Cooya Beach

FORESHORE MANAGEMENT PLAN

July 2021

DOUGLAS SHIRE COUNCIL

The Eastern Kuku Yalanji and Yirrganydji Peoples are the Traditional Custodians and Owners of the land and sea country that encompass the Douglas Shire region.

Douglas Shire Council acknowledges the 'Bama', the traditional rainforest Aboriginal coastal people of our region who hold the unique position of being the First Peoples of this country. We recognise and respect Bama cultural heritage, values, beliefs and continuing relationships and responsibility to their land and sea country. We honour and respect your Elders past, present and future.

We commit to maintaining and strengthening our partnerships and respectful relationships with Bama in the spirit of reconciliation so that together we can increase the opportunities for successful and positive outcomes to the advantage of everyone in our communities.

Council respectfully acknowledges other Aboriginal and Torres Strait Islander people who call our region 'home'.

This report has been prepared by Alluvium Consulting Australia Pty Ltd and Wild Environmental for Douglas Shire Council under the contract titled 'WO5429 Foreshore Management Plan'.

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Review:	Fiona Chandler (Alluvium)
Approved:	Emily Lazarus
Version:	04 - Final
Date issued:	July 2021
Issued to:	Melissa Mitchell
Citation:	Alluvium, 2021, Foreshore Management Plan: Cooya Beach, report prepared by Alluvium Consulting Australia and Wild Environmental for the Douglas Shire Council.
Cover image:	Cooya Beach foreshore.

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1 Introduction

The coastline is an important place for many Australians, providing significant social and cultural value. This is especially so for many residents of the Douglas Shire who have identified these unique coastal landscapes and natural ecosystems among some of the most important factors attracting people to this coastline (DSC 2019a). The Douglas Shire coastline also has high tourism value, attracting many visitors to the area.

The Eastern Kuku-Yalanji and Yirriganydji Peoples are the Traditional Custodians of the Land and Sea Country within the Douglas Shire. They have lived in and cared for this region for thousands of years, represented in important cultural sites throughout the Shire, and the memories and experiences of its people; past, present and future.

Douglas Shire Council (DSC) has an extensive 111 km long coastline extending from Degarra in the north to south of Wangetti. The Shire is well known for its diverse coastline and its proximity to the Great Barrier Reef. Much of the Shire is within the Wet Tropics World Heritage Area and its dynamic coast consists of a variety of sandy beaches, rocky headlands and coastal rainforests.

The region's beaches and foreshore areas are important both to people and to the ecosystems around them. Coastal landscapes provide essential habitat for life on the foreshore and provide visual and recreational amenity to the people. Healthy coastal ecosystems are necessary to promote the resilience of plant and animal communities to coastal hazard impacts. Denser vegetation types are also effective in reducing the destructive forces of a storm tide for communities and infrastructure landward of the foreshore.

However, these ecosystems are experiencing ongoing disturbance as a result of erosion, vehicle and pedestrian access, weeds and pest species, illegal dumping, and runoff from stormwater and agricultural land. These factors threatening dune stability and reducing the erosion buffer often result in vegetation loss, impacts to native fauna species, and changes in ecosystem structure.

To help manage and protect these important coastal zones, DSC has developed five Foreshore Management Plans (FMPs) for the Wonga, Newell, Cooya, Four Mile and Oak Beaches.

1.1 Purpose

In 2019, DSC developed the Resilient Coast Strategic Plan 2019-2029 (referred to henceforth as the Strategy) and has committed to undertake actions to reduce the impacts of coastal hazards, such as erosion and coastal flooding, and activities in the coastal zone. A priority outcome of the Strategy is to undertake dune protection, maintenance and monitoring. This encompasses the foreshore area and is the focus of the FMPs.

The FMPs will help to guide Council in the protection, maintenance and management of the coastline and foreshore, while maintaining the natural character of the area and respecting ecological, cultural and social values of these coastal reserves. Funding has been secured through the Queensland Government Reef Assist Program which will be used to support some of the implementation of the management actions outlined in the FMP.

The plans will:

- Ensure there is a **shared understanding** of the social, cultural, environmental and economic values and uses of the foreshore zone
- Identify options for the **proactive management** of vulnerable areas of the foreshore zone over the next 5 years
- Help **improve and maintain** the vegetation cover and condition in the foreshore zone.

1.2 Foreshore Management Plan area

Cooya Beach is a coastal community located along an embayment between Rocky Point and Port Douglas that is part of a larger beach ridge system that is vegetated along this section of beach (Figure 1) (DSC 2019b). Ridges and swales are evident in the backshore environment. The beach is located south of the Mossman River estuary and is the last section of sandy beach that transitions to an extensive estuarine mangrove system south towards the headland at Port Douglas. The intertidal zone is up to 500 m wide in some places.

Cooya Beach settlement comprises of over 200 dwellings and is located on the coast, east of Mossman. The most recent census data from 2016 indicates there are approximately 546 residents in Cooya Beach (ABS 2017). However, it is likely that there has been an increase in the population since this census. Cooya Beach is largely a residential area, with a neighbourhood centre and childcare centre. There does not appear to be any tourism infrastructure at Cooya Beach. Residents of Mossman frequently visit the coastal settlements, including Cooya Beach due to its close proximity.

Figure 1. *Cooya Beach foreshore management area.*

1.3 Implementation

This FMP has been developed following a series of site inspections, including vegetation mapping, species identification and coastal morphology assessments, as well as public engagement with residents and ratepayers from Cooya Beach and the greater Douglas Shire. The site inspections, survey results and feedback from public engagement sessions have informed the management actions and planning decisions for the Cooya Beach foreshore area. The management actions have been tailored to incorporate what the community values about their foreshore and how the foreshore is used.

The Cooya FMP outlines actions for dune protection, including weed species for removal, native vegetation species for regeneration, and pedestrian and vehicle access management. It also provides a schedule for implementation to allow Council to prioritise actions for the area. This FMP remains non-statutory but once approved by Council provides an informed and proactive guide for the future management of Cooya Beach over a five-year timeframe.

2 Study area and planning context

Cooya Beach is a coastal community located along a sandy embayment between Rocky Point and Port Douglas. The coastline of Cooya Beach is bordered by the Great Barrier Reef Marine Park. There are a variety of land zoning uses and ecological communities at Cooya Beach. The following section outlines relevant information for the study area, including DSC land zoning and vegetation and faunal communities identified in literature review and validated during site visits and surveys.

2.1 Legislative, policy and strategy setting

Coastal management is guided by Commonwealth, State and local legislation. The legislation results in a complex structure of rights and responsibilities. Key legislation, plans, policies and strategies relevant to foreshore management are summarised in Table 1.

Table 1. Summary of the legislation, policy, plans and strategies relevant to foreshore management

Legislation	Relevance

Biosecurity Act 2014	• This Act provides a comprehensive biosecurity framework to manage the impacts of animal and plant diseases and pests.
	• The purpose of this Act is to:
	  ○ Provide a framework for an effective biosecurity system for Queensland.
	  ○ Ensure the safety and quality of animal feed, fertilisers and other agricultural inputs.
	  ○ Help align responses to biosecurity risks in the State with national and international obligations and requirements.
	• The purpose of the Act is also to manage risks associated with emerging, endemic and exotic pests and diseases.

Coastal Protection and Management Act 1995	• This Act aims to provide for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity. • This Act considers the goal, core objectives and guiding principles of the National Strategy for Ecologically Sustainable Development in the use of the coastal zone. • This Act ensures that decisions about land use and development safeguard life and property from the threat of coastal hazards. • This Act encourages the enhancement of knowledge of coastal resources and the effect of human activities on the coastal zone.

Planning Act 2016	• This Act provides for an efficient, effective, transparent, integrated, coordinated and accountable systems of land use planning and development assessment to facilitate the achievement of ecological sustainability by:
	  ○ Coordinating and integrating planning at the local (i.e., planning schemes), regional and State scales
	  ○ Managing the process and effects of development on the environment (including managing the use of premises).

Native Title Act 1993	• The purpose of this Act is for the recognition and protection of native title.
	• It covers:
	  ○ Acts affecting native title.
	  ○ Determining whether native title exists and compensation for acts affecting native title.

Legislation	Relevance
Aboriginal Cultural Heritage Act 2003	• The main purpose of this Act is to provide effective recognition, protection and conservation of Aboriginal cultural heritage.
Vegetation Management Act 1999	• This Act aims to regulate the clearing of vegetation by: o Managing the environmental effects of clearing. o Regulating clearing in a way that conserves remnant vegetation that is an endangered regional ecosystem, an of concern ecosystem, or a least concern regional ecosystem. o Ensuring clearing does not cause land degradation and allows for sustainable land use. o Preventing the loss of biodiversity, maintain ecological processes, and reduce greenhouse gas emissions.
Environmental Protection Act 1994	• This Act aims to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, and that maintains the ecological processes on which life depends. • The Act defines environmental value, environmental harm and best practice environmental management.
Nature Conservation Act 1992	• This Act aims to conserve nature while allowing for the involvement of indigenous people in the management of protected areas. • This is to be achieved by a conservation strategy for Queensland that declares and manages protected areas, protects native wildlife and habitats, ensures use of protected wildlife and areas to be ecologically sustainable, and allows cooperative involvement of Aboriginal and Torres Strait Islander people.
Environment Protection and Biodiversity Conservation Act 1999	• This Act aims to provide protection of the environment, promote ecologically sustainable development and the conservation of biodiversity. • The Act aims to promote the use of indigenous knowledge of biodiversity through a cooperative approach to the protection and management of environments.
Queensland Local Government Act 2009	• This Act provides a system of local government in Queensland, including: o The way in which a local government is constituted and the nature and extent of its responsibilities and powers • A system of local government in Queensland that is accountable, effective, efficient and sustainable.
Marine Parks Act 2004	• The main purpose of this Act is to provide for conservation of the marine environment. • This purpose as it relates to this plan can be achieved through: o Cooperative involvement of public authorities and other interested groups and persons, including members of Aboriginal and Torres Strait Islander communities. o Recognition of the cultural, economic, environmental and social relationships between marine parks and other areas, whether of water or land.

Legislation	Relevance
Local Laws	• Local laws sit within the *Local Government Act 2009* and under the Act a local government may make and enforce any local law that is necessary or convenient for the good rule and local government of its local government area. • This legislation sets out the laws for the DSC area, including animal management, community and environmental management, local government areas, and facilities.

2.2 Zoning

Land use

The DSC Planning Scheme (2018) has been used to understand the boundaries between different land uses (Figure 2) (DSC 2018a). At Cooya Beach, the primary land uses within or immediately adjacent to the foreshore area are conservation, community facilities and low density residential. These land uses have implications for the management of the foreshore area. Changes within these zones can have flow-on impacts to the foreshore area, including:

- habitat fragmentation (loss of habitat into smaller, isolated areas)
- runoff
- illegal clearing and planting, including weed dispersal and growth
- impacts on fauna (light and noise pollution, road/beach kills).

Conservation zone

The conservation zone provides for the protection, restoration and management of areas identified to support significant biological diversity and ecological integrity (DSC 2018a). Relevant outcomes identified in the Douglas Planning Scheme for the conservation zone include (DSC 2018a):

- Protection of biological diversity, ecological integrity and scenic amenity.
- Recreational or other uses of areas are consistent with the management plans of the controlling authority so that conservation and scenic values of these areas are not adversely affected.
- Any use of land in private ownership does not affect the environmental, habitat, conservation or scenic values of that land or surrounding area.
- Any low intensity facilities based on the appreciation of the natural environment or nature based recreation only establish where there is a demonstrated need and provided they have a minimal impact on the environmental and scenic amenity values of the site or surrounding area.
- The provisions of the Return to Country Local Plan facilitate economic and social opportunities on traditional Indigenous lands.
- Further lot reconfigurations other than amalgamations, boundary realignments to resolve encroachments, or for the practical needs of essential community infrastructure, or to facilitate Return to Country outcomes do not occur.

Community facilities zone

The community facilities zone provides for community related activities and facilities under public or private ownership (DSC 2018a). Relevant outcomes identified in the Douglas Planning scheme for the community facilities zone include (DSC 2018a):

- Development is designed to provide and promote safe and efficient public use, walking and cycling.
- Facilities are in accessible locations, are supplied with necessary infrastructure and are well integrated into surrounding land uses.
- Community facilities are protected by excluding development that could limit the on-going operation of existing community uses or prejudice appropriate new activities.

Residential

Within Cooya Beach, there are low density residential areas adjacent to the foreshore area. Low density residential areas provide for predominantly dwelling houses supported by community uses and small-scale services and facilities that cater for local residents (DSC 2018a). The purpose of the low density residential zone will be achieved through the following relevant outcomes (DSC 2018a):

- Development maintains a high level of residential amenity having regard to traffic, noise, dust, odour, lighting and other locally specific impacts.
- Development reflects and enhances the existing low density scale and character of the area.
- Development is reflective and responsive to the environmental constraints of the land.
- Development is supported by necessary community facilities, open space and recreational areas and appropriate infrastructure to support the needs of the local community.

Great Barrier Reef Coast Marine Park Zoning

The Great Barrier Reef (GBR) Coast Marine Park Zoning classifies the land and waters below the low tide mark as a Habitat Protection Zone (Figure 2). This zoning protects and manages sensitive habitats and ensures that they are generally free from damaging activities (GBRMPA 2021). Additionally, the area around the Cooya Beach boat ramp is classified as an Estuarine Conservation Zone. This zoning provides for the protection of the areas in a natural state while also allowing the public to appreciate the relatively undisturbed nature in that area. The use of the area also includes providing for traditional hunting and gathering.

