the formation of the cave goes upwards along the groundwater drainage line, thus often extending inland beyond the influence of the sea.

The Dales contain flowstone formations which are more typically found underground (SKM 2000). The islands water drainage system is karstic, with rainfall percolating into the limestone then forming underground aquifers and drainage lines along the basalt. Short spring fed surface streams occur on the margins of the island where limestone and basalt interface leading to surface expression of the groundwater. The Dales support three such springs.

Grimes (2001) describes The Dales as narrow ravines, some with springs, occurring at volcanic outcrops forming streams which become deep fissures closer to the coastline. Considered surface karst features themselves, the other karst features at The Dales include springs and tufa deposits (Grimes 2001). Tufa deposits occur at Hugh's waterfall below a spring and have large vertical tufa deposits (Grimes 2001). Tufa is the calcareous and siliceous rock deposits which come from springs and groundwater.

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

Christmas Island is a seamount island, which rises above the 5 500 metre deep abyssal area of the Western Australian Basin (SKM 2000). The island has a basaltic volcanic core overlain with limestone of predominantly Tertiary origins (Woodroffe 1988). The island is characterised by a series of stepped terraces, which developed during uplift events. The most prominent of the limestone terraces, is the lowest one, called the "shore terrace". This feature surrounds the entire island, with the exception of a short break in the northeast at Flying Fish Cove. The Dales Ramsar site lies predominantly in the shore terrace, however the site also spans the plateau and rocky shores.

Although Christmas Island is completely surrounded by coral reef, the extent of this habitat is limited (Gray and Clarke 1995). At the seaward edge, reef is limited by a steep drop off some 20 to 100 metres from shore, where the underwater terraces descend steeply. At the landward edge, reef is limited by the exposed coastline and high impact of waves and consequently only extends to the intertidal zone in sheltered locations (Gray and Clarke 1995).

The soils of Christmas Island are derived from two sources; limestone (terra rossa soils) or basaltic extrusive rocks (krasnozem soils). Terra rossa soils occur mainly on exposed terraces, and are predominantly thin, red-grey soils that dry out rapidly. They may have high phosphate content and be over 30 metres deep. Krasnozem soils are red brown in colour and occur in areas of volcanic activity or in fault or fissure zones. There has been no systematic evaluation of the non mined/non phosphate reserve regions of the island, so other soil types may exist.

The hydrology of Christmas Island is driven strongly by the underlying geology. The high porosity of the surface soils and underlying limestone limits the formation of permanent surface water. Surface water run-off is confined to the wet season (December to March) in relatively short, spring fed streams (Grimes 2001). The dominant water resource on the island, and the source of water for The Dales Ramsar site, is groundwater.

Climate in the catchment is as described above in section 16.

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Christmas Island has a karst drainage system with surface water restricted to a few springs, and intermittent systems which flow after significant rainfall events in the wet season, but last only for short periods of time (Grimes 2001). Springs are fed from recharge areas on the plateau (Puhlovich et al. 2003) with approximately half of incident rainfall passing through the soil zone to recharge the aquifers, with recharge occurring rapidly once soils are saturated. Recharge also occurs through dissolution features including dolines and sinkholes (Puhlovich et al. 2003).

Rain infiltrates the land surface and contributes to soil water storage, being taken up by plants or moving to recharge the groundwater. Water either flows along the interface or down fractures in the volcanic rock and contributes to basal and perched aquifers (SKM 2000). Higher permeability of the limestone on the margin of the island results in the water table being just above sea level (SKM 2000; Grimes 2001).

The Dales represent the main area of permanent surface water on Christmas Island and are expressions of groundwater discharge and seasonal rainfall.

19. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp • Ts • U • Va • • Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

In the RIS (2002) Ramsar wetland types Tp and Ts were listed as occurring at The Dales, however, in the 2010 Ecological Character Description these marsh and pool areas were not felt to be distinct from the permanent and intermittent streams and as such have been combined under type M and N.

b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

The extent of each wetland type is not known at this stage but the following is judged the order of likely dominance:

Zk(b), Zk(a), N, D, C, Y, Xf, M, E.

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The terrestrial vegetation, and other biota, of Christmas Island are derived from species colonisation and show little affinity with the Australian mainland. The isolation of the island and the randomness of the colonisation process have resulted in a unique flora and fauna (Expert Working Group 2009). The major types of rainforest on the island are dominated by plants which are pan-tropical species most likely from South East Asia (Expert Working Group 2009). The dominant vegetation types present on Christmas Island include plateau/primary rainforest, marginal rainforest, and scrub forest (also referred to as open forest and vine forest). Other minor community types include coastal fringe forest (also referred to as shore cliff and spray zone vegetation), and areas with surface water such as The Dales. Within the boundary of the site the following vegetation associations occur:

- Semi deciduous closed forest/ Marginal rainforest (438.2 hectares): characterised by a more open forest than the plateau rainforest, on thinner soils on the lower terraces, at elevations predominantly above 130 metres (Mitchell 1985).
- Evergreen tall closed forest/ Plateau rainforest (86.4 hectares): characterised by deeper soils with rainforest species reaching 30 – 45 metres tall with emergent trees reaching up to 50 metres. Usually restricted to elevations above 160 metres (Mitchell 1985). Included in this association is the distinctive vegetation community of ‘closed forest, freshwater seepage’. Hugh’s Dale supports a 10 hectare mono-dominant stand of Tahitian chestnut (*Inocarpus fagifer*).
- Coastal fringe shrubland and herbland/ coastal fringe forest (11.1 hectares): as the name suggests this vegetation type is a narrow strip along the coastline between the sea cliffs and edge of the marginal forest, dominated by low stature sclerophyllus species which have their stature affected by exposure to wind and sea spray (Mitchell 1985, Parks Australia 2008).

The Dales supports a number of unique ecological and geomorphic features including anchialine cave communities, surface karst including the unique stepped tufa deposits at Hugh’s waterfall, the stand of Tahitian chestnuts, supports a large number of endemic terrestrial species and a significant number of seabirds including Abbott’s booby (*Papasula abotti*), red-footed booby (*Sula sula*) and the brown booby (*Sula leucogaster plotus*), all of which breed at the site.

The Dales Ramsar site supports all 20 species of land crabs found on the island. In particular, large numbers of three species occur at the spring site:

- red crab (*Gecarcoidea natalis*) – which are the most abundant at the site and is endemic to Christmas Island;
- robber crab (*Birgus latro*) – which are considered common; and
- blue crab (*Discoplax hirtipes*) – which have been described as restricted to the freshwater wetland (and other freshwater areas on the Island). Although widespread, this species occurs in its blue form only on Christmas Island.

The site includes a rocky marine shore and coral reef. Although there is little direct information on these environments, observations and anecdotal evidence suggests that the marine environment and biota of the east coast of Christmas Island is similar to other marine areas that have been surveyed (Jean-Paul Hobbs, James Cook University, pers. comm.). The reef at Christmas Island is dominated by hard corals, with low cover of soft corals, encrusting algae and other biota. Six hundred and twenty-two species of fish from 80 families have been recorded in the waters of Christmas Island (Hobbs et al. 2010). The list includes species of Indo-Pacific, Pacific Ocean and Indian Ocean origins and Christmas Island is considered as an important “stepping-stone” in the dispersal of species between the Indian and Pacific Oceans (Hobbs et al. 2010).

Services provided by the site are largely ecological supporting services and include ecological connectivity, near natural wetland ecosystem, significant biodiversity values, two distinct food webs, special ecological and geomorphological features, supporting threatened wetland species and unique wetland species.

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The Dales Ramsar site supports a diverse community of tree species and epiphytes. At Hugh’s Dale, both above and below the waterfall, and in parts of Anderson Dale and Sydney’s Dale are monodominant stands of Tahitian chestnut (*Inocarpus fagifer*) and the rare epiphytic ribbon fern (*Ophioglossum pendulum*). The endemic arenga palm (*Arenga listeri*) and endemic Ridley’s orchid (*Brachypezia archytas*) are common in The Dales. The tropical almond (*Terminalia catappa*) grows to an unusual size on Christmas Island and several large specimens occur in The Dales. The main vegetation associations are described in section 20 above.

