*Coasts and Communities*

# Blacks Beach Spit

## Management Plan

October 2013

Mackay Regional Council

Reef Catchments

# Contents


1. Introduction 3
   1.1 Description of the Site 4
   1.2 Statutory Obligations 6

2. Conservation and Management Issues 7
   2.1 Vegetation 8
      2.1.1 Dune Vegetation 10
      2.1.2 Estuarine Vegetation 12
      2.1.3 Non-native Vegetation 14
   2.2 Waste Dumping and Litter 16
   2.3 Public Access and Facilities 17
   2.4 Wildlife 20
   2.5 Cultural Heritage 24
   2.6 Erosion 25

3. Recommended Activities 27

4. Implementation and Review 29

5. References 30

Appendix 1: Flora Species List for Blacks Beach Spit 31
Appendix 2: Weed Management Plan for Blacks Beach Spit 35
Appendix 3: Fire Management Guidelines for landscapes within Blacks Beach Spit 37
Appendix 4: Stormwater Quality Improvement Devices proposed for McCreadys Creek Catchment 41
Appendix 5: Fauna Species List for Blacks Beach Spit 42
Appendix 6: Proposed Revegetation Activities for Blacks Beach Spit 46



**Acknowledgements:** *Blacks Beach Spit Management Plan* has been prepared by Reef Catchments (2013).




**Cover image:** 0.1 metre pixel 2012 imagery supplied by Mackay Regional Council.

# 1 Introduction

Blacks Beach Spit ('the Spit') includes 42 hectares of coastal land located approximately 8 kilometres north of the city of Mackay. The Spit consists of 15 hectares of Reserve land, and 27 hectares of Freehold land. Mackay Regional Council is trustee for Reserve lands and purchased the adjacent Freehold land on the Spit in July 2012 using funds from the Natural Environment Levy. By purchasing this additional land, all 42 hectares of Blacks Beach Spit is now under the management of Mackay Regional Council, prompting the need for a comprehensive management plan for the area.

In accordance with the strategic goals for land purchased by the Natural Environment Levy land acquisition fund, Blacks Beach Spit is to be managed to:

- Maintain and enhance the natural area,
- Protect and restore biodiversity and ecological processes,
- Contribute to a world class natural area reserve system,
- Reduce the loss of significant native vegetation and habitat areas, and
- Provide appropriate opportunities for nature-based recreation, education and learning.

(Mackay Regional Council, 2007, Policy No. 064)

The objective of this plan is to develop management strategies to guide the long-term protection of the natural environment of Blacks Beach Spit in line with the strategic goals outlined above. This plan has been developed in accordance with Mackay Regional Council's Coastal Management Guidelines (2009) and should be read in conjunction with the Blacks Beach, Beach Plan (Mackay Regional Council and Reef Catchments, 2010).


**Acknowledgements:** 0.5 metre imagery 2009 and Digital Cadastral Data 2012 supplied by Queensland Government.

**Figure 1: Blacks Beach Spit**

## 1.1 Description of the site

Blacks Beach Spit lies within the Proserpine-Sarina Lowlands of the Central Queensland Coast bioregion. The area included in the Blacks Beach Spit management plan consists of land south of the residential area, including:

- 27 ha of Freehold land (Lot 1113 on Plan C124506)
- 10 ha of Reserved land along the eastern seaward edge of the spit (Lot 567 on Plan C124506)
- 5 ha of Reserved land adjacent to McCreadys Creek (Lot 900 on Plan SP104477)

All land is under the management of Mackay Regional Council. Within the current Planning Scheme, Reserved lands are zoned as Open Space, and Freehold land is split-zoned as partially Urban Expansion and partially Open Space (Figures 2, 3). However, the process is underway to rezone the section of land that is currently Urban Expansion to Open Space, to reflect the new management intent of the land.

Blacks Beach Spit is a peninsular bounded by McCreadys Creek to the west and Slade Bay to the east. The landform consists of a sandy beach, beach ridges characterised by dunal vegetation, mixed forest and woodlands, and a low lying area of coastal wetlands associated with McCreadys Creek. The Spit is in the McCreadys Creek catchment of the Mackay City and forms part of a larger complex of wetlands covering over 400 hectares.


**Acknowledgements:** Digital Cadastral Data 2012 supplied by Queensland Government.

**Figure 2: Blacks Beach Spit Land Tenure**


**Acknowledgements:** Planning Scheme 2006 supplied by Mackay Regional Council.

**Figure 3: Blacks Beach Spit Planning Scheme Zonation**

## 1.2 Statutory Obligations

There are a range of statutes at Regional, State and Commonwealth level that are relevant to, and may guide the management of natural resources on Blacks Beach Spit:

- *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.
- The *Land Act* 1994 provides for the designation of the Reserve and its Trustee, and makes the requirement that its management is "for the protection of natural environment values while allowing low impact public use".
- The *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.
- The *Nature Conservation Regulation* 1994 provides management principles for wildlife within Queensland.
- The *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.
- The *Fisheries Act* 1994 provides protection for marine plants including mangroves and saltmarshes, and provides the regulatory environment for control of recreational fishing activities.
- The *Environmental Protection and Biodiversity Conservation Act* 1999 provides a high level of protection for matters of National environmental significance. In particular it provides protection for important populations of migratory species such as shorebirds present at Blacks Beach Spit.
- The *Sustainable Planning Act* 2009 provides the regulatory background for the development of planning schemes.
- International Agreements: The China and Australia Migratory Bird Agreement, the Japan and Australia Migratory Bird Agreement, and the Republic of Korea-Australia Migratory Bird Agreement provide for conservation of shorebirds (waders) across the migratory flyway for these species.

# 2 Conservation and Management Issues

Blacks Beach Spit lies directly adjacent to the Great Barrier Reef World Heritage Area and consists of 42 hectares of remnant coastal vegetation that forms part of a larger complex of coastal wetlands covering over 400 hectares. The area has substantial natural values, sustaining important marine and terrestrial natural resources, and supporting wildlife populations of national and international significance. The ecological communities present provide a range of ecosystem services including stabilisation of the shoreline, natural filtration of water, and carbon sequestration. The Spit also contributes to the scenic coastal landscape values of the Mackay area, and provides a semi-remote destination for recreation by both residents and visitors to the region.

Mackay Regional Council has invested considerable time and resources into vegetation management of the Spit's eastern Reserve. However, the recently purchased Freehold land has a history of uncontrolled vehicle access and waste dumping, which has resulted in significant degradation of the natural values of the area.

Conservation and management issues for consideration at Blacks Beach Spit include:

- Vegetation
- Waste dumping and litter
- Public access and facilities
- Wildlife
- Cultural heritage
- Erosion

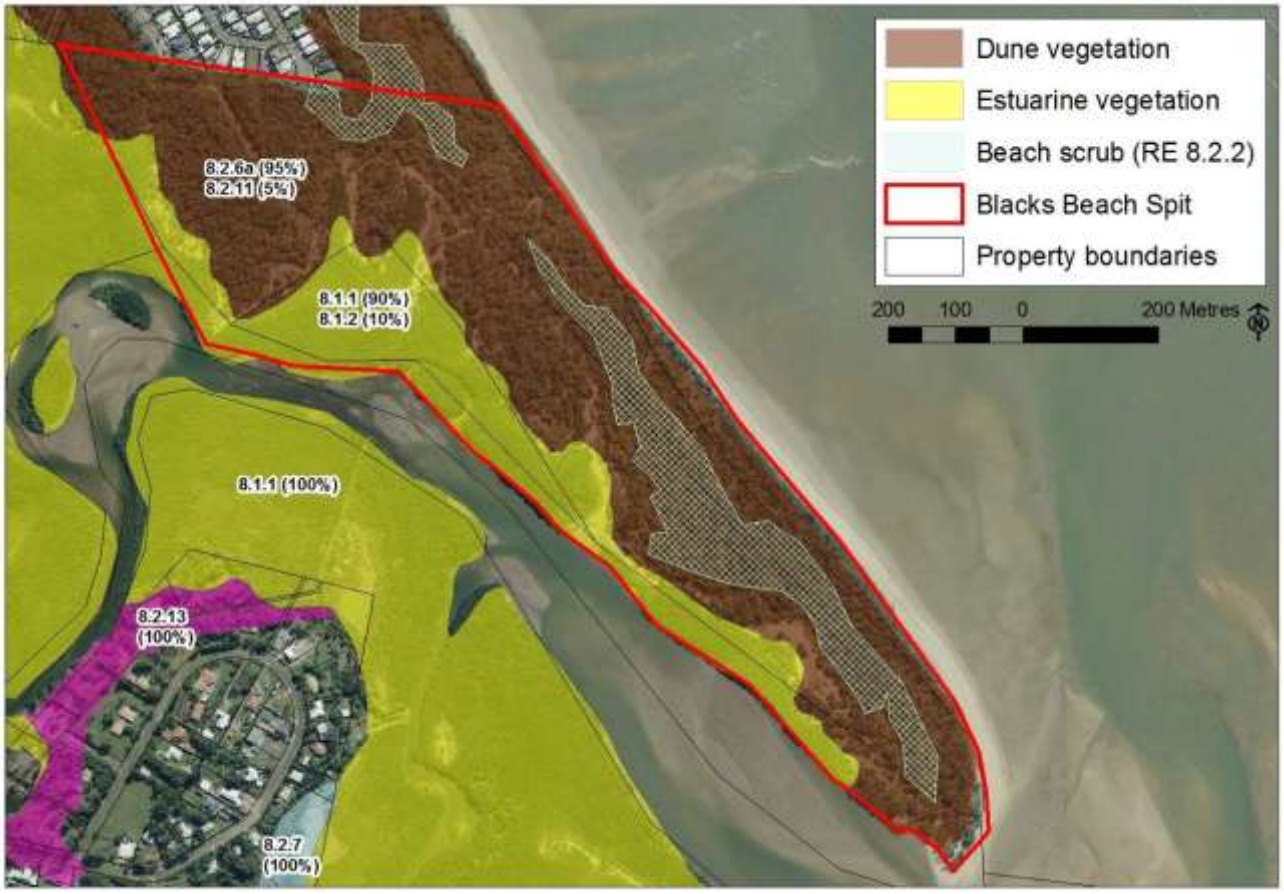
## 2.1 Vegetation

All land on Blacks Beach Spit is mapped as remnant vegetation, defined as an area of naturally occurring vegetation that has survived clearing since European settlement. In Queensland remnant vegetation is mapped as Regional Ecosystems (RE) at a scale of 1:100,000, delineated by unique combinations of landzones and the overlying vegetation communities. Of the public coastal land that is under Mackay Regional Council jurisdiction, approximately 70% remains as remnant vegetation. However, these remnants are largely fragmented and subject to high levels of disturbance. These remnants are a critical part of the urban landscape, providing important ecosystem services, habitat corridors, and recreational values.

