

# 2017

## Grasstree Beach Local Coastal Plan

**Acknowledgements:** This project is supported by Reef Catchments and Mackay Regional Council through funding from the Australian Government *National Landcare Programme* and Mackay Regional Council's *Natural Environment Levy*. Local Coastal Plans are based on Mackay Regional Council's *Coastal Management Guidelines* (MRC 2012). Technical geomorphic assessment of the *Grasree Beach Local Coastal Plan* area was provided by Alluvium.

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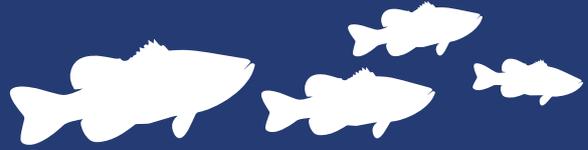
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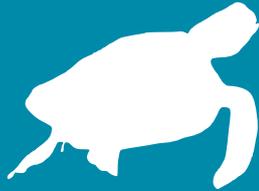
GRASSTREE BEACH  
CONTAINS  
ESSENTIAL  
HABITAT FOR  
**MANGROVE  
MOUSE**



**THE CABBAGE TREE CREEK** ESTUARY SUPPORTS  
MANGROVES WHICH PROVIDE ENVIRONMENTAL SERVICES  
INCLUDING **HABITAT FOR JUVENILE FISH, SEDIMENT  
TRAPPING AND CARBON SEQUESTRATION**



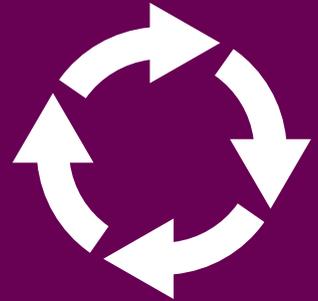
A KNOWN  
**TURTLE  
NESTING  
BEACH**



THERE ARE

**6**

**REGIONAL ECOSYSTEMS**  
WITHIN AND BORDERING  
THE COASTAL UNIT



**GRASSTREE BEACH**  
SUPPORTS PATCHES OF  
**CRITICALLY ENDANGERED**  
BEACH SCRUB

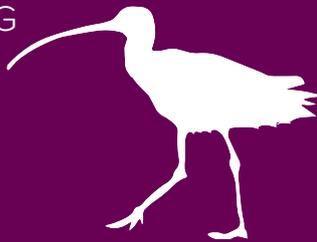


**1.8km**

OF BEACH



**HOME TO RARE AND THREATENED  
SPECIES** INCLUDING  
**MIGRATORY  
SHOREBIRDS AND  
MARINE TURTLES**



**2** **NEW**  
BEACH  
ACCESSES  
BUILT  
IN 2016



THE NEARBY  
CREEKS AND REEFS  
MAKE IT **A POPULAR  
FISHING AND  
RECREATION AREA**



**24 ha**

OF WEED CONTROL AND MAINTENANCE WORKS  
HAVE OCCURRED SINCE 2010



### Zone A

- Weed control and assisted natural regeneration
- Work with the community to develop a plan to provide additional infrastructure at Hillside Drive Park area, including a small scale lookout and additional picnic facilities
- Formalise beach accesses between Gold Street and Driftwood Close.
- Fencing
- Interpretive and regulatory signage

### Zone B

- Weed control and assisted natural regeneration
- Fence realignment
- Car park resurfacing, all abilities play equipment and basketball court repairs
- Trial vegetation restoration
- Interpretive and regulatory signage

### Zone C

- Weed control and assisted natural regeneration
- Fence realignment
- Investigate additional recreational opportunities at the southern end of the coastal unit
- Interpretive and regulatory signage

### Activities across multiple zones

- Undertake cultural heritage surveys
- Investigate ecotourism opportunities
- Implement Coastcare education and activities program
- Monitor beach profiles, flora and fauna

### Zone D

- Weed control and assisted natural regeneration
- Rationalise access tracks through reserves
- Interpretive and regulatory signage
- Fencing

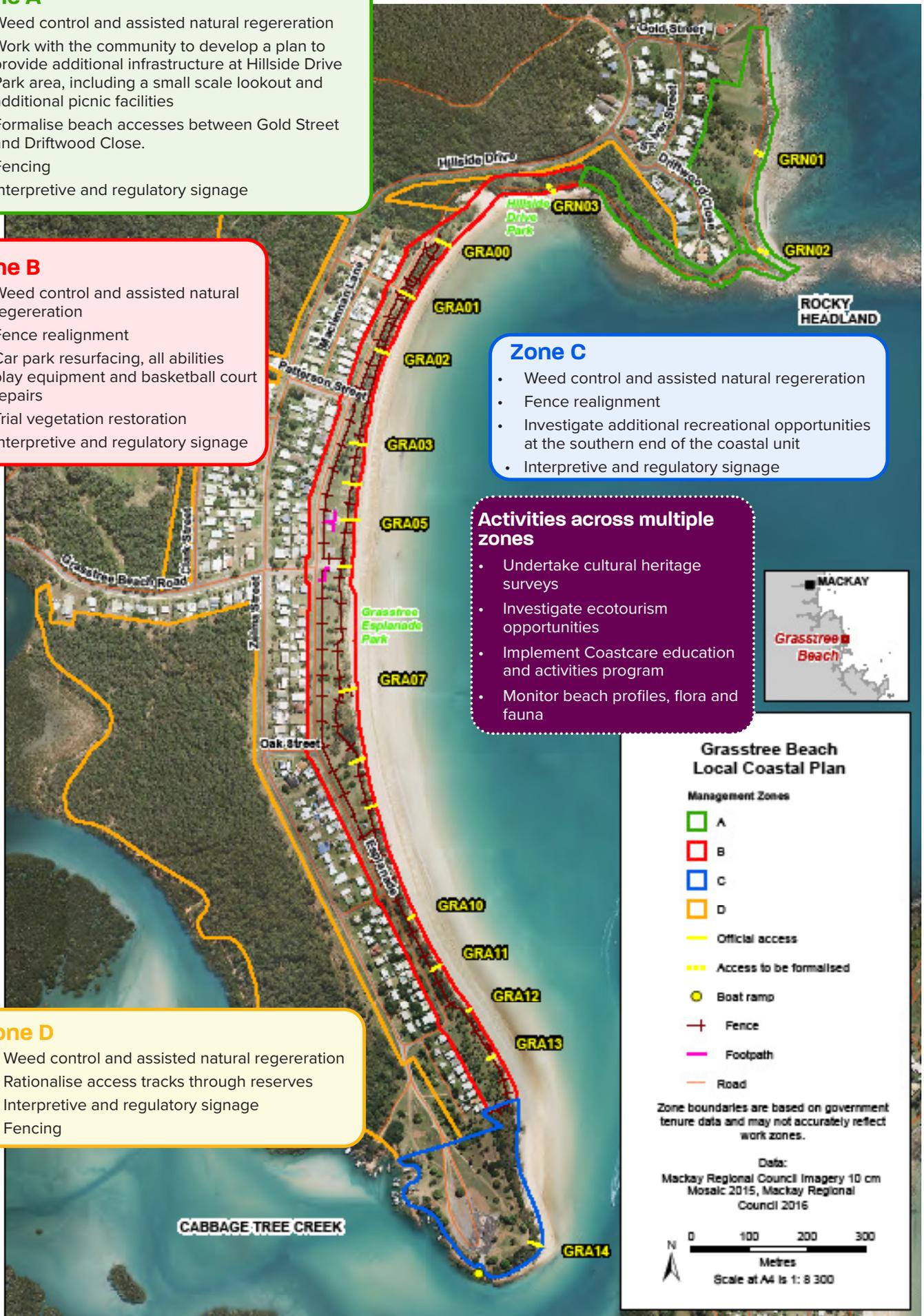


Figure 1: Visual summary of recommendations



Grasstree Beach

# 1 Executive Summary

Grasstree beach is also a popular recreational area for locals and visitors to our region. Mackay Regional Council (MRC) (hereafter referred to as Council) manages its coastal land at Grasstree Beach through an integrated program of planning, on-ground works, monitoring and community engagement known as the *Coasts and Communities Program*. As part of this program, *Coastal Management Guidelines* have been developed to provide a framework for management decisions and activities for coastal land under Council's jurisdiction. Individual Local Coastal Plans, such as this plan for Grasstree Beach, provide site-specific recommendations for individual Coastal units.

The Grasstree Beach coastal unit supports rare and threatened species including migratory shorebirds, marine turtles and critically endangered beach scrub vegetation. The *Grasstree Beach Local Coastal Plan* describes the environmental and social values of the coastal unit, as well as the key threats and management issues. Key pressures include the presence of non-native vegetation, the removal of native vegetation, waste dumping, erosion and climate change. Recommendations to manage these threats include weed control, revegetation, fencing and access management. Social values are also described and opportunities to improve recreational facilities and values have been identified, including additional beach accesses, pathways, interpretive signage and infrastructure such as bike racks. The recommended activities will be implemented on a prioritised basis as resources become available. Community engagement is recognised as a critical part of the success of on-ground works and opportunities for the community to learn about coastal ecosystems and get involved in management activities at Grasstree Beach will be provided through the Coastcare program.

The activities recommended in this Local Coastal Plan (Figure 1) will help protect and improve the condition of assets in the coastal unit, ensuring that best-practice management principles are implemented and on-ground activities are prioritised and

undertaken in a coordinated and strategic way. This plan will help attract additional funding to the region (including from State and Federal sources) to protect coastal resources and improve recreational opportunities for our community.

## Key recommendations include:

- Weed control across all zones, targeting major weeds including Guinea grass and lantana, and revegetation to replace weeds, stabilise dunes and supplement native vegetation.
- Installation of regulatory and interpretive signage where appropriate.
- Beach access upgrades and additional park infrastructure, such as a viewing platform, at Hillside Drive following additional consultation and park planning
- Investigating additional recreational opportunities at the southern end of the coastal unit.
- Removing waste and preventing future waste dumping through fencing and closing tracks on Reserve land.
- Providing the local community with opportunities to learn about coastal ecosystems and assist with the management of coastal land at official Coastcare events.
- Undertaking a trial vegetation restoration project.



## 2 Introduction

Council has a major role to play in the management of public coastal lands. Council is responsible for the public land along the coast including Esplanade, Reserves and Open Space areas. The *Coastal Protection and Management Act 1995* and associated *Queensland Coastal Management Plan* (DEHP 2013) underpin coastal management in Queensland and along with multiple other pieces of State and Federal legislation and Council's own Local Laws and *Coastal Management Guidelines* (MRC 2012); direct the management of these public coastal areas.

The *Mackay Coastal Management Guidelines* (MRC 2012) recognise that the coast is characterised by a diverse range of natural features including: sandy beaches, rocky headlands, rainforest, woodland and grassland, extensive intertidal flats and substantial areas of coastal wetland. The Mackay coastline is a dynamic and forever changing landscape, shaped and formed by a range of factors including: wave action, changing tides, predominant winds and human influences. Mackay also has a large tidal range that exceeds six metres (EPA 2004).

The Mackay region is prone to severe storm events and tropical cyclones that impact coastal areas causing localised erosion. After a storm, some areas recover quickly. However, if there is not enough time for adequate recovery before another storm event, or if the coast is experiencing an overall loss of sand, the sand bar may be washed seaward and permanent erosion may alter the shape of the coastline.

Management options to improve the resilience of coastal areas to future storm events are available. Maintaining a sufficient buffer of vegetated dune or other coastal ecosystems such as mangroves acts to bind and retain sediment in coastal areas. The *Mackay Coast Study* (EPA 2004, p.4) describes the need to protect coastal areas not only for their importance as assets to tourism and recreation, but also as the maintenance of wide sandy beaches and well vegetated dune systems as it provides a natural barrier to storm wave energy and protects inland areas against extreme water levels. Effective coastal management can therefore be viewed as a risk mitigation strategy.

Within the region, development has occurred in some areas that are prone to erosion (EPA 2004). Some areas are already seeing changes in their local coastlines. With future predicted increases in sea level rise and more extreme weather events there is an increasing need to forecast the impact on coastal areas and plan effective, achievable action for protection of coastal values, including:

- The safety and longevity of communities - this includes property, infrastructure and services required for healthy communities.
- Meeting of appropriate recreational needs - many locals and visitors utilise coastal areas for activities that add to their health and fitness, provide relaxation and as a space to enjoy nature.
- Continuity of economic services - fisheries and tourism rely heavily on healthy and attractive coastal areas.
- Environmental values – the provision of ecosystem services relies upon healthy coastal vegetation communities and natural environmental processes. Marine turtles and shorebirds require sandy beaches and dune systems for nesting and feeding and many other native flora and fauna require coastal areas for habitat and food.

Adaptation options for coastal areas need to be well considered to ensure that the region as a whole is best placed for the future. Maladaptation can occur when proper planning and best science are not incorporated into decision-making processes.

Council manages coastal areas through an integrated program of planning (i.e. Local Coastal Plans - formerly Beach Plans), on ground works, monitoring and community engagement known as the *Coasts and Communities Program* (Figure 2). The *Coasts and Communities Program* is a joint initiative of the Council and Reef Catchments, funded through Council's *Natural Environment Levy* and the Australian Government *National Landcare Programme*. The aim of this program is to protect coastal ecosystems in the Mackay region and, where opportunities exist, restore these areas to enhance their biodiversity values whilst allowing for appropriate recreational



access and use. Visit [www.mackay.qld.gov.au/coasts](http://www.mackay.qld.gov.au/coasts) for more information on the program.

This Local Coastal Plan is an update of the *Grasree Beach Plan* which was written in 2007. The 2007 Beach Plan identified key pressures affecting the coastal unit. Since then, strong emphasis has been on the protection, conservation, rehabilitation and management of the coastal unit and its biological diversity. Actions from the 2007 Beach Plan implemented over the last eight years include:

- Weed control and revegetation along the foredunes and surrounding Reserve areas.
- Installation of interpretive signage including turtle signage.
- Bollard fencing along the roadside and post and rail fencing along the foredune.
- Installation and upgrade of beach access tracks.

These works were undertaken to improve habitat connectivity and support dune systems to increase their resilience to natural processes including storm events. The post and rail fence line protects fragile ecosystems and directs pedestrians to designated beach access tracks.

The objectives of this updated Local Coastal Plan are to:

- Identify the values and pressures in the coastal unit.
- Develop strategies to guide the long-term protection of the natural coastal environment of Grasree Beach.
- Improve recreational opportunities within the coastal unit.

Council is committed to ensuring that communities are well informed throughout this process of review and implementation.



## Mackay Coasts and Communities Program implementation model

**Figure 2** Mackay Coasts and Communities Program Implementation Plan



## 2.1 STATUTORY OBLIGATIONS

There are a range of statutes at the Regional, State and Federal level that are relevant to, and may guide the management of natural resources and recreation within the Mackay area. These are shown in Figure 3.



### FEDERAL GOVERNMENT

- *Biosecurity Act 2015* provides management principles for diseases and pests that may cause harm to human, animal or plant health or the environment, and for other related purposes.
- *Environmental Protection and Biodiversity Conservation Act 1999* provides a high level of protection for Matters of National Environmental Significance (MNES). In particular it provides protection for important populations of migratory species.
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides for the preservation and protection of areas and objects in Australia and in Australian waters that are of particular significance to Aboriginals in accordance with Aboriginal tradition.



### INTERNATIONAL AGREEMENTS

- *China and Australia Migratory Bird Agreement (CAMBA)*, the *Japan and Australia Migratory Bird Agreement (JAMBA)*, and the *Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)* provide for conservation of shorebirds (waders) across the migratory flyway for these species.



### STATE GOVERNMENT

- *Land Act 1994* provides for the designation of reserves and assignment of Trustees for the protection of environmentally and culturally valuable and sensitive areas and features.
- *Recreation Areas Management Act 2006* provides for the establishment, maintenance and use of recreation areas; and aims to coordinate, integrate and improve recreational planning, recreational facilities and recreational management for recreation areas.
- *Vegetation Management Act 1999* provides management principles for vegetation within Queensland.
- *Coastal Protection and Management Act 1995 (Coastal Act)* provides a comprehensive framework for the coordinated management of the Queensland Coast, and establishes the Queensland Coastal Plan 2012 as the primary statutory instrument under the Coastal Act.
- *Nature Conservation Act 1992* provides management principles for wildlife within Queensland.
- *Native Title (Queensland) Act 1993* identifies the presence of Native Title over land.
- *Land Protection (Pest and Stock Route Management) Act 2002* provides the regulatory basis for control of pest species. In particular the Act classifies pest species and provides obligations for landholders.
- *Fisheries Act 1994* provides protection for marine plants including mangroves and saltmarshes, and provides the regulatory environment for control of recreational fishing activities.
- *Sustainable Planning Act 2009* provides the regulatory background for the development of planning schemes.
- *Environmental Protection Act 1994* regulates environmentally relevant activities, including release of emissions on land, air or water and noise.
- *Marine Parks Act 2004* regulates use of Marine Park to protect marine environment.
- *Waste Reduction and Recycling Act 2011* provides regulatory regime for management of litter and illegal dumping.
- *Queensland Coastal Plan 2012* provides policy guidance to coastal land managers including best practice coastal management principles which support the development of local management plans.



### LOCAL GOVERNMENT

- *Mackay Regional Council Local Law No. 4 (Local Government Controlled Areas, Facilities and Roads) 2011* provides for the management of Council controlled lands by enabling the prohibition of vehicle access and protection of vegetation and infrastructure.
- *Mackay Regional Council Local Law No. 2 (Animal Management) 2011* provides for the management of animals in the natural environment, including ensuring that they are under effective control and requiring removal of faeces in a public place.
- *Coastal Management Guidelines 2012* provides a framework for management decisions and activities for land under Mackay Regional Council jurisdiction in the coastal zone.
- *Mackay Regional Council Planning Scheme Open Space Strategy No. 12* outlines Mackay Regional Council's commitment to provide a balanced mix of public open space that in turn will provide for a range of active and passive recreational opportunities for the community.
- *Reef Guardian Council program* Recognises Council's commitment to protect, conserve and enhance the values of the Great Barrier Reef for future generations through effective and responsible land-based management practices. The *Coasts and Communities Program* is a key initiative under this program.

Figure 3: Regulatory Framework

# 3 Coastal Unit Description

Grasstree Beach is situated in Zelma Bay and is located approximately 27 km south of Mackay and 11 km north-east of Sarina. It is one of the three oldest beach settlements in the former Sarina shire (Short 2000) and stretches 1.8 km from a rocky headland in the north to Cabbage Tree Creek in the south (Figure 4).

Residential development is established along the majority of the shoreline; two rows of houses run adjacent to the shoreline, and an additional cluster of houses is situated on the northern headland. The majority of Grasstree Beach's foreshore area is tenured Esplanade with the exception of two small parcels of Reserve separating Esplanade tenure from Freehold tenure in the north. The area to the west is tenured Reserve and like the small Reserve parcels in the north and the Esplanade, is managed by Council (Figure 5). Planning scheme zonation in the coastal unit is a mix of Rural, Village, Open space and Esplanade (Figure 6).

The coastal unit includes 17.09 hectares of coastal Esplanade and 36.91 hectares of Reserve tenure. The coastal unit is divided into four zones (Figure 4) based on common management values and issues. Zone A encompasses both the Reserve and Esplanade land around the rocky headland; Zone B the rest of the Esplanade land along the sandy section of Grasstree Beach; Zone C the southern tip of the coastal unit area; and Zone D covers the remaining Reserve areas.

Vegetation communities within this coastal unit, particularly those located along the foreshore include *Casuarina equisetifolia* woodland with sparse herbland to open scrub, and *Corymbia tessellaris* and beach scrub species on parallel dunes. Historic vegetation removal, active erosion and weed incursion have limited coastal vegetation zonation

and succession and as result present a highly modified and disturbed ecosystem. Vegetation communities to the west and north-west of the coastal unit remain largely intact. Vegetation communities transition from Cabbage Tree Creek to the Reserve and include mangroves, *Corymbia tessellaris* and beach scrub species on parallel dunes and *Eucalyptus* and *Corymbia spp.* woodland and open forest.