There are approximately 420 species of vascular plants on Christmas Island, however a floristic survey specific to The Dales has not been undertaken. Of the 420 species found on Christmas Island, 242 are indigenous and 177 are naturalised since human occupation (Claussen 2005). The island has eighteen endemic species (see Appendix A), including the lithophytic fern, *Asplenium listeri*, which is listed under the EPBC Act. Two ground ferns *Pneumatopteris truncate* and *Tectaria devexa* var *minor* are also EPBC Act listed.

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Christmas Island is renowned for its birdlife, with a large number of seabirds and migratory species utilising the habitats of the island for roosting and breeding, many of which occur in The Dales. Of particular note are the large breeding colonies of seabirds, including the last extant colony for Abbott's booby (*Papasula abotti*) which is listed as endangered under the EBPC Act. Another threatened wetland dependent listed species also occurs within the site, the Christmas Island frigatebird (*Fregata andrewsi*), which is listed as vulnerable. Data from the Bird Atlas (Birds Australia unpublished) puts the number of species on the island at 42, with 20 of these species occurring within The Dales Ramsar site. Other sources put the number of bird species on the island as much higher, as a large number of vagrant species (104 vagrants - Parks Australia 2008, 76 vagrants - Director of National Parks 2002) have been sighted on the island. See Appendix B for wetland species recorded in The Dales.

The Christmas Island fish community also consists of seven endemic species which are likely to occur within the site:

- mottled sole (*Aseraggodes crypticus*)
- Cocos angelfish (*Centropyge jocularis*)
- lemonpeel angelfish (*Centropyge flavissima*)
- Christmas eviota (*Eviota natalis*)
- Christmas dotyback (*Pseudochromis viridis*)
- Christmas blenny (*Praealticus natalis*)
- island Gregory (*Stegastes insularis*)

The Cocos angelfish (*Centropyge jocularis*) is locally abundant and endemic to both Christmas Island and Cocos (Keeling) Islands. The Island Gregory (*Stegastes insularis*) is also locally abundant in shallow waters (Gilligan et al. 2008) and can only be found at Christmas Island and in small pockets of the north east Pacific.

Christmas Island is also a globally significant area for whale sharks because juveniles aggregate at the Island in summer to feed on the larvae of red crabs (Hobbs et al. 2009). They have been observed along the east coast of the island within 50 metres of the shoreline (J-P Hobbs, James Cook University, pers. comm.) and so potentially could occur at times within the Ramsar Site.

A notable feature of Christmas Island is that it supports a broad band of caverns and associated crevicular habitat from above the surface of the ocean to a depth of over 100 metres (Humphreys et al. 2009) that support anchialine fauna. Anchialine systems are essentially interfaces between marine and inland waters, described by Humphreys and Danielopol (2006) as groundwater estuaries (see section 4.3.1). There is only one other anchialine system in Australia, the Cape Range/Barrow Island area (Humphreys and Eberhard 2001). Two distinct types of anchialine fauna have been identified, each with an often predictable species assemblage: the remipede and procaridid types (Humphreys and Danielopol 2006). The procaridid type is usually restricted to seamount islands such as Christmas Island and typically comprises procaridid, alpheid, hippolytid, and atyid shrimps (Humphreys and Danielopol 2006). Whilst the stygofauna is considered a significant component of the biodiversity values of the island it is not known if anchialine communities are present within The Dales Ramsar site, however as there is at least one sea cave within the site it is likely. This remains a knowledge gap for the site.

23. 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:

Local people as well as tourists visit The Dales. It is, in fact, one of the most popular destinations for sightseeing and recreation on the island, with the waterfall at Hugh's Dale being the sites greatest attraction. The Dales are an area of high conservation and recreation significance. An increase in this type of activity may be expected in the future.

The resident population of the island has an ethnic composition of Chinese, European and Malay. The Christmas Island Rey Tseng Temple Association, a Chinese Buddhist sect, have declared the Hugh's Dale waterfall as a significant cultural site in relation to their worship and regularly conduct ceremonies and worship at the site.

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?

If Yes, tick the box and 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:

24. Land tenure/ownership:

a) within the Ramsar site:

The Dales Ramsar site is entirely within a declared Commonwealth Reserve under the control of the Director of National Parks.

b) in the surrounding area:

The Dales are predominantly surrounded by National Park, although there is a mining area (Mining Lease 140) adjacent to the site boundary to the east and north-east. The main Christmas Island Immigration Detention Centre facility is approximately 0.5 kilometres from the northern boundary of the site.

25. Current land (including water) use:

a) within the Ramsar site:

National Park, conservation, research and recreation.

b) in the surroundings/catchment:

The surrounding areas are predominantly National Park with some areas of mining, transport (roads and airport), detention centre and domestic residences at the opposite side of the island.

26. 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 Ramsar site:

The greatest known threat to the ecological character from within the Ramsar site comes from the invasive yellow crazy ant (*Anoplolepis gracilipes*). Yellow crazy ants are thought to have been introduced accidentally to Christmas Island between 1915 and 1934 (O'Dowd et al. 1999). Listed as one of the top 100 worst invasive alien species in the world by the Global Invasive Species Database (2009), they have caused wide scale impacts to tropical ecosystems on Christmas Island. Yellow crazy ants forage over a large range of habitats, including forest floor and canopy and are scavengers feeding on a range of invertebrates, but may also be reliant on carbohydrates, which they obtain from plant nectar or honeydew-producing scale insects (particularly of the Homoptera genus). On Christmas Island the relationship between yellow crazy ants and scale insects has resulted in the formation of multi-queen "super colonies" which result in high population densities (Abbott 2005). Yellow crazy ants were first found at The Dales in 1997 (P. Green, Latrobe University, pers. comm.) prior to listing and this has resulted in impacts on the red crabs and forest structure dynamics in parts of the site. The blue crab appear to be less affected by the ants, perhaps due to the water within their burrows diluting the formic acid.

Increased population on the island has potential to increase recreational impacts on the site. Increases in visitor numbers may necessitate further low key facilities and infrastructure to maintain the area in a relatively pristine condition.

b) in the surrounding area:

There is little permanent surface water on Christmas Island, and water for consumptive uses is extracted from the unconfined aquifers. While, there is no information on the quantity of water extracted for consumptive purposes, recent increases in the population at Christmas Island (including the large influx of people associated with the immigration detention facility) may pose a serious threat to freshwater ecosystems. Although water is not extracted from The Dales directly, Grimes (2001) described the groundwater resources of the island as interconnected. This suggests that extraction from water on the plateau at Grants Well or Jane-up, could impact on the discharge volumes and rates at coastal springs on the shore terrace. A significant reduction in flow, or a loss of permanent water at The Dales Ramsar site has the potential to result in dramatic effects to the ecological character of the site. This situation could be exacerbated by climate change if rainfall were to decrease.

There are a variety of climate change predictions for Christmas Island (McInnes et al. 2008); those of direct relevance to The Dales Ramsar Site are related to rainfall, tropical storms and sea temperature. In general it is thought that the intensity (if not the frequency) of tropical storms could increase and sea surface temperatures will rise by up to 2.5 degrees Celsius by 2070 (McInnes et al. 2008). The predicted increases in sea temperature are likely to impact on the marine communities of Christmas Island (including those in the Ramsar Site) through increasing diseases such as White Syndrome and coral bleaching.

The nearby Christmas Island Immigration Detention Centre (IDC) may also be a direct or indirect threat regarding groundwater use, impacts of traffic on land crabs and the IDC providing habitat and therefore source populations for invasive species, such as cats and rats. However, these threats have not been fully assessed or quantified.

The South-East Asian wolf snake (*Lycodon aulicus capucinus*) was accidentally introduced to the island around 1987, and densities in the residential areas of the Island were relatively high until about 1993. Since then, anecdotal evidence suggests that their densities have declined but they now occur in primary rainforest and in the Central Plateau area. This increase in range may have contributed to the decline in numbers of some of the native reptiles and the pipistrelle bat in the national park. Further research is required to understand the potential impact of this species and possible control options.

The giant African snail (*Achatina fulica*) was probably introduced to Christmas Island during the Second World War (Sproul 1983). It feeds on a wide variety of plants and there is concern about the potential environmental damage it could cause. The presence of land crabs appears to restrict its distribution and abundance. The impact of yellow crazy ants on crab populations may provide potential for the snail to expand its range.

27. Conservation measures taken:

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

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

The site is within a National Park, managed for conservation and visitor access to the site is controlled by Parks Australia.