Remnant vegetation mapping provides no indication of the current condition of this vegetation, and this will be discussed in sections 2.1.1 and 2.1.2. However, the Regional Ecosystem Description Database lists both the Biodiversity Status and the Vegetation Management Class of each regional ecosystem (Table 1). The Biodiversity Status is based on an assessment of the condition of remnant vegetation in addition to the percentage of pre-clearing vegetation remaining which is used to determine the class under the *Vegetation Management Act* 1999 (Queensland Government, 2013).

Current vegetation communities on the Spit (Figure 4) are divided into either estuarine vegetation (tidal flats) or dune vegetation (quaternary coastal sand deposits) based on their land zones and geology (Department of Environment and Heritage Protection, 2013). The broad 1:100,000 scale of Regional Ecosystem mapping means that multiple regional ecosystems are mapped in the same polygon. Overlaying this mapping on Figure 4 is the larger scale 1:12,000 Central Queensland Beach Scrub mapping which extracts 'Beach Scrub' communities (Regional Ecosystem 8.2.2), further discussed in section 2.1.1.

Table 1 includes a description of the mapped Regional Ecosystems on Blacks Beach Spit. A flora species list for the Spit is included as Appendix 1.




**Acknowledgements:** 0.1 metre imagery 2012 supplied by Mackay Regional Council. 2011 Remnant Vegetation Version 7 at 1:100,000 supplied by Queensland Herbarium. 2008 Central Queensland Beach Scrub mapping at 1:12,000 supplied by Queensland Government.

**Figure 4: Remnant Vegetation Blacks Beach Spit**

**Table 1: Remnant vegetation (Regional Ecosystem) communities at Blacks Beach Spit**

| Regional Ecosystem (RE) | Short description (Department of Environment and Heritage Protection, 2013) | Approximate area (ha) on Blacks Beach Spit | Vegetation Management Act 1999 status | Biodiversity status | EPBC Status |
|---|---|---|---|---|---|
| **8.2.6a** | *Corymbia tessellaris* ± *Acacia leptocarpa* ± *Banksia integrifolia* ± *Melaleuca dealbata* ± beach scrub species open forest on coastal parallel dunes. | 28 ha | Of concern | Of concern | n/a |
| **8.2.2** | Microphyll vine forest on coastal dunes. | 7.5 ha | Of concern | Endangered | Critically Endangered |
| **8.2.1** | *Casuarina equisetifolia* open forest to woodland with *Ipomoea pes-caprae* and *Spinifex sericeus* dominated ground layer on foredunes. | 2 ha | Of concern | Of concern | n/a |
| **8.2.11** | *Melaleuca* spp. woodland in parallel dune swales (wetlands). | 1.5 ha | Of concern | Of concern | n/a |
| **8.1.1** | Mangrove vegetation of marine clay plains and estuaries. Estuarine wetland. | 10.8 ha | Not of concern | No concern at present | n/a |
| **8.1.2** | Samphire open forbland to isolated clumps of forbs on saltpans and plains adjacent to mangroves. | 1.2 ha | Not of concern | Of concern | n/a |

*Approximate area of remnant vegetation is 51 hectares, as compared to 42 hectares for the Spit (section 1). This discrepancy comes from the difference in land mass versus the property boundaries as drawn on the digital cadastral database.

### 2.1.1 Dune Vegetation

Approximately 39 hectares of the Spit is dune vegetation, occurring on quaternary sands and beach ridges. Natural vegetation zonation is still in place with the eastern foredune lined with a band of Coastal She-oak forest to woodland with *Ipomoea pes-caprae* and *Spinifex sericeus* dominated ground layer on foredunes (RE 8.2.1). The hind dunes are dominated by a dune shrub-land to open forest of Moreton Bay Ash (*Corymbia tesselaris*), *Acacia leptocarpa, Banksia integrifolia* and beach scrub species on coastal parallel dunes (RE 8.2.6a), covering approximately 70% of the dunal area. Some small patches of Melaleuca woodland to open forest (RE 8.2.11) also occur, particularly closer to the residential settlement at the end of Pacific Drive. Remnants of closed beach scrub communities (RE 8.2.2) are present along the length of the Spit in the dune swales and have been mapped at a scale of 1:12,000, covering approximately 7.5 hectares (Figure 4). This particular ecological community is listed as critically endangered by the Australian Government's *Environment Protection and Biodiversity* (EPBC) *Act* 1999 and differs from other adjacent regional ecosystems in its high floristic and structural diversity. Graphic representation of these Regional Ecosystems is shown in Figure 5.

Moreton Bay Ash open forest (RE 8.2.6a).

Microphyll Vine Forest (Beach Scrub) (RE 8.2.2).

Coastal She-oak forest, and Goats Foot and Spinfex-dominated foredunes (RE 8.2.1).

Melaleuca woodland to open forest (RE 8.2.11).

**Figure 5: Dune Regional Ecosystems**

The dune vegetation on Blacks Beach Spit is primarily threatened by weed invasion. Weed species can outcompete native species and subsequently alter the structure and composition of some ecosystems. Species such as Lantana (*Lantana camara*) and Guinea Grass (*Megathyrsus maximus*) additionally increase the fuel load where much of the coastal vegetation is sensitive to fire (Reef Catchments, 2010) (Figure 6). Non-native species will be discussed in more detail in section 2.1.3.

Patches of beach scrub (RE 8.2.2) with a closed canopy are less affected by the impact of weeds. However, inappropriate fire regimes have caused a reduction in area of this nationally threatened vegetation community. Beach scrub communities are intolerant to fire, and high intensity and high frequency fires have resulted in this ecosystem reverting to a more open woodland community dominated by sclerophyllous species (RE 8.2.6a) (Figure 6).

Vehicle access throughout the Spit has physically disturbed dune vegetation in localised areas, and encouraged the dumping of waste, which has introduced new weeds to the area.

Condition of dune vegetation can be improved through the staged removal of invasive weed species and exclusion of fire from Blacks Beach Spit. By removing weeds, natural regeneration will be promoted, and by excluding fire, it is expected that beach scrub species will recolonise the understory and eventually replace the Moreton Bay Ash in the canopy.

| | |
|---|---|
| Lantana and Guinea Grass prevent natural recruitment and add to the fuel load in dune ecosystems. | Inappropriate fire regimes scorch fire sensitive beach scrub vegetation and over time the ecosystem will revert to open woodland. |

**Figure 6: Major factors reducing the condition of dune vegetation**

**Principal Recommendation 1:** Dune vegetation communities to be progressively rehabilitated using appropriate weed control techniques. This will improve the condition of dunal communities as a whole and assist in expanding beach scrub communities to their natural extent. Weed removal should be staged, to ensure that it can be maintained, and account for the current extent and role of weeds (particularly Lantana) in providing interim habitat. Remaining dead lantana should be pulled away from native vegetation, and mulched down to reduce the risk of fire and increase the opportunity for native regeneration to occur. Appendix 2 provides a map and description of weed control techniques for use at Blacks Beach Spit.

**Principal Recommendation 2:** Planned burning will not be conducted within the Reserve. All landscapes within the Spit are fire sensitive. Excluding fire from the reserve will assist in the regeneration of Beach scrub ecosystems that have been progressively reduced in size. A mown buffer zone that acts as a fire break is provided on the boundary margin of the Spit and should be kept clear of all private belongings so that it can be appropriately maintained. Appendix 3 provides fire management guidelines for landscapes within the Spit.

### 2.1.2 Estuarine Vegetation

Approximately 12 hectares of Blacks Beach Spit is mapped as estuarine vegetation which is subject to periodic tidal inundation. The majority of this (90%) is closed mangrove forest (RE 8.1.1) lining McCreadys Creek, and includes Avicennia, Rhizophora and Ceriops dominated communities. The remainder is Samphire open forbland and isolated clumps of forbs on saltpans and plains adjacent to the mangroves (RE 8.1.2) (Figure 7).

Mangrove communities line much of McCreadys Creek (RE 8.1.1).

Isolated clumps of forbs on saltpans and plains adjacent to the mangroves (RE 8.1.2).

**Figure 7: Estuarine Regional Ecosystems**

Historical vehicle access through Freehold land has resulted in an extensive network of vehicle tracks. This has resulted in physical degradation of the soil surface and alteration of soil hydrology. Soil salinity is a principal driver of zonation within estuarine systems. Within the Mackay locality maximum soil salinity within mangrove forests reaches approximately $60^{o/oo}$ (parts per thousand) whilst in salt marsh this figure can rise to more than $120^{o/oo}$ (Ball, unpublished data). However, even salt marsh is not resistant to highly elevated levels of soil salinity. On spring high tide events estuarine water pools in vehicle tracks and ruts, subsequently evaporates, leading to increased soil salinity. This process of continued build-up of evaporates can lead to very high soil salinities and this discourages re-establishment of salt marsh plants.

Water quality and stormwater litter provide additional management challenges for estuarine ecosystems. McCreadys Creek, adjacent to Blacks Beach Spit, drains a catchment of 3,112 hectares. It is a highly

developed catchment, with 82% of land use being rural or residential, and 18% open space representing the estuarine areas of McCreadys Creek (GHD, 2005). The McCreadys Creek Catchment Management Plan (2005) identifies a range of Stormwater Quality Improvement Devices for the catchment including gross pollutant traps, constructed wetlands and trash racks (Appendix 4). The installation of these structures will trap gross pollutants and sediments, and remove nitrogen and phosphorous from the water to achieve improved water quality. The implementation of all of these activities will have positive impacts on the condition of estuarine vegetation in Blacks Beach Spit.

An extensive network of vehicle tracks has degraded the condition of vegetation.

Estuarine vegetation is potentially impacted by storm water quality and litter from the entire catchment.