Wet Tropics World Heritage Area

Land classified under the Wet Tropics World Heritage Area is located well inland of Cooya Beach. While this is a consideration for the environmental values of the foreshore area, the World Heritage Area is not directly impacted by the management of the Cooya Beach foreshore.

Native Title

Native Title determination recognises the holders to exercise their rights to traditional law and customs. The northern end of Cooya Beach adjacent to Mossman River is held under Native Title by the Eastern-Kuku Yalanji People (Figure 2) (NNTT 2020).

Mangrove regrowth at the southern end of Cooya Beach.

Figure 2. *Cooya Beach foreshore area land use zoning (DSC 2018a, NNTT 2020, GBRMPA 2021).*

2.3 Coastal hazards

The length of Cooya Beach is vulnerable to coastal erosion (DSC 2019b). This erosion may be temporary or permanent. Temporary erosion is generally caused by storms, winds or waves, and the beach rebuilds during calmer periods. Permanent erosion is more likely to occur over the longer-term due to rising sea levels or significant changes to sediment transport dynamics where sand becomes lost to the coastal system. Erosion may impact the foreshore area, including the vegetation, wildlife habitats, infrastructure, recreational uses or values.

Foreshore management precinct

The foreshore zone at Cooya Beach extends from the highest astronomical tide (HAT) line to the road reserve limit of the Conservation zone along the length of Bougainvillea St (Figure 3).

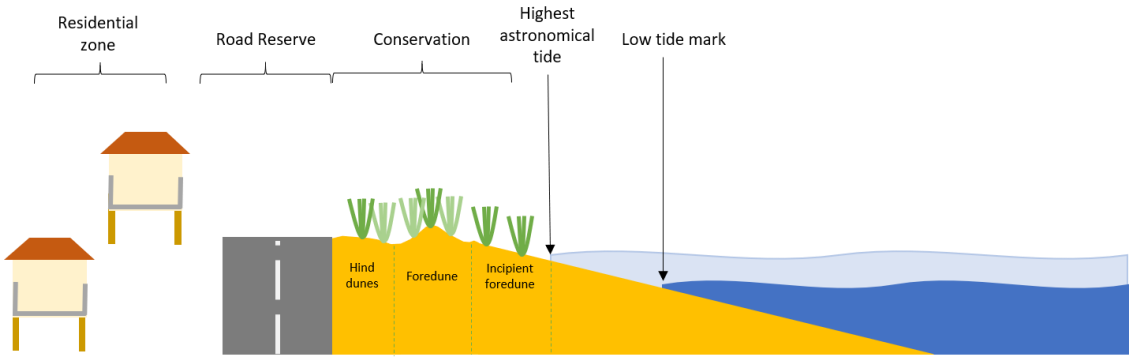


Figure 3. *Graphic representation of the Cooya Beach foreshore management precinct.*

The foreshore area includes the dune system behind the beach, immediately landward of the HAT mark and is made up of the following three key sections (Figure 3):

- **Incipient foredune:** a windblown platform that forms in front of the foredune, however is not present on all beaches. This is where vegetation such as grasses and creepers first establishes and provides a protective buffer to erosion, and storm effects, including winds and waves.
- **Foredune:** the main sandy formation and is of greater height than the incipient dune. Larger vegetation species establish here, including shrubs, which provide greater wind protection.
- **Hind dune:** a smaller dune system behind the foredune. These systems tend to be well established, including larger vegetation species such as trees.

3 Foreshore values

The Cooya Beach foreshore is valued, used and enjoyed in a wide variety of ways. These values support the management of the foreshore area. The following section outlines the social, cultural and environmental values identified for the Cooya Beach foreshore area, as well as describing any threats or challenges to these values.

Healthy incipient foredune at Cooya Beach.

3.1 Knowledge sharing and community engagement

The Cooya Beach community was engaged through the Strategy. However, there was no specific feedback relating to Cooya Beach provided as part of this previous project (DSC 2018b, DSC 2019b). For the current FMP, a survey was distributed to the Cooya Beach community and wider Douglas Shire residents and ratepayers to understand:

- how they use the foreshore zone,
- what they value about the foreshore zone,
- how they would like to see it managed.

The survey was advertised through the Council Foreshore Management Plans website, Facebook, community noticeboards, emails to residents and community groups, and physical copies were made available at Council offices. The survey ran from 31st March to 23rd April 2021 and received a total of 317 responses from residents and community groups throughout the Douglas Shire. A total of 63 responses were received for Cooya Beach, with the vast majority being permanent residents (homeowners).

In addition to the survey, there was also a four-week public comment period following the release of the draft FMP for Cooya Beach. During this period, residents and ratepayers from Cooya Beach and the greater Douglas Shire were given the opportunity to submit feedback on the draft FMP. Several drop-in sessions were held at numerous locations throughout the Shire, including a session at Cooya Beach along the foreshore. The session allowed people to discuss the FMP in greater detail. Feedback from the public consultation has been used to further understand the values and shape the management actions for the final FMP.

Social uses

The majority of respondents at Cooya Beach live adjacent to or within 1 km of the foreshore area. Most respondents also visit the foreshore at least once a week. This information indicates that the foreshore area is significant to residents and ratepayers at Cooya Beach.

Residents predominantly use the Cooya Beach foreshore for exercise and relaxation (Figure 4). The next most common uses of the foreshore are dog walking, meeting friends and family, and fishing. Dog walking seems to be slightly more common at Cooya Beach than other beaches in the Douglas Shire, and Cooya Beach is also one of three beaches where fishing is more common. The least common uses for the foreshore are for recreation

and BBQs. Approximately one in five respondents indicated that they use the foreshore as an extension of their yard.

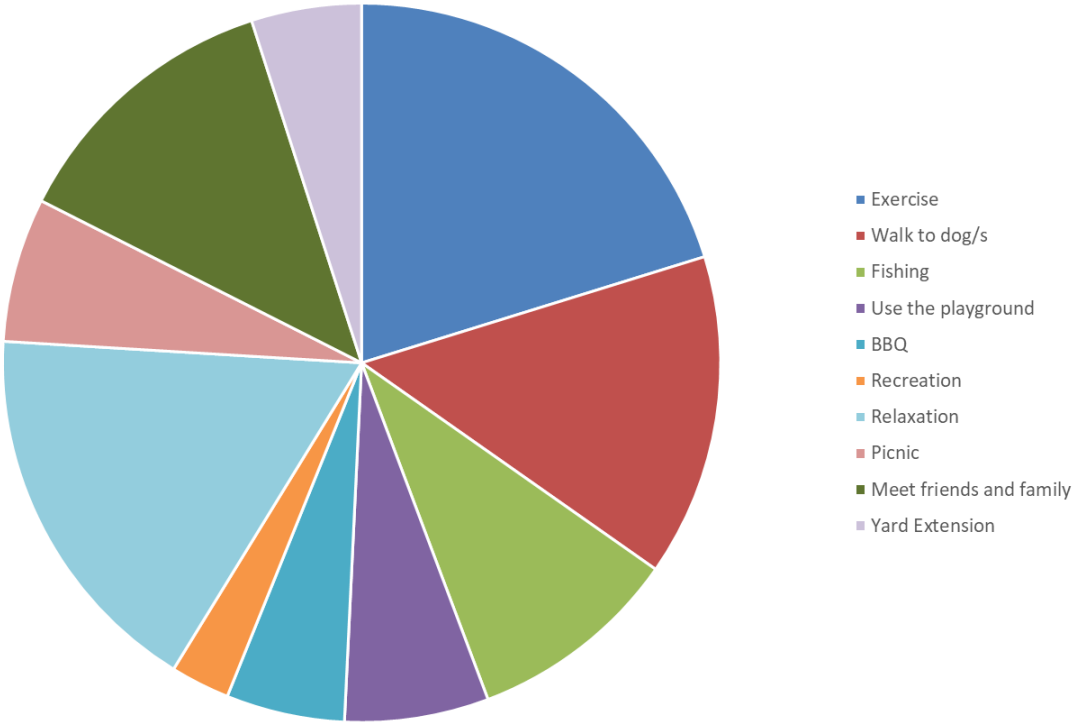


Figure 4. *The most common uses of the foreshore area at Cooya Beach.*

Sense of place

Residents of Cooya Beach value the unspoilt natural beauty and peacefulness of the beach and foreshore. They also value natural vegetation such as the shade trees and mangroves, as well as the abundant wildlife such as birds, butterflies and marine life. Cooya Beach is a place where locals and families can enjoy natural parkland areas, walkways, and local amenities for exercise, playing and socialising.

There are also several culturally significant sites at Cooya Beach. The land at the northern end of Cooya Beach, including the boat ramp on the Mossman River, is held under Native Title by the Eastern Kuku-Yalanji people. This land is the traditional area for camping, hunting, fishing and gathering (TNRM 2010). The Traditional Owners continue to use the area for hunting, gathering, fishing, camping, cultural tourism, cultural education camps for Yalanji people and other traditional purposes (TNRM 2010). North of the boat ramp there are shell middens and areas being regenerated by First Nations people. Land management work has been undertaken in the past by the Traditional Owners as part of the Cooya Beach Revegetation and Rehabilitation project (TNRM 2010). Southern areas of the beach are also home to shell middens, as well as native vegetation used for food and medicine (e.g., salt bush).

Concerns and threats

From the survey, many community concerns were raised about the vegetation and accessibility on the Cooya Beach foreshore. Residents suggested the vegetation buffer be managed by removing debris and weed species (including strangler figs suffocating trees), and that overgrowth towards the southern end be addressed.

There were some conflicting concerns regarding vegetation management, with some desiring more clearing to improve views and safe access to the beach, while others emphasised the importance of trees and native vegetation in protecting dunes from erosion and reducing habitat fragmentation. There were also conflicting views regarding coconut palms. Some believe these are native trees with root systems which help to hold the foredune together, while others noted the number of coconut palms have increased and fallen fronds look messy and exclude native foredune species.

Residents also identified the need for a smooth pathway (rather than the current dirt pathway) adjacent to Bougainvillea Street to provide a safe walking track for people of all abilities. Other concerns include the increase in informal access paths to the beach which contribute to habitat fragmentation and cause damage important dune vegetation.

Vegetation clearing for access tracks.

Further concerns include activities occurring on the foreshore, such as development, vehicle use, and dog on or off-leash areas. Residents of Cooya Beach wish to avoid overdevelopment (such as in Port Douglas) to retain the values of a tight-knit, peaceful coastal community. Some residents were also concerned about those walking dogs off-leash, noting some dogs chase and disturb resident and migratory shorebirds.

3.2 Environmental values

Cooya Beach is well developed as a residential area and much of the narrow foreshore area is considered to be non-remnant with coconut palms featuring heavily in both remnant and non-remnant sections. The foreshore vegetation is heavily impacted by historical residential use and illegal clearing of foreshore vegetation to maintain views and access. In the past there have been revegetation activities undertaken by the community to re-establish this vegetation.

Flora composition

A desktop assessment of the vegetation mapping at Cooya Beach indicates some of the residential foreshore reserve is mapped as remnant closed to open vegetation types (DOR 2020). The northern end is largely non-remnant. Four Regional Ecosystems (REs) are mapped for Cooya Beach. A full list of the REs is provided in Attachment A. There are two REs dominating the foreshore vegetation, these they are summarised in Table 2 and Figure 5.

Table 2. Regional ecosystems (REs) of the Cooya Beach foreshore

RE	Mapped RE description	VM Class	BD Status	Local representation
7.2.1c	Closed forest with *Calophyllum inophyllum*, *Terminalia arenicola*, *Dillenia alata*, *Myristica insipida*, *Planchonella obovata*, *Millettia* pinnata, and *Hibiscus tiliaceus*. Beach ridge deposits adjacent to the foredune, in the very wet rainfall zone.	E	E	Vegetation is semi-intact with individuals of the representative tree strata *Calophyllum inophyllum* and *Terminalia catappa* however coconuts dominate this strata, sometimes in pure stands or groves. *Cordia subcordata, Terminalia muelleri* and *Pongamia pinnata* are also present.

RE	Mapped RE description	VM Class	BD Status	Local representation
7.2.7a	Complex of open shrubland to closed shrubland, grassland, low woodland and open forest. Includes pure stands of *Casuarina equisetifolia*, and *Acacia crassicarpa*, *Syzygium forte* subsp. *forte*, *Calophyllum inophyllum* and *Pandanus* spp. woodland to open forest. Beach strand and foredune.	OC	E	*Thespesia populnea a*nd *Calophyllum inophyllum* is present and the lower strata are frequently removed or the vegetation has been replaced with stands of coconut trees (*Cocos nucifera*). Incipient dunes are largely intact containing a diversity of beach vines, *Ipomoea pes-caprae, Canavalia rosea,* and *Vigna marina.* Shrubs *Scaevola taccada, Wollastonia uniflora* and *vitex rotundifolia* are also present.

Vegetation communities within the Cooya Beach foreshore correlate to only a few foreshore zones; incipient dune, foredune and mangroves. Within the assessed residential areas, only the incipient dune and foredune were present. Vegetation within the incipient dune is prone to removal and impacts of other human activity. The RE descriptions, Vegetation Management (VM) class, Biodiversity (BD) status and local representation of the vegetation communities within the foreshore zone are summarised in Error! Not a valid bookmark self-reference.. There was no hind dune vegetation present within the residential precincts at Cooya Beach.