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?:

Christmas Island National Park Management Plan, Director of National Parks (2002).

d) Describe any other current management practices:

Current management activities include:

- Research and control programs to better understand the ecology of the yellow crazy ant
- Island wide survey that monitors yellow crazy ant and red crab distribution and abundance as well as other biodiversity is ongoing.
- Visitor management activities include maintaining interpretative signage, board walks and walking tracks to minimise recreational impacts.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

The management plan is currently being updated and due for release in 2011.

29. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Scientific research is periodically carried out within the Ramsar Site boundaries, although no site specific recent studies have occurred within the site boundary.

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

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

The management plan for the Christmas Island National Park contains a number of key communication messages and a program for implementing community education.

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The Dales, plays a role in the economic development of the island as an eco-tourism destination (Director of National Parks 2002). Recreational activities within The Dales include, walking, sightseeing, and the enjoyment of wildlife (Director of National Parks 2002). Since human settlement in 1888 members of the Malay and Chinese communities, in particular, have fished for food and they consider fishing to be part of their cultural lifestyle rather than a recreational pursuit (Director of National Parks 2002). Overall visitor numbers are low and so the pressure from recreation and tourism is considered low. There is, however, increasing use of the site due to recent population increases on the island and potential impacts from recreational activities needs to be monitored. Visitor facilities that have been provided at The Dales include interpretive signs and a short self-guided nature trail along boardwalks and walking tracks.

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Commonwealth of Australia

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Director of National Parks
GPO Box 787
Canberra, ACT 2601

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

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Appendix A to The Dales Ramsar Information Sheet Endemic Flora (vascular)

Species names from EWL Sciences and Tallegalla (2005), common names from Director of National Parks (2002).

Family	Species	Lifeform	Habitat	Common name
Malvaceae	<i>Abutilon listeri</i>	shrub	coast and shore terrace	lantern flower
Arecaceae	<i>Arenga listeri</i>	palm	closed forests	arenga palm, Christmas Island palm
Aspleniaceae	<i>Asplenium listeri</i>	fern	exposed limestone outcrops	spleenwort
Acanthaceae	<i>Ayastasia alba</i>	herb	terrace forest	
Orchidaceae	<i>Brachypezia archytas</i>	epiphytic orchid	terrace and plateau forests	
Rhamnaceae	<i>Colubrina pendunculata</i>	shrub/ small tree	terrace shrubland	
Urticaceae	<i>Dendrocnide peltata</i> <i>var. murrayana</i>	small tree	inland cliffs	stinging tree
	<i>Dicliptera maclearii</i>	herb	terrace vegetation	
	<i>Flickingeria nativitatis</i>	epiphytic orchid	plateau forests	
Tiliaceae	<i>Grewia insularis</i>	small tree	terrace forest	
Asclepidaceae	<i>Hoya aldrichii</i>	vine	closed forests	hoya vine
Poaceae	<i>Ischaemum nativitatis</i>	grass	seacliffs	Christmas Island duck beak
Pandanaceae	<i>Pandanus christmatensis</i>	shrub	shore and inland cliffs	pandanus, screw pine
	<i>Pandanus elatus</i>	shrub/small tree	forest understorey	pandanus, screw pine
Piperaceae	<i>Perperomia rossii</i>	epiphytic herb	plateau (?)	
	<i>Phreatia listeri</i>	epiphytic orchid	plateau forests	
Cucurbitaceae	<i>Zehneria alba</i>	vine	forest margins	
	<i>Zexxine exilis</i>	epiphytic orchid	plateau forests	

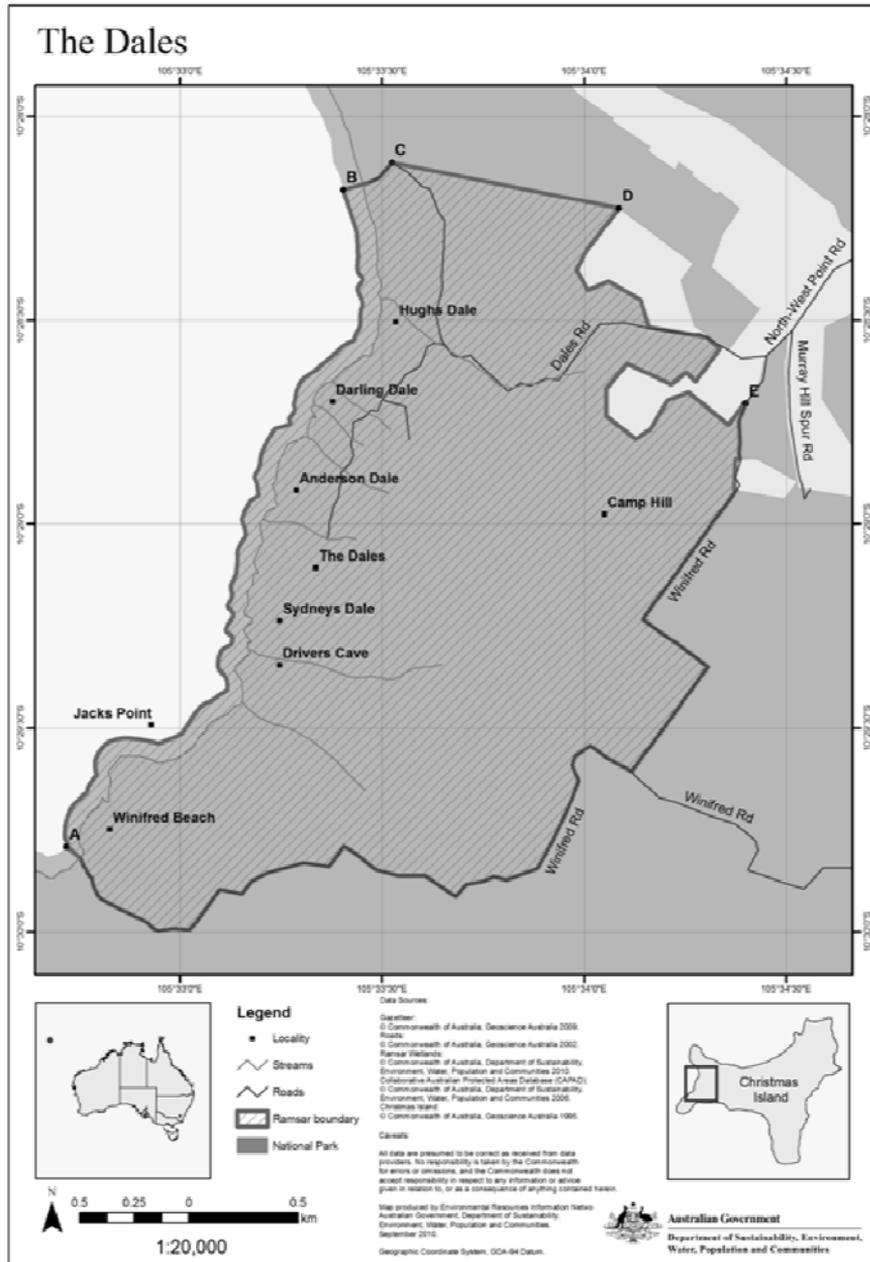
Appendix B to The Dales Ramsar Information Sheet

Wetland birds recorded in The Dales Ramsar Site

Species list compiled from Birds Australia Bird Atlas (Birds Australia unpublished).

Scientific Name	Family Name	EPBC Listing
<i>Amaurornis phoenicurus</i>	White-breasted water-hen	
<i>Egretta novaehollandiae</i>	White-faced heron	
<i>Egretta sacra</i>	Eastern reef egret	Marine; Migratory (CAMBA)
<i>Fregata andrewsi</i>	Christmas Island frigatebird	Vulnerable; Marine; Migratory (CAMBA)
<i>Fregata ariel</i>	Lesser frigatebird	Marine; Migratory (CAMBA, JAMBA, ROKAMBA)
<i>Fregata minor</i>	Greater frigatebird	Marine; Migratory (CAMBA, JAMBA)
<i>Nycticorax caledonicus</i>	Nankeen night heron	Marine
<i>Papasula abbotti</i>	Abbott's booby	Endangered; Marine, Migratory (JAMBA)
<i>Phaethon lepturus fulvus</i>	White-tailed tropicbird	Marine
<i>Phaethon rubricauda</i>	Red-tailed tropicbird	Marine
<i>Sula sula</i>	Red-footed booby	Marine; Migratory (CAMBA, JAMBA)

Figure 1 for The Dales Ramsar Information Sheet
Map of The Dales



Hosnies Spring Ramsar Site 512;(WI Site 5AU040)

Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

1. Name and address of the compiler of this form:

Jennifer Hale and the Australian Government
Department of Sustainability, Environment,
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FOR OFFICE USE ONLY.