**Figure 8: Major factors reducing the condition of estuarine vegetation in Blacks Beach Spit**

**Principal Recommendation 3:** Public vehicle access is to be prohibited on Blacks Beach Spit. A 1.2km fence has been erected (December 2012) around the boundary of the Spit to prevent vehicle access. Council's Local Law 4 allows for the prohibition of motorised vehicles from Council public land. Management vehicles with permission from Mackay Regional Council, such as mosquito and pest control patrols, are permitted but should be restricted to low impact quad motorbikes. Minimum control for entry should be that only required for effective and efficient application of chemical control, and wherever possible in dry conditions, so as to avoid further damage to vegetation and the soil surface. Five gated vehicle access points for management and emergency vehicles are shown on Figure 12. The mapped pedestrian access track is also the preferred management vehicle access track.

**Principal Recommendation 4:** Stormwater Quality Improvement Devices, as identified in the McCreadys Creek Catchment Management Plan (2005, Table 6-7, p 42), should be installed. These devices will trap gross pollutants and sediments and remove nitrogen and phosphorous from the water prior to their discharge into McCreadys Creek. Appendix 4 provides a full list of proposed devices and current status of implementation.

### 2.1.3 Non-native Vegetation

Non-native vegetation has been recorded throughout Blacks Beach Spit (full flora species list provided in Appendix 1). All weed species were found in the dune vegetation, their spread being limited by the extent of tidal inundation.

Lantana (*Lantana camara*) has the largest percentage of weed cover on the Spit, in some areas forming dense, impenetrable thickets and preventing or severely limiting the regeneration of native vegetation (Figure 9). Lantana also creates a significant fuel load for fire, which provides increased risk to fire-sensitive coastal vegetation. Lantana is a declared Weed of National Significance (WONS) as well as being declared a Class 3 pest under the *Land Protection (Pest and Stock Route Management) Act* 2002. Lantana should be progressively removed from Blacks Beach Spit in a staged manner, taking into consideration the important role that it is currently playing in sand stabilisation (particularly when present in foredune areas) and habitat provision (when occupying large continuous areas).

Other non-native species for removal include;

- Guinea Grass (*Megathyrsus maximus*), which also provides increased fuel loads and competes with native species, preventing regeneration.
- Prickly Pear (*Opuntia* sp.*)* Declared Class 2 under *Land Protection (Pest and Stock Route Management) Act* 2002
- Agave (*Agave* sp.) has established as a ground cover in some locations.
- Woody weeds such as Guava (*Psidium guajava*), Cadagi (*Corymbia torelliana*) and Poinciana (*Delonix regia*) are scattered throughout the Spit and have the potential to expand if uncontrolled.
- A multitude of other herbaceous garden escapees are also present, resulting from the close proximity to residential areas, disturbance, historical vehicle access, and dumping of garden waste.

The removal of all non-native species from the Spit will improve the condition of native vegetation, enhancing habitat quality and resilience to natural disturbance.

Lantana forms dense, impenetrable thickets in some places, reducing opportunities for native regeneration.

Prickly Pear (*Opuntia* sp.) is a declared Class 2 weed recorded in the Spit.

Guava (*Psidium guajava*) is a woody weed scattered throughout the Spit with the potential to expand if left untreated.

Agave dominates the ground cover in some areas of the Spit.

**Figure 9: Non-native vegetation in Blacks Beach Spit**

**Principal Recommendation 1 (from section 2.1.1):** Dune vegetation communities are to be progressively rehabilitated using appropriate weed control techniques. The progressive removal of all non-native species should be carried out over a suitable time period, as resourcing for maintenance allows. Weed control priorities include declared species, and those capable of altering habitats or ecosystem function. The presence of declared, invasive, or environmental weeds on adjacent land parcels should also be addressed given the obvious implications of seed or vegetative spread from nearby sources, including the Council Reserve behind Pacific Drive, and residential gardens through a community education program. Appendix 2 provides a map and detail of weed control techniques to be used within Blacks Beach Spit.

## 2.2 Waste Dumping and Litter

Illegally dumped waste has been accumulating on Blacks Beach Spit for many years. Vehicle access through the Freehold land (Lot 1113 on Plan SP124506) resulted in Mackay Regional Council having no jurisdiction that would have allowed prevention of access and associated waste dumping. Waste dumping is not only unsightly, but is a public safety issue, can leach pollutants into the environment, and poses a threat to wildlife.

Since purchasing this piece of land and installing a fence to exclude vehicle access, Mackay Regional Council has conducted an extensive waste removal program. In January 2013 this effort saw the removal of:

- 77 tyres
- 23 metres$^3$ concrete
- 6.24 tonnes steel
- 107.82 tonnes of other waste

With recent exclusion of vehicle access from the Spit, large scale waste dumping is expected to be significantly reduced, however, ongoing monitoring and compliance will be required. Appropriate regulatory signage and a public education and awareness program on the values of the Spit and impacts of waste dumping should complement other management actions.

Despite Council's clean-up, litter and small debris remains, particularly around the margins of estuarine vegetation and along access tracks. A clean up of existing litter is recommended, and signage installed to encourage future recreational users to keep the Spit clean of litter in a preventative approach. Litter will continue to enter the Spit from upstream areas through stormwater drainage from the catchment. The implementation of gross pollutant traps, as identified in the McCreadys Creek Catchment Plan, should go some way towards addressing this issue into the future.

Mackay Regional Council undertook a major clean up of Blacks Beach Spit in January 2013.

**Figure 10: Waste dumping on Blacks Beach Spit**

**Principal Recommendation 3 (from section 2.1.2, above):** Public vehicle access is to be prohibited on Blacks Beach Spit. This will remove most of the capacity for waste dumping. Ongoing monitoring, compliance, and maintenance of the fence will be required. In addition, appropriate regulatory signage should be installed.

**Principal Recommendation 4 (from section 2.1.2, above):** Stormwater Quality Improvement Devices, as identified in the McCreadys Creek Catchment Management Plan (2005) are to continue to be installed.

**Principal Recommendation 5:** Existing and ongoing litter and marine debris to be removed from Blacks Beach Spit. Such clean-ups can potentially be done through the existing Coasts and Communities (Coastcare) program for Blacks Beach. Rubbish bins, dog waste bags, and signage requesting that rubbish be taken from the site to be installed at key entry or recreational points.

## 2.3 Public Access and Facilities

Blacks Beach Spit provides many opportunities for nature-based recreation and learning opportunities. The Spit is directly adjacent to the growing residential suburb of Blacks Beach and the natural values of the beach and the lifestyle that it provides are a key drawcard for the area. When appropriately managed, recreational activities such as bushwalking, fishing and bird watching can be enjoyed without compromising the natural values of the area.

Mackay Regional Council currently provides public park facilities at the northern end of Blacks Beach, including barbeque, tables, playground, and toilet facilities. Two boat ramp accesses are available into McCreadys Creek from the southern side, at Slade Point and Andergrove. Four interpretive signs are present along Blacks Beach, at Blacks Beach Park, Pitt Street beach access, and two at Anglers Parade beach access. The establishment of Blacks Beach Spit as a nature-based recreational area will complement these existing facilities in the area.

New management principles for the Spit should ensure that any activities or infrastructure are low-impact, and provide opportunities for nature-based recreation, and learning. An extensive network of access tracks currently runs through Blacks Beach Spit. Safe and comfortable pedestrian access and the natural environment would both benefit from a rationalisation that would see the maintenance of one, preferred pedestrian track to the mouth of McCreadys Creek. As tracks are well formed already, this should not require any additional construction or materials (Figure 11).

Signage will be required along the pedestrian track to assist users on following the most direct route (nearly two kilometres from the end of Pacific Drive) and would ideally include direction and distance to the Spit, and closure of track junctions. Interpretive signage at key entrance points and along the track would assist in community engagement and education on the natural and cultural values of Blacks Beach Spit. Providing seating benches at the Spit would also add to the low-impact recreational amenity of Blacks Beach Spit. However, users should be encouraged to take all their rubbish with them to avoid the need for maintenance vehicles to empty rubbish bins. All infrastructure (such as signage and seating

benches) should be non-permanent owing to the dynamic nature of the coastal zone and the Spit, and monitored with high tides and other extreme events.

There are multiple pedestrian access points available to the Spit, including from the end of Pacific Drive, a public easement at 39 Corella Way, and from the end of Corella Way. A pedestrian access track heading south from the car park at the end of Anglers Parade also connects with the pedestrian access tracks to the Spit. Depending on the popularity of the Spit as Mackay continues to grow, the formalisation of additional car parks may be needed at one or several of these pedestrian access points into the future.

Example of existing tracks on Blacks Beach Spit.

Example of coastal interpretive signage used at other coastal locations around Mackay.

**Figure 11: Existing pedestrian access tracks and potential coastal interpretive signage**

**Principal Recommendation 6:** Temporary, re-locatable, recreation facilities to be provided on Blacks Beach Spit to support the management intent of the land. This includes the maintenance and signage of one pedestrian access track to the Spit, interpretive signage to highlight the natural and cultural values of the area, and seating benches at the Spit itself. Multiple pedestrian access entry points should be well signed. Parking requirements at entry points to the Spit are to be monitored and consideration given to the provision of low-impact car parking the end of Pacific Drive and/or the end of Corella Way. Figure 12 displays preferred pedestrian access track location, signage, and maintenance vehicle access points.


**Acknowledgements:** 0.1 metre imagery 2009 supplied by Mackay Regional Council. Digital Cadastral Data 2012 supplied by Queensland Government.

**Figure 12: Proposed access points, pedestrian track and signage on Blacks Beach Spit**

## 2.4 Wildlife

Blacks Beach Spit provides habitat for wildlife that is of national and international significance. A fauna survey was completed in 2002 (Bloor, 2002), and monitoring of marine turtle (annual) and shorebird (biennial) populations has been undertaken since 1992 and 2003, respectively. Regional Ecosystem and Essential Habitat mapping provide further descriptions of fauna that could potentially inhabit the Spit. A comprehensive fauna list for Blacks Beach Spit is included in Appendix 5. Figure 14 provides graphic representation of mapped wildlife habitat areas.

Blacks Beach has the highest mean number of annual nesting turtles in the Mackay region (Mackay and District Turtle Watch Association, 2012). Since 1992, an average of 23 turtle nests have been recorded on Blacks Beach, with the majority of those being Flatback Turtles (*Natator depressus*) (Figure 13). Green Turtles (*Chelonia mydas*) have also been recorded in very small numbers. Both of these species are listed as Vulnerable in state (*Nature Conservation Act* 1992) and national (*Environment Protection and Biodiversity Conservation Act,* 1999) legislation. Given their status, a Recovery Plan for Marine Turtles in Australia has been in place since 2003 and provides an overview of threats and recovery actions required for these species. While there are many pressures on marine turtles throughout their life cycle, the key threats on Blacks Beach Spit include; disturbance while nesting or hatching, predation, loss or changes to the nesting habitat, and light pollution. Although there is no residential housing (and thus associated lighting) directly behind the foredune at Blacks Beach Spit, where a complete tree line does not exist, light can still impact on the success of turtle hatchlings in reaching the ocean (Griffin, pers. comms 2013). Management activities such as enforcing existing dog-on-lead laws, excluding vehicles from the Spit, and minor revegetation along some areas along the frontal dune will assist in improving the habitat conditions for turtle populations.