Table 3. Dune vegetation composition at Cooya Beach

Zone	Vegetation	Comments
Incipient dune	Beach vines – coastal jack bean (*Canavalia rosea)*, coastal morning glory (*Ipomoea pes-caprae)* and dune bean *(Vigna marina)* Grasses, sedges and salt couches – *Sporobolus virginicus* and *Paspalum vaginatum* Shrubs – beach lavender (*Vitex rotundifolia*), sea daisy (*Wollastonia uniflora)* and sea lettuce (*Scaevola taccada)*	• Most exposed area • Prone to atypical erosion – vegetation removed or impacted by anthropogenic activity
Foredune	Trees and shrubs – beach she oak (*Casuarina equestifolia),* beach almonds *(Terminalia catappa, Terminalia arenicola)* and beauty leaf (*Calophyllum inophyllum)* Vines – match box bean (*Entada rheedii)* and *Smilax calophyllum*	• Supports larger trees and shrubs • Coconuts also dominant throughout foredune, including planted groves with maintained lawns beneath

Figure 5. *Remnant regional ecosystems at Cooya Beach (DES 2021).*

Conservation significance

The remnant vegetation of Cooya Beach is mapped as 'Essential Habitat' for several conservation significant species including: the endangered southern cassowary (*Casuarius casuarius johnsonii*); eastern curlew (*Numenius madagascariensis*); great knot (*Calidris tenuirostris*); curlew sandpiper (*Calidris ferruginea*), and lesser sand plover (*Charadrius mongolus*) and the vulnerably listed bar-tailed godwit (*Limosa lapponica baueri*). Essential habitat is regulated under the *Vegetation Management Act 1999* (VM Act). The full list of these species is provided in Attachment B.

Habitat fragmentation

The foreshore vegetation in the less urbanised areas of Cooya Beach is well connected to the north and south, however connectivity within foreshore habitats adjacent to the residential areas is poor. Surrounding vegetation communities maintain continuous connectivity westward to the remnant mountain range vegetation behind Mossman. This connectivity will allow fauna movement within and between these communities and minimise impacts due to population isolation. The altered vegetation in the urbanised areas often lacks the shrub layer that would allow for protected movement of fauna through the coastal vegetation and beachfront areas minimising connectivity through these areas. Canopy dwelling and nesting species may still inhabit these areas and the impacts are more likely to be associated with other human activity such as noise from recreational vehicles and pest species (rats and cats) commonly associated with urban areas.

There have been several disturbances to the foreshore area and vegetation at Cooya Beach. Residential areas adjacent to the foreshore are becoming increasingly exposed to coastal hazards because of diminishing dune vegetation. This loss of vegetation has largely been the result of illegal clearing through the understorey. Table 4 summarises the disturbances and their potential impacts to the foreshore flora and fauna.

Table 4. Disturbances and their potential impacts to flora and fauna at Cooya Beach

Disturbance	Potential impacts to ecology
Dune erosion	• Further loss of vegetation and fauna habitat • Loss of sea turtle nesting habitat through loss of the foredune vegetation • Increase foredune slope and decreasing suitability for nesting sea turtles • Reduced biodiversity
Vegetation loss	• Increases in foreshore dune erosion • Exposure of hind dune systems and vegetation that are less adapted to extreme weather events • Loss of breeding and roosting habitat for nesting shorebirds and sea turtles • Loss of food trees for southern cassowary
Weeds	• Compete with native species for resources – light, nutrients, space • Reduced biodiversity of flora • Loss of habitat and food plants for conservation significant species • Create barriers for connectivity and fauna population dispersal • Increased fuel loads
Pest animals	• Predation of native animals • Sea turtle nest predation • Reduced fauna populations and diversity
Green waste and illegal dumping	• Impacts to marine fauna • Damage to sea turtle nesting areas through suffocation or preventing nesting • Introduction of weed species to natural areas • Increased atypical fire risk

Disturbance	Potential impacts to ecology
Stormwater and agricultural runoff	• Impacts to marine fauna • Increased sediment runoff and resulting increases in nearshore turbidity • Increased nutrient loads and subsequent algal blooms
Coconut debris	• Fallen fronds and fruit to reduce recruitment of native species • Reduced opportunity for sea turtle nesting • Increase habitat for rodents and potential bird egg predation

Fauna

Cooya Beach has potential to provide habitat features for many fauna of conservation significance, including nesting turtles; shorebirds and other notable species such as the endangered southern cassowary (*Casuarius casuarius johnsonii*) (southern population). Anthropogenic disturbance may be the greatest limiting factor here. The full list of these species is provided in Attachment B.

Pest species

During the site inspections, several environmental weeds were identified at Cooya Beach, including the coconut palm. According to the most recent audit, there are approximately 600 coconut palm trees (*Cocos nucifera*) present at Cooya Beach (DSC 2015). Where there is a large concentration of coconut palms (known as "Coconut Grove"), there is very little understorey. Coconut palms will continue to be managed by the Coconut Management Plan (DSC 2015). The following environmental weeds were also identified at Cooya Beach (Table 5). Environment weeds pose a threat to biodiversity by outcompeting native vegetation with respect to available resources such as nutrients and light, establishing monocultures and increasing fuel loads. This additionally results in reduced habitat value for fauna.

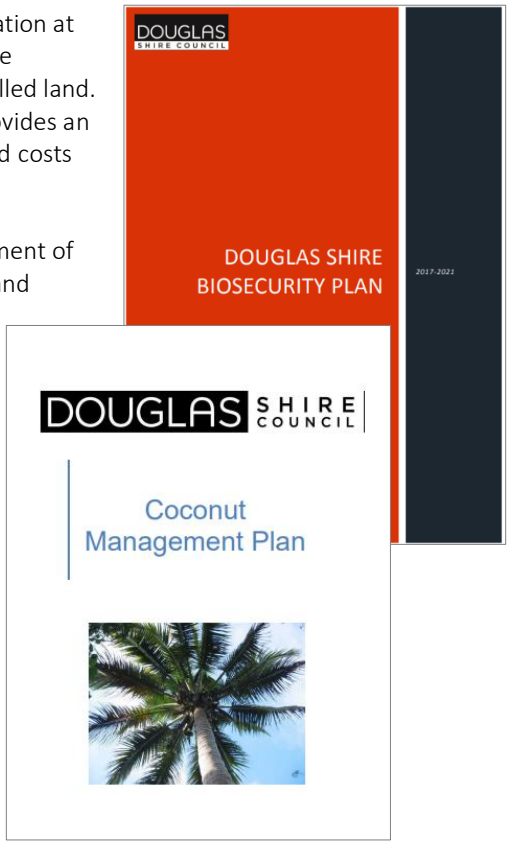
Table 5. Weed species identified at Cooya Beach (BQ 2020, Conn 2021, DSC 2015, Murphy et al. 2016)

Scientific name	Common name	Dispersal Method	Environmental Impacts
Cocos nucifera	Coconut palm	• Large nuts which fall from trees • Nuts germinate if uneaten	• Identified as a transformer weed in littoral (coastal) rainforests • Outcompetes native species for space, light and nutrients • Falling nuts and fronds cause physical damage to species below
Sphagneticola trilobata	Singapore daisy	• Spreads by cuttings from slashing and pruning	• Outcompetes native species for space, light and nutrients • Invades lawns, irrigated areas, and around drains
Sansevieria trifasciata	Mother-in-law's tongue	• Spreads by dumping of garden waste • Seeds spread by birds and other animals	• Forms dense infestations • Outcompetes native species for space, light and nutrients • Tends to form monoculture
Bryophyllum delagoense	Mother of millions	• Spread by floodwaters • Spread by animals, vehicles and garden waste	• Invades coastal dunes, grasslands and woodlands • Outcompetes native species for space, light and nutrients • Very poisonous to humans and livestock

Scientific name	Common name	Dispersal Method	Environmental Impacts
Agave sp.	Agave	• Spread by vegetative reproduction (new plant grows from a fragment) • Planted intentionally as part of a garden	• Does not naturally grow in QLD, though 10 related species have naturalised • Potentially invasive to native species
Megathyrsus maximus var maximus	Guinea grass	• Spreads by seeds attaching to fur of animals	• Invades roadsides and untended areas • Forms large clumps and may cause soil erosion
Leucaena leucocephala	Leucaena	• Spreads seeds by wind, water and animals • Spreads rapidly to adjacent areas	• Forms dense thickets which hinder movement of wildlife • Strongly outcompetes native plants for space, light and nutrients
Tecoma stans	Tecoma, yellow bells	• Spreads seeds by wind, water, garden waste	• Invades native bushland and roadsides

Vegetation management

Douglas Shire Council has several instruments to manage the vegetation at Cooya Beach. The Coconut Management Plan (DSC 2015) defines the objectives for the management of coconut palms on Council-controlled land. The plan identifies the coconut trees within a given location and provides an assessment of the potential risk, distribution, impacts and associated costs of management.



The Douglas Shire Biosecurity Plan (2017-2021) guides the management of invasive biosecurity matter as well as locally declared pests (plants and animals) as outlined in the *Biosecurity Act 201*4. Under this plan, there are programs being undertaken by DSC to eradicate pest species. Prioritisation of pest species is based on several factors, including (DSC 2017):

- Existing plans and priorities on a national, state and local level
- Impacts and threats
  - Conservation and biodiversity
  - Riparian or aquatic environment
  - Agricultural or production
  - Residential and urban areas
- Capacity to manage
  - Achievability
  - Current extent

These programs include (relevant to vegetation) (DSC 2017):

- Siam Weed Eradication Program
- Hiptage eradication Program
- Miconia Species (Four Tropical Weeds Eradication Program)

3.3 Amenity and liveability

There are several facilities and access points for residents and tourists to engage in recreational activities at Cooya Beach. The accessibility and recreational uses of the Cooya Beach foreshore area are summarised in this section and the management implications are discussed.

Boats moored off the Cooya Beach foreshore.

Infrastructure

There is a boat ramp at the northern end of Cooya Beach providing access to the Mossman River. It is located on Native Title land, however, it remains managed by Council. In addition to the boat ramp, there is access for vehicles to the beach at several locations along the foreshore. This also includes the construction of moorings by residents along the beach and vehicles accessing the beach via the Council access road through the Council conservation area. These activities have caused a disruption to the vegetation cover along the foreshore and have the potential to cause erosion and negatively impact essential wildlife habitats.

Passive recreation

Cooya Beach offers the opportunity for residents and tourists to engage in passive recreational activities. Examples of such activities include:

- walking along the beach and foreshore
- bird watching
- fishing at the Mossman River mouth
- traditional owner guided beach walks.

These activities are relatively low impact but can still affect the foreshore condition. If foreshore users create informal access tracks through the vegetation to access the foreshore and beach, this can lead to a loss of vegetation, destabilisation of the sand or soil which may lead to erosion or dune destabilisation, and it could also contribute to habitat loss, fragmentation and destruction. Activities such as bird watching will have similar impacts on the foreshore in relation to access. The impact of fishing will largely be a result of vehicle access to the Mossman River mouth and moorings along the foreshore, including vegetation clearing for access tracks and driving on the sand where there may be important and sensitive wildlife habitats. Dumping of fishing nets or waste may also occur.

A local First Nations family conduct tours at Cooya Beach (Kuku Yalanji Cultural Habitat Tours) and show tourists traditional hunting practices.

Kuku Yalanji Cultural Habitat Tours at Cooya Beach (Source: kycht.com.au).

Pedestrian access

A recent audit of the beach access points within Douglas Shire shows that there are 18 access points along Cooya Beach. Three are formalised access tracks and the remainder are informal. The creation of informal access tracks presents challenges to foreshore management, particularly with regards to illegal vegetation clearing and dune destabilisation.

Dog off-leash areas

An off-leash dog area is located at the northern end of Cooya Beach. Dogs pose a risk to fauna as they may attack or scare vulnerable species, particularly when off-leash.

4 Management precincts

The Cooya Beach foreshore zone has been divided into four management precincts. Management actions have been tailored to specific concerns and threats within each precinct. The four precincts are:

- Precinct 1 – Native Title area
- Precinct 2 – Northern Cooya Beach
- Precinct 3 – Central Cooya Beach
- Precinct 4 – Southern Cooya Beach

Figure 6. *Cooya Beach foreshore management precincts.*

The threats and challenges within each management precinct are summarised in Table 6. These threats and challenges have been identified through the background review, site inspections and community engagement feedback.

Table 6. Cooya Beach foreshore precinct threats and challenges

Precinct	Key foreshore threats and challenges
1 – Native Title area Unpopulated precinct and falls under Native Title.	• Cultural sites vulnerable to coastal processes and foreshore degradation that may impact cultural practices. • Pedestrian and other access along foreshore within potential sensitive and vulnerable habitats, including turtle and shorebird nesting areas – access during nesting and hatching season may pose a threat to vulnerable species. • Environmental weeds present – may impact the conservation value within the precinct.
2 – Northern Cooya Beach Includes land for conservation.	• Cultural sites vulnerable to coastal processes and foreshore degradation that may impact cultural practices. • Illegal clearing to create informal beach access tracks through the vegetation in the foreshore area – these activities may not meet the outcomes of the Conservation zone code, including biological diversity, ecological integrity and scenic amenity. • Environmental weeds present – may impact the conservation value within the precinct.
3 – Central Cooya Beach Populated precinct with land for conservation and significant number of environmental weeds present.	• Cultural sites vulnerable to coastal processes and foreshore degradation that may impact cultural practices. • Illegal clearing to create informal beach access tracks through the vegetation in the foreshore area – these activities may not meet the outcomes of the Conservation zone code, including biological diversity, ecological integrity and scenic amenity. • Environmental weeds present – may impact the conservation value within the precinct.
4 – Southern Cooya Beach Populated precinct with land conservation and environmental weeds present.	• Cultural sites vulnerable to coastal processes and foreshore degradation that may impact cultural practices. • Illegal clearing to create informal beach access tracks through the vegetation in the foreshore area – these activities may not meet the outcomes of the Conservation zone code, including biological diversity, ecological integrity and scenic amenity. • Environmental weeds present – may impact the conservation value within the precinct.