A prominent recreational feature within the coastal unit is the Grasstree Esplanade Park. This Park spans the length of the foreshore area and provides a range of recreational facilities including exercise equipment, picnic tables, showering areas and a public toilet. Other areas set aside for recreational use include Hillside Drive Park and associated Reserve, Zelma Street Park (which is currently leased by the Rural Fire Brigade) and the open area at the southern end of the coastal unit which provides a car park, boat ramp and turning circle.

The Mackay region is inshore from the Great Barrier Reef and activities must comply with the regulatory zoning conditions introduced by the Great Barrier Reef Marine Park Association (GBRMPA) in 2004. Marine Park zoning is an important component of managing marine areas (GBRMPA 2011). The area offshore from Grasstree Beach is designated as a Habitat Protection (dark blue) Zone (Figure 7). This zone assures the conservation of areas in the Marine Park by protecting and managing sensitive habitats to ensure they are free from potentially damaging activities. In practice, activities including harvest fishing, tourism, research and shipping require permits and trawling are not allowed. For additional details regarding restriction in the Habitat Protection (dark blue) Zone, visit the GBRMPA website: [www.gbrmpa.gov.au](http://www.gbrmpa.gov.au)





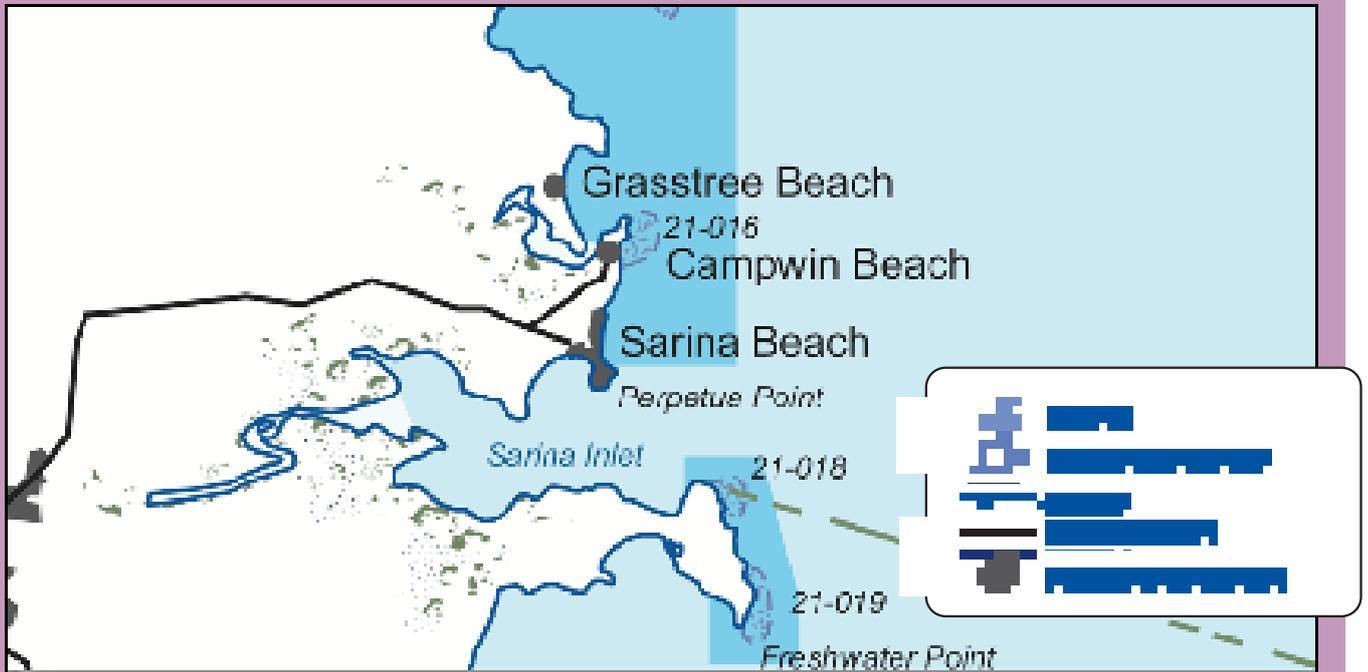
Figure 4: Extent and Management Zones of Grasstree Beach Coastal Unit



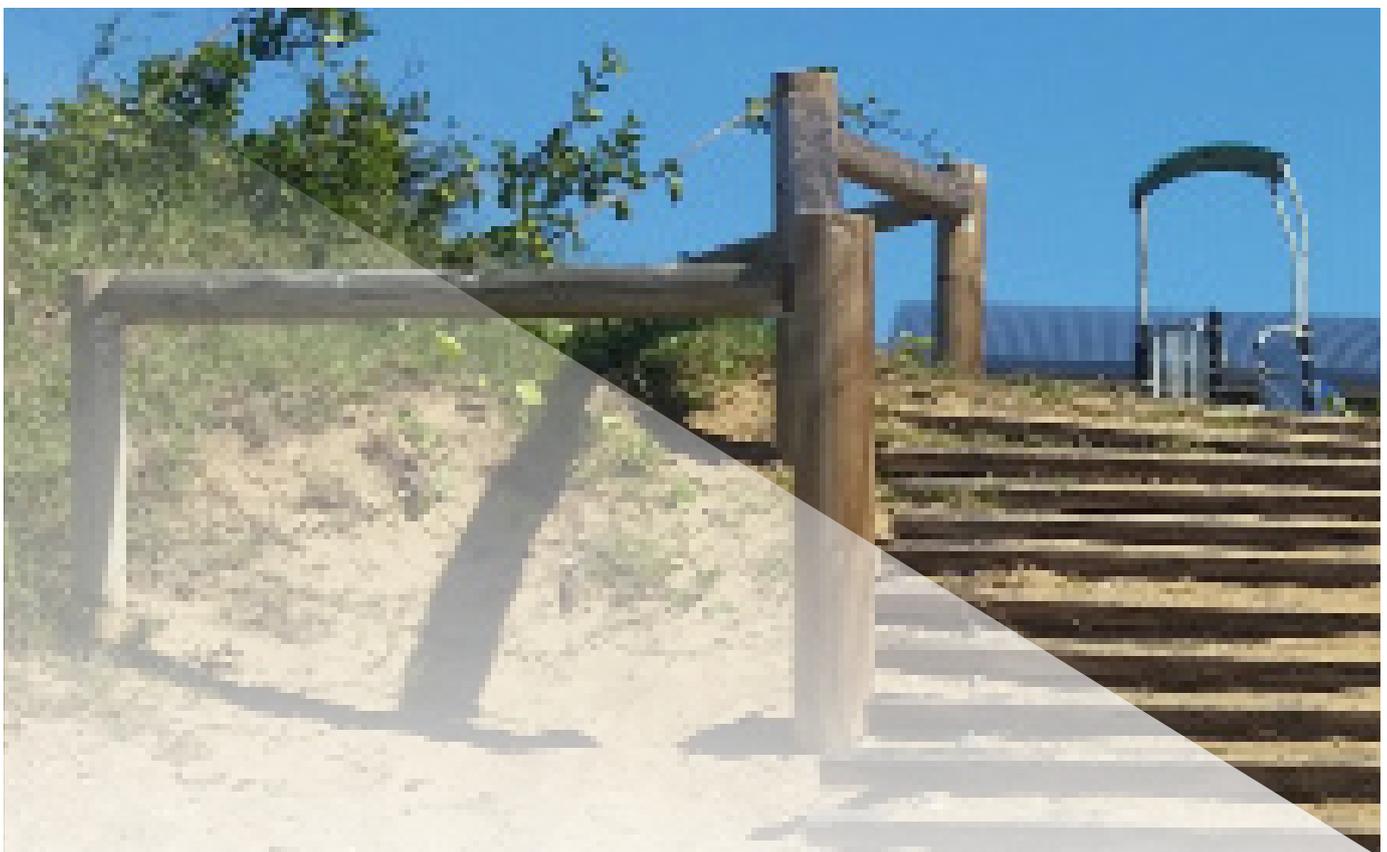
Figure 5: Land tenure at Grasree Beach



Figure 6: Planning scheme zonation at Grasstree Beach



**Figure 7:** GBRMPA Zoning – Excerpt from Zoning Map 12 (GBRMPA, 2011), indicating the extent of the Habitat Protection Zone (dark blue) offshore of Grasstree Beach.



# 4 Environmental Values and Management Issues

Grasstree Beach foreshore and coastal Reserve areas contains 38.97 ha of remnant and significant vegetation communities which provide important corridor linkages across the Mackay landscape. These vegetation communities are valuable not only in their own right; but as habitat for native fauna. The coastal ecosystems sustain important marine and terrestrial life and support wildlife populations of Regional, State and National Significance. In addition, the ecosystems are important in maintaining natural processes and providing ecosystem services to the region. Carbon storage, water filtration, climate regulation, stabilisation of the shoreline, nutrient cycling and scenic and recreational values constitute just a few examples of the ecosystem services that these areas provide to the local community.

This section outlines the distribution and significance of coastal vegetation and wildlife in the Grasstree Beach area and its environmental values. The major threats and management issues relevant to the environmental values will be discussed, including dune systems and erosion processes.

## 4.1 VEGETATION

The vegetation component of this plan considers three important facets that define the integrity and condition of vegetation in the coastal unit.

**Remnant vegetation** is the historical vegetative cover of an area and is captured within official Regional Ecosystem (RE) mapping. It includes both woody and non-woody vegetation and is dominated by species characteristic of the vegetation's undisturbed canopy. Remnant vegetation is distinguished by the dominant canopy having greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum (Queensland Government, 2016).

**Vegetation zonation** is the sequence of different vegetation communities or zones that occur along a coastline. The zones reflect changes in the nutrient and moisture content of dune soils which increase in a landward direction, as well as changes in the degree of exposure to strong winds, salt spray and sandblast, which decrease in a landward direction (DEHP 2015). When vegetation communities are heavily disturbed, for example by weed encroachment or mowing, vegetation zonation is inhibited.

**Non-native vegetation** is discussed in terms of the weed species that are present and may require management.

### 4.1.1. Remnant vegetation

Remnant vegetation is mapped at a scale of 1:100,000 by the Queensland Government for legislative and management purposes (Queensland Government 2016). Regional Ecosystems are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. The Regional Ecosystem

Description Database lists the biodiversity status and the vegetation management class of each RE (Table 1) as Endangered, Of concern or No concern at present/Least concern based on these factors in accordance with the *Vegetation Management Act 1999* (EPA 2013). It is important to note that RE mapping provides no indication of the current condition of this vegetation at the local scale.

The importance of coastal vegetation includes, but is not limited to:

- Native dunal vegetation can provide a significant refuge and source of food for local and migratory fauna species.
- Existing native dunal vegetation provides a seed bank for future generations of vegetation, thus protecting the natural biodiversity of the area.
- Native dunal grasses and groundcover facilitate dune growth by colonising and trapping windblown sand, foredunes preventing its escape from the beach system.

In coastal areas, vegetation can be scorched by high temperatures and salt, as well as abraded by windblown sand. Species that can withstand these effects can actually benefit from onshore winds by intercepting wind-borne nutrients from the sea. These nutrients are deposited on the leaves of coastal plants and washed into the sand by the first showers of rain, thereby introducing nutrients to the system and allowing less hardy species to colonise the coastal area (Gold Coast City Council 2007).

In Queensland, approximately 80% of people live on the coast (DEHP 2013). As a result, remnant coastal vegetation is often fragmented and subject to high levels of disturbance (Caton and Harvey 2010). Coastal development characteristically results in a loss of coastal vegetation since it often facilitates disturbance throughout the coastal zone and/or mowing and clearing areas of vegetation for recreation. Coastal vegetation remnants, however, remain a critical part of the landscape, providing important ecosystem services, habitat corridors, and recreational values (Figure 8).

General principles for the conservation of remnant vegetation include:

- Controlling weeds to allow native species to regenerate.
- Discouraging the dumping of garden and general waste.
- Replanting areas adjoining remnant vegetation patches with native species, to build a buffer between the core vegetation and adjacent land uses.
- Controlling activities such as four-wheel driving, foot and traffic (Nordstrom *et al.* 2000).

Appropriate fire regimes are required to maintain native vegetation communities. Fire management for the Grasstree Beach area should follow the recommendations of the *Clarke Connors Range Fire Management Guidelines* (Appendix 1).

Table 1 - Remnant Vegetation (RE) communities of the Grasree Beach Local Coastal Unit.

Regional Ecosystem (RE)	Short description	Approximate area in hectares (ha) on Reserve and Esplanade tenure	Vegetation Management Act status	Biodiversity status	Environment Protection and Biodiversity Conservation Act Status
8.1.1	Mangrove closed forest of marine clay plains and estuaries (estuarine wetland)	0.26 ha	Least concern	No concern at present	n/a
8.2.1	<i>Casuarina equisetifolia</i> woodland and/or sparse herbland to open scrub on foredunes and beaches	3.95 ha (shared with RE 8.2.6a)	Of concern	Of concern	n/a
8.2.2	Semi-evergreen microphyll vine thicket to vine forest, on coastal dunes	5.4 ha	Of concern	Endangered	Critically endangered
8.2.6a	<i>Corymbia tessellaris</i> +/- <i>Acacia leptocarpa</i> +/- <i>Allocasuarina littoralis</i> +/- <i>Banksia integrifolia</i> +/- rainforest species open forest on parallel dunes	22.28 ha (+ 3.95 ha shared with RE 8.2.1)	Of concern	Of concern	n/a
8.12.12d	<i>Eucalyptus tereticornis</i> and/or <i>Corymbia spp.</i> and/or <i>E. platyphylla</i> and/or <i>Lophostemon suaveolens</i> woodland to open forest on hill slopes on Mesozoic to Proterozoic igneous rocks	5.46 ha	Least concern	No concern at present	n/a
8.12.13a	Tussock grassland, or <i>Xanthorrhoea latifolia</i> shrubland, including areas recently colonised by <i>Timonius timon var. timon</i> shrubland, on slopes of islands and headlands, on Mesozoic to Proterozoic igneous rocks and Tertiary acid to intermediate volcanics	1.62 ha	Of concern	Of concern	n/a

The majority of the coastal unit is covered by remnant vegetation as described in Table 1. The eastward facing sandy beach is bordered from behind, between the main road/ Esplanade and the foreshore, by both RE 8.2.1 and 8.2.6a. At the northern end of the coastal unit, REs 8.12.13a, 8.1.1 and 8.2.12d are present on and behind the rocky headland. The northern Reserves behind the rocky headland are comprised of RE 8.12.12d, and the remaining reserves, behind the residential area, are comprised of RE 8.2.6a. Finally, bordering Cabbage Tree Creek, an additional expanse of RE 8.1.1 is present. REs found on Council managed land are further described in Appendix 2 and shown in Figure 8.

Opportunities exist to protect and enhance the native vegetation throughout the coastal unit, including via revegetation, weed control and the landward offset of the post and rail fence. Succession planning of old trees in parklands would ensure that the natural and recreational values (shade etc.) of these trees are sustained. Educating residents about tree succession planning would also be beneficial to ensure longevity of tree cover in the area as a whole.

Restoration of vegetation will enhance the complexity of vegetation zonation, increase the environmental value of the area, reduce impacts of artificial lighting on turtle hatchlings and act as a buffer against wind, salt and extreme weather events. Additional native vegetation will also provide habitat for local fauna. In areas where the native vegetation remains

largely intact, the approach to be taken will be one of assisted natural regeneration. By controlling weeds and limiting disturbance, natural recruitment of dunal species will occur and large-scale revegetation will generally not be required. Small-scale supplementary planting may be undertaken in these areas to enhance vegetation complexity and to replace removed weed species. In areas where natural recruitment is not occurring (for example, due to mowing), or where vegetation has been cleared, revegetation will be used as a technique to restore and enhance native vegetation.

All revegetation activities should follow the coastal revegetation principles documented in Appendix 3 and include species from the recommended species list provided in Appendix 4. The species selected for revegetation at any particular location will ultimately depend on current and pre-clearing RE mapping and site specific conditions such as aspect, topography, existing vegetation, soil condition and the availability of appropriate plants.

#### 4.1.2 Vegetation Zonation

A key feature of dune vegetation is the sequence of different vegetation communities that occur with increasing distance landward. Typically, this involves a gradual transition from bare sand, to ground cover, to open forests or woodlands (DEHP 2015). Vegetation zonation processes are those which facilitate this progression, and are discussed in this Local Coastal Plan as recruitment and colonisation. Vegetation zonation refers

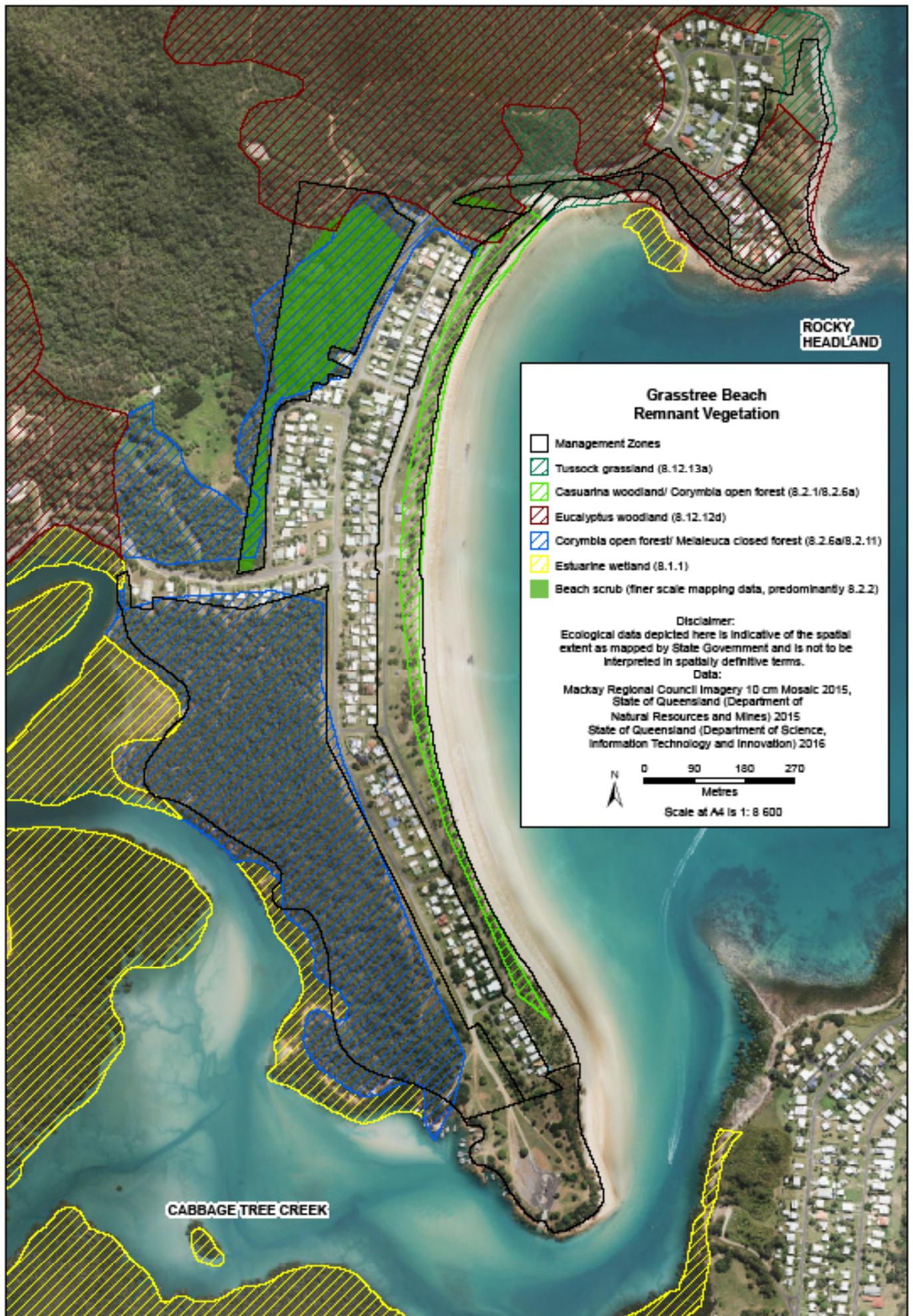


Figure 8: Remnant vegetation at Grasstree Beach

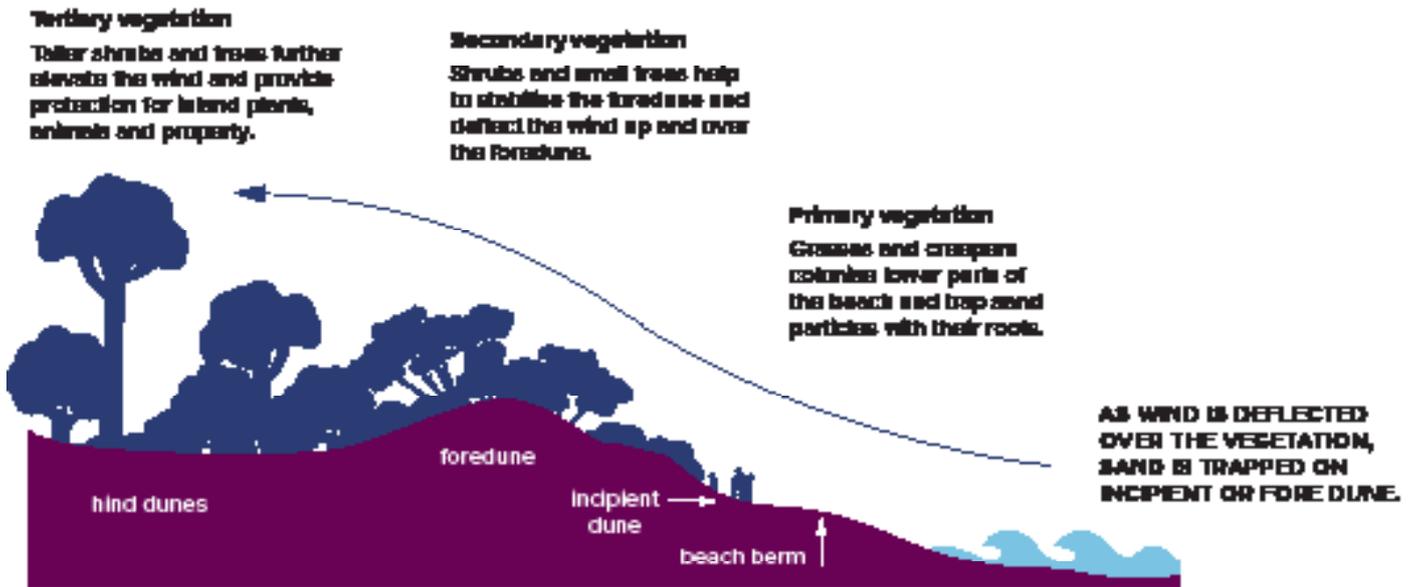


Figure 9: Role of dune vegetation



Figure 10: Multiple weed species established on the foredune



Figure 11: The mown area containing only mature shade trees behind the post and rail fence on the foredune at Grasstree Beach



Figure 12: Council land mown to the edge of the beachfront on the rocky headland in the northern extent of Grasstree Beach

to what is effectively a normally behaving ecosystem, where recruitment and colonisation can occur unhindered over natural gradients (Figure 9). Along Grasstree Beach however, these processes are in some areas hindered by weed incursion and mowing.