Blacks Beach Spit has an identified shorebird roost (Figure 14) that has been monitored by the Queensland Wader Study Group on a regular basis since 2003. Extensive surveys undertaken as part of the Mackay Shorebird Project in 2003 recorded up to 584 birds present at any one time and described the Spit as “an important roost for the shorebirds feeding on the northern beaches of Mackay” (Harding and Milton, 2003). This includes a combination of both resident and migratory shorebirds (Figure 13). The most recent shorebirds survey at Blacks Beach Spit in November 2012 recorded a maximum of 172 birds and six different species at the site (Queensland Wader Study Group, 2012). Given the logistical difficulty of monitoring shorebirds, natural annual variations, and the global trend of declining shorebird numbers (Australasian Wader Studies Group, 2008), it is difficult to make any causal statement about the decline in numbers at this particular site. However, it is certain that disturbance plays a major threat to shorebirds at Blacks Beach Spit. This can variously include dogs off-leash, jet skis, loud music, motor bikes, fishers, boats and people walking causing the birds to fly. The effect of this disturbance is to reduce 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). The exclusion of vehicles is expected to reduce much of the disturbance to shorebirds on Blacks Beach Spit. Signage and enforcement of dog-leashing local laws and interpretive signage about not disturbing shorebirds would also help to protect

the roost. Monthly monitoring of shorebirds at Blacks Beach Spit would help to inform any additional adaptive management strategies that may be required now that vehicles have been excluded.

Marine turtle hatchlings at Blacks Beach.

Resident and migratory shorebirds on Blacks Beach Spit.

**Figure 13: Wildlife on Blacks Beach Spit**

In addition to management activities for populations currently being monitored, taking a habitat approach to fauna biodiversity and management throughout the Spit is recommended. This approach centers on maintaining the broad distribution of Regional Ecosystems (habitats) that currently exist within the Spit by eliminating further damage to vegetation and improving the condition of the existing ecosystems (Figure 4). This can be achieved primarily through the exclusion of vehicles from Blacks Beach Spit, and progressive weed removal across all ecosystems present.

Based on Regional Ecosystem (habitat) mapping, the representative fauna that may be contained by the Spit at any point include:

### 8.1.1 Mangrove vegetation of marine clay plains and estuaries.

Although terrestrial vertebrate diversity is relatively low in mangrove vegetation, this ecosystem nevertheless represents important habitat for key species. The vulnerable Mangrove Mouse (*Xeromys myoides*) is known from some mangrove communities within the northern section of the bioregion; mature animals appear to utilise taller communities dominated by Yellow Mangrove (*Ceriops tagal*) and Orange Mangrove (*Bruguiera* spp), however juveniles are sometimes located in low forests of yellow mangrove. Although not restricted to this ecosystem, common Brush-tail Possums (*Trichosurus vulpecular*) are often observed nesting and feeding within mangrove trees. Flying Foxes (*Pteropus* spp) form large 'camps' within mangroves at several locations such as the Proserpine River, and at Eimeo and may use other areas from time to time. The rare Rusty Monitor (*Varanus semiremex*) has been located within mangrove vegetation behind Smalley's Beach (Cape Hillsborough area) and is likely to be present at other locations. Mangrove vegetation within the bioregion supports a diverse assemblage of avifauna. Some waders such as Whimbrel (*Numenius phaeopus*) and Grey-tailed Tattlers (*Tringa brevipes*) roost in mangrove vegetation when high tides inundate their foraging grounds. The Little Kingfisher (*Alcedo pusilla*) reaches the southern extremity of its range within the bioregion. Although never common, this species can be observed within estuarine systems and associated riparian vegetation in upstream areas.

### 8.1.2 Samphire to open forbland to isolated clumps of forbs on saltpans and plains adjacent to mangroves.

Samphire flats provide important roosting sites for wader birds, particularly during spring tides when sand-flats and sandy foreshores become inundated. Notable species include the near threatened Eastern Curlew (*Numenius madagascariensis*), Whimbrel (*Numenius phaeopus*), Bar-tailed Godwit (*Limosa lapponica*), Red-necked Stint (*Calidris ruficollis*), and Red-capped Plover (*Charadrius ruficapillus*). The near threatened Radjah Duck (*Tadorna radjah*) forages amongst the samphire although sightings mostly consist of only a few birds. The vulnerable Beach Stone-Curlew (*Esacus giganteus*) feeds within this ecosystem and along its margins, particularly when it lies in close association with sandy foreshores. Mammals do not appear to heavily utilise this ecosystem, although some macropods such as Agile Wallabies (*Macropus agilis*), are sometimes observed browsing on samphire. Common Planigale (*Planigale maculata*) are sometimes found nesting under driftwood, and near urban centres, under rubbish such as roofing iron. Flats of samphire and associated vegetation, lying close to estuarine waterways, can provide suitable nesting areas for Estuarine Crocodiles (*Crocodylus porosus*). The Littoral Skink (*Cryptoblepharus littoralis*) is a common inhabitant of this ecosystem, often found foraging amongst driftwood and larger clumps of samphire.

### 8.2.1 *Casuarina equisetifolia* open forest to woodland with *Ipomea pes-caprae* and *Spinifex sericeus* dominated ground layer on foredunes.

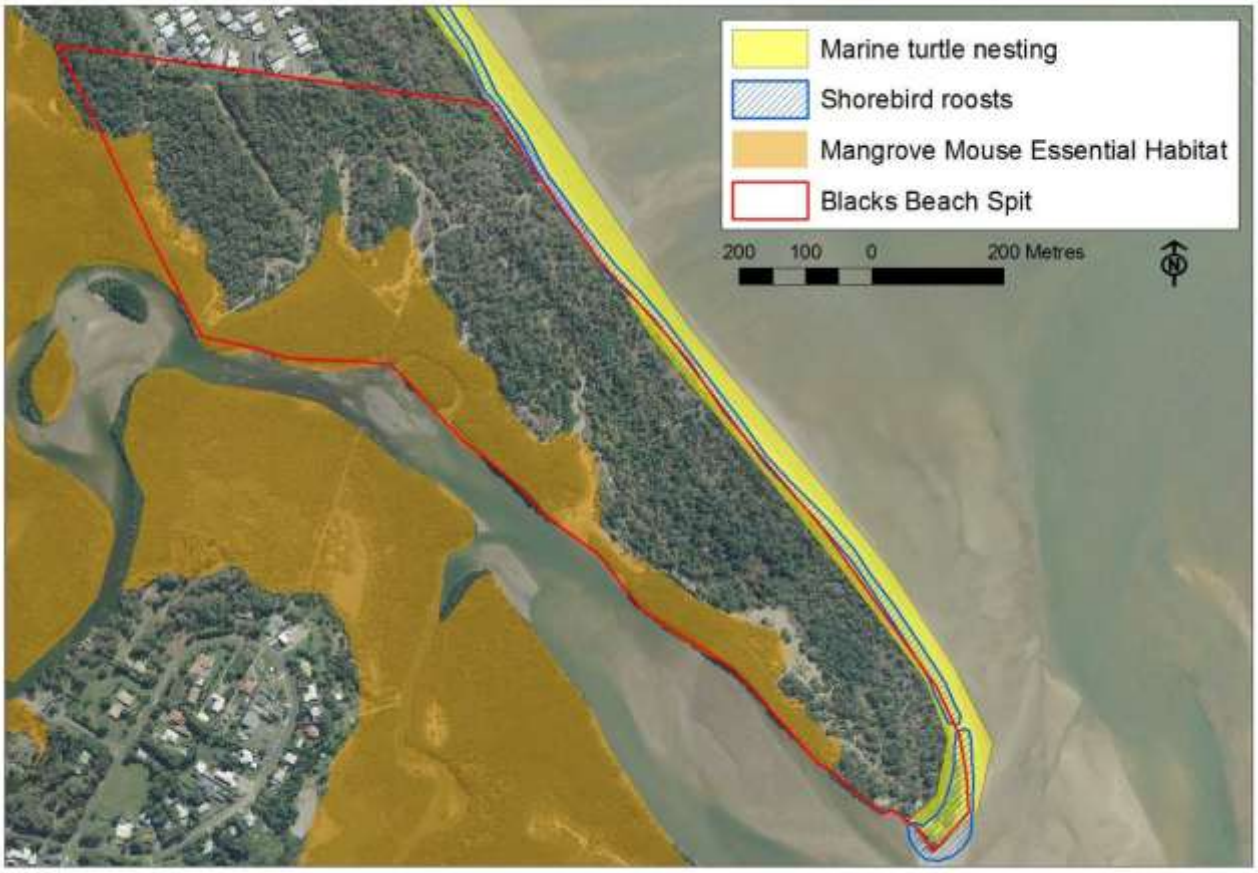
Ground litter layers within this foreshore ecosystem provide habitat for burrowing skinks; Eastern Striped Skink (*Ctenotus robustus*), Copper-tailed Skink (*Ctenotus taeniolatus*), the Litter Dweller (*Lygisaurus foliorum*) and the Arboreal Skink (*Cryptoblepharus virgatus*). Other reptiles encountered include the Dtella (*Gehyra dubia*), Bynoe's Gecko (*Heteronotia binoei*), the vulnerable Stripe-tailed Delma (*Delma labialis*), *Carlia schmeltzii*, *Cryptoblepharus littoralis*, Eastern Striped Skink (*Ctenotus robustus*), Major Skink (*Egernia frerei*), and Mulch Skink (*Glaphyromorphus punctulatus*). Both Flatback Turtles (*Natator depressus*) and Green Turtles (*Chelonia mydas*) nest in sand dunes seaward of this forest, although at times nests are constructed well into wooded areas. Beach Stone-Curlew (*Esacus giganteus*) nest and raise chicks within this regional ecosystem, although foraging tends to be within intertidal areas of sand and mud flat, fringing reef or samphire flat. A pair of Beach Stone-Curlews is known to have inhabited Blacks Beach Spit for some time and has been sighted as recently as January 2013 (Griffin, pers. comms 2013). Raptors, notably the White-bellied Sea-Eagle (*Haliaeetus leucogaster*) and Osprey (*Pandion haliaetus*) roost in casuarinas and often consume their prey from these vantage points. Based on available data it would appear that mammals do not make significant use of this ecosystem. The exception is the Short-beaked Echidna (*Tachyglossus aculeatus*) which is at times observed feeding amongst driftwood in areas more removed from marine influences.