5 Management plan

The following section outlines the adaptive management approach to address the threats and challenges identified for the Cooya Beach foreshore area. The objectives for management have been identified to inform measures for management success. Priorities have also been set to appropriately guide management of the foreshore threats and challenges of the immediate, medium-term and longer-term timeframes. The objectives and priorities shape the management actions for each precinct. In addition, any monitoring and evaluation activities that are to take place following the implementation of the actions will also be summarised to measure the progress of the foreshore management.

5.1 Management objectives

Objectives are useful for measuring the success of the management actions undertaken. They have been informed by the community values identified through the engagement process. The objectives will guide the metrics for monitoring and evaluation of the management actions. They can be applied at the whole of foreshore (community) and precinct scale.

Management objectives for Cooya Beach foreshore

- Maintain the overall natural form and function of the beach.
- Maintain and preserve the cultural value of the beach.
- Enhance and maintain vegetation condition – littoral rainforests, dune vegetation for vulnerable species and to prevent dune erosion.
- Build positive behaviour change outcomes to minimise adverse impacts of foreshore use.
- Proactively undertake weed management to restore native vegetation habitats.
- Monitor the presence and health of potential turtle and shorebird nesting sites in foreshore areas.
- Enforce Local Laws for illegal clearing to prevent further the formation of unauthorised and informal beach access tracks.

5.2 Management prioritisation

Prioritisation of the management actions has been assigned as immediate, medium-term or future.

1 **Immediate** (recommend implementation within next 12 months)

Actions for immediate prioritisation include sites where weeds are present and it is necessary to eradicate the weeds and revegetate the site with native vegetation cover. Environmental weeds pose a significant threat to the values of the Cooya Beach residents, including the natural habitats and wildlife. Actions also revolve around access and use of the foreshore area, such as for fishing or pedestrians. The uses may pose a threat the sensitive habitats and management actions are focussed on minimising the impact.

2 **Medium-term** (recommend implementation within next 2-3 years)

Medium term priority actions are recommended to be implemented within the next two to three years. These actions are important for the management of the foreshore precinct, however, they require community engagement and education to understand their benefits. There is an element of community involvement with the medium-term actions.

3 **Future** (recommend implementation within 5 years)

Future management actions are those that first require an evaluation of the outcomes from immediate to medium-term actions that have been undertaken before being implemented. It is recommended future actions are implemented within five years of the plan's adoption. This timeframe allows sufficient time for immediate actions to be implemented and their progress and success to be evaluated.

5.3 Management actions

Management actions and their priorities for the Cooya Beach foreshore are summarised in Table 7. Maps of the management actions for each precinct are provided in Attachment C. It should be noted that public consultation will occur before any management actions are implemented.

Table 7. Cooya Beach foreshore precinct management actions

	All precincts	*Precinct 1*	*Precinct 2*	*Precinct 3*	*Precinct 4*
Outcome 1: **Preserve the cultural, social and environmental values of the foreshore area, including cultural land practices, dune vegetation, and turtle and shorebird nesting sites.**					
A1.1: Undertake beach monitoring of turtle and shorebird nesting sites during nesting and hatching seasons to understand the impact foreshore access may have on these habitats. Survey vegetation cover to assess revegetation requirements and progress to support nesting habitats.	3				
A1.2: Establish a platform on the DSC Environmental Hub giving residents and visitors the ability to upload information and photos about flora and fauna species they have noticed in the foreshore.	1				
A1.3: Establish an additional, clearly defined and formalised shared use access track in consultation with the Cooya Beach community behind the dune adjacent to Bougainvillea Street for safe thoroughfare within the foreshore.	2				
A1.4: Collaborate with Traditional Owners to maintain and preserve cultural heritage sites within the foreshore area.	1				
A1.5: Continue the boat ramp as a shared maintenance area in collaboration with all stakeholders to maintain safe access for all vessels.		1			
A1.6: Undertake a preliminary costing assessment for an additional toilet block along the foreshore for consideration in the 2022-23 Operational Plan.	1				

	All precincts	*Precinct 1*	*Precinct 2*	*Precinct 3*	*Precinct 4*
Outcome 2: **Restore the conservation value of the foreshore area by reducing the presence and impact of environmental weeds.**					
A2.1: Undertake dune revegetation with native species (see Attachment D) within a 10 m buffer landward of the HAT mark and regenerate cleared land to stabilise the dune protecting against erosion. Install fencing around the revegetated area to reduce damage or clearing and encourage regrowth.	1				
A2.2: Clear and revegetate the foreshore area with appropriate native species in consultation with residents and community.					1
A2.3: Formalise and maintain defined access tracks and install appropriate signage at the beach and land entrances. This is to minimise the impact on the frontal dune. Issue fines for people found to be illegally clearing under Local Law No. 4 (Local Government Controlled Areas, Facilities and Roads).		2	1	1	1
A2.4: Establish a weed eradication and maintenance program in conjunction with the Biosecurity Plan to remove environmental weeds present in the foreshore area and undertake revegetation with native species (see Attachment D).	1				
Outcome 3: Build positive behaviour change outcomes to minimise adverse impacts of foreshore use.					
A3.1: Undertake a community education program to communicate knowledge around environmental concerns such as weeds, including transfer and establishment, awareness and management.	2				
A3.2: Undertake a community education program in collaboration with local Traditional Owners to communicate knowledge around the cultural significance and uses of the foreshore. For example, invite community members to participate in a cultural tour of Cooya Beach.	2				
A3.3: Include crocodile awareness information when undertaking new programs (e.g., booklets for walks).	1				

5.4 Monitoring and evaluation

The success of the management actions is measured through monitoring and evaluation mechanisms. The monitoring focusses on the sensitive and vulnerable environments, including turtle and shorebird nesting habitats, and key coastal vegetation habitats.

Nesting habitats

The habitat monitoring should be undertaken to observe where turtle and shorebird nesting habitats are present in the foreshore area and to understand the vegetation composition of these habitats. Turtle monitoring should be undertaken based on the Queensland Marine Turtle Field Guide (Attachment E) between October and May to assess the seasonal use of these habitats by turtles (QPWS, DES 2016). Guidelines for shorebird monitoring will need to be developed based on local knowledge.

It is recommended monitoring be undertaken in partnership with the Indigenous Rangers and local community groups. In addition, a platform on the DSC Environmental Hub website should be created for residents and visitors to submit photos and information regarding any turtles or shorebirds they notice when using the foreshore. The purpose of the habitat monitoring is to understand which species are accessing the foreshore area for nesting and hatching, as well as the vegetation composition of these habitats.

Vegetation

The vegetation monitoring is a simple measure for the percentage of cover and survival success in relation to the revegetation of the foreshore. This monitoring should be undertaken on a yearly basis to record the survival rate, particularly when undertaking revegetation activities. It is recommended that vegetation is monitored on a yearly basis at the end of the wet season.

The purpose of collecting information about the success of revegetation and other site management issues such as exotic plants (environmental weeds), other threats, habitat quality and connectivity, and significant species values is to be able to refine and direct resources accordingly. Flexibility in program delivery is required to maintain the condition of assets such as plantings, respond to threats as they change through time and account for new values if they emerge during the delivery of the project.

Monitoring and evaluation metrics

Table 8 outlines the monitoring and evaluation metrics for the corresponding management action to evaluate the progress and success of implementation. A detailed method for rapid vegetation assessment is supplied in Attachment E.

Table 8. Foreshore management action monitoring and evaluation metrics

Management action	Monitoring	Evaluation	Timing
Fauna monitoring	• Nesting species • Vegetation composition of nesting habitats	• Turtle tracks, bird nests, animal health • Population dynamics	Nesting season
Vegetation monitoring	• Species specific observations to identify which species may be doing poorly • Weed cover within each of the canopy layers (top 5 transforming weed species)	• Measure of the percentage survival of revegetation • Percentage survival of key species • Percentage cover over canopy layers of weeds • Percentage of bare/disturbed ground • Natural recruitment • Habitat connectivity • Significant species	Annual

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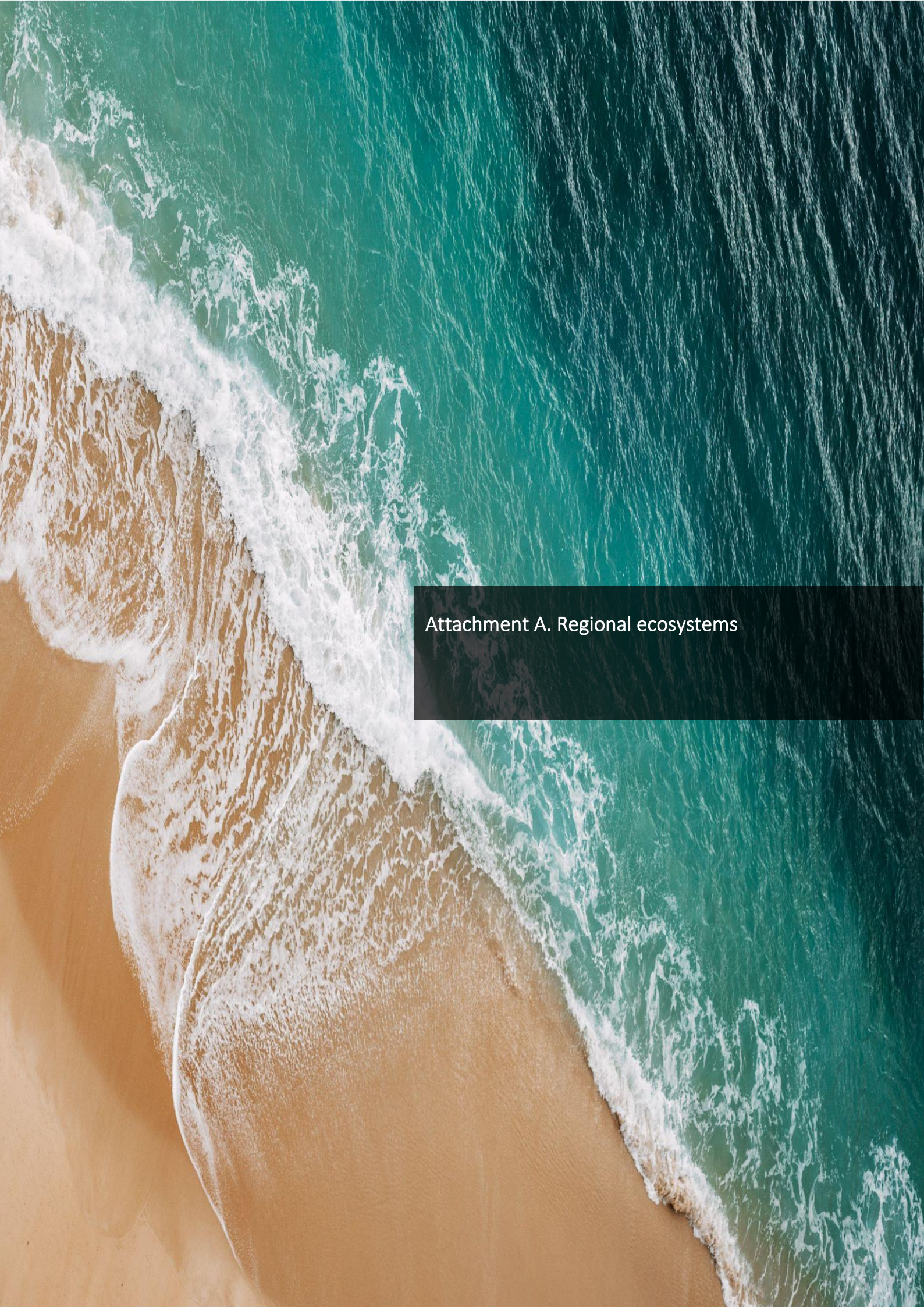
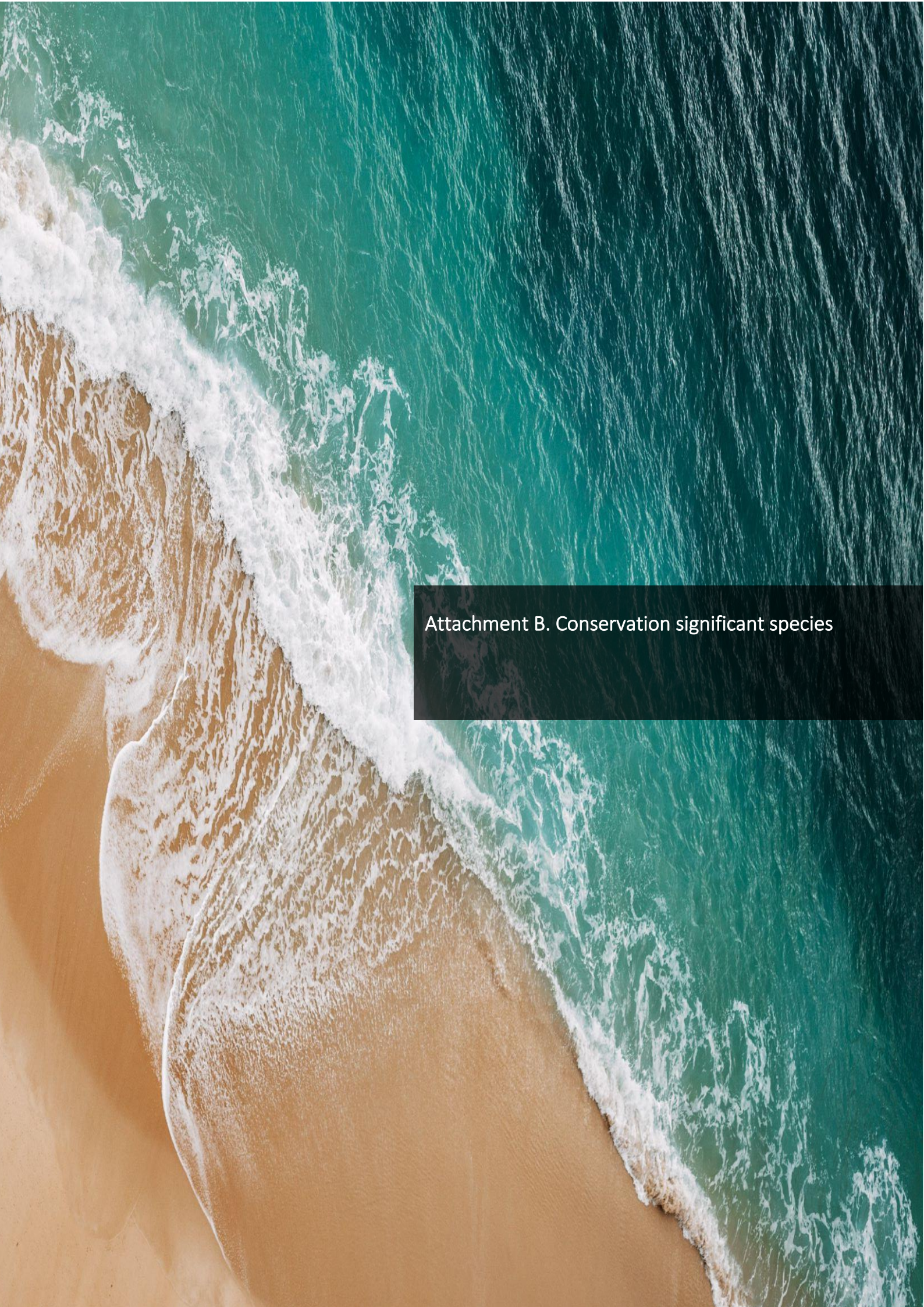