Weeds have established across the entire length of the foredune and are out-competing many native species (Figure 10). Many weeds, especially the woody and grassy species, have the ability to transform the ecosystem into another state. For example, the invasion of weedy grasses means that the fuel load and fire risk is increased. In some ecosystems, such as RE 8.2.1, even low intensity burns can negatively impact the dominant *Casuarina* species. Additionally, because many grasses can re-establish quickly and even more extensively after fire, they are capable of fundamentally transforming the vegetation present. Weed control will assist in opening up space for native recruitment, reduce competitive exclusion of natives and maintain the fire regime.

The other major threat to natural vegetation zonation at Grasstree Beach is the extent to which the bordering land is mown. All Esplanade tenure behind the entire length of the sandy section of the beach is mown (Figure 11). This has detrimental effects on zonation processes as it inhibits recruitment of native vegetation, as young seedlings are unable to become established. Moreover maintaining mown lawn in coastal environments suppresses the growth of the sand dunes (height and width), and inhibits their capacity to act as long-term sand reserves. The absence of sand-trapping vegetation causes sand to be lost from the system and the natural, dynamic system of sand movement is therefore disrupted (Gold Coast City Council 2007). In areas where native dunal vegetation has been encouraged, the replenishment of sand has resulted in well-formed dunes (Gold Coast City Council 2007).

In mown areas, recruitment of natives cannot occur, because when they are germinating (and therefore are small), they are mown over. This has resulted in a sparse scattering of mature trees, with no younger recruits (Figure 11). Outside the park behind the rocky headland, mowing still inhibits natural zonation, as mowing is occurring through the Reserve land behind the Esplanade, right to the edge of the beachfront (Figure 12). Currently, the vegetation is a very sparse corridor running along the boundary of the high tide line, which offers little erosion protection or habitat for wildlife. Clearly defined boundaries will reduce the extent of maintained lawns, private gardens and belongings from Esplanade and Reserve tenure and will allow vegetation zonation to be reinstated.

Vegetation in Zone B of the coastal unit has been subject to poisoning and physical removal despite community involvement in project planning. Designated activity hubs and offset areas may act to alleviate this pressure by promoting revegetation activity outside of the intensely used areas. Community involvement in park planning and design, and through Coastcare events is recommended.

### 4.1.3 Non-native Vegetation

The presence of non-native vegetation can be detrimental to the function of the dunal environment. Non-native vegetation can displace native dune vegetation due to its ability to grow aggressively, smother native species, and compete for available nutrients. Transformative weeds such as Guinea grass and lantana can also increase fuel loading and fire intensity.

It is important to note that while not all weeds require immediate removal due to low impacts on native species, under the *Biosecurity Act 2014*, Council and the local community have a general biosecurity obligation to take reasonable and practicable steps to minimise the risks associated with invasive plants and animals under their control. This legislation was put into force on 1st July 2016, and changes the classifications of weed species from what has been discussed in earlier beach plans. Subsequently, weeds will now be discussed in terms of:

- **Declared weeds** are described as species that have, or could have, serious economic, environmental or social impacts (DAFF 2013a). Declared weeds recorded at Grasstree Beach include lantana (*Lantana camara*) and mother-of-millions (*Bryophyllum delagoense*) and require action for removal under the *Land Protection (Pest and Stock Route Management) Act 2002*.
- **Environmental weeds** are described as those that can cause major modifications to natural ecosystem function. These species are capable of out-competing native vegetation and in some cases, have the potential to increase fuel loads in coastal ecosystems largely sensitive to fire (DAFF 2013b). Environmental weeds for removal at Grasstree Beach include Guinea grass (*Megathyrsus maximus*) and siratro (*Macroptilium atropurpureum*).
- **Locally significant weeds** are those that impact natural processes at a local scale. Locally significant weeds at Grasstree Beach are as above, as well as crowsfoot grass (*Eleusine indica*), snake weed (*Stachytarpheta cayennensis*) and cobblers peg (*Bidens pilosa*).
- **Non-transformative/nuisance weeds** are problematic on a local scale and should be managed on a case-by-case basis. A multitude of herbaceous weeds and garden escapees result from the close proximity of coastal areas to residential zones and include mother-in-law's tongue (*Sansevieria trifasciata*), painted spurge (*Euphorbia cyathophora*), pink periwinkle (*Catharanthus roseus*), Seaforth burr (*Cenchrus echinatus*), sensitive weed (*Mimosa pudica*), agave (*Agave* spp.), Moses-in-the-cradle (*Tradescantia spathacea*) and sand rattlepod (*Crotalaria mitchelli* supsp. *mitchellii*).

Council recognises that some community members may value coconuts (*Cocos nucifera*) for their aesthetic appeal. The removal of coconuts from recreational and parkland areas is beyond the scope of this plan. However, adult and juvenile coconuts that occur within areas managed for environmental purposes will be removed in accordance with the coastal weed control principles (Appendix 5). Removal will be undertaken in a staged manner. Coconuts can be a significant risk to pedestrians, increase fire risk and intensity through the accumulation of vegetative waste and smother

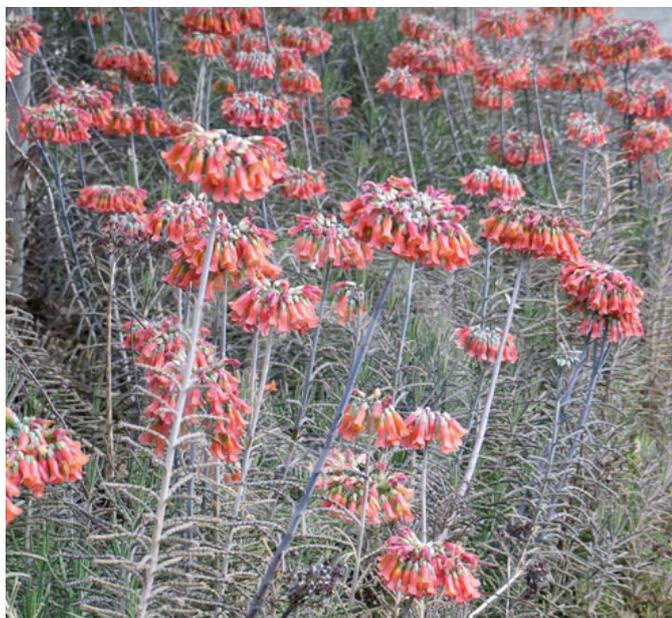
native vegetation preventing regeneration. It is a common misconception that coconut trees assist foredune stability, however their root system is very shallow and is easily undermined by high waves.

Weed occurrence along the Grasstree Beach foredune is prolific. Some invasive species are garden escapees, such as mother-of-millions (*Bryophyllum delagoense*) (Figure 13) and pink periwinkle (*Catharanthus roseus*). In some cases, as is evident on the northern headland, whole mown gardens extend beyond private property boundaries to the foreshore. It is recommended Council install post and rail fence along Council owned land and maintain reclaimed land to encourage natural regeneration. Community education may help prevent the future introduction of environmental weeds.

Other weed species such as lantana (*Lantana camara*), snake weed (*Stachytarpheta cayennensis*), painted spurge (*Euphorbia cyathophora*) (Figure 14), Seaforth burr (*Cenchrus echinatus*) and crowsfoot grass (*Eleusine indica*) (Figure 15)

have colonised various sections of the foredune. Dense stands of lantana and snake weed between GRA9 and 10 should be the focus for initial weed control efforts, as these species are transformative weeds, which spread and establish very quickly and have already formed dense stands, which will completely shade out underlying species and prevent the colonisation of native species (Figure 16).

The removal of non-native species from the coastal unit will improve the condition of native vegetation, enhancing habitat quality and its resilience to natural disturbance whilst also reducing the risk of fire. Some weeds have established to such an extent that they are playing a role in dune stabilisation (in the absence of native vegetation). Their removal should be managed in an appropriately staged manner to manage dune stability and not displace native fauna. Using appropriate weed control techniques in a progressive manner, as time and resources permit, will assist the dune rehabilitation of coastal vegetation communities.



**Figure 13:** Garden escapee mother-of-millions (*Bryophyllum delagoense*)



**Figure 14:** Garden escapee painted spurge (*Euphorbia cyathophora*)



**Figure 15:** Crowsfoot grass (*Eleusine indica*)



**Figure 16:** A dense stand of lantana (*Lantana camara*)

Opportunities for local community members to get involved in coastal management activities will be provided through the Coastcare program. Using appropriate weed control techniques in a progressive manner, as time and resources permit, will assist the dune rehabilitation of coastal vegetation communities. All activities should follow the principles documented in Appendix 3. A list of weed species can be found in Appendix 6.

Weed control is already underway in the Reserve behind Palm Street, targeting lantana (*Lantana camara*) and Guinea grass (*Megathyrsus maximus*).

## 4.2 WILDLIFE

Grasstree Beach is one of the Mackay region's known turtle-nesting beaches. Regional Ecosystem 8.2.1 is found along the foredune of Grasstree Beach and is known to provide habitat for a number of turtle species, including the flat-back turtle (*Natator depressa*), green turtle (*Chelonia mydas*) and loggerhead turtle (*Caretta caretta*). While there are many pressures on marine turtles throughout their life cycles, the land-based threats to turtles and their reproductive success are identified as:

- Light and noise pollution from nearby houses disorients hatchlings during their movement to the ocean.
- The presence of dogs and other domestic pets in the area, particularly those not on leashes, pose a number of threats including mortality of hatchlings from predation, exposing of clutches from digging and injury to turtles while laying eggs.
- Distribution and type of vegetation (i.e. root system), including excessive shading or lack thereof plays an influential role determining the sex of the hatchling.
- Unofficial tracks through the dune system, where tracks appear brighter than surrounding areas due to light reflection and can disorientate both hatchlings and adults.
- Beach vehicle access, as turtles are not able to penetrate the compacted sand or navigate wheel ruts.

Regional Ecosystem 8.2.1 is also known to provide nesting sites for significant and iconic bird species including the beach stone-curlew (*Esacus magnirostris*), the rare eastern curlew (*Numenius madagascariensis*), the sooty oystercatcher (*Haematopus fuliginosus*), and significant migratory species including Mongolian plover (*Charadrius mongolus*), great knot (*Calidris tenuirostris*), terek sandpiper (*Xenus cinereus*), bar-tailed godwit (*Limosa lapponica*) and ruddy turnstone (*Arenaria interpres*). Disturbance to shorebird roosting at this site occurs from boating, domestic animals, pedestrian and vehicular traffic. This disturbance reduces the amount of resting time the birds have at high tide, forcing them to use excessive energy at a time when they need to maximise their reserves for migration. The result may be a failure to migrate back to their breeding grounds, or a reduced ability to breed (Harding and Milton, 2003).

Regional Ecosystem 8.2.6a occurs along the extent of the coastal unit. An array of reptiles are known to inhabit this ecosystem including: geckos, dragons, monitors, skinks and snakes, as are mammals such as possums, flying foxes and melomys. During the wet season RE 8.2.6a is known to support a diversity of frogs (Queensland Government 2016). It is recommended that weed management continues throughout the coastal unit and this, together with revegetation activities to replace removed weed species, will prevent future weed re-occurrence and assist the reestablishment of native vegetation.

Regional Ecosystem 8.2.2 is known to provide suitable habitat for the rare northern quoll (*Dasyurus hallucatus*). The northern quoll is known to occupy a diverse range of habitats such as woodlands dunes and creek lines. However their distribution is restricted as a result of an increase in usage and development of adjacent lands. The loss of foraging habitat as a consequence of coastal development, combined with predation (cats and foxes) and potential ingestion of cane toad toxin may pose threats to this species in this coastal unit (Oakwood, 2003).

Essential Habitat (EH) mapping identifies sites and locations considered to contain important habitat for flora and fauna species of conservation significance. It is only mapped over either remnant or regrowth vegetation, and is based on either confirmed sightings, records of breeding, known suitable habitat or resources occurring at a location, or habitat that forms part of a potentially important corridor (EPA 2002).

The coastal unit contains Essential Habitat for the coastal sheath-tail bat (*Taphozous australis*) (Queensland Government 2011) (Fig. 17). These bats are known to live in highly specialised habitats such as dune scrub, mangroves, melaleuca swamps and coastal heathlands – as such, any threats to these vegetation communities constitutes a threat to the bat which is classified as vulnerable under the *Nature Conservation Act 1992*. Coastal sheath-tail bats are suspected to be easily disturbed when at roost, and could be negatively impacted by noise. There is currently no widespread decline documented for the species, however, disturbance due to high rates of human visitation at roost sites can have negative impacts on the species and may cause low breeding success or roosts to be abandoned coastal vegetation communities. Loss of foraging habitat as a consequence of coastal development, combined with roost disturbance (with increasing human access to the coast) may pose a threat to this species.

The westward edge of Zone B, adjacent to Grasstree Beach Esplanade and the rows of housing, is mapped as containing Essential Habitat for the vulnerable mangrove mouse (*Xeromyces myoides*), however the extent to which it has been developed and mown presents a serious threat to the persistence of the species in this area. Mature animals appear to utilise taller communities dominated by yellow mangrove (*Ceriops tagal*) and orange mangrove (*Bruguiera spp.*). The extent juveniles are sometimes located in low forests of yellow mangrove. The quantity and quality of storm water entering the catchment will be of relevance to the health of the mangrove mouse population.

Currently, the major threats to wildlife along the coastal unit include loss of habitat through development, erosion and weed incursion, infrastructure and artificial lighting. A targeted community education campaign around restraining domestic animals both in home (cats) or on the beach (dogs), and increased enforcement would benefit shorebird and marine turtle populations. Restricting domestic animals on the foreshore at critical times of the year (i.e. nesting) would help to protect the ecological values of Grasstree Beach (Figure 17), specifically shorebird and marine turtle populations using the area. There are opportunities to install interpretive signage featuring key faunal species and ecosystems (such as beach scrub and mangroves) at high profile locations within the coastal unit.



Figure 17: Wildlife values at Grasree Beach



## 4.3 EROSION

### 4.3.1 Coastal processes and erosion

Grasstree Beach and a large portion of the broader Mackay region's beaches maintain sand dunes in the coastal unit. Coastal dune systems play a crucial role in facilitating coastal ecosystem processes and in the protection of property in the coastal unit (DERM 2011). As part of the broader sand movement process, healthy dune systems act to dissipate the kinetic energy of waves, which may otherwise propel into adjacent infrastructure and property. The sand and dunes create friction when waves pass over them, slowing the waves down and dissipating their energy. Healthy coastal dunes help protect coastal infrastructure during intense wind, storm and cyclone events (Figure 18). The dunes also act to replenish the foreshore with sand after major sand-loss events.

However, human induced changes have altered coastal areas and therefore dune formation. For example, the loss of coastal vegetation for open space and coastal development reduces the capacity of beaches to catch and trap wind-borne (aeolian) sand grains. Once the protective capacity of the dune system is weakened in this way, coastal erosion can take place, leading to significant damage to landforms and infrastructure via coastal recession (Figure 18).

Planners and coastal residents may have a negative association with erosion and coastal recession, though in many cases it is a natural phenomenon. There are constant interactions between coastal landforms and the ocean, and this creates a dynamic and ever-changing environment. Sandy coastlines migrate landward and seaward in response to natural phases of sand erosion (loss) and accretion (gain). Sand movements can form dunes onshore, sand bars offshore, or instigate beach erosion. All of these movements are governed by wind, waves and tidal activity over varying time scales.

Over short time scales there are natural beach fluctuations in response to intense weather activity. For example, during a storm, strong waves carve away sand from the beach and dunes, resulting in escarpments onshore and sand bars offshore. Gradually, sometimes over many years, the sand that was lost offshore is pushed back onshore by gentler high tides (Figure 18). This process is natural and in many cases, cannot be stopped.

However, long term erosion or accretion is driven by fundamental changes in the dynamics of sand deposition and removal from a beach system. This is an on-going problem, and preventing beach recession would often require continual nourishing. This is illustrated in Figure 18 where too much sand from coastal dunes is lost seaward to allow the dune to be restored to its original state.

Challenges to dune health are often unavoidable in developed areas such as Grasstree Beach. However, intervention and management can protect the coastal landforms. Dunes should be protected where possible by maintaining and enhancing native vegetation. Ground cover, shrub and tree species stabilise dunes with their root systems, and catch wind-borne sand sediments to replenish the dunes and foreshore. The loss of this vegetation can lead to accelerated rates of erosion of the dunes. The natural build-up of sand in frontal dunes needs to be encouraged as a reservoir for sand during periods of wind and wave erosion. Plant communities provide vegetative cover, which stabilises the dune and thus makes the system resilient to pressures such as sea level rise, storms, and floods. Supporting vegetation as a surface cover increases dune stability but also biodiversity and ecological function of the dune system (DEHP 2013). Coastal vegetation is also important in protecting infrastructure and houses, as it slows wind speeds and reduces the amount of salt and sand transported inland.

Damage to dunal vegetation in the Mackay region often occurs through pedestrian and vehicle traffic, and through acts of vandalism. Intentional removal of coastal dune vegetation, as well as inappropriate pedestrian and vehicle access, displaces sand, and where it continuously occurs, can lead to localised eroded areas. Clearly established paths to the foreshore can help to mitigate the threat of people and vehicles destroying dunal vegetation by funneling activity to a small number of well-maintained pathways. To prevent the degradation of dune systems and for public safety, it is important for users to stay on designated tracks. A range of consultation and education opportunities should be provided to the local community to mitigate damage to dunal vegetation.