DD MM YY

Designation date

Site Reference Number

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2. Date this sheet was completed/updated:

June 2011

3. Country:

Australia

4. Name of the Ramsar site:

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

Hosnies Spring

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

a) Designation of a new Ramsar site ; or

b) Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged:

or

If the site boundary has changed:

i) the boundary has been delineated more accurately ; or

ii) the boundary has been extended ; or

iii) the boundary has been restricted**

and/or

If the site area has changed:

i) the area has been measured more accurately ; or

ii) the area has been extended ; or

iii) the area has been reduced**

** Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the

Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

In 2010 the area of Hosnies Spring was expanded from 0.33 hectares to 202 hectares. This extension increased the boundary of the Ramsar site to match that of the national park boundary on the eastern side of Christmas Island. This additional area around the original 0.33 hectares gives greater protection to the unique and ancient freshwater mangrove stand. The expansion means the site now includes two additional Ramsar wetland types including C) coral reefs and D) rocky marine shores.

Previous versions of the Ramsar Information Sheet stated that the site met criterion 2. Re-examination of the evidence to support this criterion has revealed that the site does not (and never did) support threatened species. There are two threatened wetland bird species that have been recorded within the Hosnies Spring Ramsar Site: Abbott's booby (*Papasula abbotti*) and Christmas Island frigatebird (*Fregata andrewsi*). However, the Ramsar Site is not considered to provide core habitat in terms of feeding, roosting or nesting for these species (Peter Green, pers. comm.). There are few records for these wetland birds from within the Ramsar Site and they are numerous in other areas of Christmas Island (Hennicke 2007). Therefore, although threatened species have been recorded within the site, the wetlands within the site are not considered to play a significant role in supporting them.

7. Map of site:

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

- i) a hard copy (required for inclusion of site in the Ramsar List): ;
- ii) an electronic format (e.g. a JPEG or ArcView image) ;
- iii) a GIS file providing geo-referenced site boundary vectors and attribute tables .

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

Hosnies Spring Ramsar site is on the eastern side of Christmas Island.

The boundary of the Ramsar site is identical to that of the Hosnies Spring section of Christmas Island National Park as established by Proclamation made on 14 December 1989 and published in the *Commonwealth of Australia Gazette* No. GN 49 of 20 December 1989. See Figure 1 for map.

8. Geographical coordinates (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

Latitude: 10°28'S Longitude: 105°41'E

9. General location:

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

Hosnies Spring is located in the Australian Territory of Christmas Island in the Indian Ocean. The site is 2,800 kilometres west of Darwin (Northern Territory) and 2600 kilometres northwest of Perth (Western Australia); within the Christmas Island National Park.

10. Elevation: (in metres: average and/or maximum & minimum)

Maximum – 37 metres AHD (Australian Height Datum) Minimum – sea level

11. Area: (in hectares)

202 hectares

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Hosnies Spring is an area of permanent, shallow freshwater wetland, fed by a natural spring system located approximately 30 metres above sea level and 120 metres inland of the seaward cliff. The wetland is covered by a stand of mangroves (*Bruguiera gymnorhiza*) estimated to be 120 000 years old (Woodroffe 1988). The Ramsar Site includes surrounding terrestrial areas with rainforest grading to coastal scrub, and includes an area of shoreline and coral reef. The site is significant for the age, location and size of the mangroves as well as for supporting large numbers of crabs including: red crabs (*Gecarcoidea natalis*), robber crabs (*Birgus latro*) and blue crabs (*Discoplax birtipes*).

13. Ramsar Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1: *A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.*

Christmas Island represents the only land mass within the Christmas Island Province bioregion and the wetlands associated with Hosnies Spring, particularly the spring system and mangrove stand are unique in a bioregional (and in fact broader) context (Woodroffe 1988). The mangrove stand is remarkable for three reasons: first it occurs up to 37 metres above sea-level and on an inclined surface; second, the mangroves are among the largest of their species (*Bruguiera gymnorhiza* and *Bruguiera sexangula*) ever recorded; and, third, conditions favourable for mangrove establishment do not appear to have existed since the last Interglacial period and, therefore, the stand has probably persisted in this location for up to 120 000 years.

Criterion 3: *A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.*

This wetland is important for supporting a relict mangrove species which is unique within the bioregion and possibly worldwide. The stand comprises two species, *Bruguiera gymnorhiza* and *Bruguiera sexangula*, both of which usually occur in intertidal zones. However, at Hosnies Spring the trees are located at the spring some 120 metres inland and 37 metres above sea level. It is thought that the stand is a relic of times when the site was inundated by the sea more than 120 000 years ago (Woodroffe 1988).

This site supports the red crab (*Gecarcoidea natalis*) which is endemic to Christmas Island. There is also a total of eighteen endemic species (see Appendix A) of vascular plants on Christmas Island which may be present on the Ramsar site, however a floristic survey specific to the Hosnies Spring Ramsar site has not been undertaken.

The Christmas Island fish community also consists of seven endemic species which are likely to occur within the site:

- mottled sole (*Aseraggodes crypticus*)
- Cocos angelfish (*Centropyge jocularis*)
- lemonpeel angelfish (*Centropyge flavissima*)
- Christmas eviota (*Eviota natalis*)
- Christmas dottyback (*Pseudochromis viridis*)
- Christmas blenny (*Praealticus natalis*)
- island Gregory (*Stegastes insularis*)

The Cocos angelfish (*Centropyge jocularis*) is locally abundant and endemic to both Christmas Island and Cocos (Keeling) Islands. The Island Gregory (*Stegastes insularis*) is also locally abundant in shallow waters (Gilligan et al. 2008) and can only be found at Christmas Island and in small pockets of the north east Pacific.

Criterion 4: *A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.*

The site is important for the blue crab (*Discoplax hirtipes*), which is reliant on the freshwater provided by the spring to maintain respiratory function (Hicks et al. 1984). During the wet season there is sufficient surface water in forests to maintain gill functioning and they can range over large areas of Christmas Island. However, during the dry season they are restricted to permanent freshwater sources, such as that provided by Hosnies Spring (Hicks et al. 1984). Their burrows at Hosnies Spring intersect the water table, with the bottom part of the burrow underwater (Hicks et al. 1984).

The spring is one of the few permanent sources of freshwater on Christmas Island and acts as a dry season refuge for a number of terrestrial species. In addition, the site provides a connection from the plateau to the ocean and as such is a likely migratory route for the endemic red crab (*Gecarcoidea natalis*) during breeding migrations.

Christmas Island is also a globally significant area for the vulnerable whale sharks (*Rhincodon typus*) because their juveniles aggregate by the Island in summer to feed on the larvae of red crabs (Hobbs et al, 2009). They have been observed along the east coast of the island within 50 metres of the shoreline (Jean-Paul Hobbs, pers. Comm.) and so potentially could occur at times within the Ramsar site.

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Christmas Island Province

b) biogeographic regionalisation scheme (include reference citation):

IMCRA v4 (Commonwealth of Australia 2006)

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins – natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Christmas Island 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. Annual average rainfall at Christmas Island is in the order of 2,000 millimetres per year. The site is located in an area subject to tropical cyclones. Thirteen tropical cyclones were recorded in the vicinity of Christmas Island between 1972 and 2005, on average this equates to a tropical cyclone every two and a half years.

The hydrology of Christmas Island is driven strongly by the underlying geology. The high porosity of the surface soils and underlying limestone limits the formation of permanent surface water. Surface water run-off is confined to the wet season (December to March) in relatively short, spring fed streams (Grimes 2001). The dominant water resource on the island, and the source of water for the Hosnies Spring Ramsar site, is groundwater.

Hosnies Spring is located at the inland extent of the shore terrace where freshwater trickles over a calcareous flowstone at the base of a limestone cliff. The wetland stretches from approximately 120 metres inland of the coast on gravel soils, which cover 0.33 of a hectare (Woodroffe 1988). Hosnies Spring is an example of a land based spring discharge of a perched aquifer. Water discharges from a number of discrete locations and saturates the soil for an area of approximately 3,300 square metres (Director of National Parks 2002). Although flow rates are not known, the spring is a permanent water source and remains flowing through the dry season.