Attachment A. Regional ecosystems

Table 9. Cooya Beach regional ecosystems (REs)

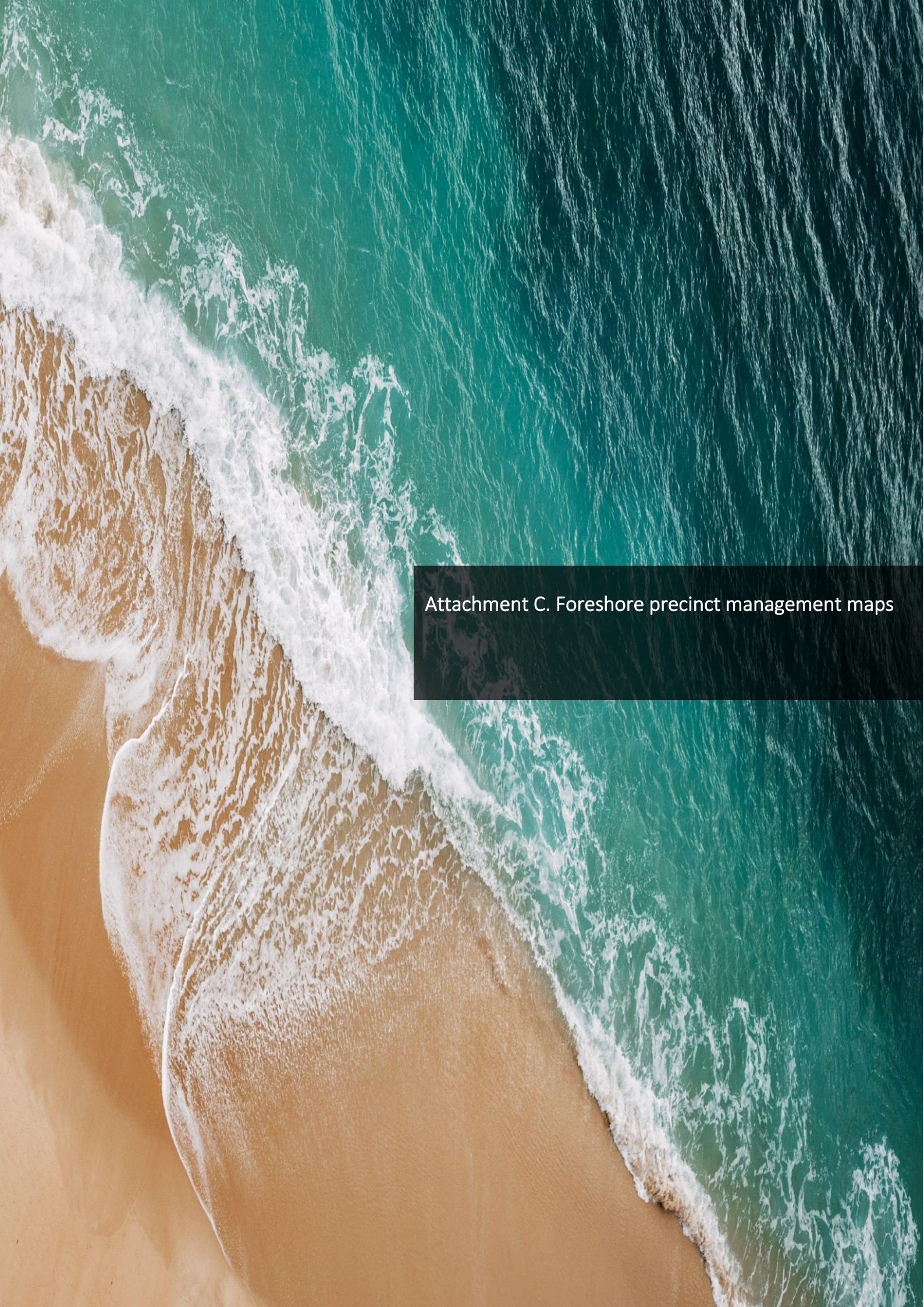
RE	Mapped RE description	VM Class	BD Status
7.1.1	Mangrove closed scrub to open forest. Sheltered coastlines, estuaries, and deep swales between dunes, on fine anaerobic silts, inundated with saline water at high tide.	LC	NC
7.2.1c	Closed forest with *Calophyllum inophyllum*, *Terminalia arenicola*, *Dillenia alata*, *Myristica insipida*, *Planchonella obovata*, *Millettia pinnata*, and *Hibiscus tiliaceus*. Beach ridge deposits adjacent to the foredune, in the very wet rainfall zone.	E	E
7.2.2a	Notophyll vine forests, often with *Acacia* emergents. Species commonly include *Cupaniopsis anacardioides*, *Diospyros geminata*, *Canarium australianum*, *Alphitonia excelsa*, *Acacia crassicarpa*, *Pleiogynium timorense*, *Chionanthus ramiflorus*, *Mimusops elengi*, *Polyalthia nitidissima*, *Millettia pinnata*, *Geijera salicifolia*, *Ficus opposita*, *Sersalisia sericea*, *Terminalia muelleri*, *T. arenicola*, *Drypetes deplanchei*, and *Exocarpos latifolius*. Lowlands on dune sands, of the moist and dry rainfall zones.	OC	E
7.2.7a	Complex of open shrubland to closed shrubland, grassland, low woodland and open forest. Includes pure stands of *Casuarina equisetifolia*, and *Acacia crassicarpa*, *Syzygium forte* subsp. *forte*, *Calophyllum inophyllum* and *Pandanus* spp. woodland to open forest. Beach strand and foredune.	OC	E



Attachment B. Conservation significant species

Table 10. Conservation significant fauna and the likelihood for occurrence at Cooya Beach

Scientific name	Common name	EPBC Act	NC Act	Likelihood of occurrence
		Shorebirds		
Esacus magnirostris	Beach-stone curlew	—	V	Likely
Casuarius casuarius johnsonii	Southern cassowary	E	E	Possible
Calidris ferruginea	Curlew sandpiper	CE	CE	Likely
Numenius madagascariensis	Eastern curlew	CE	E	Likely
Charadrius mongolus	Lesser sand plover	E	E	Likely
Charadrius leschenaultii	Greater sand plover	V	V	Likely
Calidris canutus	Red knot	E	E	Likely
		Sea turtles		
Natator depressus	Flatback turtle	V	V	Likely
Chelonia mydas	Green turtle	V	V	Likely
Eretmochelys imbricata	Hawksbill turtle	V	E	Likely
Dermochelys coriacea	Leatherback turtle	E	E	Possible
Caretta caretta	Loggerhead turtle	E	E	Likely
Lepidochelys olivacea	Olive ridley turtle	E	E	Likely
		Other		
Hirundapus caudacutus	White-throated needletail	V	V	Likely
Cyclopsitta diophthalma macleayana	Macleay's fig-parrot	—	V	Likely
Crocodylus porosus	Estuarine crocodile	—	V	Likely



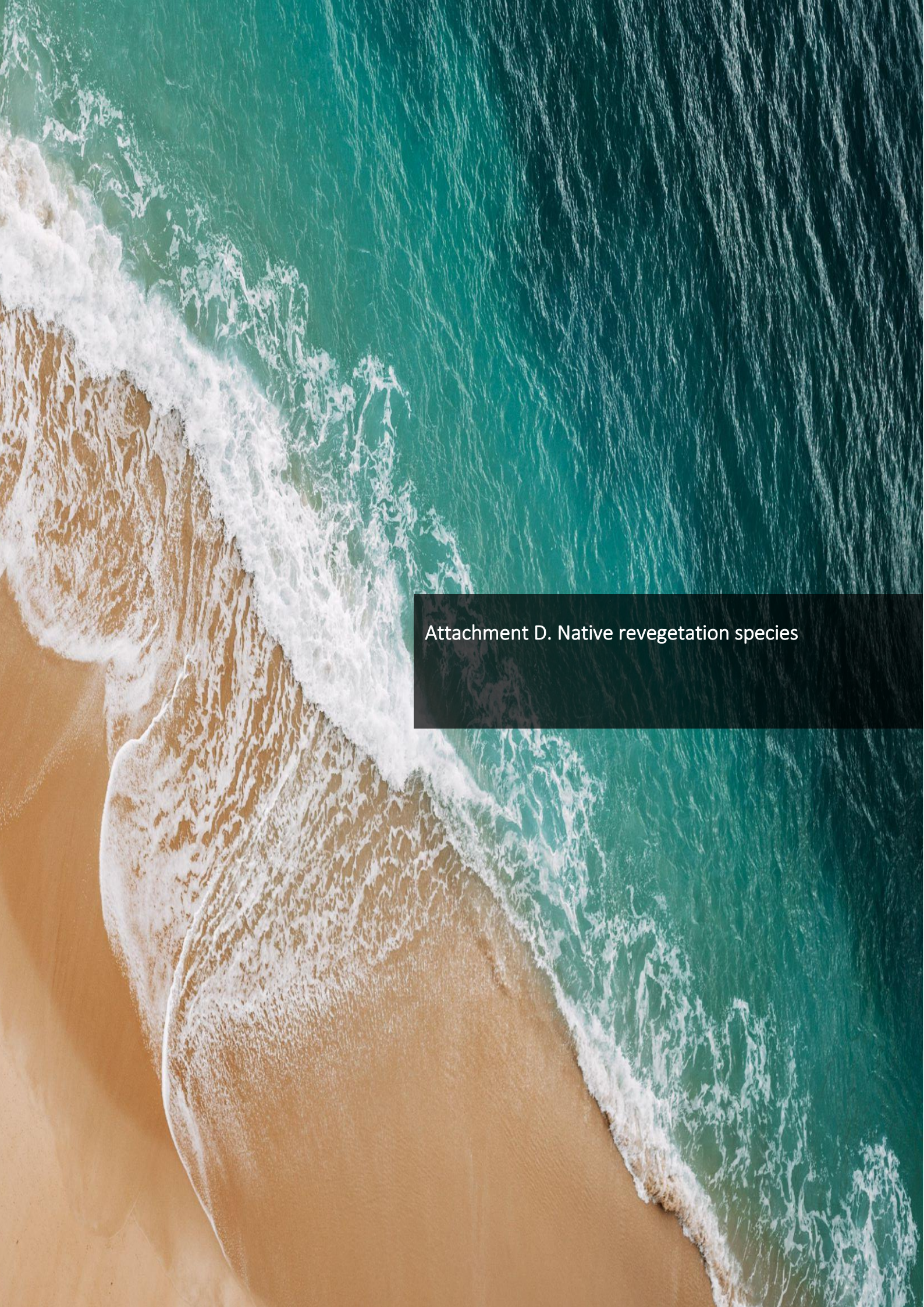
Attachment C. Foreshore precinct management maps

Figure 7. *Cooya Beach foreshore precinct 1 management actions.*

Figure 8. *Cooya Beach foreshore precinct 2 management actions.*

Figure 9. *Cooya Beach foreshore precinct 3 management actions.*

Figure 10. *Cooya Beach foreshore precinct 4 management actions.*



Attachment D. Native revegetation species

Table 11. Native revegetation species (highlighted species are key components of remnant ecosystems) (Florentine, Pohlman and Westbrooke 2015)