Another major threat to dunes is hard infrastructure (e.g. seawalls). Often these structures are built in the attempt to protect property from shoreline recession. Seawalls and other hard structures, rather than gradually dissipating wave energy like dunes, reflect it onto other areas. This leads to scouring



around the edges and in front of seawalls, and accelerates the loss of sand on the surrounding beach.

Ensuring that erosion prone areas (Figure 19) remain free of constructed infrastructure and well covered by native vegetation allows natural processes to occur unhindered. This provides the best opportunity for managing shoreline erosion and retaining environmental values (EPA 2004). Where infrastructure is installed, such as seawalls, the amount of sand that is lost seaward is much greater than the natural amount, thereby accelerating erosion and beach recession. However, Council recognises that in some exceptional circumstances, soft and hard solutions may be considered.

### 4.3.2 Landscape context

Grasstree Beach has developed predominantly as a prograding beach ridge system, with multiple beach ridge lines evident along the shoreline, although their morphology is altered by residential development (Figure 21). Over landscape evolution timelines (several thousand years) beach ridges have developed as the southerly sediment transport and cross-shore sediment transport has contributed to building the linear dune systems (ridges) along the shoreline between the headland in the north, and a rocky island / outcrop at the southern end of the beach (Figure 21).

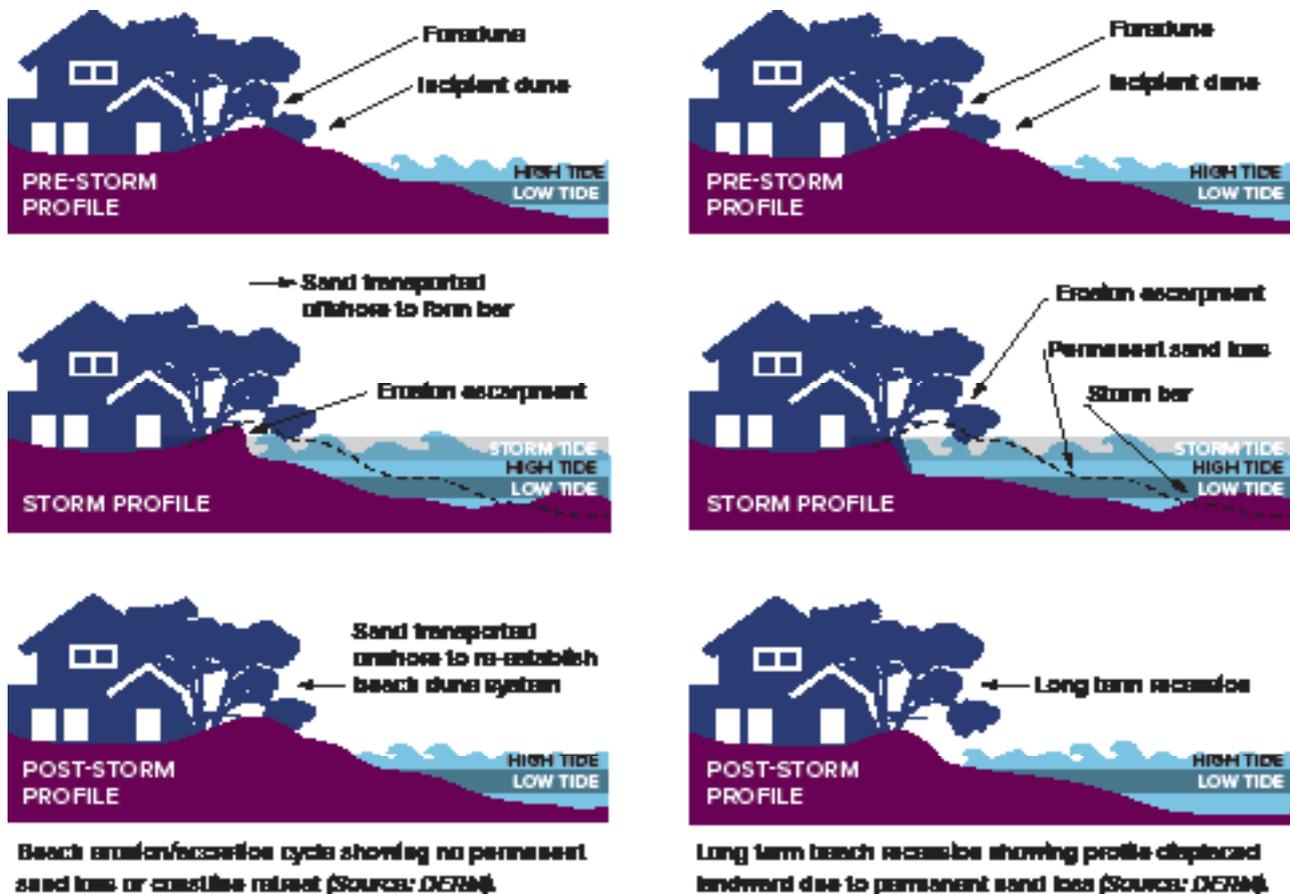


Figure 18: Beach erosion



Figure 19: Erosion prone area of Grasree Beach



**Figure 20:** *Grasstree Beach indicative sediment supply and distribution pathways (after EPA 2004) (2015 aerial imagery courtesy of Mackay Regional Council)*

-  Longshore sediment transport
-  Cross-shore sediment transport

Dune building has been progressively interrupted by periods of storm activity or reduced sand supply (resulting in swales between ridges).

There is evidence of a paleochannel of Cabbage Tree Creek west of the beach ridges and exiting at the northern end of Grasstree beach (now a small tidal channel), and a barrier spit complex behind the beach ridges associated with past alignments of the creek (Figure 21).

### 4.3.3 Sediment transport pathways

Dominant longshore sediment transport along Grasstree Beach is to the south, in the lee of the Coral Point headland (Figure 20). The beach is situated in a relatively enclosed embayment, and sediment losses out of the embayment will be minimal, however there is likely to be substantial ongoing deposition in the Cabbage Tree Creek estuary. Within the embayment, cross-shore sediment transport is likely to be significant in the removal and return of sediment to the beach profile.

### 4.3.4 Sediment supply and trajectory

Sources of historical sediment supply to Grasstree Beach include the major river systems to the south, as well as from Cabbage Tree Creek itself. The net long term trajectory of sediment supply to the coastal unit is uncertain. A review of the trajectory of sediment supply to Grasstree Beach could be incorporated into a regional study on long term sediment supply for the broader Mackay coastline.

### 4.3.5 Shoreline changes

The northern end of Grasstree Beach has a relatively flat intertidal zone (Figure 22) and the backshore, the area of the beach landward from the high water line, is also of low elevation compared to the central and southern parts of the beach. No major change in shoreline position is observable from 2004 – present. The presence of bar and cusp formations toward the dry beach zone at this location indicates a relatively high energy environment. This is consistent with the orientation of this section of beach to the open ocean and prevailing winds. This location is likely to be aligned with the main pathway where sediment is transported into the bay from the outer ocean, and therefore the rate of sediment supply is also likely to be high and facilitate rebuilding of the beach after storm events. From here longshore sediment transport is to the south, and may be locally north at the top end of the embayment.

Towards the central parts of Grasstree Beach, the backshore environment changes considerably, with elevated aeolian dune systems (Figure 21) and an elevated backshore zone largely modified for recreational use. Between 2004-09, shoreline prograde in the order of 5 – 10 m occurred in this region, followed by 5 – 15 m of retrograde between 2009-15 (Figure 23). This central section of shoreline is likely to continue to be susceptible to erosion from storm events, however has capacity to rebuild in intervening periods. Improving the stabilising vegetation corridor along the dune system, and

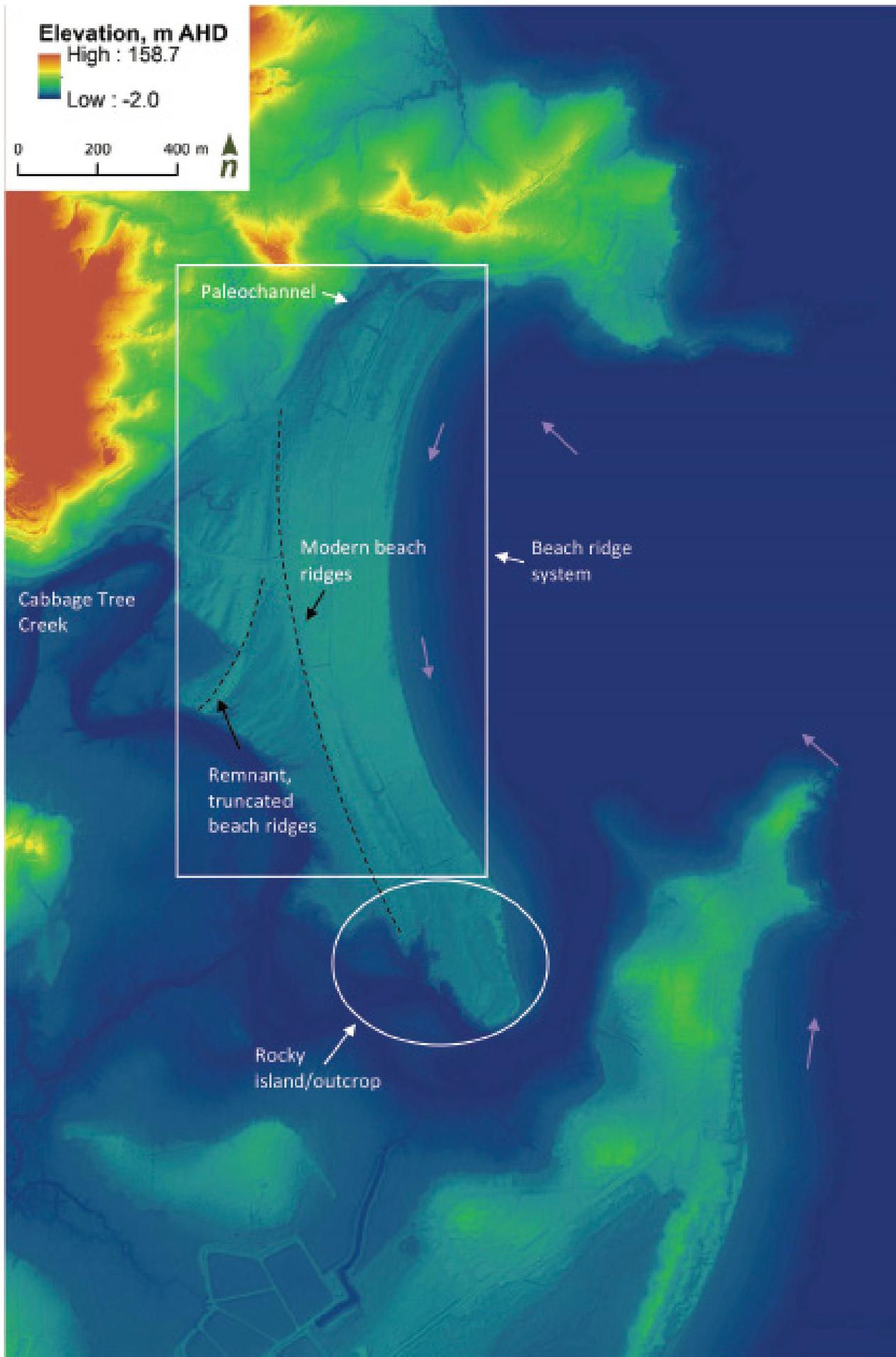
minimising disturbance to the dunes (minimising access) is recommended to enhance the rate of recovery after storm events and minimise erosion potential. No earlier historical imagery was available for this assessment, so it is unclear if there is any past evidence of a longer term trend in shoreline prograde or recession.

Moving towards the southern end of the beach, a similar flat beach profile and elevated backshore environment is maintained. Minimal net change in the shoreline position occurred between 2004-09, however up to 12 m of retrograde has occurred from 2009-15 (Figure 24), associated with storm activity.

Shoreline comparisons of the southern-most end of Grasstree Beach (Figure 25) indicate reasonably consistent shoreline retrograde towards the southern rocky point at the mouth of Cabbage Tree Creek, with up to 20 m net retrograde from 2004-15. This may be indicative of an episodic nature of longshore sediment transport to the southern end of Grasstree Beach, and the sediment dynamics around the estuary mouth and in the estuary zone, and not necessarily associated with long term recession. The estuary is likely to be acting as a sediment sink, and anecdotal information suggests it is building up in height, or filling in, with the input of sediment over recent decades.

The presence of a well vegetated dune system along the length of Grasstree Beach will be critical as a buffer during major storm events, to reduce the magnitude of erosion, protect private property, and as a source of sand to re-nourish the beach. This is particularly important if major storm events occur in close succession (before natural rebuilding of the beach has occurred).

The majority of foreshore and landward Reserve along Grasstree Beach remains denuded of protective coastal vegetation communities. Strategies to manage competing objectives for use of this land within the community should be implemented. Appropriate vegetation communities include those that were historically present at the site and elsewhere in the region where similar vegetated dune systems are present, as these vegetation communities have evolved to have a specific geomorphic function in the development of dune systems, as well as supporting the relevant ecological communities for the region.



**Figure 21:** Grasstree Beach landscape features (High elevation – Red, Low elevation – Green) highlighting sites of sediment depletion – Refer Figure 20 for location detail



**Figure 22:** Grasstree Beach images (July 2016) – Left: view south from the northern end of the beach, flat tidal beach profile, Centre: view south from the centre of the beach, aeolian built elevated dunes, Right: view into estuary zone from rocky island/outcrop at southern end of the beach



**Figure 23:** Grasstree Beach central region – shoreline position comparison 2004, 2009, 2015 (refer Figure 26 for context)





**Figure 24:** *Grasree Beach central - southern region – shoreline position comparison 2004, 2009, 2015 (refer Figure 26 for context)*



**Figure 25:** *Grasree Beach southern point – shoreline position comparison 2004, 2009, 2015 (refer Figure 26 for context)*



**Figure 26:** Comparative shorelines 2004, 2009, 2015 (courtesy of Mackay Regional Council)



**Figure 27:** *Grasstree beach includes erosion prone areas*

# 5 Social Values and Management Issues

This section provides an assessment of the social values, such as cultural values, recreational opportunities and facilities present in the area. The focus lies on a sustainable approach to explore recreational opportunities while conserving the natural cultural and environmental values of the area. Provision of adequate facilities that cater for a range of interests and abilities is also an important consideration of this plan.

Grasstree Beach is one of the most picturesque beaches in the Mackay region and is a 15 minute drive from the nearby town of Sarina. The beach is located within Zelma Bay, making it a sheltered and popular swimming area though it is not patrolled. The beachfront is backed by Grasstree Esplanade Park and provides a long, grassy recreational area, complete with a playground, exercise equipment, a public toilet, four showering areas, bins and more than ten picnic tables. The nearby reefs, islands and creeks make the area a plentiful fishing location, with locals often fishing straight off the beach and launching from the boat ramp located in Cabbage Tree Creek.

## 5.1 CULTURAL HERITAGE

The Traditional Owners of the Mackay region are the Yuwibara people. Many coastal areas, before development, were used as camping and hunting areas by the Indigenous people of the land. There is evidence of this throughout many Mackay beaches in the form of shell middens and tools. It is likely that Grasstree Beach was similarly utilised by the Yuwibara people due to its high suitability for fishing. Middens, fish traps or other items of cultural significance may be present in the area. Council is committed to managing culturally significant places sensitively in partnership with the Yuwibara people. It is suggested that Traditional Owners be employed to document finds and outline clear management goals for their protection.

## 5.2 RECREATIONAL OPPORTUNITIES

Recreational sites are important as they provide a range of social benefits, including opportunities for active and passive recreation, tourism, education and social interaction. They also support community wellbeing and provide opportunities for improving general health through outdoor recreation. Council's *Planning Scheme* (MRC 2006) outlines Council's vision to provide *a balanced mix of public and open space that in turn will provide for a range of active and passive recreational opportunities for the community*. Open space is set aside for recreational and non-recreational activities. Active and passive recreational opportunities are provided to meet the needs of the community, whereas non-recreational open space is provided for the protection of natural areas (including environmentally significant vegetation, wildlife habitat areas, waterways, and wetlands), landscape character, and for the use of land for utilities and stormwater management (MRC 2016), through dedicated environmental, conservation, drainage and road reserves. In order to develop an integrated and comprehensive Local Coastal Plan, it is important to

consider public use and future opportunities that balance the environmental conservation and recreational needs of this coastal unit.

The *Planning Scheme* (MRC 2016) was considered when assessing the coastal unit for possible recreational and conservation based recommendations, including the risks recreation may pose to local wildlife and native vegetation. Environmental sustainability is prioritised in line with the *Coastal Management Guidelines* (MRC 2012), with consideration for providing a range of recreational opportunities in order to meet the needs of the broader Grasstree Beach and Mackay community and visitors. Council's *Draft Open Space Strategy* (MRC 2016) seeks to achieve recreational diversity and effective distribution of recreational areas, to facilitate interactions between the environment and the community, and to establish a network of open space areas accessible to everyone. This Local Coastal Plan seeks to align this policy, community needs and environmental conservation.

There is a considerable amount of infrastructure already present at Grasstree Beach (Figure 28), including a large playground, many park benches and undercover seating areas, signage, a toilet block and exercise stations (Figure 29 and 30).

Hillside Drive Park is located in the north of the coastal unit and is described as a Local Park under the *Draft Open Space Strategy* (MRC 2016). There are presently two large tables overlooking Grasstree Beach as it stretches to the south (Figure 31) and limited parking. Council will work with the community to develop a plan to enhance recreational opportunities at the Hillside Drive Park area through the provision of additional infrastructure, including a small-scale lookout and additional picnic facilities. Linkage to the adjacent underdeveloped Reserve at the rocky headland and to the already popular Grasstree Esplanade Park should be considered to maximise recreational opportunities within the suburb.

Grasstree Esplanade Park is an open, mown park that borders the entire length of the beach and has infrastructure scattered throughout. It is classified as a District Park (MRC 2016) and is purposed to provide outdoor recreation opportunities and encourage extended stay through the provision of additional seating and picnic facilities, larger active play areas, public toilet facilities and car parking.

The value of the coastal unit, both in terms of conservation and recreation, may be increased by designating the most frequently and intensely used sections of the parkland as 'activity hubs'. This aligns with the Council's performance standards for District Parks, one of which outlines that embellishments and infrastructure supporting recreational opportunities are clustered in areas with high levels of public exposure. The most obvious possible activity hub is between GRA04 and 06 (Figure 35), where there is a wide range of facilities including the playground and toilet block, undercover

area, exercise equipment and beach access tracks (Figure 28). Intensifying the use of activity hubs could be offset by revegetating or allowing natural regeneration of vegetation in other sections of the mown park where recreational activities are not as focused. Designated activity hubs would provide Council clear areas to focus on mitigating the impacts of recreation and instigating vegetation restoration activities. An additional benefit is the reduced ongoing maintenance costs where regeneration can occur outside of the activity hubs. There is scope to involve the local community in identifying the activity hubs given that these are the people most familiar with the park.

It has been noted that the community utilise open, mown space for recreational activities (Figure 32). The recreational value of such areas may be increased by creating a path to link barbecues, seats, toilets, signage and access tracks throughout mown areas. Currently, no paths exist throughout the park. The construction of paths may encourage visitors to walk the length of the park or encourage users of the equipment to walk onto the beach by connecting to beach access tracks. The paths could also assist in guiding visitors to official access tracks by designating a clear route, thereby minimising unofficial beach access.

Another activity hub could be established at the southern end of the beach, in Zone C, to ensure a distribution and intensification of recreational opportunities, and multiple activity hubs. Council should investigate whether the current facilities (mostly in the middle section of Zone B) are adequate,

and whether the establishment of additional facilities would be a useful investment. It is recommended that additional recreational opportunities at the southern end of the coastal unit (Zone C) be investigated.

It is also important to encourage and enable people to use the Reserve areas responsibly. Currently, there are a few unofficial car tracks through the Reserve to Cabbage Tree Creek, where people are fishing (Figure 34). It may be beneficial to close some tracks, which have been badly affected by erosion, or which lead to waste dumping areas rather than recreational sites. The formalisation of one track to the creek will increase recreational opportunities in the area by increasing the access to fishing spots. Facilitating this access aligns with the *Draft Open Space Strategy* (MRC 2016). Additionally, formalising one path and closing all others will reduce waste dumping and disturbance to vegetation.