The area within the Ramsar site that surrounds the spring, is predominantly rainforest characterised by a 20 to 30 metre tall canopy of evergreen and deciduous tree species such as *Pisonia grandis* and *Barringtonia racemosa* and a conspicuous lack of a herb and shrub layer. There is a narrow band of coastal scrub with hardy species such as *Scaevola taccada* at the seaward margin of the shore terrace, with an unvegetated area of limestone pinnacles at the top of the sea cliffs (Woodroffe 1988). The cliff descends some 17 metres almost vertically to the rocky marine shore below. The site extends 50 metres seaward of the low water mark and includes areas of shallow coral reef.

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

Christmas Island is a seamount island, which rises above the 5,500 metre deep abyssal area of the Western Australian Basin (SKM 2000). The island has a basaltic volcanic core overlain with limestone of predominantly Tertiary origin (Woodroffe 1988). The island is characterised by a series of stepped terraces, which developed during uplift events. The most prominent of the limestone terraces, is the lowest one, called the “shore terrace”. This feature surrounds the entire island, with the exception of a short break in the northeast at Flying Fish Cove. The freshwater spring lies wholly within the shore terrace, however the Ramsar site spans the plateau, shore terrace and rocky shores.

Although Christmas Island is completely surrounded by coral reef, the extent of this habitat is limited (Gray and Clarke 1995). At the seaward edge, the reef is limited by a steep drop off some 20 to 100 metres from the shore, where the underwater terraces descend steeply. At the landward edge, the reef is limited by the exposed coastline and high impact of waves and consequently only extends to the intertidal zone in sheltered locations (Gray and Clarke 1995).

The soils of Christmas Island are derived from two sources; limestone (terra rossa soils) or basaltic extrusive rocks (krasnozem soils). Terra rossa soils occur mainly on exposed terraces, and are predominantly thin, red-grey soils that dry out rapidly. They may have high phosphate content and be over 30 metres deep. Krasnozem soils are red brown in colour and occur in areas of volcanic activity or in fault or fissure zones. There has been no systematic evaluation of the non mined/non phosphate reserve regions of the island, so other soil types may exist.

Climate in the catchment is as described above in section 16.

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Christmas Island has a karst drainage system with surface water restricted to a few springs, and intermittent systems which flow after significant rainfall events in the wet season, but last only for short periods of time (Grimes 2001). Springs are fed from recharge areas on the plateau (Puhlovich et al. 2003) with approximately half of incident rainfall passing through the soil zone to recharge the aquifers, with recharge occurring rapidly once soils are saturated. Recharge also occurs through dissolution features including dolines and sinkholes (Puhlovich et al. 2003).

Rain infiltrates the land surface and contributes to soil water storage, being taken up by plants or moving to recharge the groundwater. Water either flows along the interface or down fractures in the volcanic rock and contributes to basal and perched aquifers (SKM 2000). Higher permeability of the limestone on the margin of the island results in the water table being just above sea level (SKM 2000; Grimes 2001).

Hosnies Spring is one of a limited number of permanent springs on Christmas Island. Flow rates of the spring have not been measured but are very low. Without the spring, it could be expected that the mangrove stand situated upon it would atrophy.

19. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar “Classification System for Wetland Type” present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K •
Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp • Ts • U •
Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

The spring itself is wetland types Y (freshwater springs) and Xf (freshwater tree dominated wetlands) and comprises 0.33 hectares.

The extent of coral reefs (type C) and rocky shores (type D) is not known at this stage.

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The terrestrial vegetation, and other biota, of Christmas Island are derived from species colonisation and show little affinity with the Australian mainland. The isolation of the island and the randomness of the colonisation process have resulted in a unique flora and fauna (Expert Working Group 2010). The major types of rainforest on the island are dominated by plants which are pan-tropical species most likely from South East Asia (Expert Working Group 2010). The dominant vegetation types present on Christmas Island include plateau/primary rainforest, marginal rainforest, and scrub forest (also referred to as open forest and vine forest).

Hosnies Spring Ramsar site contains a unique inland stand of mangroves from the genus *Bruguiera*. Investigations in the 1970s and 1980s identified two species of mangrove at the site *Bruguiera gymnorhiza* and *Bruguiera sexangula* (van Steenis 1984 in Woodroffe 1988). However, the two species are morphologically very similar and very difficult to distinguish. The mangroves cover almost the entire area of freshwater wetland and there is a range of age classes present on the site, indicating active regeneration.

The Hosnies Spring Ramsar site supports a large number of land crabs. In particular large numbers of three species occur at the spring site:

- red crabs (*Gecarcoidea natalis*) – which are the most abundant at the site;
- robber crabs (*Birgus latro*) – which are considered common; and
- blue crabs (*Discoplax hirtipes*) – which are described as restricted to the freshwater wetland (and other freshwater areas on the Island). Although widespread, this species occurs in its blue form only on Christmas Island.

The site includes a rocky marine shore and coral reef. Although there is little direct information on these environments, observations and anecdotal evidence suggests that the marine environment and biota of the east coast of Christmas Island is similar to other marine areas that have been surveyed (Jean-Paul Hobbs, pers. Comm.). The reef at Christmas Island is dominated

by hard corals, with low cover of soft corals, encrusting algae and other biota. Six hundred and twenty-two species of fish from 80 families have been recorded in the waters of Christmas Island (Hobbs et al, in press). The list includes species of Indo-Pacific, Pacific Ocean and Indian Ocean origins and Christmas Island is considered as an important “stepping-stone” in the dispersal of species between the Indian and Pacific Oceans (Hobbs et al, in press).

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Hosnies Spring is remarkable for its almost pure stand of mangroves *Bruguiera gymnorhiza* and *B. sexangula* growing 120 metres inland and approximately 30 metres above sea level.

There are approximately 420 species of vascular plants on Christmas Island, however a floristic survey specific to Hosnies Spring Ramsar site has not been undertaken. Of the 420 species found on Christmas Island, 242 are indigenous and 177 are naturalised since human occupation (Claussen 2005). The island has eighteen endemic species (see Appendix A), including the lithophytic fern, *Asplenium listeri*, which is listed under the EPBC Act. Two ground ferns *Pneumatopteris truncate* and *Tectaria devexa* var *minor* are also EPBC Act listed.

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

In addition to the crabs, listed in section 20 above, there are two threatened wetland bird species that have been recorded within the Hosnies Spring Ramsar: Abbott’s booby (*Papasula abbotti*) and Christmas Island frigatebird (*Fregata aendrensi*). However, the Ramsar site is not considered to provide core habitat in terms of feeding, roosting or nesting for these species (Peter Green, pers. Comm.). A number of other endemic and threatened bird species are also present within the site boundary (Director of National Parks 2002).

Threatened and Endemic Bird Species Present at Hosnies Spring Ramsar Site

Common name	Scientific name	IUCN	CITES	CMS	National Status EPBC Act
Abbott's booby	<i>Papasula abbotti</i>	Endangered	Appendix I	-	Endangered, Marine, Migratory
Christmas Island frigatebird	<i>Fregata andrewsi</i>	Critically Endangered	Appendix I	-	Vulnerable, Marine, Migratory
Christmas Island imperial pigeon	<i>Ducula whartoni</i> (endemic)	Vulnerable		-	Vulnerable
Christmas Island emerald dove	<i>Chalcophaps indica natalis</i> (endemic)	-	-	-	Endangered
Christmas Island goshawk	<i>Accipiter fasciatus natalis</i> (endemic)	Endangered	-	-	Vulnerable
Christmas Island hawk-owl	<i>Ninox natalis</i> (endemic)	Vulnerable	Appendix I	-	Endangered
Christmas Island thrush	<i>Turdus poliocephalus erythropleurus</i> (endemic)	-	-	-	Endangered
Christmas Island white-eye	<i>Zosterops natalis</i> (endemic)	Vulnerable	-	-	-

23. 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:

Although there is some opportunity for recreation and tourism within the site, because the site is a sensitive site, Hosnies Spring is not actively promoted for tourism and visitor access is limited. Visitor access of small, interest groups such as bird watchers, or scientific teams is managed by Parks Australia to conserve the ecological character of the site.

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?