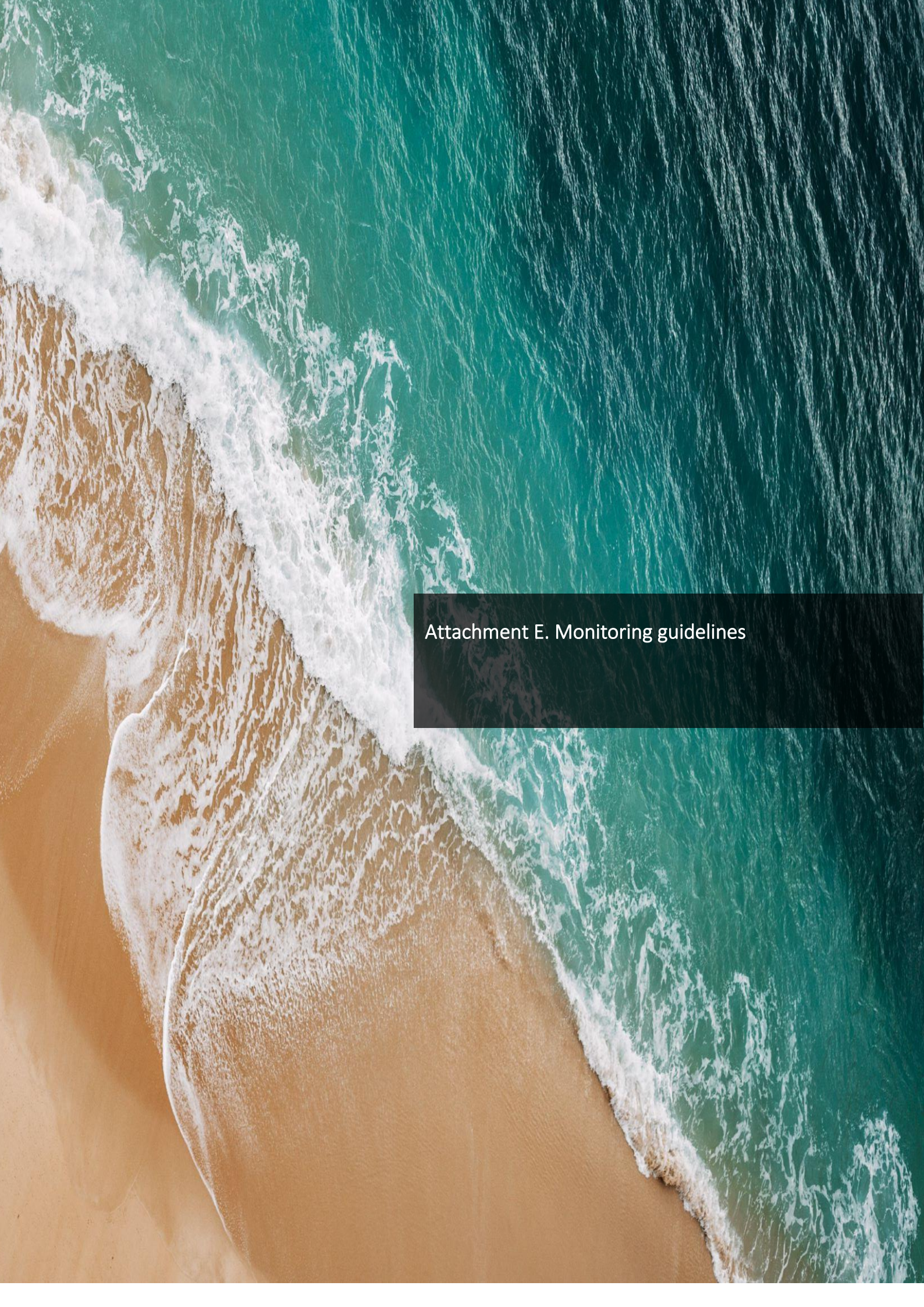
Botanical name[1]	Common name	Precinct 1	Precinct 2	Precinct 3	Precinct 4
*Acacia crassicarpa**	Northern golden wattle				✔
*Acacia mangium**	Broadleaf salwood				✔
*Acacia oraria**	Coastal wattle				✔
Aglaia elaeagnoidea	Coastal boodyarra				✔
*Alphitonia petriei**	Sarsaparilla				✔
Alyxia spicata	Chain fruit	✔	✔	✔	✔
Atractocarpus fitzalanii	Brown gardenia				✔
Barringtonia asiatica	Mango bark, Mango pine				✔
Barringtonia calyptrata	Mango pine				✔
Beilschmiedia obtusifolia	Blush walnut				✔
Blepharocarya involucrigera	Rose butternut				✔
Brachychiton acerifolius	Illawarra flame tree				✔
Breynia cernua	Fart bush				✔
Calophyllum inophyllum	Beach calophyllum				✔
Calophyllum sil	Blush touriga				✔
Canarium vitiense	Canarium				✔
Canavalia rosea	Beach bean	✔	✔	✔	✔
Carallia brachiata	Corky bark, Fresh water mangrove				✔
*Casuarina equisetifolia**	Beach casuarina				✔
Cerbera manghas	Dog bane				✔
Chionanthus ramiflora	Native olive				✔
*Clerodendrum floribundum**	Lolly bush				✔

[1] * denotes pioneer species that will grow and establish quickly, allowing for natural recruitment or planting of secondary species.

Botanical name[1]	Common name	Precinct 1	Precinct 2	Precinct 3	Precinct 4
Clerodendrum inerme	Scrambling clerodendrum	✔	✔	✔	✔
*Clerodendrum longiflorum**	Long flowered clerodendrum				✔
*Colubrina asiatica**	Beach berry bush	✔	✔	✔	✔
*Cordia subcordata**	Sea trumpet				✔
Crinum pedunculatum	Beach lily, Swamp lily	✔	✔	✔	✔
Cupaniopsis anacardioides	Beach Tamarind				✔
Cyperus pedunculatus		✔	✔	✔	✔
Deplanchea tetraphylla	Golden bouquet tree				✔
Dillenia alata	Red beech				✔
Diospyros compacta	Australian ebony				✔
*Dodonea viscosa**	Hop bush	✔	✔	✔	✔
Elaeodendron melanocarpum	False olive				✔
Eucalyptus plattyphylla	Ghost gum				✔
*Euroschinus falcata**	Pink poplar				✔
Ficus benjamina	Weeping fig				✔
Ficus drupacea	Drupe fig				✔
Ficus microcarpa	Small fruited fig				✔
Ficus opposita	Sandpaper fig				✔
Ficus racemosa	Cluster fig				✔
*Ganophyllum falcatum**	Daintree hickory				✔
Glochidion harveyanum	Harvey's buttonwood				✔
Glochidion philippicum	Daintree cheese tree				✔
Gmelina dalrympleana	White beech				✔
Gomphandra australiana	Buff beech				✔
*Guioa acutifolia**	Glossy tamarind				✔
Haemodorum coccineum	Blood root	✔	✔	✔	✔

Botanical name[1]	Common name	Precinct 1	Precinct 2	Precinct 3	Precinct 4
*Hibiscus tiliaceus**	Coast cottonwood				✔
Intsia bijuga	Kwila				✔
*Ipomoea pes-caprae**	Coastal morning glory	✔	✔	✔	✔
Jagera pseudorhus	Foambark				✔
Livistona muelleri	Northern Cabbage Tree Palm				✔
Lophostemon suaveolens	Swamp mahogany, swamp box				✔
*Macaranga tanarius**	Kamala, Blush macaranga				✔
Mallotus philippensis	Red Kamala				✔
Maytenus fasciculiflora	Orangebark				✔
Melaleuca leucadendra	Weeping paperbark				✔
Melaeuca viridiflora	Broad leaved paperbark				✔
Melia azederach	White cedar				✔
Micromelum minutum	Lime berry				✔
Miliusa brahei	Rasberry jelly plant				✔
*Millettia pinnata**	Pongamia tree				✔
Mimusops elengi	Red coondoo				✔
Mischocarpus exangulatus	Red bell mischocarp				✔
Morinda citrifolia	Rotten cheesefruit				✔
Pandanus tectorius	Beach pandan				✔
*Pittosporum ferrugineum**	Rusty pittosporum				✔
Planchonia careya	Cocky apple				✔
Pleiogynium timorense	Burdekin plum				✔
*Polyscias elegans**	Celerywood				✔
Pouteria chartacea	Thin leaved coondoo				✔
Pouteria obovata	Yellow boxwood				✔
*Premna serratifolia**	Coastal premna				✔

Botanical name[1]	Common name	Precinct 1	Precinct 2	Precinct 3	Precinct 4
Ptychosperma elegans	Solitaire palm				✔
Rhus taitensis	Sumac				✔
*Scaevola taccada**	Beach lettuce	✔	✔	✔	✔
Schefflera actinophylla	Umbrella tree				✔
Scolopia braunii	Brown birch				✔
Sporobolus virginicus	Sand couch	✔	✔	✔	✔
Sterculia quadrifida	Peanut tree				✔
Syzygium angophoroides	Yarrabah satinash				✔
Syzygium hemilamprum (Syn. Acmena hemilampra)	Blush satinash				✔
Tarenna dallachiana	Tree ixora				✔
Terminalia arenicola	Brown damson				✔
*Terminalia catappa**	Indian almond				✔
Terminalia microcarpa	Damson plum				✔
Terminalia muelleri	Mueller's damson				✔
*Thespesia populneoides**	Tulip tree				✔
Thuraea involuta	Tropical beachgrass	✔	✔	✔	✔
Timonius timon	False fig				✔
Vitex rotundifolia	Beach vitex	✔	✔	✔	✔
*Vigna marina**	Beach pea	✔	✔	✔	✔



Attachment E. Monitoring guidelines

Rapid Vegetation Assessment Method Data collection

General survey information	Survey ID	Description of survey					
	Assessor Name/s	Descriptive text					
	Date of record	Date					
	Assessment number	Assessment	1	2	3	4	5
Specific location	General Location	Descriptive text					
	Easting	GPS spatial data					
	Northing	GPS spatial data					
	Spatial uncertainty	GPS spatial data					
Desired cover by year 5							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Under							
Mid							
Over							
Current overall cover							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Under							
Mid							
Over							
Percentage survival of each layer							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Under							
Mid							
Over							
Species specific observations							
	% Understorey		% Mid-storey		% Overstorey		%
Sp. 1							
Sp. 2							
Sp. 3							
Sp. 4							

Sp. 5							
Environmental weeds cover							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Under							
Mid							
Over							
High threat environmental weeds							
	% Understorey		% Mid-storey		% Overstorey		%
Sp. 1							
Sp. 2							
Sp. 3							
Sp. 4							
Sp. 5							
Bare ground created by disturbance							
	Present	1 (1-5)	2 (6-25)	3 (26-50)	4 (51-75)	5 (76-100)	Absent
Vehicles							
People							
Erosion							
Other							
Natural recruitment							
	Absent		Present		%		
Under							
Mid							
Over							
Connectivity							
	Patch size (ha)		Distance (km)		Connection		
Patch 1					H	M	L
Patch 2					H	M	L
Patch 3					H	M	L
Significant species identified							
	Location	Population size	Threat		Proposed response		

Sp. 1				
Sp. 2				
Sp. 3				

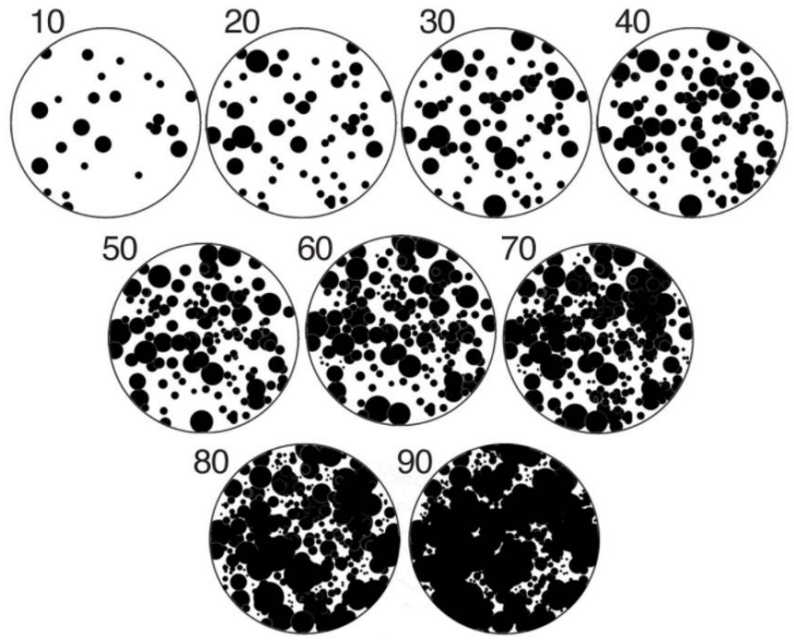
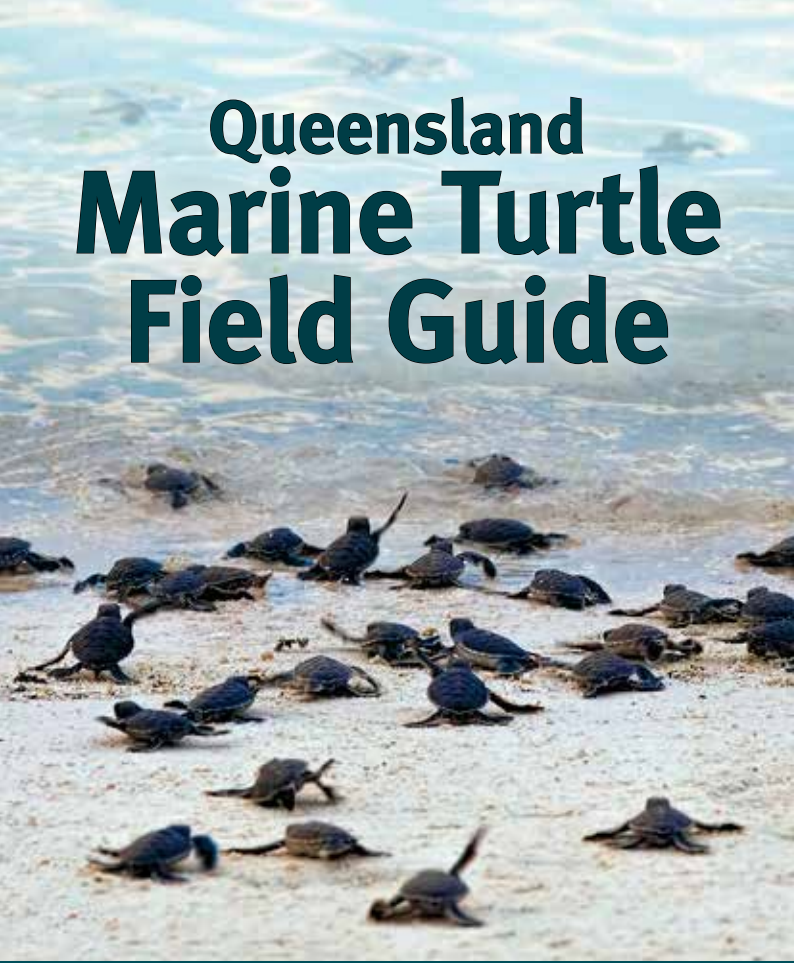


Figure 11. *Schematic representation of percentage cover categories.*

Queensland Marine Turtle Field Guide



Nest to Ocean
Turtle Protection Program

Australian Government

Queensland Government


APN

Queensland's coast has some of the most important marine turtle nesting sites in the world. Six species of threatened marine turtles nest along our idyllic beaches. These rookeries support significant nesting populations of green, loggerhead, hawksbill, flatback and olive ridley turtles.