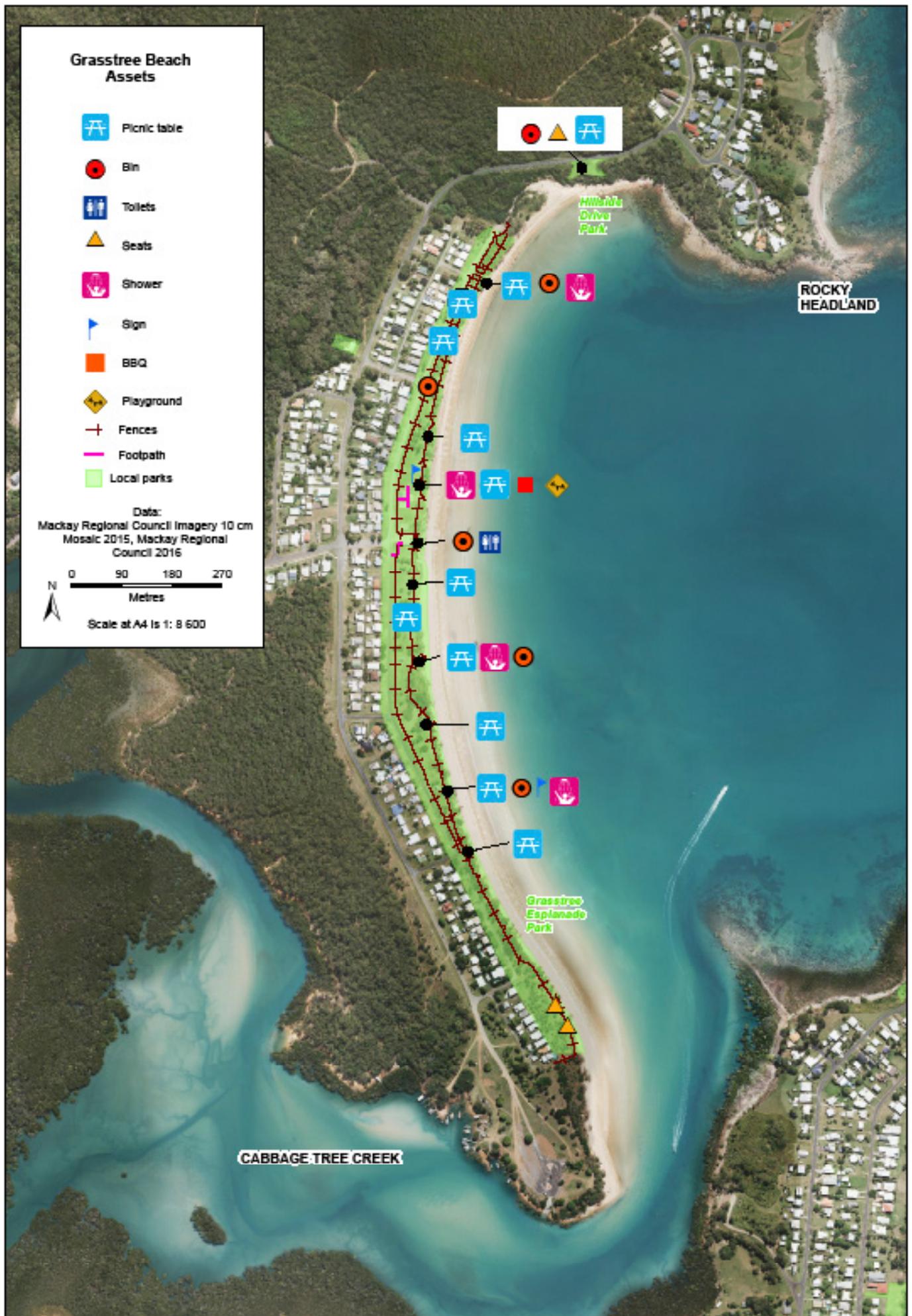


Figure 26. map of infrastructure at Grasstree Beach



**Figure 29:** Exercise station at Grasree Beach



**Figure 30:** Toilet block at Grasree Beach



**Figure 31:** Possible location for scenic lookout and picnic spot on the headland of Grasree Beach



**Figure 32:** Open, mown space at Grasree Beach



**Figure 33:** Coconut grove in Zone B of the Grasree Beach coastal unit

## 5.3 PUBLIC ACCESS



**Figure 34:** Unofficial access track through Reserve land

To prevent the degradation of dune systems and for public safety, it is important for users to stay on designated access tracks. Pedestrian and vehicle traffic displaces sand, and where it continuously occurs, can lead to localised erosion. Recreational activities/facilities (i.e. pathways, picnic facilities etc.) where possible, should only be located outside of the erosion prone area and inside the landward dunal areas (DERM 2011).

Since the implementation of the 2007 *Grasree Beach Plan*, bollard fencing has been installed to prevent vehicle access to the foredune and beach, and post and rail fencing has been installed behind the foredune to direct pedestrian traffic to official access tracks. This has been successful in its original goal to reduce erosion and protect foredune vegetation.

Currently there are fifteen official access tracks to Grasree Beach (Figure 35). Two access tracks (GRA06 and 11) have been upgraded since the *Grasree Beach Plan*, and are different from the standard sand ladder and railing access tracks (Figure 36). They are staircases to the beach, made largely from recycled materials. These staircases minimise the disturbance to sand by pedestrian traffic and off-path movements. It is recommended that the remaining access tracks be upgraded to the same standard over time.

Activity is directed to official access tracks by post and rail fence that runs the length of the park. The fence protects native vegetation and delineates the extent of mown parkland. The movement of sand has meant that in some sections, the fence is almost completely buried (Figure 37). A new post and rail fence should be constructed further landward to maximise vegetated buffer zones that allow natural coastal processes to occur. This fencing should open to the foreshore only at official access tracks in order to discourage unofficial access.

Public access to the beachfront on the rocky headland is via a walkway from Driftwood Close (Figure 40). The state of the walkway may be contributing to the increasing use of adjacent unofficial access tracks, therefore the repair of the formal access track is recommended.

A wide buffer area between the road and the park provides Council with the opportunity to reposition bollards and reclaim land for recreation or conservation uses. In areas of high recreational use, or in front of official access tracks, parking space is important. However, in other sections park bollards could be moved back, where appropriate, to the roadside to promote natural regeneration and vegetation zonation (i.e. in non-intense use zones/activity hubs).

Unofficial vehicle access tracks are causing localised erosion or leading to illegal dumping within the Reserve areas (Figure 34 and 43). All unofficial vehicle access tracks should be closed, with the exception of one. A main track leading onto Cabbage Tree Creek should remain open to continue to provide access to green areas. However, the sites need to be monitored for green and general illegal waste dumping.

## 5.4 SIGNAGE

Signage provides education and interpretive opportunities for visitors and increases the value that locals place on the natural environment. Signs can highlight areas of high value, provide information about current projects and advise of site-specific restrictions or hazards (Figure 41). Beach access signage is present at the landward and seaward end of each formal and official beach access throughout the coastal unit. It is recommended that signage be regularly audited and updated where required to ensure consistency and accuracy.

There is scope for the installation of new signage detailing the importance of coastal vegetation in reducing erosion. This would be best situated near revegetation sites to further dissuade the removal or destruction of vegetation via education and awareness raising. Additional interpretive signs could be provided to educate visitors about dune health and function, important or unique native species including nesting turtles, and REs including critically endangered beach scrub. Similarly, signage reflecting the cultural history of the area could enhance visitor experience and ensure that the importance of cultural heritage is reflected and appreciated by locals and visitors.

Additional signage is required along the edge of the Reserves outlining dumping and littering restrictions (Figure 41). Signage should accompany all access tracks and be used as an information, education and regulation/enforcement tool.



Figure 35: Grasree Beach access



**Figure 36:** *Upgraded beach access track made from mostly recycled material*



**Figure 37:** *Foredune post and rail fencing*



**Figure 38:** *Unofficial access track*



**Figure 39:** *Unofficial Public access to the beachfront*

## 5.5 ECONOMIC VALUES

Beaches are important economic assets as well as natural resources, as they provide services to people and property that have an economic value, including reduced storm damage, together with recreational and tourism opportunities (Stronge 2005).

The tourism industry is important for the Australian economy, comprising approximately three per cent of gross domestic product in 2014-15 (Productivity Commission 2015).

Australia's tourism industry is dominated by the natural environment, with national parks and protected areas forming the basis of nature-based tourism experiences (Weaver et al., 1999). Beaches are the most popular coastal attractions for visitors, providing opportunities for a range of activities including bushwalking, whale watching and fishing (Clarke and Johnston 2017).

Beach visitors generate income for the local economy through their expenditure. Spending by tourists is a component of the economic activity across a variety of sectors including accommodation, cafes and restaurants, transport and storage, retail trade, cultural and recreational services and education (Pambudi et al., 2009). Income generated by the coastal tourism sector is highly dependent on the quality and extent of beach systems (Jones and Phillips 2007).

Ecotourism is a significant and growing sector of the tourism industry, and provides a way to reconcile tourism and conservation (Weaver 2001). By marketing natural values, ecotourism can maintain the aesthetic appeal of coastal tourist areas while deriving economic value, and simultaneously produce environmental benefits (Clarke and Johnson, 2017).

Beach and dune environments are among the most valuable natural habitats on the coast, providing environmental services,

landscape values and habitat for marine and terrestrial plants and animals which can serve to attract tourists as well as provide amenity for local residents (James, 2000). The costs associated with recreational and tourist usage of beaches includes the cost of infrastructure provision and maintenance.

Beaches provide goods and services to many stakeholders, with a range of market and non-market values which can be worth millions of dollars per year. The way people value the natural environment however can vary. Value can be associated with direct uses, such as fisheries or tourism, as well as indirect uses, such as mangroves providing nursery habitat for juvenile fish species. Indirect uses are usually found outside the market place and are effectively unpriced. Determining the full value of a natural asset is challenging and often overlooked, however if no monetary value is placed on environmental goods and services there is a risk that they will be perceived as having no value (zero worth) and may be vulnerable to exploitation (Kirkpatrick 2011).

Coastal resources in the Mackay region are highly sought after for competing uses including residential, commercial, tourism and recreation. Effective management is required to ensure that the natural values and attributes of the coast are preserved while economic development and population growth are accommodated (EPA 2004).

Climate change is likely to have a range of direct and indirect economic impacts on recreation and tourism in coastal areas. Local and state governments will need to invest in natural assets to ensure the continuation of a strong tourism culture and investigate opportunities to diversify the tourism image for beach-focused destinations while balancing the value of natural coastal assets against trade-offs for other uses such as industry and development (Kirkpatrick 2011).





**Figure 40:** *Public access to the beachfront requiring maintenance*



**Figure 41:** *Signage outside Zone D*



**Figure 42:** *Palm fronds smothering and impeding native ground cover vegetation*



**Figure 43:** *Dumped garden plants establishing in Reserve*

## 5.6 WASTE DUMPING AND LITTER

Green and general waste has aesthetic, social and conservation repercussions. Litter and green waste reduce the visual appeal of beaches, present health threats to visitors (e.g. toxic waste, glass and sharps etc.) and compromise vegetation. Green waste such as palms fronds smother and suppress native vegetation establishment (Figure 42), and as consequence can reduce dune stability and increase weed invasion and fire risk. Plastics and other general waste often wash out to sea, presenting dangers for marine wildlife including birds, fish, sharks, turtles and marine mammals. Marine debris may lead to drowning, or cause injury or death through entanglement and internal injuries, or from starvation following ingestion.

Waste dumping was not found to be a serious issue on the foreshore of Grasstree Beach, however dumping of general and green waste is one of the prominent threats to surrounding Reserve areas. Dumping of palm fronds and coconuts is evident, as well as other green waste including garden plants. In some cases, the dumped garden plants are establishing in the Reserve (Figure 43) undermining the weed control efforts.

Appropriate regulatory signage and a public education and awareness programs on the values of the coastal unit and impacts of waste dumping should complement other management actions.

# 6 Climate Change

Climate change is the term used to describe long-term changes in global weather patterns, and the gradual increase in mean global temperature. There is strong evidence that suggests that the gradual warming trend over the last fifty years has been driven largely by human activity, for example, the burning of fossil fuels, deforestation and intensification of agriculture (The Royal Society 2010). Climate change is having, and will continue to have, significant impacts on human lives and the ecosystems on which we depend.

Coastal areas are highly exposed to climate change with sea level rise being one of the greatest threats. The best known model relating shoreline retreat due to an increase in local sea level is that proposed by Per Bruun (1962) (Figure 44).

Projected sea level rise (0.8 m by 2100) is expected to increase erosion and damage property and infrastructure (DERM 2011). The response of Australian coastal ecosystems and landforms to climate change will vary, but most are expected to involve shoreline recession, vertical accretion of sand, increased saline inundation of wetlands, and the modification and southward shift of habitat (Australian Government 2013). Additionally, many intertidal ecosystems such as mangroves, seagrass and tidal flat communities will decline.

Key climate change messages for the wet tropics Natural Resource Management (NRM) cluster, that encompasses the Mackay region, are displayed in Figure 45. Current predictions suggest that much of the dune system will be inundated by 2100 (Queensland Government 2011b). Maintaining and improving the condition of a buffer area of coastal vegetation, where possible, will provide the best opportunity to build resilience into these ecosystems to cope with changes into the future. The *Mackay, Whitsunday and Isaac Climate Sustainability Plan 2016-2020* contains forecasts local to the Mackay region. Figure 45 highlights additional key changes associated with climate change, such as increased temperatures and more severe tropical storms.

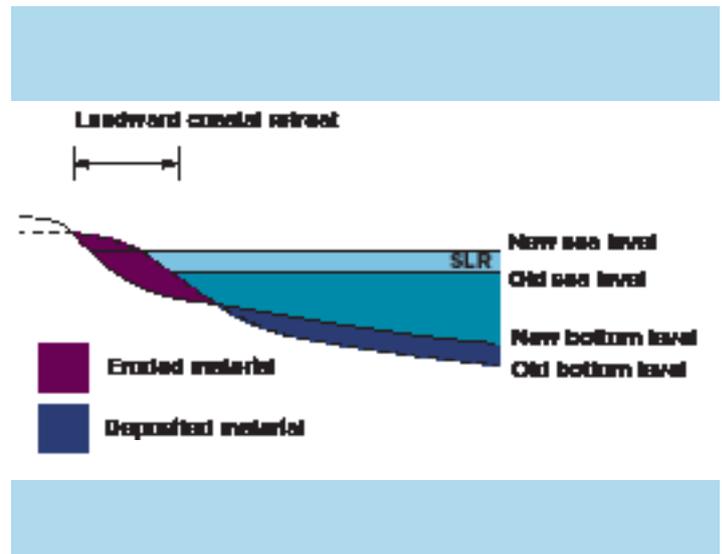
There are opportunities to improve vegetation structure and condition through weed control and rehabilitation activities in order to provide effective buffers against climate change. Weed control will allow native vegetation to regenerate, and rehabilitation should focus on establishing deep-rooted natives such as *Casuarina equisetifolia* to stabilise dunes. Removing as many pressures from the wildlife and vegetation communities will provide them the best opportunity to persist.

Sea level rise and associated erosion is predicted to affect the entire residential community of Grasstree Beach, the mangrove community along Cabbage Tree Creek and the coastal rainforest vegetation in the Reserves bordering the mangroves and creek. Retreat from the rising sea is likely to be required in the longer term in some places. Rising sea levels will therefore see the loss of habitats such as sand dunes that are not provided space to retreat landward.

This will be the case for most of the sand dunes along Grasstree Beach. The loss of this important habitat may have impacts on local turtles, birds and other flora and fauna.

The mangrove communities are well buffered from climate change, given that they have space behind them (Reserve areas) to retreat in response to sea level rise.

Minimising the extent to which the area is developed will ensure that the rainforest communities can migrate inland and have open space to colonise.



**Figure 44:** Source: Bruun 1962 *The Bruun Rule* showing erosion of the upper beach and offshore deposition under sea level rise (SLR)

The challenge for future planning will be to identify suitable ecological retreat zones for our developed sections of coastlines, informed by geomorphic processes, to accommodate for climate change processes and preserve unique habitat in specific geographic regions. For example, it may be important to limit development around estuary areas and coastal wetlands and waterways, in order to preserve a zone to accommodate ecological retreat. Adaptation planning is recommended to ensure that this is comprehensively considered to mitigate risk to social and environmental values in the area.

Residents of the coast are already familiar with the risks of living close to the ocean, such as storm surges, cyclones and erosion. However, the intensity of these threats is expected to increase with a warming global climate, so it is important to understand and prepare for this. Reducing environmental pressures will increase the resilience of coastal ecosystems, thereby increasing the likelihood of their persistence into the future.

## KEY MESSAGES FOR THE WET TROPICS



Average temperature will continue to increase in all seasons.



More hot days and warm spells.



Changes to rainfall possible but unclear.



Increased intensity of extreme daily rainfall events.



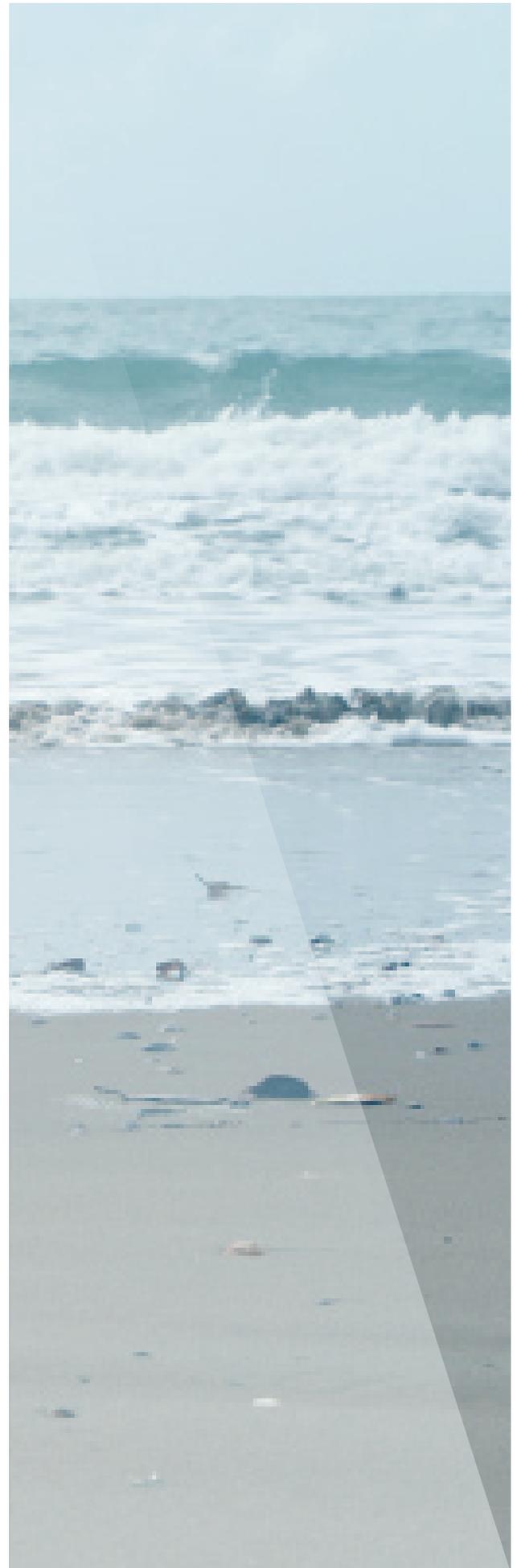
Mean sea level will continue to rise. Height of extreme sea-level events will also increase.



Fewer but more intense tropical cyclones.



On annual and decadal basis, natural variability in the climate system can act to either mask or enhance any long-term human induced trend, particularly in the next 20 years and for rainfall.



**Figure 45:** Key climate change messages for the Wet Tropics Natural Resource Management (NRM) cluster (Source: Abbs, D. et al., 2015).