If Yes, tick the box and 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:

24. Land tenure/ownership:

a) within the Ramsar site:

Hosnies Spring Ramsar site is entirely within a declared Commonwealth reserve under the control of the Director of National Parks.

b) in the surrounding area:

Over 70 percent of Christmas Island is declared National Park, immediately surrounding the site are freehold areas used for mining, transport (roads and airport) and domestic residences.

25. Current land (including water) use:

a) within the Ramsar site:

Land use within the site is conservation and research, within a National Park.

b) in the surroundings/catchment:

The surrounding areas are used for mining, transport (roads and airport) and domestic residences.

26. 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 Ramsar site:

The greatest threat to the ecological character from within the Ramsar site comes from the invasive yellow crazy ant (*Anoplolepis gracilipes*). Yellow crazy ants are thought to have been introduced accidentally to Christmas Island between 1915 and 1934 (O'Dowd et al. 1999). Listed as one of the top 100 worst invasive alien species in the world by the Global Invasive Species Database (2009), they have caused wide scale impacts to tropical ecosystems on Christmas Island. Yellow crazy ants forage over a large range of habitats, including forest floor and canopy and are scavengers feeding on a range of invertebrates, but may also be reliant on carbohydrates, which they obtain from plant nectar or honeydew-producing scale insects (particularly of the Homoptera genus). On Christmas Island the relationship between this species and scale insects has resulted in the formation of multi-queen "super colonies" which result in high population densities (Abbott 2005). Results of island wide surveys (Parks Australia unpublished) indicate that yellow crazy ant super colonies are present within the Hosnies Spring Ramsar site and that this has resulted in decreases in red crabs. Yellow crazy ants were observed within the mangrove stand in the 1990s. However, the mangrove may not be a good host for the scale insect and the ants have not significantly impacted on the mangrove stand at the site (Peter Green, pers. comm.). In addition, blue crabs appear to be less affected by the ants, perhaps due to the water within their burrows diluting the formic acid.

b) in the surrounding area:

There is little permanent surface water on Christmas Island, and water for consumptive uses is extracted from the unconfined aquifers. While, there is no information on the quantity of water extracted for consumptive purposes, recent increases in the population at Christmas Island (including the large influx of people associated with the immigration detention facility) may pose a serious threat to freshwater ecosystems. Although water is not extracted from Hosnies Spring directly, Grimes (2001) described the groundwater resources of the island as interconnected. This suggests that extraction from water on the plateau at Grants Well or Jane-up, could impact on the discharge volumes and rates at coastal springs on the shore terrace. A significant reduction in flow, or a loss of permanent water at the Hosnies Spring Ramsar site has the potential to result in dramatic effects to the ecological character of the site, with the potential loss of the mangrove stand and severe impacts to blue crabs, both of which are reliant on permanent water. This situation could be exacerbated by climate change if rainfall were to decrease.

There are a variety of climate change predictions for Christmas Island (McInnes et al. 2008), those of direct relevance to the Hosnies Spring Ramsar site are related to rainfall, tropical storms and sea temperature. In general it is thought that the intensity (if not the frequency) of tropical storms could increase and sea surface temperatures will rise by up to 2.5 degrees Celsius by 2070 (McInnes et al. 2008). The predicted increases in sea temperature are likely to impact on the marine communities of Christmas Island (including those in the Ramsar site) through increasing diseases such as White Syndrome and coral bleaching.

The increase in population due to the Christmas Island Immigration Detention Centre (IDC) may also be a direct or indirect threat regarding increased groundwater use; increased mortality of land crabs due to increased traffic and increases in invasive species like cats, even though the site is some distance from the IDC. However, these threats have not been fully assessed or quantified.

The South-East Asian wolf snake (*Lycodon aulicus capucinus*) was accidentally introduced to the island around 1987, and densities in the residential areas of the Island were relatively high until about 1993. Since then, anecdotal evidence suggests that their densities have declined but they now occur in primary rainforest and in the Central Plateau area. This increase in range may have contributed to the decline in numbers of some of the native reptiles and the pipistrelle bat in the national park. Further research is required to understand the potential impact of this species and possible control options.

The giant African snail (*Achatina fulica*) was probably introduced to Christmas Island during the Second World War (Sproul 1983). It feeds on a wide variety of plants and there is concern about the potential environmental damage it could cause. The presence of land crabs appears to restrict its distribution and abundance. The impact of yellow crazy ants on crab populations may provide potential for the snail to expand its range.

27. Conservation measures taken:

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

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

The site is within a National Park, managed for conservation and visitor access to the site is controlled by Parks Australia.

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?:

Christmas Island National Park Management Plan, Director of National Parks, 2002.

d) Describe any other current management practices:

Current management activities include:

- Research and control programs to better understand the ecology of the Yellow Crazy Ant
- Island Wide Survey of yellow crazy ant and red crab distribution and abundance is ongoing.

- Continuation of the Christmas Island Biodiversity Monitoring Program.
- Visitor management activities include maintaining interpretative signage, board walks and walking tracks to minimise recreational impacts.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

The management plan is currently being updated and due for release in 2011.

29. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Scientific research is periodically carried out within the Ramsar site boundaries, although no specific recent studies have occurred within the site boundary.

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

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

The management plan for the Christmas Island National Park contains a number of key communication messages and a program for implementing community education.

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Visitor access of small, interest groups such as bird watchers, or scientific teams is managed by Parks Australia to conserve the ecological character of the site.

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Commonwealth of Australia

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Director of National Parks
GPO Box 787
Canberra, ACT 2601

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

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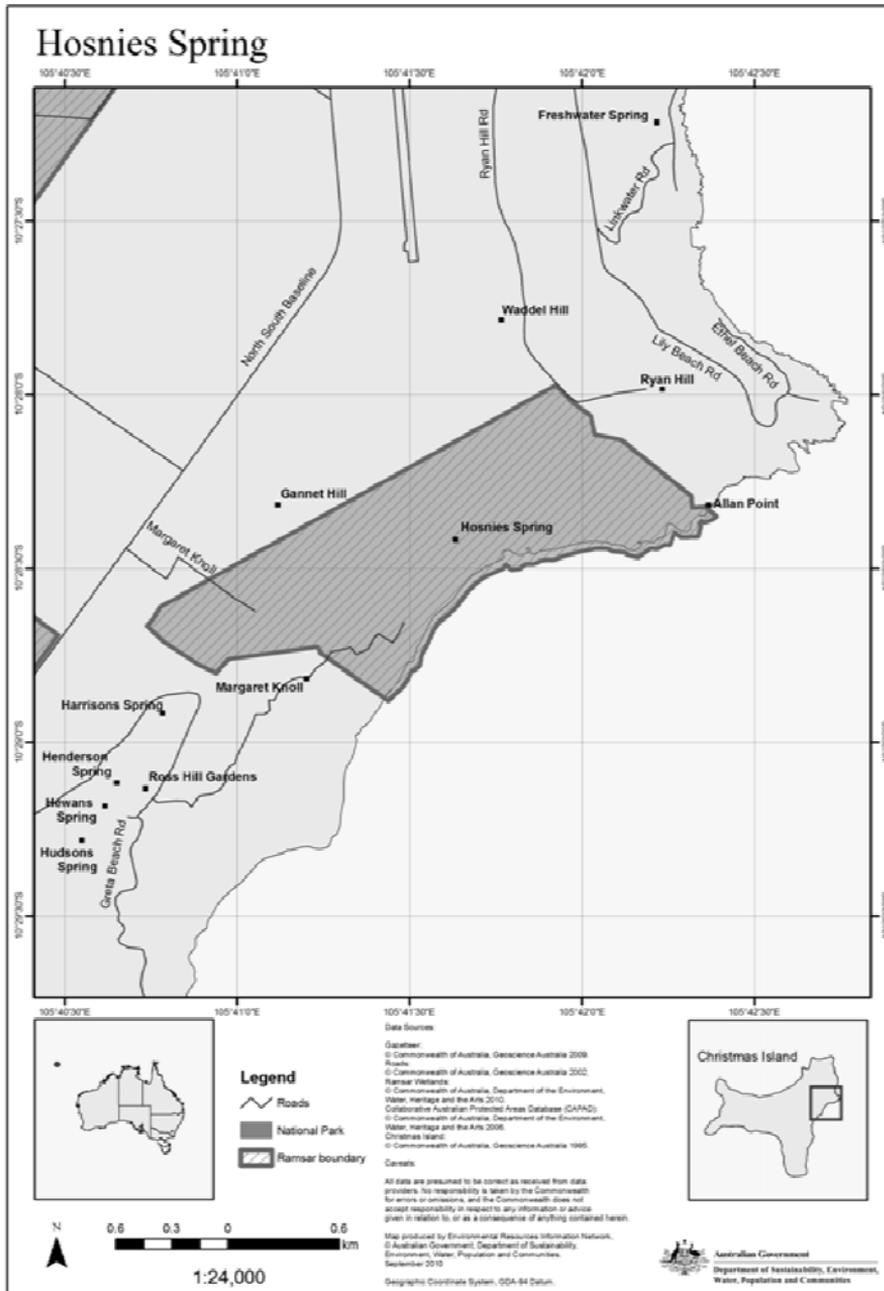
Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • e-mail: ramsar@ramsar.org

Appendix A to Hosnies Spring Ramsar Information Sheet Endemic Flora (vascular)

Species names from EWL Sciences and Tallegalla (2005), common names from Director of National Parks (2002).