One of the most serious threats to nesting turtle populations is the destruction of their eggs and hatchlings by predators. Feral pigs have been found to be responsible for destroying over 70 per cent of turtle nests at nesting beaches on Cape York, continued loss at this rate is not sustainable. Other predators include foxes, dogs, dingoes and goannas.

To reduce predation on marine turtle nests and help the recovery of threatened marine turtle populations, the Australian and Queensland Governments have together invested nearly $7million in the Nest to Ocean Turtle Protection Program. The program supports predator control and turtle monitoring at priority nesting beaches. It also assists Traditional Owner and community groups to increase their participation in these important activities.

This field guide has been developed as part of the Nest to Ocean Turtle Protection Program. Correctly identifying marine turtles, and the animals that prey on their nests, provides valuable information about turtle populations and shows where predator control activities are most needed.

Nest to Ocean
Turtle Protection Program

Front Cover: Turtle hatchlings © K Jorgen
Inside Cover: Steven Marpoondin (APN Cape York) © *Brian Ross*

Contents

Marine Turtle Species Identification Key

Indo-Pacific Marine Turtles

Carapace with:
- No continuous ridges
- Large scales
- Claws on flippers

Carapace with:
- 5 distinct continuous ridges
- No large scales
- No claws on flippers

Leatherback Turtle
Dermochelys coriacea

4 pair costal scales

5 pair (rarely 6) costal scales

Carapace longer than wider
Red-brown to brown
No pores in scale of bridge

Loggerhead Turtle
Caretta caretta

6 pair or more costal scales

Carapace more circular
Grey-green
Pores in scale of bridge

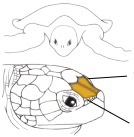
Olive Ridley Turtle
Lepidochelys olivacea

2 pair prefrontal scales
Thick overlapping carapace scales

2 pair prefrontal scales

Hawksbill Turtle
Eretmochelys imbricata

1 pair prefrontal scales
No thick overlapping carapace scales

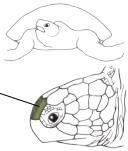


1 pair prefrontal scales

Preocular scales

Low domed carapace with upturned edges
Preocular scales
Olive grey

Flatback Turtle
Natator depressus



High domed carapace
No preocular scales
Light to dark green with dark mottling

Green Turtle
Chelonia mydas

Photographs of Adults and Hatchlings

Green Turtle *Chelonia mydas* Page 10

Olive Ridley Turtle *Lepidochelys olivacea* Page 14

Hawksbill Turtle *Eretmochelys imbricata* Page 18

Loggerhead Turtle *Caretta caretta* Page 12

Flatback Turtle *Natator depressus* Page 16

Leatherback Turtle *Dermochelys coriacea* Page 20

Marine Turtle Track Identification Key

Alternating Stroke

Flipper marks alternate

Track Features

Early morning monitoring is best as tracks will deteriorate over time. The clarity of tracks can be affected by flipper damage, terrain, sand moisture, tides, wind and weather. Look for several key identifying features, along different sections of track.

The key track identification features are:

- Stroke Style
- Track Width
- Hind Flipper Marks
- Front Flipper Marks
- Plastron Drag
- Tail Drag

Loggerhead

Track Width
Less than 1 meter

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag
Not present

Hawksbill

Track Width
Approx. 70-80 cm

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag

Olive Ridley

Track Width
Approx. 70-80 cm

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag

Breast Stroke

Flipper marks side by side

Green

Track Width
Approx. 94-144 cm

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag

Flatback

Track Width
Approx. 90-100 cm

Hind Flipper

Front Flipper

Plastron Drag

Tail Drag

Leatherback

Track Width
Greater than 2 meters

Hind Flipper

Front Flipper

Plastron Drag
Not Visible

Tail Drag

Track Direction

Clues to determine track direction:

Turtles push sand backwards, the higher sand mound is at the back.

If track overlaps, the top track is the returning track.

Sand is always thrown back over the emerging track when digging.

Measuring Width

Measure from outer edge of track. This may be the front or rear flipper, depending on species.

Basic Beach Monitoring

Guidelines on how to **Record** data and implement **Action** during a basic beach survey (see page 9). These may be tailored to suit individual monitoring programs and implemented in accordance with training.

Record

Species Identification: Use track or sighting to identify species.

GPS Nest Location: Note GPS coordinates & waypoint number.

False Crawl: Track with no nest.

Extent of Damage: Partial or complete destruction of nest.

Evidence of Predation: Diggings, tracks, sighting.

Predator Identification: Use track or sighting to identify species.

Hatchlings Emerged: Yes, hatchling tracks or sighting.

Tag Information: Note tag ID number and its location on turtle.

Curved carapace length (CCL): From front (where skin and carapace meet), down midline to back edge of carapace (over tail).

Action

Photograph: To verify species and/or nest damage/predation.

Mark Nest: Install marker to indicate nest location (if required).

Bury Eggshells and Mark Track: To avoid record duplication; mark track line above the high tide mark.

Submit Data: Project manager to submit data to the relevant Queensland Department.

Basic Beach Survey

Traverse beach to locate fresh turtle tracks.
Walk along the high tide line or drive on the wet sand just below the high tide mark

Equipment Checklist

- GPS (Use datum WGS 84 and decimal degrees)
- Data sheets or charged data recording device
- Pencil
- Tape measure
- Camera
- Personal safety gear
- Torch (night monitoring)
- Spare batteries
- Monitoring field guide

Record fresh tracks only

Adult Track No nesting turtle

Identify Species

refer to **Track Identification** (Pages 6-7)

Is there a nest or is it a false crawl?

Nest

Record / Action
- Species ID
- GPS Nest Location
- Mark Nest

Is nest damaged?

No

Yes

Record / Action
- Extent of Damage
- Evidence of Predation
- Predator ID (refer to pages 22-25)
- Photograph
- Bury Eggshells

False Crawl

Record / Action
- Species ID
- False Crawl

Unsure

Record / Action
- Species ID
- GPS Nest Location
- Mark Nest
- Photograph

Adult Track Nesting turtle

Identify Species

refer to **Species Identification** (Pages 3-5, 10-21)

Once female has settled into laying or has completed nesting

Record / Action
- Species ID
- Tag Information
- Curved carapace length
- GPS Nest Location
- Mark Nest

Refer to Page 8 for Record / Action monitoring protocols

Hatchling Tracks Hatchlings

Identify Species

if hatchling present refer to **Species Identification** (Pages 3-5, 10-21)

Record / Action
- Species ID
- Hatchlings Emerged
- Marked Nest ID or GPS Nest Location
- Evidence of Predation
- Predator ID (refer to pages 22-25)

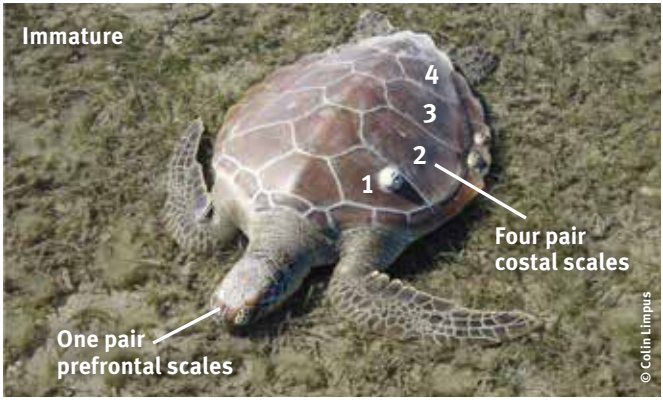
Mark monitored track with a line, above high tide mark, so it's not recorded twice

Continue and complete survey

Submit data forms and photographs for verification to project manager

Green Turtle, *Chelonia mydas*

Status: Nationally Vulnerable, Queensland Vulnerable



Key Identification Features

Breast Stroke Track

Carapace Scales

4 Pair Costal Scales

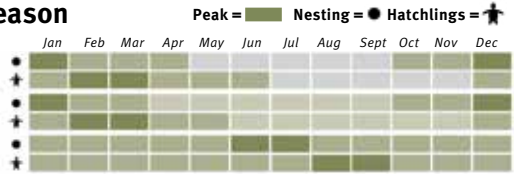
1 Pair Prefrontal Scales

Qld Nesting Sites

Adult: *Carapace is a high dome. Colour is light to dark green with dark mottling. Plastron colour is cream-white.*

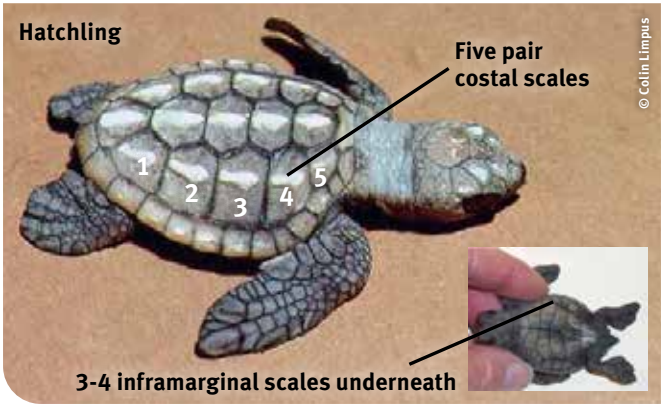
Hatchling: *Black-dark brown with white margins, white plastron.*

Breeding Season



Loggerhead Turtle, *Caretta caretta*

Status: Nationally Endangered, Queensland Endangered



Key Identification Features

Alternating Track

Carapace Scales

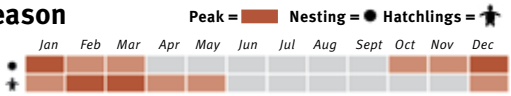
5 Pair Costal Scales

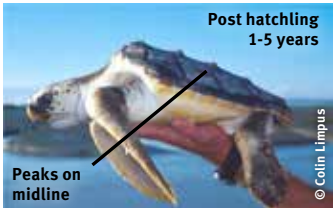
Qld Nesting Sites

Adult: *Carapace is longer than wider. Colour is red-brown to brown. Plastron colour is yellow.*

Hatchling: *Dark brown with 5 costal scales and dark plastron with 3-4 inframarginal scales.*

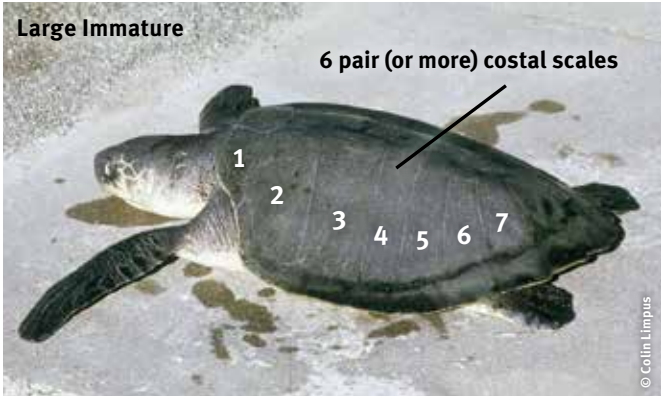
Breeding Season





Olive Ridley Turtle, *Lepidochelys olivacea*

Status: Nationally Endangered, Queensland Endangered

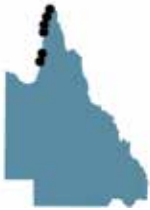


Key Identification Features

Alternating Track

Carapace Scales

6 Pair (or more) Costal Scales

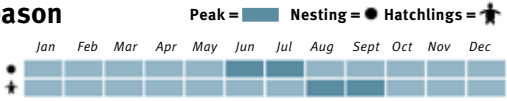


Qld Nesting Sites

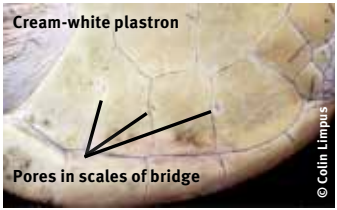
Adult: *Carapace is circular. Colour is grey-green with no conspicuous markings. Plastron colour is cream-white.*

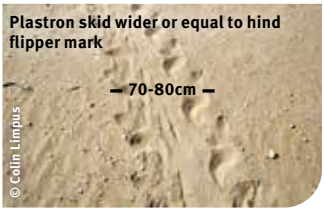
Hatchling*: Charcoal-grey/black-brown on both sides.*

Breeding Season



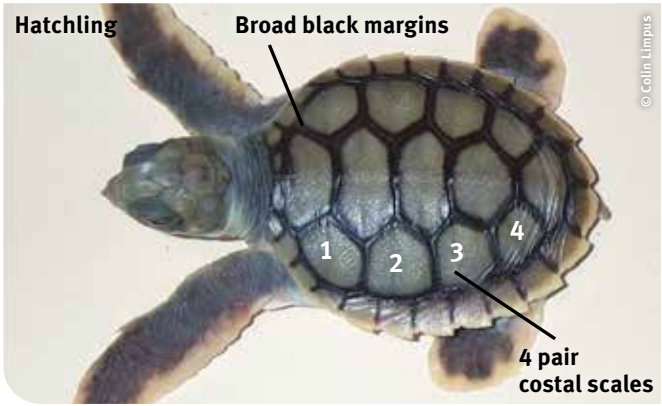
All year, peaks during dry season.