# 7 Recommended Activities

**Table 2:** Recommended Activities for the Grasree Beach Local Coastal Plan

RECOMMENDED ACTIVITIES	
<b>Zone A   Northern headland (4.53ha)</b>	
<b>1</b>	<b>Vegetation management</b>
1.1	Control major target weed species including lantana and Guinea grass.
1.2	Undertake assisted natural regeneration.
1.3	Monitor and where suitable, manage other problematic weed species including, but not limited to: Chinese burr, corky passionflower, snakeweed and stinking passionflower.
1.4	Control weeds on and around beach access tracks including highly dispersive weeds such as cobbler's peg and Seaforth burr.
<b>2</b>	<b>Recreational opportunities</b>
2.1	Working with the community, develop a plan to enhance recreational opportunities at the Hillside Drive Park area through the provision of additional infrastructure, including a small-scale lookout and additional picnic facilities.
<b>3</b>	<b>Access management</b>
3.1	Install post and rail fencing to clearly define areas for conservation and recreational purposes.
3.2	Formalise beach accesses between Gold Street and Driftwood Close.
<b>Zone B   Esplanade (11.05ha)</b>	
<b>4</b>	<b>Vegetation management</b>
4.1	Control major target weed species including lantana, Guinea grass, coconut palms, mother of millions and agave.
4.2	Undertake assisted natural regeneration.
4.3	Monitor and where suitable, manage other problematic weed species including, but not limited to: tridax daisy, pink periwinkle, prickly starwort, corky passionflower, siratro, cobblers peg, mother-in-laws tongue, painted spurge, crows foot grass, Seaforth burr, snakeweed and buffel grass.
4.4	Monitor and use available legislation to protect existing native vegetation on Esplanade and Reserve tenure as required. Install additional surveillance cameras near revegetation works in the middle of Zone B, where there is evidence of tree poisoning.
4.5	Control weeds on and around beach access tracks including highly dispersive weeds such as cobbler's peg and Seaforth burr.
4.6	Undertake a trial vegetation restoration area in consultation with the community, to demonstrate the benefits of native vegetation and a well-vegetated dune system.
<b>5</b>	<b>Recreational opportunities</b>
5.1	Distinguish intense use zones and priority restoration areas for planning purposes. Suggested zones include the playground and toilet facilities near GRA05 and the southern end of the beach (Zone C). Provide shade to picnic tables in these zones.
5.2	Support resurfacing the car parking area, the installation of all abilities play equipment in the existing playground and repairs to the basketball court.
<b>6</b>	<b>Access management</b>
6.1	Reconstruct and realign post and rail fence along the foredune where necessary.
6.2	Realign bollard fencing closer to the road where appropriate to maximise recreational land.
6.3	Upgrade all access tracks over time.

**Table 2: Recommended activities for the Grasstree Beach Local Coastal Plan**

<b>Zone C   Southern tip of coastal unit (4.14ha)</b>	
<b>7</b>	<b>Vegetation management</b>
7.1	Control major target weed species including lantana and Guinea grass.
7.2	Undertake assisted natural regeneration.
7.3	Monitor and where suitable manage: tridax daisy, pink periwinkle, prickly starwort, corky passionflower, siratro, cobbler's peg, mother-in-laws tongue, painted spurge, crows foot grass, Seaforth burr, snakeweed and buffel grass.
7.4	Control weeds on and around beach access tracks including highly dispersive weeds such as cobbler's peg and Seaforth burr.
<b>8</b>	<b>Recreational opportunities</b>
8.1	Investigate the development of an activity node and/or the installation of infrastructure as appropriate.
8.2	Work with the State Government to secure funding for the construction of additional upgrades to the boat ramp including a floating pontoon and car parking as recommended in the Queensland Recreational Boating Facilities Demand Forecasting Study 2016.
<b>9</b>	<b>Access Management</b>
9.1	Reconstruct and realign post and rail fence along the foredune where necessary.
<b>Zone D   Reserves (32.66ha)</b>	
<b>10</b>	<b>Vegetation management</b>
10.1	Control major target weed species including lantana and Guinea grass.
10.2	Undertake assisted natural regeneration.
10.3	Monitor and where suitable, manage other problematic weed species including, but not limited to: Chinese burr, Blue couch, corky passionflower, tridax daisy, and annual stylo.
10.4	Control weeds on and around access tracks including highly dispersive weeds such as cobbler's peg and Seaforth burr.
<b>11</b>	<b>Access management</b>
11.1	Rationalise unofficial vehicular tracks throughout the Reserves. Retain one vehicular track leading to Cabbage Tree Creek for public access.
11.2	Establish a post and rail fence to delineate conservation and recreation areas.
<b>12</b>	<b>Signage</b>
12.1	Install regulatory and interpretive signage where appropriate along the length of the Reserves to reduce unofficial access and waste dumping.
<b>13</b>	<b>Waste management</b>
13.1	Remove green waste and regulate hot spot locations with signage.

**Table 2: Recommended activities for the Grasstree Beach Local Coastal Plan**

<b>Other activities across multiple zones</b>	
<b>14</b>	<b>Cultural heritage</b>
14.1	Engage Traditional Owners to undertake cultural heritage surveys of the area to outline clear management objectives for the preservation of cultural heritage within the coastal unit.
<b>15</b>	<b>Signage</b>
15.1	Install signage at the landward end of each beach access point that clearly identifies the beach access number, restricted activities, hazards present and provides information on the appropriate first aid treatment for marine stingers.
15.2	Install beach access numbering signage at the seaward end of each beach access point.
15.3	Rehabilitation areas should be accompanied by signage detailing its purpose and any regulatory mechanisms in place.
<b>16</b>	<b>Access Management</b>
16.1	Install regulatory signage to protect shorebird and marine turtle populations.
16.2	Consider pathway linkages in neighbouring areas to improve connectivity between Parks and Reserves.
<b>17</b>	<b>Waste management</b>
17.1	Inform residents of appropriate waste disposal methods. Follow up with education, regulation and enforcement activities.
17.2	Educate the community on the impacts of waste on native vegetation, dune health, and wildlife.
<b>18</b>	<b>Tourism</b>
18.1	Investigate opportunities for increased tourism visitation to the beach. Facilitate low impact events such as the Grasstree Beach Races. Provide in-kind assistance where possible to generate interest and visitation to the area. During events, ensure there are adequate rubbish disposal facilities and that the foredunes are temporarily fenced off to prevent access and minimise disturbance to native vegetation.
<b>19</b>	<b>Education</b>
19.1	Partner with Coastcare and others to deliver education programs about: <ul style="list-style-type: none"> <li>- Local weed species and the use of local native species in residential gardens.</li> <li>- Garden waste and general waste disposal.</li> <li>- Responsible pet ownership including having dogs on leads at all times, unless in a designated dog off leash area, where they must still be under effective control and respond to the owner’s commands.</li> <li>- The ecology and threats to native wildlife including marine turtles and shorebirds.</li> </ul>
<b>20</b>	<b>Monitoring</b>
20.1	Undertake beach profile monitoring to record and assess change over time and monitor the impacts of sea level rise and the changing dynamics of coastlines to guide future coastal planning and works.
20.2	Consider a regional study on the long-term sediment (sand) supply for the Mackay coastline.
20.3	Monitor, or in partnership with others, assist with the monitoring of shorebirds and turtles.
<b>21</b>	<b>Climate Change</b>
21.1	Consider how to manage future predicted reduction in coastal land to retain buffer above the high tide mark (e.g. rolling boundaries).
21.2	Review existing revegetation list to ensure that species reflect diversity of all Regional Ecosystems present in coastal unit and in preparation for future predicted climates.
<b>22</b>	<b>Erosion mitigation</b>
22.1	Investigate the potential for appropriate integrated erosion mitigation options such as sand scraping and subsequent dune stabilisation.

**23 Legislation and local laws**

23.1 Use available legislation to protect existing native vegetation on Esplanade and Reserve tenure as required.

23.2 Using existing laws, undertake enforcement and compliance activities across the area, particularly relating to unrestrained dogs and motor vehicles in park and beach areas.

23.3 Review and update this document in line with changing legislation.

**24 Community involvement**

24.1 Provide opportunities for community members to be involved in coastal management activities at formal Coastcare events.

**25 Enhancement of surrounding areas**

25.1 Implement a tree succession plan across the length of the coastal unit.

25.2 Implement a roadside vegetation program to increase the amount of street trees along roads.

# 8 Implementation and Review

The implementation of the *Grasstree Beach Local Coastal Plan* will occur on a prioritised basis as resources become available.

In addition to Council's Natural Environmental staff and *Natural Environment Levy* funding, multiple external opportunities for funding and resources to assist in the implementation of the *Grasstree Beach Local Coastal Plan* exist. These include:

- Federal Government grant opportunities
- State Government grant opportunities
- Corporate grant opportunities
- Regional Natural Resource Management (NRM) group (Reef Catchments Mackay Whitsunday Isaac) partnerships
- Specialist organisations (such as the Mackay and District Turtle Watch Association, Birdlife Mackay, and Queensland Wader Study Group)
- Local community groups
- Local community volunteers as part of the Coastcare program

A formal review of the *Grasstree Beach Local Coastal Plan* should take place every five years as feasible. However, Council may seek to update the Local Coastal Plan at any stage based on the results of monitoring programs, and in line with further protecting the natural environment values of the area.

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# 10 Appendices

## Appendix 1: Clarke Connors Range Fire Management Guidelines

**The Clarke Connors Range**  
bushfire consortium

The Clarke Connors Range Bushfire Consortium is a Reef Catchments Initiative with funding support from the Australian Governments Caring for Our Country and Queensland Governments Blueprint for the Bush.

**FIRE MANAGEMENT GUIDELINES**

**REEF CATCHMENTS**  
Madley Whitsunday Inc

Queensland Government

RURAL FIRE SERVICE

CARING FOR OUR COUNTRY

Blueprint FOR THE BUSH

# Introduction

Rural Catchments and the Clarrie Connors Range Bushfire Consortium  
 Rural Catchments is a community based, not-for-profit organisation that has a proven track record in advancing natural resource management in the Mackay-Whitsunday Region. Rural Catchments works seamlessly across the private and all levels of the public sector to deliver the results where they matter. For more information and contact details visit the website [www.ruralcatchments.com.au](http://www.ruralcatchments.com.au)

The Bushfire Consortium was formed to begin reducing the threat of inappropriate fire on the outstanding natural and economic values of the Clarrie-Connors Range on the Central Queensland coast. This area experiences an extremely variable climate and exhibits fringing bushfires that numerous large and intense dry season wildfires have occurred over the last 10 years. The concern is that a drier and hotter climate may further increase the incidences of these fires with consequent environmental and economic impacts. Rural communities recognise the magnitude of these fires, and their effects on life, property, productivity, and the environment. However, the wider community has not had access to good information on appropriate fire management practices until now.

Rural Catchments, in partnership with Volunteer Rural Fire Brigades, Government and non-Government landholders, and the Queensland Fire and Rescue Service, has taken up the challenge of providing the best information available on fire management and planning in the region. These Fire Management Guidelines are the culmination of extensive discussions with experienced members of Volunteer Rural Fire Brigades and other respected fire managers and fire scientists.

The Clarrie-Connors Range Bushfire Consortium is a Bush Catchments initiative with funding support from the Australian Government's Country for Our Country and Queensland Government's BushSafe for the Bush.

Disclaimer: This content is provided for information purposes only. No claim is made as to the accuracy or reliability of the content. Rural Catchments does not accept any liability for the information or advice for the use of such information or advice which is provided or incorporated into it by individuals.

These Guidelines are one of the products of the Bushfire Consortium and are intended to be used by Volunteer Rural Fire Brigades and landholders who are on the front line in managing fire in rural communities. They are intended to be used to help land managers plan hazard reduction burning, and in undertaking planned burns for improved production and conservation outcomes.

Using these guidelines  
 These Fire Management Guidelines have been developed for 12 landscape types in the Mackay-Whitsunday region. These landscape types are composed of vegetation types that require similar fire prescriptions.

- Four important factors to consider when planning for fire management are:
1. Fire Frequency - how often should an area be burnt.
  2. Fire Intensity - how hot does the fire need to be.
  3. Season - what time of year will usually provide the desired conditions for a planned burn;
  4. Burning mosaic - the percentage of ground cover remaining unburnt after a fire.

Other important factors to consider are fuel loads, wind speed, humidity, fuel curing, slope and aspect.

These guidelines are not intended to account for all circumstances. Seasons, yearly and even daily conditions can vary dramatically. Plan ahead to carry out burns when conditions are suitable and always obtain and adhere to conditions of a permit from your fire warden.



**Green** - Under most circumstances the number of years between burns should fall within the GREEN range. This range is generally considered appropriate for fire hazard management, production and conservation outcomes.

**Orange** - Under some circumstances there may be a need for more or less frequent fire but this should fall within the ORANGE range. Generally, this would occur as a 'one off' e.g. two fires in 3 years to reduce a herbicide infestation.

**Red** - Generally, it would be considered undesirable for fire frequency to fall within the RED range. For example these long periods of time between fires would result in undesired vegetation thickening and loss of pasture productivity.

**Note:** Deviating frequency by "years" can be misleading e.g. in three of drought or particularly high rainfall. Some fire managers prefer using "average years," (determined by having received +/- 20% of the local average annual rainfall by May).

**Green** - Under most circumstances the desired conditions will be available within the GREEN range of months.

**Orange** - Deviated fire conditions will sometimes fall within the ORANGE range of months under the specific requirements for a particular burn will differ in a particular circumstance e.g. Storm burning requires relatively high soil moisture.

**Red** - Under most circumstances, conditions within the RED range of months would result in damaging fire and/or fire that is difficult to control.

Healthy fuels produced by moister burns can be very effective in reducing the intensity and spread of wildfire without losing the complete loss of pasture grasses, loss of soil and nutrients, weed infestations or environmental damage that sometimes result from complete removal of the ground layer from large areas.

Different fire intensities perform different land management tasks as described within the guidelines.

**LOW** intensity fire is < 1m in height.

**MODERATE** intensity fire is < 2m in height.

**HIGH** intensity fire is > 2m in height.

The Clarrie Connors Range  
 bushfire consortium

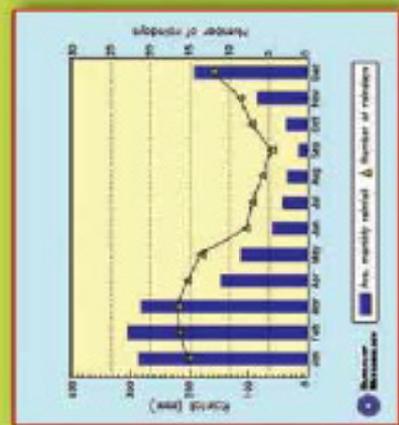
# Mangroves and Estuarine Wetlands

The Management Guidelines for Central Queensland Coast  
**Landscapes 1**



**BURNING IS GENERALLY NOT RECOMMENDED IN THIS LANDSCAPE**

Mangroves, saltmarsh, saltwater couch, areas of saltpan and fringing melaleuca forests and pandanus.



BURNING MOSAIC - UNBURNT **100%**

LOW MODERATE HIGH  
 FIRE INTENSITY - °C



The Clarke Connors Range  
 BEST PRACTICE MANAGEMENT **1**

### **Hazard Mitigation**

Saltmarsh and saltwater couch grasslands are regularly inundated by high tides which maintain high soil moisture and ensure continual green growth throughout the year. Because of this these areas rarely present a fire hazard risk. Risk is further minimised by the fact that the grasslands rarely accumulate large amounts of fuel and tend to be broken up by patches of saline clay and sparse saltmarsh.

The native ground cover within fringing melaleuca woodland and forests is also saltwater couch and this does not represent high fire hazard. However, in many areas Guinea grass and other exotic grasses have invaded and these can accumulate high fuel loads that pose a fire risk in the dry season. Guinea grass and many other exotic grasses tend to quickly increase their biomass after fire, often reaching a similar fuel load in as little as one season. The most effective long-term fire hazard reduction strategy is to remove these grasses using herbicide such as glyphosate.

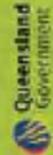
### **Problems**

Because of high salt levels in the soil, weed infestations are rarely a problem in saltwater couch grasslands and burning for weed control does not need to be undertaken. Saltwater couch is a perennial grass and pasture condition is strongly dependant on normal tidal cycles. Fire does

not improve productivity and indeed, fire can lead to loss of important nutrients. Saltmarsh and saltwater couch grasslands are an important food source, and refuge for juvenile fish. There is strong evidence that juvenile fish feed heavily in these areas on high tides. A decrease in biomass through removal by fire, or overgrazing, may have a significant impact on coastal fisheries production.

### **Conservation**

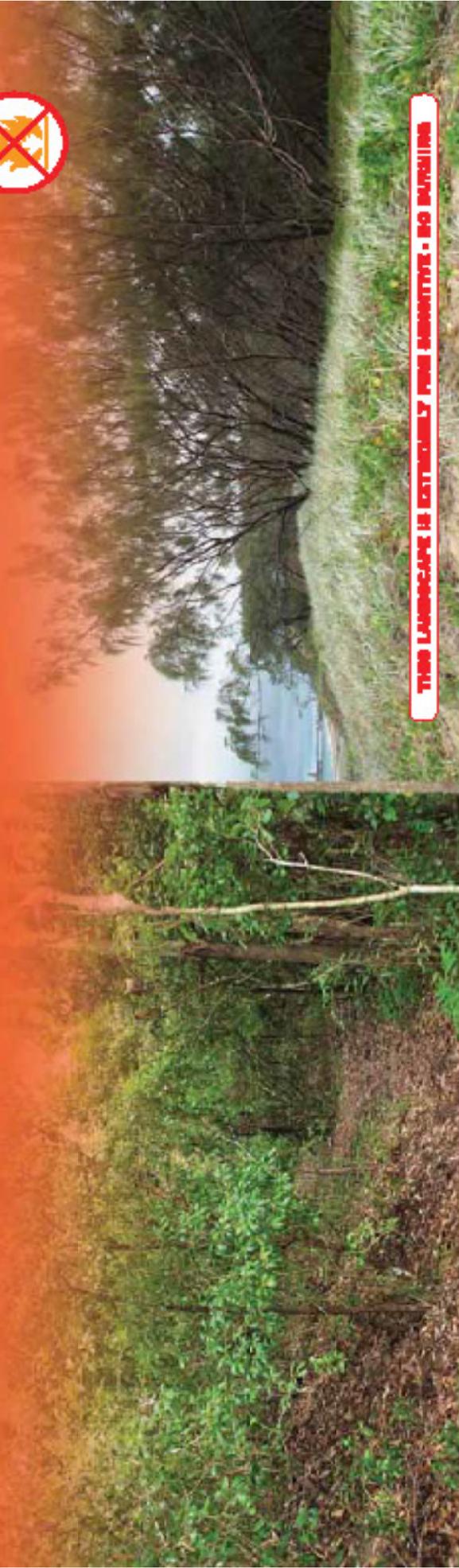
Apart from their values to coastal fisheries, mangroves, saltmarsh and saltwater couch grasslands provide essential habitat for a range of conservation dependent species. Minimising fire and other disturbances within these areas provides significant positive benefits for migratory and resident shorebirds, seabirds and the threatened mangrove mouse.



# Beaches and foreshores

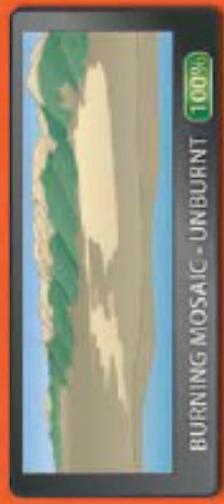
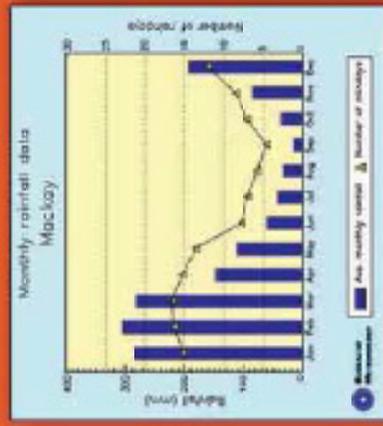
Fire Management Guidelines for Coastal Queensland Inland Coast

## Landscapes 2



**THIS LANDSCAPE IS EXTREMELY FIRE SENSITIVE - NO BURNING**

Coastal white-oak & beach scrub (rainforest) in protected areas.



The Clarke Connors Range  
NATURE CORPORATION

3

### **Hazard Reduction**

Coast she-oak and beach scrub habitats are fire sensitive and will be killed or severely degraded by even low intensity fire.