Family	Species	Lifeform	Habitat	Common name
Malvaceae	<i>Abutilon listeri</i>	shrub	coast and shore terrace	lantern flower
Areaceae	<i>Arenga listeri</i>	palm	closed forests	arenga palm, Christmas Island palm
Aspleniaceae	<i>Asplenium listeri</i>	fern	exposed limestone outcrops	spleenwort
Acanthaceae	<i>Asystasia alba</i>	herb	terrace forest	
Orchidaceae	<i>Brachypeza archytas</i>	epiphytic orchid	terrace and plateau forests	
Rhamnaceae	<i>Colubrina pendunculata</i>	shrub/ small tree	terrace shrubland	
Urticaceae	<i>Dendrocnide peltata</i> var. <i>murrayana</i>	small tree	inland cliffs	stinging tree
	<i>Dicliptera maclearii</i>	herb	terrace vegetation	
	<i>Flickingeria nativitatis</i>	epiphytic orchid	plateau forests	
Tiliaceae	<i>Grewia insularis</i>	small tree	terrace forest	
Asclepidaceae	<i>Hoya aldrichii</i>	vine	closed forests	hoya vine
Poaceae	<i>Ischaemum nativitatis</i>	grass	seacliffs	Christmas Island duck beak
Pandanaceae	<i>Pandanus christmatensis</i>	shrub	shore and inland cliffs	pandanus, screw pine
	<i>Pandanus elatus</i>	shrub/small tree	forest understorey	pandanus, screw pine
Piperaceae	<i>Perperomia rossii</i>	epiphytic herb	plateau (?)	
	<i>Phreatia listeri</i>	epiphytic orchid	plateau forests	
Cucurbitaceae	<i>Zehneria alba</i>	vine	forest margins	
	<i>Zenxine exilis</i>	epiphytic orchid	plateau forests	

Figure 1 for Hosnies Spring Ramsar Information Sheet
Map of Hosnies Spring



Appendix G

Commonwealth Heritage values of Christmas Island Natural Areas

Summary Statement of Significance:

Christmas Island is a classic example of a tectonically uplifted coral atoll with its characteristic steep series of rainforest-covered terraces and sheer limestone cliffs. The island's geological formations are significant in illustrating the evolution of the Christmas Rise due to tectonic and volcanic action and the collision of the Asian and Australian plates.

The evolutionary significance of Christmas Island is demonstrated both by its high level of endemism and by its unique assemblage of plant and animal species.

The dominance of the land crabs is a striking feature of the island's fauna. The island has thirteen of the twenty species known worldwide and one of the highest land crab densities known in the Indian Ocean. The land crabs of Christmas Island are remarkable for their variety and numbers and for the role they play in the ecology of the rainforest. The endemic red land crab (*Gecarcoidea natalis*) is numerically the most notable of this crab assemblage with an estimated population of approximately 120 million crabs. The threatened robber or coconut crab (*Birgus latro*), with a population estimated at one million individuals is one of the largest remaining in the world.

Christmas Island is famous for its spectacular annual red crab migrations from the plateau rainforest to the sea during the wet season. The migrating population has been estimated at numbering 30-45 million adult crabs.

The rainforests of Christmas Island are biogeographically significant; species have evolved from being either shoreline forest or early rainforest succession species to those that fill a tall climax rainforest role. The Island contains unique plant communities of high conservation and scientific interest including a variety of elevated and relict cycad and back-mangrove communities of international significance.

The presence of seventeen endemic plant species in the climax rainforest community contributes to the place's significance for understanding evolutionary relationships. Notable examples include a rare fern *Asplenium listeri*, a tall tree-like pandanus *Pandanus elatus* and a palm *Arenga listeri*. The island's rich endemic fauna includes three mammal species, ten bird species, five reptile species, one crab species, two insects, three marine fish species and several marine sponges species. The island is recognised as an internationally significant Endemic Bird Area. The well-developed karst landscape of Christmas Island contains an internationally significant cave fauna with twelve endemic invertebrate species.

The island is also one of the world's most significant seabird islands, both for the variety and numbers of sea-birds, with over one hundred species of bird having been recorded, including eight species which breed on the island. The island rainforest provides significant habitat for two endemics the nationally endangered Abbott's booby (*Papasula abbotti*) and the nationally vulnerable Christmas Island frigatebird (*Fregata andrewsi*).

The island's relatively simple fringing reefs and adjacent waters support a rich diversity of marine species typical of Indian Ocean tropical reefs. The island also provides habitat for two nationally vulnerable species of turtle, the green (*Chelonia mydas*) and hawksbill (*Eretochelys imbricata*), which nest on two of the Island's beaches and two nationally vulnerable shark species.

Christmas Island is one of the most scientifically documented oceanic islands in the world. Island ecosystems have been historically critical in the development of evolutionary theory as they highlight natural selection, speciation and niche filling. Christmas Island correspondingly is a significant location for scientific research. The unique ecosystems of the Island present special opportunities for the study of evolution of species in relative isolation and the adaptation of migrant species to new environments. These species have often evolved to fit different ecological niches to which they are usually associated and the rainforests on the island exhibit species with many of these characteristics.

Christmas Island provides habitat for four nationally endangered and six nationally vulnerable fauna species, and one nationally vulnerable plant species.

There are a number of places of cultural heritage value included within or adjacent to this area that are included in the Register of the National Estate (see Register database). It is possible that additional cultural heritage values exist within the area that are yet to be identified.

Official Values:

Criterion: A Processes

The island has an unusually rich diversity of land crabs with thirteen species recorded, of twenty species known world wide, and which occupy the majority of the island's terrestrial habitats. Christmas Island also has one of the highest land crab densities known in the Indian Ocean. The island is also one of the worlds' most significant seabird islands with over one hundred species of bird having been recorded, including eight species which breed on the island.

The island's relatively simple fringing reefs and adjacent waters support a rich diversity of marine species typical of Indian Ocean tropical reefs. The recorded marine species diversity include five hundred and seventy five fish species and eighty eight coral species and over three hundred molluscs, ninety echinoderms and two hundred decapod crustacean species.

The geographic isolation of Christmas Island has led to the evolution of unique ecosystems with biogeographically significant assemblages of plant and animal species, which have evolved to fit different ecological niches to which they are usually associated. The island's rainforest are structurally simple and much less complex than their related Indo-Malesian rainforest. The island's rainforest is composed of species more commonly found as restricted assemblages of smaller stature along tropical shorelines. The island's remoteness has also resulted in the evolutionary development of early rainforest succession species into climax forest niche filling species, which occupy the mature forest canopy. Some excellent examples of niche expansion in Christmas Island's flora include:- *Hernandia ovigera* which is usually a small understorey tree but has adapted on the island to grow to 40 metres and is one of only three emergents in the island's plateau rainforest; and - *Macaranga tanarius* is a canopy tree of the island's marginal rainforest and grows to 20-30 metres but usually is a short-lived secondary growth in adjacent Indonesian rainforests.

Christmas Island is evolutionary significant as a centre of endemism for many flora and fauna assemblages due to its isolation. The presence of seventeen endemic plant species in the climax rainforest community contributes to the place's significance for understanding evolutionary relationships. Notable endemic flora examples include a rare fern *Asplenium listeri*, a tree *Grewia insularis*, a tall tree-like pandanus *Pandanus elatus* and also a palm *Arenga listeri*. The island's endemic terrestrial fauna includes ten birds, five reptiles, three mammals, one crab and two insects. The island's marine fauna includes three endemic fish species and several marine sponge species.