Flatback Turtle, *Natator depressus*

Status: Nationally Vulnerable, Queensland Vulnerable



Key Identification Features

Breast Stroke Track

Carapace Scales

4 Pair Costal Scales

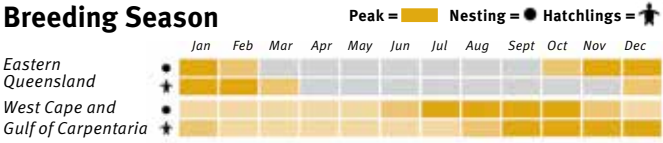
1 Pair Prefrontal Scales

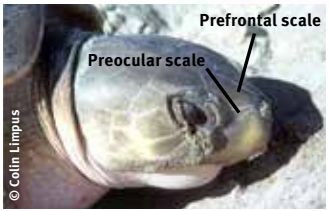
Qld Nesting Sites

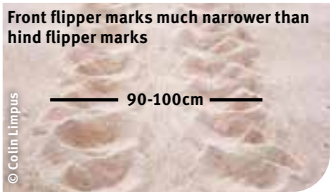
Adult: *Carapace is a low dome, smooth with upturned edges. Colour is grey to pale-grey or olive. Preocular scales. Plastron is creamy-yellow.*

Hatchling: *Olive-green, scales with broad black margin. Plastron is a solid white.*

Breeding Season

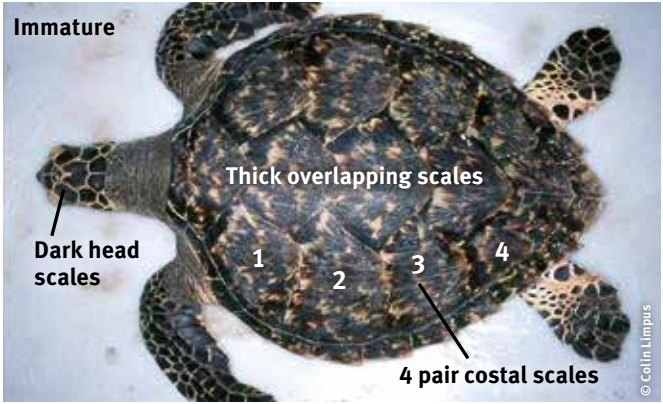


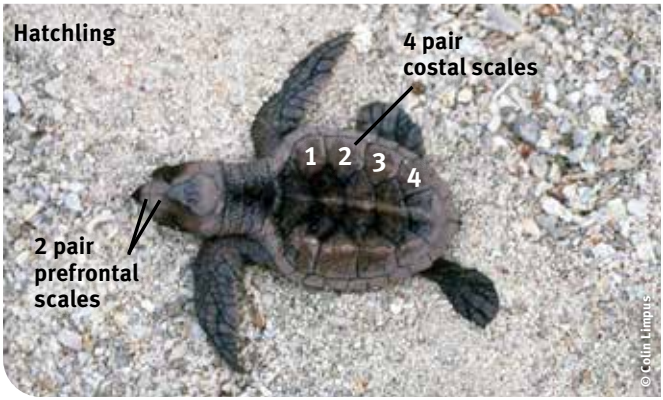




Hawksbill Turtle, *Eretmochelys imbricata*

Status: Nationally Vulnerable, Queensland Vulnerable





Key Identifcation Features

Alternating Track

Scales Thick Overlapping

4 Pair Costal Scales

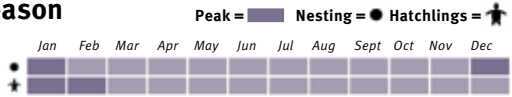
2 Pair Prefrontal Scales

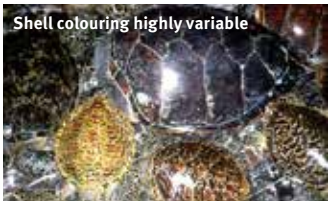
Qld Nesting Sites

Adult: *Carapace has thick overlapping scales. Colour is olive green or brown and is extensively variegated with brown/black markings. Adult plastron is yellow or white with black spots.*

Hatchlings: *Dark brown.*

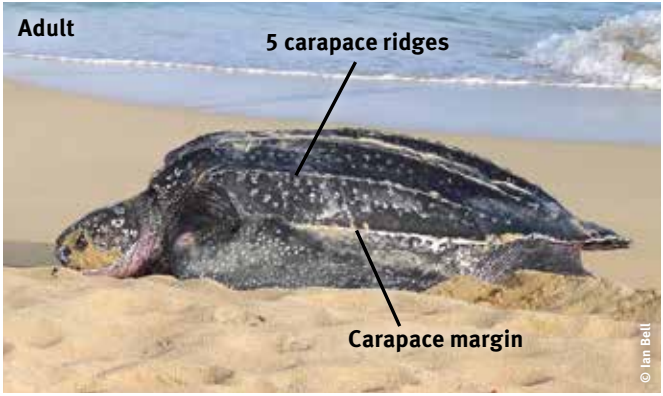
Breeding Season

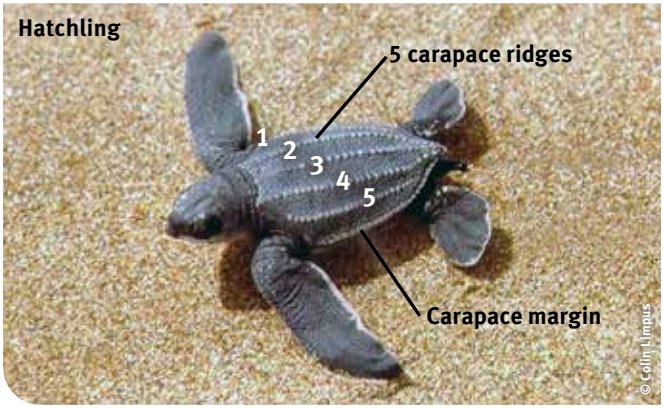




Leatherback Turtle, *Dermochelys coriacea*

Status: Nationally Vulnerable, Queensland Endangered





Key Identification Features

Breast Stroke Track

No Carapace Scales

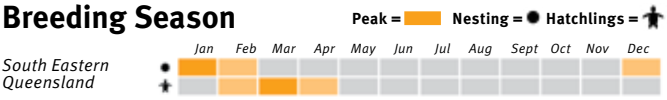
5 Carapace Ridges

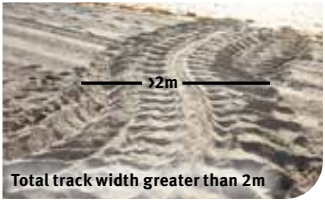
Qld Nesting Sites

Adult: *Carapace is long and pointed. Long ridges run down the length of carapace. Colour is a uniform black-brown. Soft leathery skin.*

Hatchlings: *Finely beaded, black with white markings on the carapace ridges and plastron.*

Breeding Season

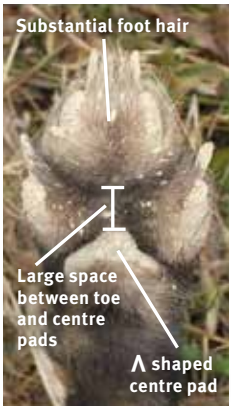




Fox

Track Identification Features

- Front foot is larger than back foot.
- Elongated oval shaped claws, may not show on track.
- Substantial foot hair, sometimes visible on track impression.
- Large space between centre pad and toe pads.
- Centre pad has a distinct inverted V shape.
- Tracks are straight, hind feet reusing front feet impressions.
- Small track width.



Management Options

- Den detection and fumigation
- Ground shooting
- Trapping
- Baiting
- Exclusion fencing
- Nest protection (cages)

Wild Dog or Dingo

Track Identification Features

- Front foot is larger than back foot.
- Little or no foot hair in between pads.
- Small space between centre pad and toe pads.
- Centre pad almost triangular.
- Foot imprint rounded.
- Tracks are straight but not as neat and aligned as a fox's track.

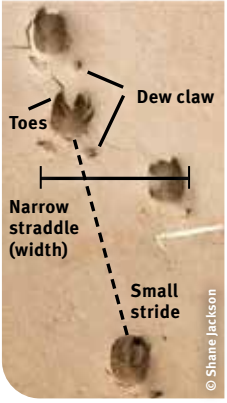
Management Options

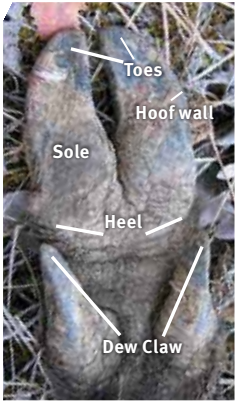
- Ground shooting
- Leg hold trapping
- Baiting (1080 or strychnine)
- Exclusion fencing
- Nest protection (cages)

Feral Pig

Track Identification Features

- Back feet slightly larger than front.
- Foot print consists of a two toe hoof and two dew claws.
- Dew claws distinctive identification feature but may not be present in harder soils.
- Small stride and narrow straddle.





Management Options

- Ground/aerial shooting
- Trapping
- Baiting
- Exclusion fencing
- Nest protection (cages)

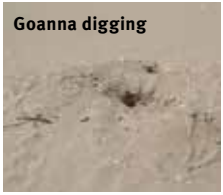
Goanna

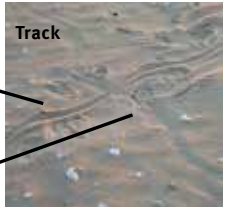
Track Identification Features

- Both walk and run tracks have alternating foot prints.
- Trail drag usually visable.

Nest Predation Identification

- Goannas burrow into nest at an angle from the side of the nest, not vertical from directly above.
- The burrow is typically domed shape, not circular.





Management Options

- Trapping
- Exclusion fencing
- Nest protection (cages)

Principles of Pest Management

Managing pest animals requires long-term control programs and a variety of approaches. Effective programs are designed around these eight principles:

1. INTEGRATION

Ensuring pest management programs are an integral part of the management of natural areas.

2. PUBLIC AWARENESS

Raising public awareness and knowledge of pests to increase community and individual participation in pest management.

3. COMMITMENT

Gaining a commitment to long term programs by the community, industry groups and government entities.

4. CONSULTATION AND PARTNERSHIP

Establishing partnerships between local communities, industry groups, state government agencies and local governments to achieve a collaborative approach.

5. PLANNING

Consistent planning at local, regional, state and national levels ensures combined resources target the agreed priorities.

6. PREVENTION

Preventing the spread of pests, and using early detection and intervention to control pests.

7. BEST PRACTICE

Using ecologically and socially responsible pest management practices to protect the environment and natural resources.

8. IMPROVEMENT

Research and regular monitoring and evaluating of programs helps improve and refine pest management practices.

Threats to Marine Turtles

Marine turtles are long-lived and slow to mature. Depending on the species they can take anywhere between 8–50 years to reach breeding age. Due to the range of threats, at their different life stages, it is thought that only 1 in 1000 hatchlings will survive to adulthood and then return to the beach to nest. For this reason it is critical to address the range of threats throughout their lifecycle.

Threats include:

- Native and introduced animals predating turtle eggs and hatchlings.
- Vehicles compacting turtle nests or forming tyre ruts that trap hatchlings.
- Humans taking turtle eggs.
- Bycatch of marine turtles in fisheries.
- Marine debris.
- Impact to breeding habitat from coastal development and artificial lighting.
- Deteriorating water quality.
- Unknown and possibly unsustainable levels of turtle harvesting, in and outside Australian waters.

What you can do:

- Support the management of predators such as pigs, dogs and foxes around turtle nesting beaches.
- Report turtle nests and predated turtle nests to your local ranger.
- Keep your dogs on a lead when walking on the beach during nesting/hatchling season.
- Drive slowly on beaches and avoid driving over nests. Drive on the wet sand below the high tide mark to avoid making wheel ruts.
- Pick up marine debris from the beach and waterways.
- Report ghost nets to your local ranger.
- At night, minimise lights on the beach, including campfires.
- Support sustainable, traditional use of adult turtles and turtle eggs.

Acknowledgements

The Queensland Parks and Wildlife Service Nest to Ocean Turtle Protection Program Team would like to acknowledge the contribution of staff from the following organisations in the development of the field guide: Western Cape Turtle Threat Abatement Alliance supported by Cape York Natural Resource Management, Balkanu Cape York Development Corporation, Aak Puul Ngantam, Feralfix, World Wildlife Fund for Nature, and University of Queensland. Also acknowledged is the input and advice of staff from our partnering Australian and Queensland Government departments.

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Green Turtles on Raine Island © Duncan Limpus

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Bp2147 June 2016