### 8.2.6 *Corymbia tessellaris* + *Acacia leptocarpa* + *Banksia integrifolia* + *Melaleuca dealbata* + beach scrub species open forest on coastal parallel dunes

Reptiles recorded in this ecosystem include the Geckoes; *Gehyra dubia,* Southern Spotted Velvet Gecko (*Oedura tryoni*), the Dragon (*Diporiphora australis*), Bearded Dragon (*Pogona barbata*), the Sand Monitor (*Varanus gouldii*), Lace Monitor (*Varanus varius*), Reduced Limb Skink (*Anomalopus verreauxii*), Rainbow Skink *(Carlia pectoralis*), Skinks *Cryptoblepharus virgatus* and *Eulamprus brachysoma, Lygisaurus foliorum*

and Copper-tailed Skink *Ctenotus taeniolatus*. Also present are the Blind Snake (*Ramphotyphlops polygrammicus*) and Common Tree Snake (*Dendrelaphis punctulata*). A relatively rich mammalian assemblage is present including Common Brush-tail Possums (*Trichosurus vulpecular*) which utilise arboreal habitats, as do Black Flying Foxes (*Pteropus alecto*) and Little Red Flying Foxes (*Pteropus scapulatus*). Smaller ground dwelling mammals include the Common Planigale (*Planigale maculata*), Fawn-footed Melomys (*Melomys cervinipes*), Grassland Melomys (*Melomys burtoni*) and Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*). Larger grazing and browsing mammals include Rufous Bettong (*Aepyprymnus rufescens*) and Agile Wallabies (*Macropus agilis*). During the wet season, this ecosystem supports a diverse assemblage of frogs including; Marbled Frog (*Limnodynastes convexiusculus*), Ornate Burrowing Frog (*Limnodynastes ornatus*), Striped Marsh Frog (*Limnodynastes peroni*), Spotted Grass Frog (*Limnodynastes tasmaniensis*), Scarlet-sided Pobblebonk (*Limnodynastes terraereginae*), and the Ruddy Treefrog (*Litoria rubella*). 49 bird species have been recorded from this ecosystem including the Bar-breasted Honey-eater (*Ramsayornis fasciatus*) which is generally uncommon in the bioregion.

Fauna descriptions for RE 8.2.2 and 8.2.11 are not available.




**Acknowledgements:** 0.1 metre imagery 2012 supplied by Mackay Regional Council. 2012 Digital Cadastral Data and Mangrove Mouse Essential Habitat mapping supplied by Queensland Government. 2012 Mackay Whitsunday Shorebird roost mapping supplied by Queensland Wader Study Group and Reef Catchments. 2009 Marine turtle nesting mapping supplied by Mackay and District Turtle Watch Association and Queensland Government.

**Figure 14: Wildlife Values Blacks Beach Spit**

**Principal Recommendation 1 (from section 2.1.1, above):** Dune vegetation communities to be progressively rehabilitated using appropriate weed control techniques. By improving the condition of existing vegetation, fauna biodiversity will also benefit.

**Principal Recommendation 2 (from section 2.1.1, above):** Planned burning will not be conducted in the Reserve. All landscapes within the Spit are fire sensitive. Appendix 3 provides fire management guidelines for landscapes within the Spit.

**Principal Recommendation 3 (from section 2.1.2, above):** Public vehicle access is to be prohibited on Blacks Beach Spit. The exclusion of public vehicles is expected to remove most of the disturbance impacting on wildlife populations.

**Principal Recommendation 7:** Recorded locations of significant wildlife populations to be protected. Given that Blacks Beach Spit contains mapped, recorded, and well-monitored populations of significant marine turtle and shorebird populations, all effort should be taken to improve the habitat viability for these animals. This includes a combination of; on-ground works such as revegetation along the frontal dune to reduce light pollution for marine turtles (Appendix 6); and community education and awareness such as interpretive and regulatory signage to ensure recreational users understand the values of the Spit and how they can help to protect these species. The ongoing monitoring of these populations by community experts should be supported by Mackay Regional Council to ensure that ongoing data is available for future reviews of the effectiveness of management plan activities.

## 2.5 Cultural Heritage

Discussions with Traditional Owners have emphasised the significance of Blacks Beach Spit for Indigenous people. During the mid to late 1800's this was a popular dwelling place for Aboriginal people given its close proximity to an orphanage which was located at what is now known as Bucasia (Mooney, pers. comms 2013). The area was rich in food and cultural resources. Given the past occupation of the area, there are likely to be artefacts, shell middens, and small fish traps distributed throughout the site (Mooney, pers comms. 2013). The Traditional Owners' vision for the management of Blacks Beach Spit is very much in line with the strategic goals for future management of the land; to keep the area natural and return the health of the environment for future generations.

Specific management requests included;

- Removing existing waste dumped on the Spit and keeping the area clear of any further waste dumping
- Restricting public vehicle access to the Spit to prevent further damage
- Removal of non-native weed species to improve natural systems
- The use of interpretive signage to acknowledge and inform the general public of the cultural significance of the Spit and its resources

## 2.6 Erosion

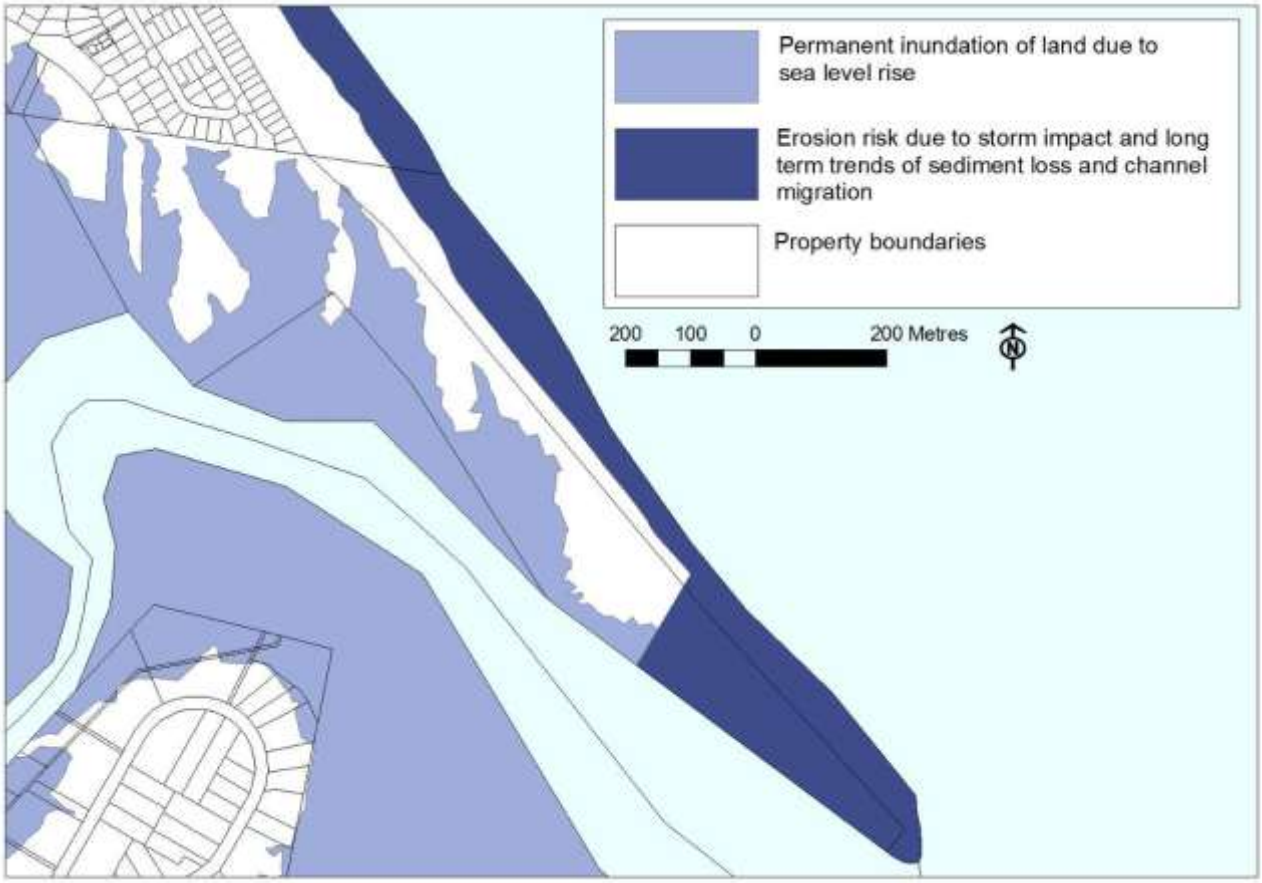
Sandy shorelines are subject to natural erosion and accretion cycles caused by the impacts of wave, wind and currents on open coastline. The alignment of Blacks Beach and the configuration of the tidal flats are controlled by the bedrock outcrops of Slade Point and Dolphin heads, which effectively provide shelter from the wave climate and impact on sediment transport across Slade Bay (Queensland Government, 2004). Along the southern end of Blacks Beach, the net longshore transport is directed weakly southward towards the entrance of McCreadys Creek, however, coastal alignment in the middle of Blacks Beach has a large potential for variability in any given season (Queensland Government, 2006). Ensuring that erosion prone areas remain free of constructed infrastructure allows natural processes to occur unhindered. This provides the best opportunity for managing shoreline erosion and retaining environmental values (Queensland Government, 2006).

Blacks Beach Spit is vulnerable to erosion from storm tide inundation and permanent inundation as a result of expected sea level rise (Figure 16). This map uses the prescribed estimation of 0.8 metre rise in sea level by the year 2100 to model what the coastline will look like, and currently predicts that much of the Spit will be inundated by this time (Coastal Hazard mapping, Queensland Government, 2011). Current king tides already reach the toe of the frontal dune in some areas, and cover pedestrian tracks on inland margins (Figure 15). Maintaining and improving the condition of remnant vegetation on the Spit will provide the best opportunity to build resilience into these ecosystems to cope with changes into the future.