The native ground cover within beach scrubs and coastal foreshores does not accumulate large amounts of fuel and does not represent a high fire hazard. However, infestations of exotic grasses and weeds can significantly increase hazardous fuels, especially along disturbed edges of this landscape.

Hazard reduction burning is generally not suitable in coastal areas as Guinea grass and other fire loving grasses quickly increase their biomass after fire, often reaching a similar fuel load in as little as one season.

An effective long-term strategy is the use of registered herbicides to reduce fuel hazards where required. Apply when grasses are actively growing, preferably prior to dry season.

### **Prevention**

Many remaining areas of beach scrub are islands in a sea of cleared land, and much remaining foreshore vegetation is the only buffer between the land and the sea.

Undisturbed foreshores and beach scrubs are fairly resistant to weed invasions, however smaller patches and disturbed areas are more prone to weed invasions and associated fire risk.

Disturbance caused by stock trampling and the presence of feral pigs can encourage spread of lambton and other

weeds into otherwise intact areas. Management of stock access and provision of sheds and watering points away from beach scrub and foreshores will reduce the impacts of disturbances in the long term.

Reducing weed impacts by means other than fire around buffers and in degraded areas will protect, and facilitate recovery of, these sensitive coastal areas.

### **Conservation**

Fire is a key threat to remaining areas of beach scrub (rainforest on sand dunes) - a critically endangered ecological community under the National Environment Protection and Biodiversity Conservation Act (1999). Beach scrubs and foreshores are key habitats for many rare and threatened plants and animals and migratory birds. Foreshores are breeding sites for marine turtles and shorebirds such as the beach stone-curlew (pictured above).

Disturbance of these habitats, commonly due to erosion; clearing/mowing of undergrowth; stock trampling; 4WD and pedestrian tracks, leads to weed invasions and increased fire risk. Weed management, rather than fire management, should be used to protect and rehabilitate remaining areas.

Very careful use of fire in adjacent fire prone landscapes is required; check that there is little to no encroachment into beach scrubs and foreshores as an indicator of successful fire management.





#### **Preventative**

Burning is not generally recommended in coastal dune systems and adjacent buffer zones for rehabilitation or protection purposes in special circumstances.

Exotic grass infestations such as Guinea grass are common along the edges of coastal dune vegetation. Many introduced grasses are favoured by disturbance and rapidly re-grow after fire, often accumulating similar fuel loads in as little as one season.

Landowners in some built up areas may desire protection burning to reduce hazards. Fire should only be used to gain initial control of weedy areas as part of a long term weed management strategy. Burn with low intensity fire; ensure good soil moisture is present (e.g. after 60mm of rain) no more than once every 3-5 years. Avoid regular or repeated burning and do not burn in dry conditions when risk is high.

Management of exotic grasses and other weeds is best achieved by using a registered herbicide when the plant is actively growing. Guinea grass is easily killed after fire with minimal herbicide use.

#### **Preventative**

Clearing and introduction of exotic pasture species occupied with impacts of stock can severely impact on fragile dune systems. Exotic species can out-compete natives in disturbed areas and alter natural fire regimes.

Open dune grasslands supporting native grasses such as black spear grass would tolerate a low intensity fire every 3-7 years. Planned burns should only be conducted when rapid

regeneration of the grassy layer is expected; burn with good soil moisture and where there is a good chance of follow up rain. Avoid regular or repeated burning as loss of groundcover and soil nutrients will encourage weeds and less favourable grasses.

Disturbance of ground layer leads to weed invasions and loss of native grasses. Minimal disturbance from stock trampling and manage weeds using other methods than fire.

#### **Considerations**

Lack of knowledge of this ecosystem and its need for fire is a major obstacle to effective fire management. In general, fire should only be applied for regeneration of native grasses and canopy trees and responses carefully monitored.

Fire management could be trialled in areas supporting a native grass ground layer. A low intensity fire no more than once every 3-7 years with good soil moisture is advised. Indicators of successful fire management include: germination of canopy tree species; maintaining native grass density; fauna abundance; and reducing exotic grass dominance.

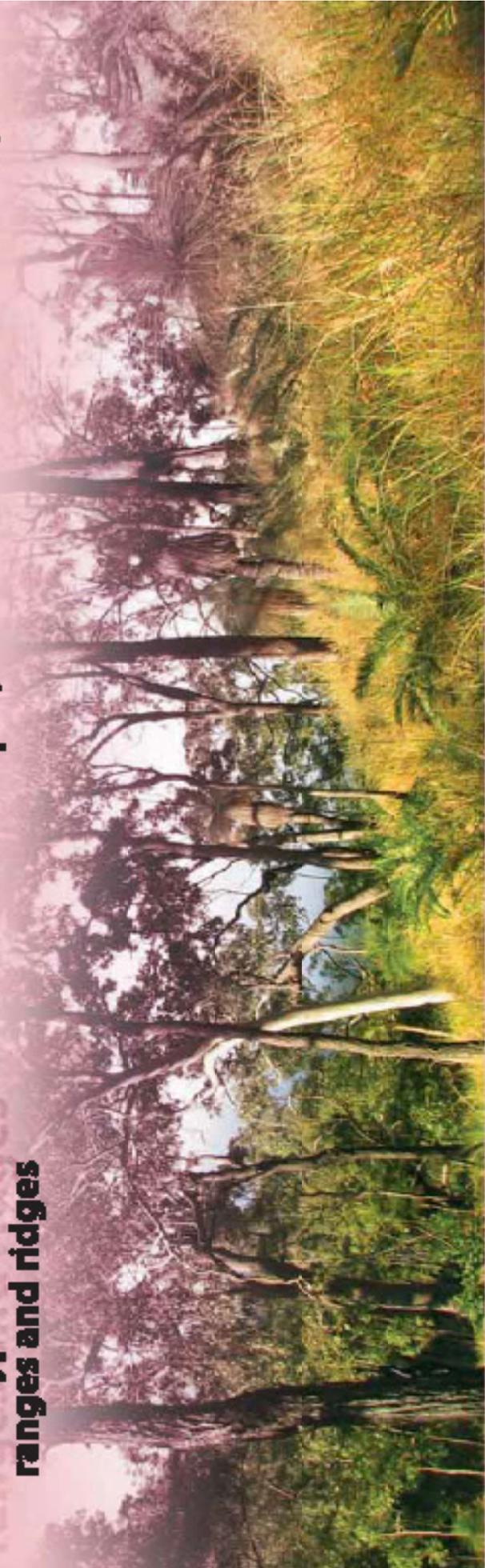
Many areas supporting beach scrub pioneer species in the understory will naturally revert to beach scrub; actively exclude fire from these areas.

Coastal landscapes support a diverse range of plants and animals and their habitats are vulnerable to disturbance. Reducing disturbance and managing weeds rather than fire will protect coastal habitats and wildlife such as the orange footed scrub fowl (pictured above).

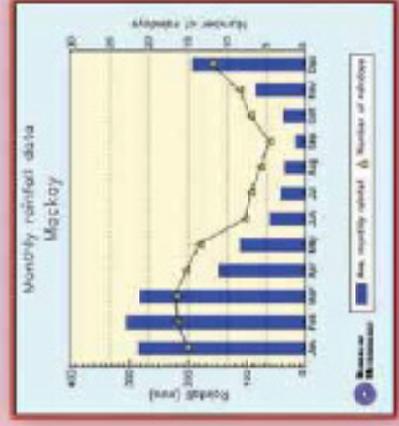


# Eucalypt forest and woodlands on hill slopes, ranges and ridges

Fire Management Guidelines for Central Queensland Coast  
**Landscaps 9**



Variable woodlands to open forests of Ironbark, Moreton Bay ash, bloodwoods, poplar gum, blue gum, yellow stringybark, brushbox, white mahogany, lemon scented gum, depending on altitude and exposure.



The Clarke Connors Range  
 NORTH QUEENSLAND

### Managed Regrowth

Fire intensity and therefore risk, increases as the dry season progresses when fuel and soil moisture is low. Conversely, fires in the early dry and wet seasons are usually of lower intensity and more patchy.

Guinea grass and other fire-favoured introduced grasses rapidly colonise burned or otherwise disturbed areas, often reaching very high fuel loads in as little as one season. Because of its superior adaptation to fire, guinea grass will out-compete native and desirable species if burnt too regularly or in dry conditions, and spread into new areas.

To reduce the severity of wildfires and the threat they pose to life and property:

- Coordinate controlled burns with neighbours to manage fuel hazards and maintain a mosaic of different ages of vegetation in the landscape;
- Aim to burn 20–40% of a patch or property in a year. Remaining greener patches can be re-lit or sprayed in protection zones post-fire;
- Vary the timing and frequency of burning & burn with good soil moisture. Burning is generally not advised between September & December unless after rain with a high chance of follow up rain;
- Observe response of vegetation and fuel load accumulation and adopt management if needed;
- Construct and maintain strategic fire breaks in populated areas or 'hot spots', potentially across several properties.

### Prevention

Burning season and years between burns will vary depending on seasonal climatic conditions, grazing pressure, the type of eucalypt community and whether country has a grassy or dense shrub understorey. Varying the season, intensity and area burnt will create a mosaic of habitats; whereas too frequent fire (annual or every second year) reduces understorey and has serious impacts on soil health and long term sustainability.

A fire after 50mm or more of rain (or final storm) every 3 to 5 years (longer in drier and/or steep and/or heavily grazed country) will maintain a good balance of trees and grass. A dense shrub layer or

thicker regrowth may increase with longer intervals.

For effective control of woody regrowth and dense shrub layer the undergrowth, fuel loads of at least 1,500 kg/ha are required. Trees and shrubs below approximately 2m high will be suppressed with a moderate intensity fire; however control of regrowth greater than 2m will be difficult as greater fuel loads are required and most eucalypts will re-sprout after fire.

Care must be taken to protect adjacent rainforest and creek edges from hot fires. Igniting along rainforest edges and allowing fire to burn downhill will reduce intensity and resulting damage to fire sensitive vegetation.

Country may need to be de-stocked prior to a burn to allow fuels to accumulate. Wet season spelling after fire will promote native grasses and diversity in ground cover.

### Conservation

Planned burning in this landscape should aim to promote patchy fires to ensure a mosaic of different vegetation types and time since fire across the landscape. Rainforests are prone to widespread intense fires in the dry season which is a key threat to biodiversity.

Fire too regularly leads to a loss of vegetation cover and directly threatens yellow-billed guller, Rufous owl and glossy black cockatoo habitat and the mature hollow bearing eucalypts they depend on. Rocky outcrops in the forest are essential habitat for the endangered northern quail. Do not burn between mid-September and mid-December when juvenile quails are most vulnerable to fire.

In potential or known quail habitat, small scale patch burns of 17ha or less are best - burn with good soil moisture or just after the wet season when the ground, leaf litter & vegetation are still very wet. Burn around every 5-7 years and leave some areas unburnt for 7 years or longer, especially in years after a hot fire has occurred. Controlling weeds (especially lentils), woody regrowth and rainforest invasion is a major focus of planned burning in most areas. Dense areas of lentils may require well planned hot fires to reduce infestations. Frost or herbicide spray before a burn can cure fuels and give better control.



2000 kg / ha



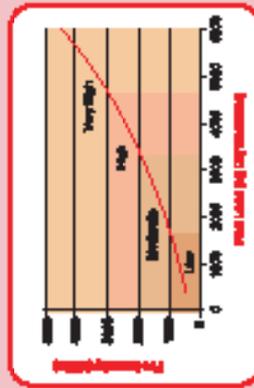
4000 kg / ha



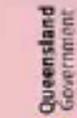
1000 kg / ha



3000 kg / ha

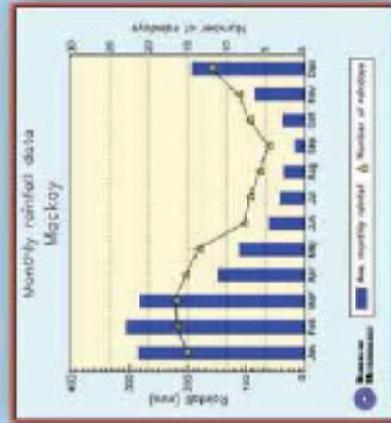


Fuel Load  
(kg Dry Matter/ha)



# Island and rocky headland landscapes

Fire Management Guidelines for Central Queensland Coast  
**Landscape 12**



Greasy headlands to eucalypt and brushbox and ironbark forest-shrubland, blue gum and poplar gum woodlands (including hybrids), Moreton Bay ash and blue gum woodland with a dense understorey of vine forest species.

The Clarke Connors Range  
 BUSHFIRE COORDINATION



**Hazard Reduction**

Island woodlands and coastal heathlands can be infested with introduced grasses and lantana which promote hotter fires and rapidly regrow after fire. In general, it is the more disturbed areas impacted by weeds. Disturbance can be from repeated fires in the past.

Control of weeds and exotic grasses by means other than fire may be preferred in areas surrounding campgrounds, island lease and picnic areas.

Where hazard reduction burning is required, fuel loads of 1500kg/ha are adequate to ensure fire intensity is low to moderate. Greater fuel loads will increase fire intensity and the chance of fire spreading.

On the mainland, four wheel drive tracks and other areas of high visitation are a conduit for introducing weeds which can pose a fire risk to surrounding areas.

**Conservation**

Some areas of open grassland are being invaded by woodland or vine forest pioneers whilst other areas remain as open grasslands. Research is needed to determine the role of fire in maintaining vegetation types to determine optimum fire regimes.

Dense thickets of swizzle bush (Timonius timon) are replacing grasslands in some areas. Swizzle bush flowers and fruits between July & November, and could be set back if burnt at during this time. Hotter fires may be needed to reduce woody vegetation and maintain an open canopy, requiring



2000 kg / ha



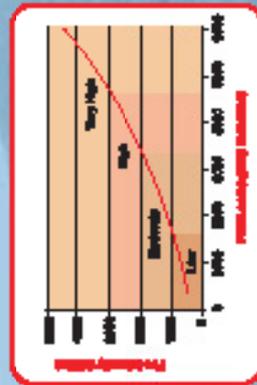
4000 kg / ha



1000 kg / ha



3000 kg / ha

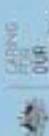


**Fuel Load (kg Dry Matter/ha)**

fuel loads of 2000-3000 kg/ha.

Maintain extent and area of grasslands, where they remain by trialling burning every 2-3 years with a low-moderate intensity fire; retain at least 60% unburnt. Monitor vegetation and adopt management depending on response to fire regime.

Lantana can be managed by fire in the same way as other woody vegetation. Suitable fuel loads must be available, between 2000-3000 kg/ha, to reduce infestations. Slow burning moderate intensity fire can suppress lantana as it damages the root and lower stem zone.



## Appendix 2: Regional Ecosystem (RE) descriptions as found on Council managed land within the coastal unit

**RE 8.1.1** describes the mangrove communities that border Cabbage Tree Creek. Mangrove communities thrive in muddy, saline, intertidal areas. Depending on their position in relation to tidal channels and the amount of freshwater received; mangroves can form a variety of different compositional communities. At the seaward edge of RE 8.1.1 *Rhizophora* species dominate, whereas white mangrove (*Avicennia marina*), blind your eye mangrove (*Excoecaria agallocha*), puzzle nut mangrove (*Xylocarpus moluccensis*), black mangrove (*Lumnitzera racemosa*), yellow mangrove (*Ceriops spp*), myrtle mangrove (*Osbornia octodonta*) and other predominant species (*Bruguiera* and *Rhizophora spp*) are more likely to occur on the landward side. These wetlands are vital breeding grounds for a range of invertebrates, including crocodiles and reef fish species (Fukuda *et al.* 2007) and are therefore both culturally and biotically significant ecosystems. Generally, these ecosystems are in good condition in the Mackay region, due to the low suitability of the saline environment for most weed species. In some less saline mangrove communities, Lantana (*Lantana camara*) may encroach (Queensland Government 2016). This may be significant for RE 8.1.1 in this coastal unit, as Lantana is well-established in the bordering Reserve. However, it is the target of weed control activities implemented by the Mackay Regional Council. In mangroves and estuarine wetlands, burning is not generally recommended. Because few weeds can establish in these areas, it is not needed for weed control. Furthermore, the loss of biomass as a result of burning may have an impact on coastal fisheries production, due to loss of habitat and food sources (Reef Catchments 2009).

**RE 8.2.1** describes *Casuarina equisetifolia* woodland and/or sparse herbland to open scrub on foredunes. This ecosystem is easily recognisable along the foredune of Grasstree Beach. It can be distinguished from all other regional ecosystems by its occurrence on foredunes and/or strand and dominance of typical foredune species such as coastal sheoak (*Casuarina equisetifolia*), beach grass (*Spinifex sericeus*) and ground cover species such as beach bean (*Canavalia rosea*), goats foot (*Ipomoea pes-caprae*) and birds beak grass (*Thuarea involuta*). The vegetation is usually zoned according to tidal inundation/exposure, with the herbaceous communities closest to the sea and the open forest to woodland communities furthest inland. These ecosystems are important, because they're often the only remaining vegetation in a matrix of cleared and developed land, and as such, are the only buffers between the land and sea. At Grasstree Beach, this RE is highly disturbed by weed incursion, erosion and mowing behind the foredune. Removal of ground cover vegetation (e.g. by walking over it) has resulted in invasion by grassy weed species, particularly in the southern end of the beach, where Guinea grass (*Megathysus maximus*) and Crowsfoot grass (*Eleusine indica*) have become well established on the foredune, outcompeting native ground cover species. These species are fire-loving, and prone to burning, however fire is an additional threat to the area, as *Casuarina* species are highly sensitive to burning, and will be killed or severely degraded by even low intensity fires (Reef Catchments 2009). Fire would also act to promote the invasive grasses, which can quickly increase their biomass after fires. To

prevent fire within RE 8.2.1 it is recommended that herbicides be used to minimise fuel loads (i.e. grassy weeds).

**RE 8.2.2** describes endangered beach scrub which is found in the Reserve behind Patterson Street alongside RE 8.12.12d. As the north of this Reserve contains such significant ecosystems, the management of this area should focus on conservation works, offset by allowing recreational use in the south or in other Reserves. Weed control works should continue throughout the area, and fire management should be guided by the *Clarke Connors Range Fire Management Guidelines*, as provided in Appendix 1.

**RE 8.2.6a** describes *Corymbia tessellaris* open forest to low woodland and extends the length of the sandy beach on both sides of the residential area, therefore in the Reserves and Esplanade land of the coastal unit. This ecosystem is *Corymbia tessellaris* open forest or woodland, usually with a very sparse to mid-dense sub-canopy tree layer, with typical species including black wattle (*Acacia leptocarpa*), coastal banksia (*Banksia integrifolia* subsp. *Compar*), cocky apple (*Planchonia careya*) and screw pine (*Pandanus cookie*). A well-developed rainforest component in the sub-canopy often exists presenting other species such as tuckeroo (*Cupaniopsis anacardioides*), soap bush (*Alphitonia excelsa*), broad-leaved native cherry (*Exocarpos cupressiformis*) and Australian almond (*Terminalia muelleri*) amongst others. A low tree or shrub layer and ground layer is present but sparse. These dune forests are naturally restricted REs which are vulnerable to erosion and weed invasion. Subsequently, a large proportion of the remaining dune forests are in moderate to poor condition. The main threatening processes across the region include clearing for coastal residential and tourist development, and for grazing or agricultural lands, and disturbance by recreational vehicles. These are reflected at Grasstree Beach; it is clear that the middle of the patch has been cleared for residential development (where the residential area now is), and disturbance by vehicles is also evident, with unofficial access tracks leading through the Reserves.

**RE 8.12.12d** describes the northern extent of the coastal unit, along the rocky headland. This is *Corymbia* and *Eucalyptus* open forests or woodlands with multiple other co-dominant canopy species and mid-story species, and is found occurring on rocks (Queensland Government 2016). As it occurs on rocks and is consistently moistened by ocean spray, the ecosystem is generally resistant to fire, and should not be burnt more often than every 4-6 years (Reef Catchments 2009). Care should be taken in this ecosystem to protect tree hollows and fallen timber habitats, which are important to many native fauna.