Notable examples of the island's three endemic seabirds include the Abbott's booby (*Papasula abbotti*), and the Christmas Island frigate bird (*Fregeta andrewsi*). The island has seven endemic land birds and the notable species include the Christmas Island hawk owl (*Ninox natalis*), the glossy cave swiftlet (*Collocalia esculanta natalis*) and the imperial pigeon (*Ducula whartoni*).

In recognition of the island's contribution to world biodiversity the island has been declared an Endemic Bird Area by Birdlife International, and as such is one of only nine such areas in Australia.

Christmas Island is also regarded as a cave fauna province of international significance due to its cave fauna diversity with rare and endemic species of high conservation significance which are evolutionary significant. The cave fauna of the island includes at least twelve endemic species.

One of the island's two endemic insects, the crab fly (*Lissocephala powelli*), is also evolutionary significant as it is an example of parallel evolution with the island's red and blue land crabs which it parasitises.

There are few oceanic islands at similar latitudes that have similar floral or faunal components or ecological integrity as exhibited by Christmas Island. The Island's fauna is significant as it includes an ecologically important and diverse land crab assemblage which dominate the forest floor scavenging role and exert an ecologically significant selective pressure on the recruitment and distribution of the island's rainforest plant species. The land crabs are also unique in their capacity to control potential threats to the integrity of the forest, effectively acting as a biological filter to invasion of many organisms. The endemic red land crab (*Gecarcoidea natalis*) is numerically the most notable of this crab assemblage with an estimated population of approximately 120 million crabs. This red crab also conducts a spectacular annual migration from the forest to the sea to breed during the wet season. The migrating population has been estimated at numbering 30-45 million adult crabs. The robber or coconut crab (*Birgus latro*) also has a significant population on the island, with an estimated one million individuals making it one of the largest remaining population in the world. The island is also significant for its large number and variety of sea-bird species. The island also provides significant habitat for the endemic Abbott's booby as it now only nests in Christmas Island's emergent plateau rainforest trees and nowhere else in the world.

As the island is predominantly porous limestone surface water is relatively rare and significant ecologically. The perennial freshwater springs, such as Hosnies Spring and The Dales, provide significant ecological habitat for species such as Tahitian chestnut (*Inocarpus fagifer*), an endemic palm *Arenga listeri* and the semi-aquatic blue crab (*Discoplax hirtipes*), amongst other water dependent or preferring species. The Dales also exhibit unusual water associated limestone deposition features including a 'flowstone' formation of a form which is usually found underground.

Criterion: B Rarity

The rainforests of the island are significant as they contain one nationally vulnerable plant *Carmona retusa*. The island is also significant for four nationally endangered terrestrial fauna species, two notable examples of which are the Christmas Island shrew (*Crocidura attenuata trichura*), which is Australia's only shrew and the Abbott's bobby (*Papasula abbotti*). The island is also important for six nationally vulnerable terrestrial fauna species, notable examples include the Christmas Island frigatebird (*Fregeta andrewsi*) and the Christmas Island blind burrowing snake (*Ramphotyphlops exocoeti*).

The marine waters include two nationally vulnerable reptiles, the green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretochelys imbricata*), which also nest on the island's beaches, and two nationally vulnerable shark species.

Several features of Christmas Island's flora are regarded as unique associations and growth patterns. These include trees achieving canopy heights not commonly seen in Australia and elsewhere; examples include 30 metre high *Pisonia grandis* forests and unusually tall *Gyrocarpus americanus* emergents.

The island also has unusual relict populations of back-mangrove species and cycads, which have been left isolated by the tectonic uplift of the island. Examples of these isolated back-mangrove and cycad associations include:

- An internationally significant wetland which is an entire *Brugiera* sp. mangrove ecosystem growing in a freshwater spring 37 metres above sea level (ASL) at Hosnies Spring. The locality is listed by the Ramsar Convention as a Wetland of International Importance, and the mangroves are the largest of their species ever seen with canopy heights of 30-40 metres tall, the age of the stand is estimated to be 120,000 years old;
- another mangrove forest of 20 metre tall *Cynometra ramiflora* also isolated from the sea and found in a single stand south of Ross Hill;
- a mangrove species *Heritalia littoralis* which usually occurs elsewhere in mangrove habitat but has expanded its distribution on the island into a number of moist environments about the island's terraces; and,
- a cycad species *Cycas rumphii* which is found both in a 300 metres ASL stand near North-west Point and individually along the East coast of the island. As this cycad is usually distributed by sea it suggests the populations has persisted since the island was at sea level.

Criterion: C Research

Christmas Island is one of the most scientifically documented high oceanic islands in the world. Island ecosystems have been historically critical in the development of evolutionary theory as they highlight natural selection, speciation and niche filling. Correspondingly Christmas Islands unique ecosystems present special opportunities for the study of evolution of species in relative isolation and the adaptation of migrant species to new environments.

Notable research areas include:

- Australian researchers have noted that the successional development of many structurally and floristically simple vegetation types as seen on Christmas Island has significant implications for understanding successional processes in Australian mainland rainforests.
- The island also provides a unique research site for plant/herbivore study due to the dominance land crabs in the Island's ecological processes through the pressure their grazing of rainforest seedlings, and so upon the establishment and distribution of plant species and rainforest assemblages.
- The recent yellow crazy ant (*Anoplolepis longipes*) population explosion, after fifty years of low level presence, has triggered a series of on-going detailed studies of the ant and its impacts of the ecology of the island and potential means of control.
- The islands geological formations, which include uplifted fossil reefs and volcanic deposits, are significant in illustrating the evolution of coral atolls and the evolution of the Christmas Rise due to tectonic and volcanic action.

Criterion: D Characteristic values

Christmas Island is an excellent example of a relatively large and high oceanic island with tropical rainforest. It is also an excellent example of a seabird breeding island as it relatively undisturbed when compared to other Indian ocean island such Aldabra island in the Seychelles.

The island is also a characteristic example of a tectonically uplifted coral atoll with its classic series of rainforest-coated steeped terraces. Few island systems exhibit this terraced nature due to Christmas Islands' distinct geological history. This island also exhibits a well-developed karst landscape, which includes a diverse variety of caves and sinkholes and a correspondingly significant cave fauna.

Condition and Integrity:

Approximately one fifth of the Island has been cleared for mining purposes. Rehabilitation of mined areas has been minimal, though some areas mined after 1975 have had some rehabilitative work carried out. Approximately sixty percent of the Island is now included in the National Park which stretches from the western side of the Island, through a substantial portion of the central plateau and to parts of the island's east and north coasts. The National Park was extended in various stages (1986, 1989) from the south-western corner of the island (the initial park area was declared in 1980) to include much of the Island. This was done to incorporate most of the remaining undisturbed forest, areas of unique vegetation and habitat for species such Abbott's booby (*Papasula abbotti*), Christmas Island frigatebird (*Fregeta andrewsi*) and red crabs (*Gecarcoidea natalis*).

Recently the yellow crazy ant (*Anoplolepis longipes*) has had a population explosion, after fifty years of low level presence. These ants pose a significant threat to the millions of red crabs which migrate each November or so to the coast to spawn. Areas with the ant are noticeably devoid of red crabs as supercolonies block many of the migration paths and have caused massive mortalities during the last few seasons' migrations (as of December 2000). This ant population explosion is thought to be partially due to El Nino related dry spells, which concentrate sap in the island's trees thus attracting sap-sucking scale insects. The crazy ants tend the scale insects, through carrying them about and defending them and in turn feed off the honeydew excreted by the scale insects, so forming a mutually beneficial or symbiotic relationship. The crazy ants now occupy an estimated thirteen percent of the island (as at December 2000), and the scale is stressing the forest canopy and causing forest dieback. These infestations have implications for the island's birdlife, especially the nestlings of the Abbot's Booby and hollow dwellers such as the Christmas Island hawk owl (*Ninox natalis*).

The outbreak has triggered a series of detailed studies by Parks North staff and Monash University researchers, both of the ant and its impacts on the ecology of the island and potential means of control. A major baiting program has been underway since 2000 to clear the red crab migration paths and is being closely monitored.

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