Current king tides reach the toe of the frontal dune in some areas along the eastern beach front of Blacks Beach Spit.

Inland tracks on Blacks Beach Spit become inundated with sea water on king tides and provide an indication of what the future average tide will look like.

**Figure 15: King Tide at Blacks Beach Spit 2013**




**Notes:**

1. The areas shown on this map are indicative of the extent of erosion and permanent inundation defined by the declared erosion prone area plans. Only the declared erosion prone area plans should be used for development assessment. To determine the actual position of the erosion prone area a registered surveyor or geotechnical consultant may be required if there is any doubt. Erosion prone area plans for each local government area and a comprehensive description of their determination are available from the Queensland Government.
2. The erosion prone area includes the impact of climate change to 2100 including a sea level rise of 0.8 metres.

**Acknowledgements:** Coastal Hazard mapping 2011 and Digital Cadastral Database 2012, provided by Queensland Government.

**Figure 16: Coastal Hazard Areas; Erosion Prone Area Indicative Footprint**

**Principal Recommendation 1 (from section 2.1.1, above):** Dune vegetation communities to be progressively rehabilitated using appropriate weed control techniques.

**Principal Recommendation 6 (from section 2.3, above):** Temporary, re-locatable, recreation facilities to be provided on Blacks Beach Spit to support the management intent of the land. Any facilities provided on the Spit should be done so keeping in mind that much of the land is expected to be permanently inundated into the future, and that extreme weather events such as cyclones and seasonal erosion frequent the coast and have the capacity to destroy infrastructure.

# 3 Recommended Activities

| Recommendations | Management Activities | | Implementation priority | Estimated cost |
|---|---|---|---|---|
| | # | Description | | |
| Principal Recommendation 1: Dune vegetation communities to be progressively rehabilitated using appropriate weed control techniques. | 1 | Progressive weed control across 39 hectares of dune vegetation, as per Appendix 2. | High | $58,500 first application (@ $1,500/ha), reducing annually. |
| | 2 | Weed management plan for adjacent Council Reserve behind Pacific Drive (Lot 913 on Plan SP199842) be developed to prevent weed spread from adjacent property. | Medium | $10,000 |
| | 3 | Community education campaign targeting local residents as to the possibility of spread of weeds from nearby residential gardens. | Medium | N/A. Incorporate into existing Council communications. |
| Principal Recommendation 2: Planned burning will not be conducted in the Reserve. | 4 | Maintain mown buffer zone as a fire break on the boundary margin of the Spit, including keeping clear of all private belongings so that it can be appropriately maintained. | High | N/A. Incorporate into existing mowing crew maintenance. |
| | 1 | Fuel loads are reduced on the Spit by progressive weed control and mulching down of dead woody weeds as per Appendix 2. | | |
| Principal Recommendation 3: Public vehicle access is to be prohibited on Blacks Beach Spit. | 5 | Current fence lines and gates to be maintained, and ensure ongoing compliance to local law. | High | N/A. Incorporate into existing natural environment budget as required. |
| | 6 | Regulatory signage to be installed at potential vehicle entry points (gated), stipulating local law “no vehicles allowed”. 5 @ $250. | High | $1,250 |
| Principal Recommendation 4: Stormwater Quality Improvement Devices, as identified in the McCreadys Creek Catchment Management Plan (2005) are to continue to be installed. | 7 | Progressive installation of Stormwater Quality Improvement Devices throughout McCreadys Creek Catchment, as per prioritised listing, Appendix 4. | Low | Refer to Appendix 4 for full costing. |
| Principal Recommendation 5. Existing and ongoing litter and marine debris to be removed from Blacks Beach Spit. | 8 | Community Coastcare events to focus on litter and marine debris removal at the Spit every 6 months, and monitor requirement for more regular clean-ups. | Medium | N/A. Build into existing program. |
| | 6, 13 | Installation of signage at entry points and key recreational areas requesting that all litter be removed from the Spit. | | |

| | | | | |
|---|---|---|---|---|
| | 9 | Installation of a rubbish bin and dog waste bag dispenser at both Anglers Parade and Pacific Drive entry points, to encourage ongoing removal of rubbish from the Spit. Monitor use over time and implement adaptive management depending on key access points being used.<br>2 bins @ $600 each. Empyting 2 bins @ $90/year (weekly empty).<br>2 dog waste bag dispenser @ $100 each. | Medium | $1,580 |
| Principal Recommendation 6: Temporary, re-locatable, recreation facilities to be provided on Blacks Beach Spit to support the management intent of the land. | 10 | Maintenance of one pedestrian access track to the Spit. No materials required. Figure 12 provides identification of preferred track for use. | High | N/A. Incorporate into natural environment crew maintenance. |
| | 11 | Signage of one pedestrian access track to the Spit. Low key signage at each track junction is recommended indicating the direction to the Spit and to entry points. Figure 12 provides identification of potential signage required.<br>20 @ $100 each. | High | $2,000 |
| | 12 | The provision of two park benches on the Spit. These should be re-locatable given the dynamic nature of the coast and potential for extreme events. Location to be determined with input from shorebird surveyors at time of installation. Mackay Regional Council landscape manual to be consulted. 2 @ $1,400 each. | Medium | $2,800 |
| | 13 | Interpretive signage at key entry points (3) and along the length of the pedestrian access track (3), promoting the natural and cultural values of the Spit. 6 @ $2,500 each. | Medium | $15,000 |
| | 14 | Parking requirements at entry points to the Spit to be monitored and consideration given to the provision of low-impact car parking the end of Pacific Drive and/or the end of Corella Way. | Medium | $100,000 capital budget |
| Principal Recommendation 7: Recorded locations of significant wildlife populations to be protected. | 15 | Screen planting as per Appendix 6 to assist in removing light pollution for nesting and hatchling marine turtles. Total 2,000$m^2$ @ $10,000/ha, plus ongoing maintenance. | High | $3,000 (year one) |
| | 13 | Installation of interpretive signage highlighting the significance of wildlife habitat on the Spit and requesting behaviours to protect these species. | | |
| | 6 | Regulatory signage to be installed at entry points, stipulating dogs on leads. | | |
| | 16 | Support the ongoing monitoring of turtle and shorebird populations on the Spit and use data to inform adaptive management activities required for vulnerable species. | Medium | Support to be provided through natural environment levy as required. |

# 4 Implementation and Review

The implementation of the Blacks Beach Spit Management Plan will occur on a prioritised basis as resources become available. The relative priority of recommended activities and associated costs is recorded in the previous section.

In addition to Mackay Regional Council's Natural Environmental Program staff and funding, multiple external opportunities for funding and resources to assist in the implementation of the Blacks Beach Spit Management Plan exist. These include:

- Federal Government grant opportunities
- State Government grant opportunities
- Corporate grant opportunities
- Regional natural resource management group (Reef Catchments Mackay Whitsunday Isaac)
- Specialist organisations with interest in the Reserve (such as the Mackay and District Turtle Watch Association, Birdlife Mackay, and Queensland Wader Study Group)
- Local community groups
- Local community volunteers

A formal review of the Blacks Beach Spit Management Plan should take place every five years. However, Mackay Regional Council may seek to update the Management Plan at any stage based on the results of monitoring programs, and in line with further protecting the natural environment values of the Spit.

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# Appendix 1: Flora Species List Blacks Beach Spit

***** non-native species
+ added in 2002 survey
^ added in 2013 survey

Growth form: (T) tree; (S) shrub; (H) non-woody plant; (V) creeper; (E) ephiphyte; (P) parasite

| Genus species | Common Name | Growth Form | Non-native species status (*Land Protection (Pest and Stock Route Management) Act* 2002) |
|---|---|---|---|
| *Abrus precatorius* | Giddy Giddy | V | |
| *Acacia leptocarpa* | Northern Wattle | T | |
| *Acronychia laevis* | Lemon Aspen | T | |
| *Aegialitis annulata* ^ | Club Mangrove | S | |
| *Aegiceras corniculatum* | River Mangrove | T | |
| **Agave sisalana* | Agave | H | |
| **Agave vivipara* var. *vivipara* | Agave | H | |
| *Aidia racemosa* | Wild Randa, Archer Cherry, Aidia | T | |
| *Alphitonia excelsa* | Soapy Ash, Red Ash | T | |
| **Alternanthera brasiliana* | Red-leaved Alternanthera | H | |
| *Alyxia spicata* | Twining Chain Fruit | V | |
| *Amyema congener* | Variable Mistletoe | E | |
| *Arytera divaricata* ^ | Rose Tamarind, Coogara | T | |
| **Aster subulatus* + | Wild Aster, Bushy Starwort | H | |
| *Avicennia marina* | Grey Mangrove | T | |
| *Banksia integrifolia* subsp. *compar* | Coast Banksia, Honeysuckle Banksia | T | |
| **Bidens alba* var. *radiata* ^ | Cobblers Pegs | H | |
| *Bruguiera exaristata* | Rib-fruited Orange Mangrove | T | |
| *Bruguiera parviflora* ^ | Small-fruited Orange Mangrove | T | |
| **Bryophyllum pinnatum* | Resurrection Plant | H | |
| *Caesalpinia bonduc* | Nicker Nut | S | |
| **Callisia fragrans* | Callisia | H | |
| *Capparis lucida* | Coast Caper | S | |
| *Cassytha* sp.+ | Dodder Laurel, Devil's Twine | PV | |
| *Casuarina equisetifolia* | Coastal She-oak, Horsetail She-oak | T | |
| **Catharanthus roseus* ^ | Pink Periwinkle | H | |
| **Cenchrus echinatus* ^ | Seaforth Burr | H | |
| *Cerbera manghas* | Dog Bane, Pink-eyed Cerbera | T | |
| *Ceriops tagal* | Spurred Mangrove, Yellow Mangrove | T | |
| *Chionanthus ramiflora* | Native Olive | T | |