**RE 8.12.13a** is found on the border between the northern extent of the sandy beach and the southern extent of the rocky headland at Grasstree Beach. It is comprised of sparse Tussock grassland or *Xanthorrhoea latifolia* shrubland (Queensland Government 2016). Because the ecosystem is largely comprised of grasses, fire is not a prominent concern, especially when the soil is moist. Threats include encroachment by rainforest species, and grazing.

## Appendix 3: Coastal revegetation principles

Encouraging the natural regeneration of native species is the best method for restoration of an area. For this to occur a viable seed bank must be present, and re-growth must include all native plant species from each stratum level. In areas where natural regeneration is to occur, the area should be clearly marked to exclude public access. In these areas, ongoing maintenance is required to minimise re-growth of weed species. However, the planting of local native vegetation (revegetation) is sometimes required due to insufficient cover or re-growth of native species.

### Revegetation techniques

Revegetation in natural areas aims to reinstate Regional Ecosystems communities as described by Queensland Herbarium (Regional Ecosystem Description Database). In disturbed areas, pre-clearing mapping is available to inform what Regional Ecosystems were present prior to vegetation clearing.

Suggested techniques for coastal revegetation in the Mackay Regional Council area include:

- Local native species for planting should be sourced from within the Sarina Proserpine lowlands Subregion of the Central Queensland Coast Bioregion.
- Site preparation, such as weed control, should be carried out prior to planting.
- Depending on the site-specific circumstances coastal plantings may benefit from the use of mulch, weed mats, stakes, and/or tree guards.
- Tubestock planted in sandy soils will benefit from the addition of a wetting agent and fertiliser at the time of planting (eg. Terracottem).
- Ongoing maintenance of the site is required.

### Consideration of fire risk

State Planning Policy 1/03 under the Sustainable Planning Act 2009 deals with the mitigation of adverse impacts of bushfire, and includes a natural hazard assessment for bushfires and the subsequent provision of safety buffers. According to this policy, a low hazard score and no prescribed safety buffer width is allocated to “narrow strips of coastal vegetation with a linear shape, less than 50 hectares in area and more than one kilometre from the nearest extensive vegetation, on 0-5% slope, with an eastern aspect” (Queensland Government, 2003).

All revegetation activities undertaken as part of coastal projects will be done so with consideration of this State Planning Policy. Designated space for fire breaks and emergency vehicle access will be provided between freehold properties and natural environment areas being revegetated, as per Mackay Regional Council Coastal Management Guidelines (2009).

### Selecting plants for revegetation

The table below provides a generic list of recommended species for dune revegetation in the Mackay region, compiled from characteristic species of relevant Regional Ecosystems (8.1.1, 8.1.2, 8.1.3, 8.2.1, 8.2.2, 8.2.6a, 8.2.9, 8.3.1a, 8.3.2 and 8.12.20a) various coastal species lists from Subregion 2, revegetation recommendations, and field observations.

The species selected for revegetation at any particular location will ultimately depend on current and pre-clearing Regional Ecosystem mapping, and site-specific conditions (such as aspect, topography, existing vegetation, soil condition, availability of appropriate plants, etc).

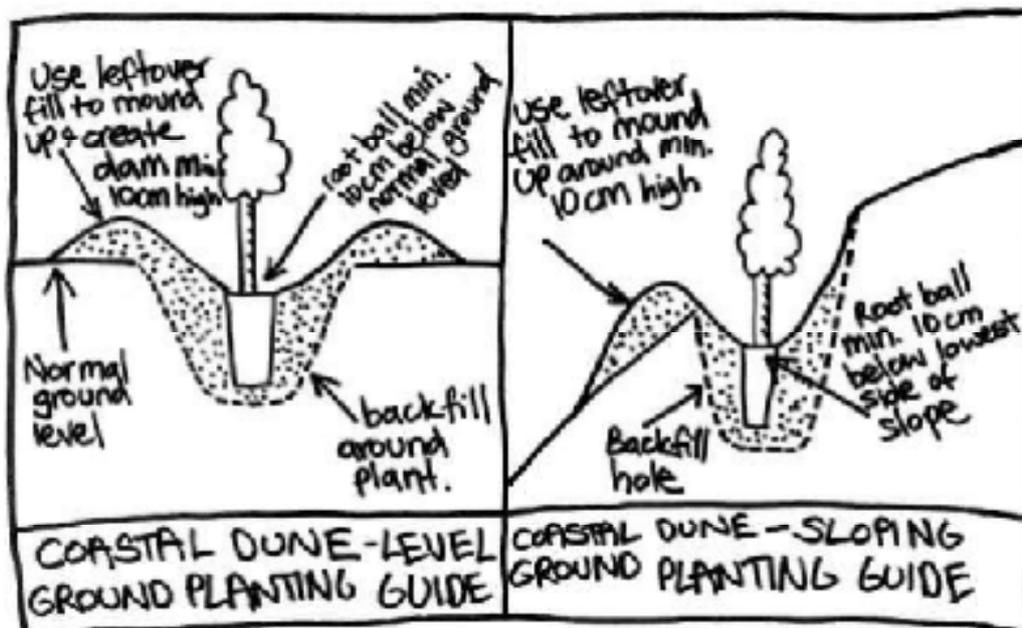


Figure 1: Coastal dune planting guide

## Appendix 4: Native plant list

Species name	Common name	Habit	Regional Ecosystem
<i>Acacia leptocarpa</i>	north coast wattl, selnder fruited wattl	Tree	8.2.6
<i>Acacia oraria</i>	coast wattl	Tree	8.2.2; 8.2.6
<i>Acronychia laevis</i>	hard aspen, glossy acronychia, yellow wood	Tree	8.2.2
<i>Alphitonia excelsa</i>	red ash, soapy ash	Tree	8.2.1; 8.2.6
<i>Argusia argentea</i>	octopus bush	Tree	8.2.1
<i>Banksia integrifolia</i> subsp. <i>Compar</i>	coastal banksia	Tree	8.2.6
<i>Calophyllum inophyllum</i>	beauty leaf, beach calophyllum, ball nut	Tree	8.2.1
<i>Canavalia rosea</i>	beach bean	Groundcover	8.2.1
<i>Capparis lucida</i>	coastal caper	Tree	8.2.1; 8.2.2
<i>Casuarina equisetifolia</i>	coastal she oak	Tree	8.2.1
<i>Chionanthus ramiflorus</i>	native olive	Tree	8.2.2; 8.2.6
<i>Clerodendrum floribundum</i>	lolly bush	Tree	8.2.2; 8.2.6
<i>Clerodendrum inerme</i>	coastal lollybush	Shrub	8.2.1
<i>Corymbia tessellaris</i>	Morton Bay ash	Tree	8.2.6
<i>Crimum pendunculatum</i>	river lily, swamp lily	Tufty	8.2.1
<i>Crotalaria mitchellii</i>	sand rattlepod	Herb	8.2.9
<i>Cupaniopsis anacardioides</i>	tuckeroo	Tree	8.2.1; 8.2.2; 8.2.6
<i>Cymbopogon refractus</i>	barbed wire grass	Grass	8.2.9
<i>Cyperus pedunculatus</i>	pineapple sedge	Sedge	8.2.1; 8.2.9
<i>Dianella caerulea</i>	blue flax lily	Tufty	8.2.6; 8.2.9
<i>Dianella longifolia</i>	smooth flax lily	Tufty	8.2.6a; 8.2.9
<i>Diospyros geminata</i>	scaly ebony	Tree	8.2.2; 8.2.6
<i>Dodeonaea viscosa</i> subsp. <i>viscosa</i>	sticky hop bush	Shrub	8.2.1
<i>Drypetes deplanchei</i>	yellow tulip	Tree	8.2.2
<i>Eragrostis interrupta</i>	coastal love grass	Grass	8.2.6; 8.2.9
<i>Eriachne triodioides</i>	wanderrie grass	Grass	8.2.6; 8.2.9
<i>Eugenia reinwardtiana</i>	beach cherry	Shrub	8.2.2
<i>Euroschinus falcatus</i>	ribbonwood	Tree	8.2.2; 8.2.6
<i>Eustrephus latifolius</i>	wombat berry	Climber	8.2.2; 8.2.6
<i>Ganophyllum falcatum</i>	scaly ash	Tree	8.2.2; 8.2.6
<i>Geitonoplesium cymosum</i>	scrambling lily	Climber	8.2.2; 8.2.6
<i>Heteropogon triticeus</i>	giant spear grass	Grass	8.2.2; 8.2.9
<i>Hibbertia scandens</i>	goldenguinea flower, snake vine	Climber/Ground cover	8.2.1
<i>Hibiscus heterophyllus</i>	native hibiscus	Shrub	8.2.6
<i>Imperata cylindrica</i>	blady grass	Grass	8.2.6; 8.2.9
<i>Ipomoea pes-caprae</i>	goats foot convolvulus	Groundcover	8.2.1
<i>Jagera pseudorhus</i>	foam bark	Tree	8.2.6
<i>Jasminum didymium</i>	native jasmine	Climber/Shrub	8.2.2; 8.2.6
<i>Lomandra longifolia</i>	spiny-headed mat-ruxh	Tufty	8.2.6
<i>Macaranga tanarius</i>	macaranga	Tree	8.2.2; 8.2.6
<i>Mallotus philippensis</i>	red kamala	Tree	8.2.2; 8.2.6
<i>Melia azedarach</i>	white cedar	Tree	8.2.6
<i>Mimusops elengi</i>	red coodoo	Tree	8.2.2
<i>Morinda citrifolia</i>	giant morinda, cheese fruit, smelly cheese tree	Tree	8.2.1
<i>Pandanus tectorius</i>	beach pandan, coastal screw, pine pandanus	Tree	8.2.1; 8.2.6
<i>Pittosporum ferrugineum</i>	rusty pittosporum	Tree	8.2.1; 8.2.6
<i>Planchonia careya</i>	cocky apple	Tree	8.2.6
<i>Pleiogynium timorense</i>	Burdekin plum	Tree	8.2.2; 8.2.6
<i>Scaevola taccada</i>	sea lettuce	Shrub	8.2.1

<i>Sophora tomentosa</i>	silver bean	Shrub	8.2.1
<i>Spinifex sericeus</i>	beach spinifex	Grass	8.2.1
<i>Sporobolus virginicus</i>	marine couch	Groundcover	8.2.1
<i>Stephania japonica</i>	tape vine	Climber/Ground cover	8.2.1; 8.2.2; 8.2.6
<i>Sterculia quadrifida</i>	peanut tree	Tree	8.2.2; 8.2.6
<i>Terminalia muelleri</i>	coast damson	Tree	8.2.1; 8.2.2; 8.2.6
<i>Themeda triandra</i>	kangaroo grass	Grass	8.2.6; 8.2.9
<i>Thespesia populnea</i>	tulip tree	Tree	8.2.1
<i>Thuarea involuta</i>	birds beak grass	Grass	8.2.1
<i>Vigna marina</i>	vigna	Groundcover	8.2.1
<i>Vitex rotundifolia</i>	creeping vitex, beach vitex	Groundcover	8.2.1
<i>Vitex trifolia</i>	coastal vitex, common blue vitex	Shrub	8.2.1
<i>Xerochrysum bracteatum</i>	golden everlasting daisy	Herb	8.2.9

## View sensitive native plant list

Species name	Common name	Habit	Regional Ecosystem
<i>Acacia simsii</i>	Sim's Wattle	Shrub	8.2.6
<i>Caesalpinia bonduc</i>	Nicker nut	Climber	8.2.1
<i>Canavalia rosea</i>	Beach bean	Groundcover	8.2.1
<i>Clerodendrum inerme</i>	Coastal lollybush	Shrub	8.2.1
<i>Crinum pedunculatum</i>	River Lily, Swamp lily	Tufty	8.2.1
<i>Crotalaria mitchellii</i>	Sand rattlepod	Herb	8.2.9
<i>Cymbopogon refractus</i>	Barbed Wire Grass	Grass	8.2.9
<i>Cyperus pedunculatus</i>	Pineapple sedge	Sedge	8.2.1; 8.2.9
<i>Dianella caerulea</i>	Blue flax lily	Tufty	8.2.6; 8.2.9
<i>Dianella longifolia</i>	Smooth flax lily	Tufty	8.2.6a; 8.2.9
<i>Dodonaea viscosa subsp. viscosa</i>	Sticky hop bush	Shrub	8.2.1
<i>Eragrostis interrupta</i>	Coastal love grass	Grass	8.2.6; 8.2.9
<i>Eriachne triodioides</i>	Wanderrie grass	Grass	8.2.6; 8.2.9
<i>Eustrephus latifolius</i>	Wombat berry	Climber	8.2.2; 8.2.6
<i>Geitonoplesium cymosum</i>	Scrambling lily	Climber	8.2.2; 8.2.6
<i>Heteropogon triticeus</i>	Giant spear grass	Grass	8.2.6; 8.2.9
<i>Hibbertia scandens</i>	Golden Guinea Flower, Snake Vine	Climber/ground cover	8.2.1
<i>Imperata cylindrica</i>	Blady Grass	Grass	8.2.6; 8.2.9
<i>Ipomoea pes-caprae</i>	Goats foot convolvulus	Groundcover	8.2.1
<i>Jasminum didymium</i>	Native jasmine	Climber/Shrub	8.2.2; 8.2.6
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	Tufty	8.2.6
<i>Scaevola taccada</i>	Sea lettuce	Shrub	8.2.1
<i>Sophora tomentosa</i>	Silver bean	Shrub	8.2.1
<i>Spinifex sericeus</i>	Beach spinifex	Grass	8.2.1
<i>Sporobolus virginicus</i>	Marine couch	Groundcover	8.2.1
<i>Stephania japonica</i>	Tape vine	Climber/ground cover	8.2.1; 8.2.2; 8.2.6
<i>Themeda triandra</i>	Kangaroo grass	grass	8.2.6; 8.2.9
<i>Thuarea involuta</i>	Birds beak grass	Grass	8.2.1
<i>Vigna marina</i>	Vigna	Groundcover	8.2.1
<i>Vitex rotundifolia</i>	Creeping Vitex, Beach Vitex	Groundcover	8.2.1
<i>Vitex trifolia</i>	Coastal vitex, Common blue vitex	Shrub	8.2.1
<i>Xerochrysum bracteatum</i>	Golden Everlasting Daisy	Annual herb	8.2.9

## Appendix 5: Weed control principles

Principles	Comments
Staged weed removal	<ul style="list-style-type: none"> <li>• Weed removal should be carried out in a staged approach.</li> <li>• Work outwards from intact remnants of coastal vegetation as a priority.</li> <li>• Particularly important in removal of non-native vegetation along the dune scarp.</li> <li>• Large woody weeds should be removed slowly to ensure the replaced native vegetation provides sufficient habitat value and protection against erosion before more removal of woody species.</li> </ul>
Physical weed removal	<ul style="list-style-type: none"> <li>• Physical weed removal, including hand pulling, chipping or cutting weeds is effective in small infestations in environmentally sensitive areas.</li> </ul>
Mechanical weed removal	<ul style="list-style-type: none"> <li>• Mowing or brush cutting will suppress weed growth, discourage seeding and spread.</li> <li>• This method should be used particularly in areas bordering large infestations.</li> <li>• Care should be taken to reduce potential disturbance as excessive mowing and brush cutting can facilitate further weed growth and reduce regeneration of native vegetation.</li> </ul>
Herbicide weed removal	<ul style="list-style-type: none"> <li>• The application of herbicides includes foliage or basal spraying, cut/ paste and stem injection where applicable.</li> <li>• Spraying may be carried out on large or robust weed infestation, particularly to gain initial control of an infestation. However the majority of spraying is likely to be small scale 'spot spray' applications to minimise non-target impacts.</li> <li>• Roundup Bi-active<sup>®</sup> is recommended due to its low toxicity to wildlife and humans.</li> </ul>
Timing	<ul style="list-style-type: none"> <li>• Weed control on foredunes to occur between April and October only, to avoid turtle nesting season (November to March).</li> <li>• Weed control on hind dunes can occur at any time of the year depending on local weather conditions. Herbicide application is ineffective if carried out during rain periods, or once the plants have entered their non-active period during extended dry periods.</li> </ul>
Consideration of fire risk	<ul style="list-style-type: none"> <li>• Once treated, remaining dead woody weeds (such as Lantana) should be pulled away from native trees to reduce the fire risk to fire-sensitive coastal vegetation should 'accidental' fires occur. This woody, dry biomass serves as fuel for fires and by pulling it away from native trees it reduces the chances of fire reaching the canopy.</li> <li>• Mulching down of large, dense areas of dead woody weeds using brush cutters or hand tools, would similarly reduce fire risk and allow native plants a better chance at regeneration.</li> </ul>
Preventing re-infestations	<ul style="list-style-type: none"> <li>• Keep maintenance vehicles on the existing tracks where possible to reduce disturbance.</li> <li>• Clean maintenance vehicles before and after access to the site to prevent weed spread or introduction.</li> <li>• Monitor the success of weed control techniques and native regeneration following several wet seasons to assess whether revegetation might be needed in large areas of infestation.</li> </ul>

## Appendix 6: Non-native plant list - main weed species found in coastal areas within the Mackay region

Species Name	Common Name	Form
<i>Agave sp.</i>	sisal hemp / century plant	Succulent
<i>Alternanthera brasiliana</i>	red-leaved alternanthera	Herb
<i>Antigonon leptopus</i>	coral vine	Climber
<i>Aster subulatus</i>	wild aster, bushy starwort	Herb
<i>Bidens alba var. radiata</i>	cobblers pegs	Herb
<i>Bougainvillea sp</i>	bougainvillea	Vine
<i>Bryophyllum sp.</i>	mother-of-millions	Shrub
<i>Callisia fragrans</i>	callisia	Herb
<i>Catharanthus roseus</i>	pink periwinkle	Herb
<i>Cenchrus echinatus</i>	seaforth burr	Grass
<i>Cocus nucifera</i>	coconut palm	Tree
<i>Corymbia torelliana</i>	cadagi	Ree
<i>Crotalaria pallida</i>	rattlepod	Herb
<i>Dactyloctenium sp.</i>	button grass	Grass
<i>Delonix regia</i>	poinciana	Tree
<i>Dichantium annulatum</i>	sheda grass	Grass
<i>Digitaria didactyla</i>	blue couch	Grass
<i>Duranta erecta</i>	duranta	Shrub
<i>Eleusine indica</i>	crowsfoot grass	Grass
<i>Emilia sonchifolia</i>	emelia	Herb
<i>Euphorbia cyathophora</i>	painted spurge	Herb
<i>Hyparrhenia rufa</i>	thatch grass	Grass
<i>Ipomoea indica</i>	coastal morning glory	Herb
<i>Lantana camara</i>	lantana	Shrub or branched climber
<i>Leucaena leucocephala</i>	leucaena	Small tree
<i>Macroptilium atropurpureum</i>	siratro	Vine
<i>Megathyrsus maximus</i>	Guinea grass	Grass
<i>Melinus repens</i>	red natal grass	Grass
<i>Melinis minutiflora</i>	molasses grass	Grass
<i>Mimosa pudica</i>	sensitive weed	Herb
<i>Momordica charantia</i>	balsam pear	Vine
<i>Oenothera drummondii subsp. drummondii</i>	beach primrose	Herb
<i>Opuntia sp.</i>	prickly pear	Succulent
<i>Passiflora foetida</i>	stinking passionfruit	Climber
<i>Passiflora suberosa</i>	corky passionfruit	Climber
<i>Psidium guajava</i>	guava	Small tree
<i>Salsola australis</i>	prickly starwort	Succulent shrub
<i>Sansevieria trifasciata</i>	mother-in-laws toungue	Herb
<i>Sida cordifolia</i>	sida	Sub shrub
<i>Solanum seafortianum</i>	Brazilian nightshade	Climber
<i>Sphagneticola trilobata</i>	Singapore daisy	Groundcover
<i>Stachytarpheta jamaicensis</i>	snake Weed	Herb or sub shrub
<i>Stylosanthes humilis</i>	stylo	Herb
<i>Themeda quadrivalvis</i>	grader grass	Grass
<i>Tradescantia spathacea</i>	moses in a cradle	Herb
<i>Tridax procumbens</i>	tridax daisy	Herb
<i>Triumfetta rhomboidea</i>	chinese burr	Sub-shrub
<i>Urochloa decumbens</i>	signal grass	Grass
<i>Yucca aloifolia</i>	yucca	Succulent



# Local Coastal Plan

## Grasstree Beach 2017

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#### Mirani

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