| | | | |
|---|---|---|---|
| *Chrysocephalum apiculatum* | Yellow Buttons | H | |
| *Clematicissus opaca* | Small-leaved Water Vine, Pepper Vine | V | |
| *Clerodendrum floribundum* | Lolly Bush, Smooth Clerodendrum | T | |
| *Clerodendrum inerme* | Scrambling Clerodendrum | V | |
| **Cocus nucifera* ^ | Coconut palm | T | |
| *Colubrina asiatica* | Beach Berry Bush, Colubrina | S | |
| *Commelina* sp. | Wandering Sailor, Native Commelina | H | |
| *Conyza* sp. + | Fleabane | H | |
| *Corymbia dallachiana* | Dallachy's Ghost Gum | T | |
| *Corymbia tessellaris* + | Moreton Bay Ash | T | |
| **Corymbia torelliana* ^ | Cadagi | T | |
| **Crotalaria pallida* + | Streaked Rattlepod | H | |
| *Cupaniopsis anacardioides* | Tuckeroo | T | |
| *Cyclophyllum coprosmoides* | Coast Canthium | T | |
| *Cynanchum carnosum* | Mangrove Milk-pod | T | |
| *Cyperus gracilis* + | Slender Sedge | H | |
| *Cyperus pedunculatus* | Pineapple sedge | H | |
| **Delonix regia* ^ | Poinciana | T | |
| *Dendrobium discolor* | Golden Orchid | E | |
| *Dianella caerulea* | Blue Flax-Lily | H | |
| *Dianella longifolia* + | Smooth Flax-Lily | H | |
| *Diospyros geminata* | Scaly Ebony | T | |
| *Dockrillia bowmanii* | Straggly Pencil Orchid | E | |
| *Dodonaea viscosa* ^ | Sticky Hop Bush | S | |
| *Drynaria rigidula* | Basket Fern | H | |
| *Drypetes deplanchei* | Yellow Tulipwood | T | |
| **Duranta erecta* ^ | Duranta | S | |
| **Emilia sonchifolia* + | Emelia | H | |
| *Enchylaena tomentosa* + | Ruby Saltbush | H | |
| *Eragrostis interrupta* | Coastal Love Grass | H | |
| *Eriachne triodioides* + | | H | |
| *Eugenia reinwardtiana* | Beach Cherry | S | |
| *Euphorbia tannensis* + | | | |
| *Euroschinus falcatus* | Maiden's Blush | T | |
| *Eustrephus latifolius* | Wombat Berry | V | |
| *Evolvulus alsinoides* | Tropical Speedwell | H | |
| *Excoecaria agallocha* | Milky Mangrove | T | |
| *Exocarpus latifolius* | Native Cherry | T | |
| *Ficus opposita* | Sandpaper fig | T | |
| *Flemingia parviflora* + | | H | |

| | | | |
|---|---|---|---|
| *Geitonoplesium cymosum* | Scrambling Lily | V | |
| *Geodorum densiflorum +* | Shepherd's Crook Orchid, Pink Nodding Orchid | H | |
| *Glochidion lobocarpum* | Buttonwood, Cheese Tree | T | |
| *Gymnanthera oblonga* | | V | |
| *Heteropogon contortus* | Black Speargrass | H | |
| *Heteropogon triticeus +* | Giant Speargrass | H | |
| *Hibiscus tiliaceus ^* | Cottonwood, Cowtucker, Cotton Tree | T | |
| *Hybanthus enneaspermus* | Spade Flower | H | |
| *Imperata cylindrica +* | Blady Grass | H | |
| **Ipomoea cairica ^* | Mile-a-Minute, Coastal Morning Glory | V | |
| *Ipomea pes-caprae +* | Goats Foot Convolvulus | H | |
| *Jagera pseudorhus* | Foambark Tree | T | |
| *Jasminium didymium* subsp. *racemosum* | Native Jasmine | V | |
| *Jasminium simplicifolium* | Native Jasmine | V | |
| **Lantana camara +* | Lantana | S | Declared Class 3 |
| *Limonium solanderi* | Sea Statice | H | |
| *Livistona decora* | Weeping Cabbage Palm | T | |
| *Lomandra longifolia* | Spiny-headed Mat-rush | H | |
| *Lumnitzera racemosa* | Black Mangrove | T | |
| *Lysiana maritima* | A mistletoe | P | |
| *Macaranga involucrata* | Brown Macaranga | T | |
| *Macaranga tanarius* | Macaranga | T | |
| **Macroptilium atropurpureum ^* | Siratro | V | |
| *Mallotus philippensis* | Red Kamala | T | |
| *Maytenus disperma* | Orange Bark | T | |
| **Megathyrsus maximus +* | Guinea Grass | H | |
| **Melinus repens +* | Red Natal Grass | H | |
| *Melaleuca leucadendra* | Weeping Tea Tree | T | |
| *Melia azedarach* | White Cedar | T | |
| *Memecylon pauciflorum ^* | Memecylon, Poor-flower Tree | T | |
| *Microsaurum punctatum +* | Calves Tongue | H | |
| *Mimusops elengi* | Red Coondoo | T | |
| *Mukia maderaspatana +* | | V | |
| *Myoporum accuminatum* | Boobiella | T | |
| *Myrsine variabilis* | Muttonwood | T | |
| **Oenothera drummondii* subsp. *drummondii ^* | Beach Primrose | H | |
| **Opuntia* sp. *+* | Prickly Pear | H | Declared Class 2 |

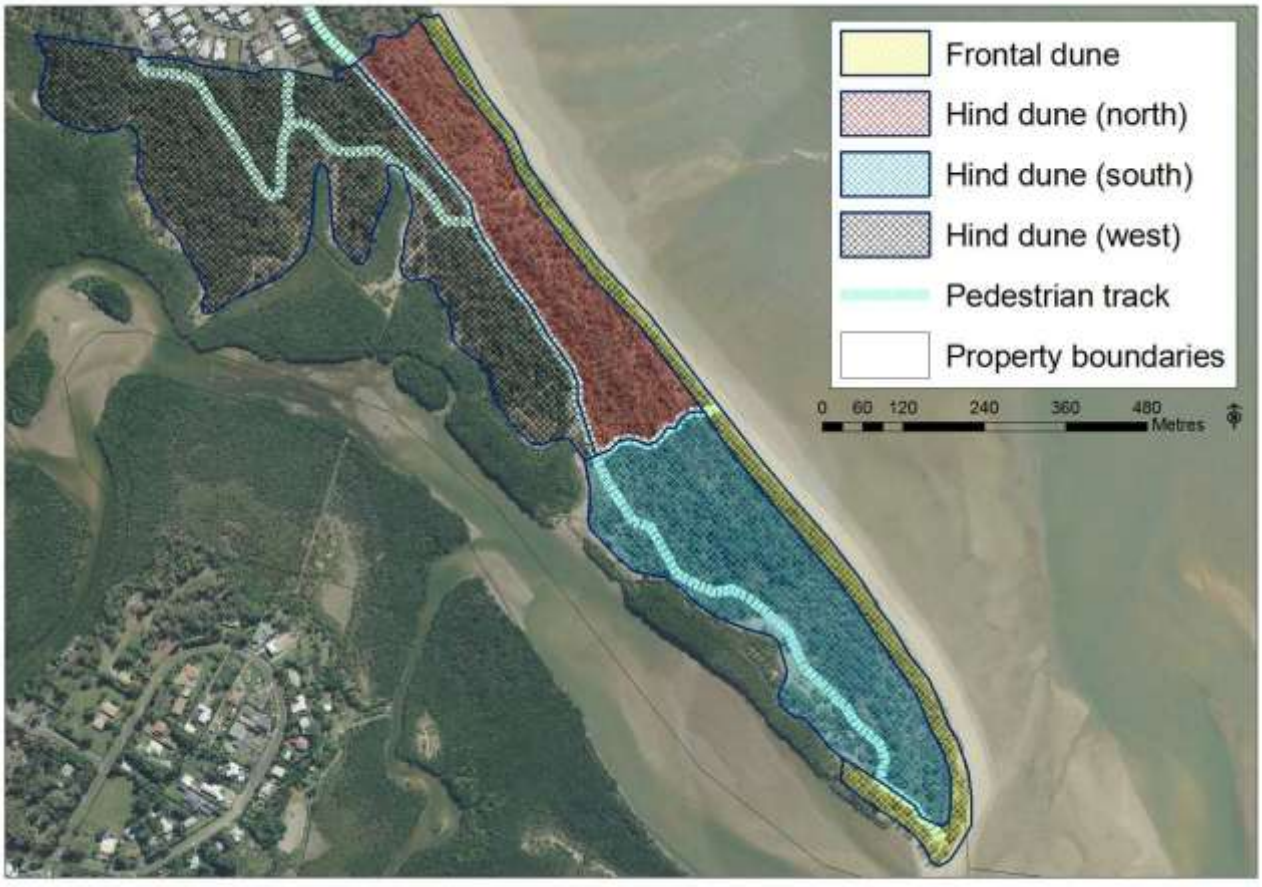
| | | | |
|---|---|---|---|
| *Osbornia octodonta* | Myrtle Mangrove | T | |
| *Pandanus tectorius* | Screw Palm | T | |
| **Passiflora foetida +* | Stinking Passionfruit | V | |
| **Passiflora suberosa +* | Corky Passionfruit | V | |
| *Pittosporum ferrugineum* | Rusty Pittosporum | T | |
| *Planchonia careya* | Cocky Apple | T | |
| *Polyalthia nitidissima* | Canary Beech | T | |
| *Polycarpaea corymbosa +* | | H | |
| *Polyscias elegans* | Celery Wood | T | |
| **Psidium guajava +* | Guava, Yellow Guava | T | |
| *Psychotria* sp. | | S | |
| *Pyrrosia* sp. | A creeping fern | EH | |
| *Rhizophora stylosa* | Stilted Mangrove, Red Mangrove | T | |
| *Sarcocornia quinqueflora* | Samphire | H | |
| *Sarcostemma viminale* subsp. *brunonianum* | Caustic Vine | V | |
| *Schefflera actinophylla* | Umbrella Tree | T | |
| *Scolopia braunii* | Flintwood, Brown Birch | T | |
| *Sersalisia sericea* | Mongo | T | |
| *Sesuvium portulacastrum* | Sea Purslane | H | |
| **Sida cordifolia +* | Flannel weed | H | |
| *Smilax australis* | Barbed Wire Vine | V | |
| *Spinifex sericeus +* | Beach Spinifex | H | |
| *Sporobolus virginicus* | Marine Couch | H | |
| **Stachytarpheta jamaicensis +* | Blue Snakeweed | H | |
| *Stephania japonica* var. *timorensis* | Snake Vine | V | |
| *Sterculia quadrifida* | Peanut Tree | T | |
| *Suaeda australis* | Austral Seablite | H | |
| *Tacca lentopetaloides* | Tacca, Arrowroot | H | |
| *Terminalia catappa ^* | Indian Almond | T | |
| *Terminalia muelleri +* | Coast Damson | T | |
| *Themeda triandra +* | Kangaroo Grass | H | |
| **Tridax procumbens +* | Tridax Daisy | H | |
| **Triumfetta rhomboidea +* | Chinese Burr | S | |
| *Trophis scandens* subsp. *scandens* | Burny Vine | V | |
| *Wikstroemia indica* | Tiebush | S | |
| **Yucca aloifolia +* | Yucca | H | |

List compiled from: Irene Champion and Kerri Woodcock (2013); Irene Champion and Matt Bloor (2002); I. Sutton (2001); Irene Champion (1990).

## Appendix 2: Weed Management Plan for Blacks Beach Spit

Encouraging the natural regeneration of native species is the best method for restoration of ecosystems within Blacks Beach Spit. Given that the area is predominantly remnant vegetation, a viable seed bank is present, and native species are likely to recover with the exclusion of non-native species as competition. Weed control should be completed in a staged approach, as maintenance can be kept up, and excluding disturbance and the re-introduction of weed species where possible.

Blacks Beach Spit can be divided into zones for weed management to assist in discussion, planning and implementation (Figure 17). The zones are based on dune vegetation zonation, timing requirements for weed control, and previous treatments completed. Access tracks have been used as boundaries where possible, to assist in identification and implementation on-ground. Notes on control techniques, priorities and timing for each zone are discussed in the table below. An ongoing weed monitoring program should be implemented as part of the weed control program. Appendix 1 includes a list of weed species on Blacks Beach Spit.

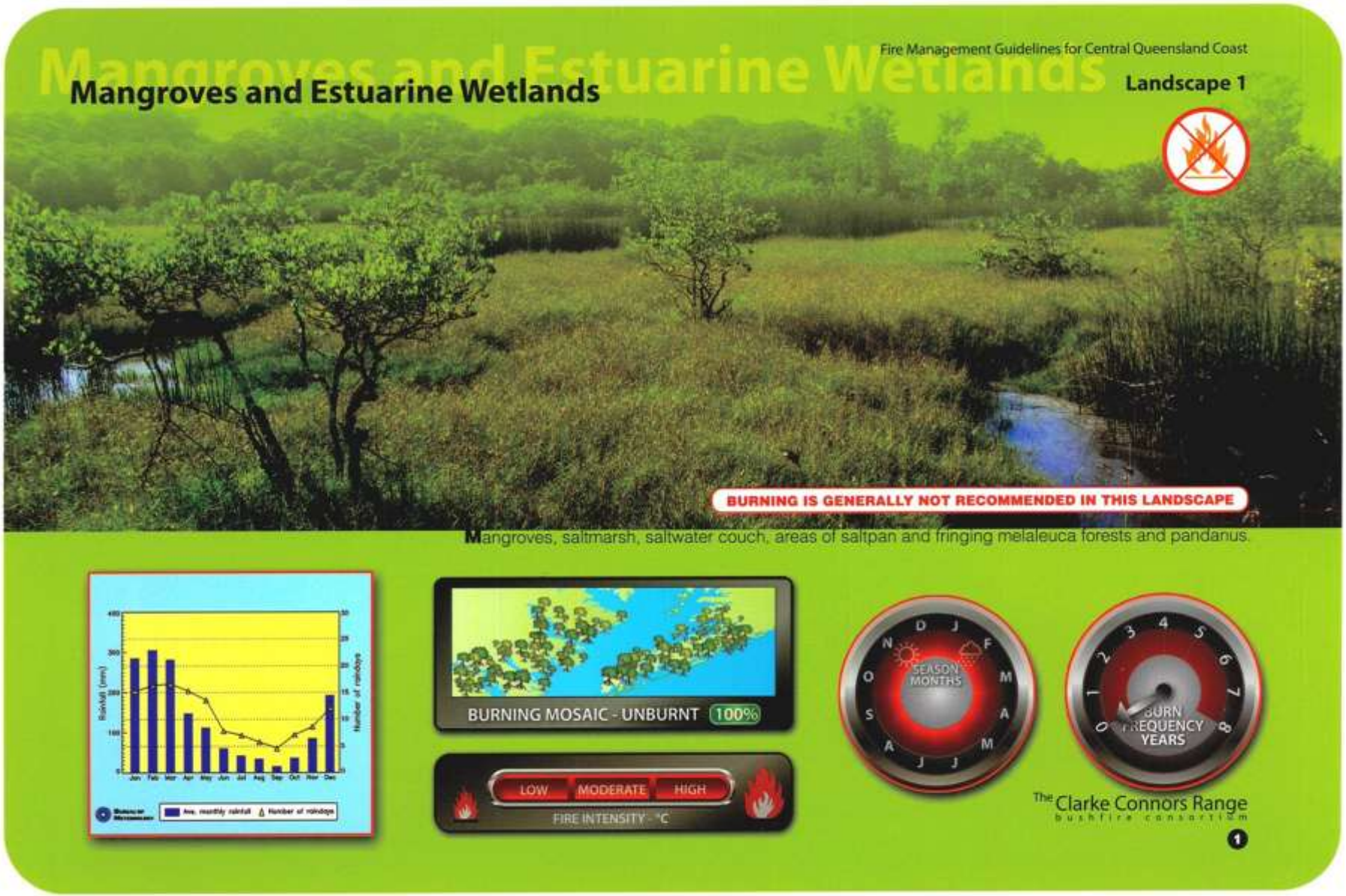



**Acknowledgements:** 0.1 metre imagery 2012 supplied by Mackay Regional Council. Digital Cadastral Data 2012 supplied by Queensland Government.

**Figure 17: Proposed weed control zones Blacks Beach Spit**

| Zone description | Weed control techniques and timing |
|---|---|
| **Frontal dune** | |
| **Frontal dune (4.4 ha)**<br>Beach front to approximately 20 m inland. | • Small scale 'spot spray' applications to minimise non-target impacts. Roundup Bi-active ® is recommended due to its low toxicity to wildlife and humans.<br>• Limit mechanical removal to the hand pulling of *Agave* sp. to avoid any disturbance to the frontal dune.<br>• Weed control to occur between April and October only, to avoid turtle nesting season (November to March). |
| **Hind dunes** | |
| **North (7.6 ha)**<br>Northern extent of Spit to the central pedestrian access track. Has already been treated once, completed February 2013. | • Apply herbicides by foliage or basal spraying, or cut/paste and stem injection where applicable. Spraying may be carried out on large weed infestations, 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. Roundup Bi-active ® is recommended due to its low toxicity to wildlife and humans.<br>• Large woody weeds (such as Lantana) should be removed slowly to ensure the regenerating native vegetation provides sufficient habitat value and protection against erosion.<br>• 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. Mulching down of large, dense areas of dead lantana using brush cutters or hand tools, would similarly reduce fire risk and allow native plants a better chance at regeneration.<br>• Keep maintenance vehicles on the proposed pedestrian tracks to reduce disturbance where possible, and clean vehicles before and after access to the site to prevent weed spread or introduction.<br>• Work outwards from intact remnants of beach scrub remnants as a priority.<br>• Weed control can occur 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.<br>• 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. |
| **South (11.4 ha)**<br>From the central pedestrian access track, to the southern extent of the Spit. | |
| **West (16.9 ha)**<br>From the pedestrian access track, west to the high tide mark. | |

## Appendix 3: Fire Management Guidelines for landscapes within Blacks Beach Spit



## Hazard Reduction

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 represent a fire hazard risk. Risk is further minimised by the fact that the grasslands rarely accumulate large amounts of fuels 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 representahigh 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.

## Production

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 dependant species. Minimising fire and other disturbance within these areas provides significant positive benefits for migratory and resident shorebirds, seabirds and the threatened mangrove mouse.

Blueprint

Queensland Government

REEF CATCHMENTS

The Clarke Connors Range Bushfire Consortium

2

# Beaches and foreshores

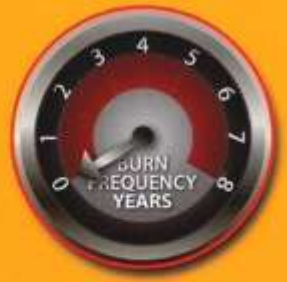
**Landscape 2**

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

**C**oastal she-oak & beach scrub (rainforest) in protected areas.








The Clarke Connors Range
bushfire consortium

3

**Hazard Reduction**

Coastal 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 herbicide to reduce fuel hazards where required. Apply when grasses are actively growing, preferably prior to dry season.

**Production**

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 lantana and other weeds into otherwise intact areas. Management of stock access and provision of shade and watering points away from beach scrub and foreshores will reduce the impacts of disturbance 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 arson; 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 these is little to no scorch into beach scrubs and foreshores as an indicator of successful fire management.

Caring for our Country | Blueprint for the Bush | Queensland Government | Rural Fire Service | REEF CATCHMENTS | The Clarke Connors Range bushfire consortium

4

# Appendix 4: Stormwater Quality Improvement Devices proposed for McCreadys Creek Catchment

**Table 6-7, page 42 from McCreadys Creek Catchment Management Plan (GHD, 2005)**

| ID | Sub catchment | Location | Site Details | Estimated Cost^ | Priority (MCC) | Current Status |
|---|---|---|---|---|---|---|
| **Gross Pollutant Traps** | | | | | | |
| McGPT1 | 19 | Apsley Road, Andergrove | Discharge point of 2/1200 RCPs | $60,000 | 4 | Design underway |
| McGPT2 | 18 | Carbeen Street, Andergrove (east of Mackillop Catholic Primary School) | Open drain, 20 m wide, grass base | $50,000 | 5 | Completed |
| McGPT3 | 6 | Nadarmi Drvie, Andergrove (wets of Mackillop Cathold Primary School) | Open drain, 30 m wide, 7 m wide concrete base | $120,000 | 1 | Design underway |
| McGPT5 | 10 | Broomdykes Drive, Beaconsfield | Open drain, 20 m wide, downstream of detention basin | $100,000 | 3 | Design underway |
| McGPT6 | 8 | Multimodal Corridor, Mt Pleasant | Open drain, 8.5 m wide, grassed | $100,000 | 6 | Not started |
| McGPT7 | 20 | Mackay Bucasia Road, Rural View | Detention Basin to be retrofitted to capture Gross Pollutants | $50,000 | 8 | Not started |
| McGPT8 | 5 | Pacific Drive, Blacks Beach | Prior to discharge into natural detention basin | $50,000 | 7 | Not started |
| **Constructed Wetlands** | | | | | | |
| McCWet1 | 7 | Caledonian Drive, Kimberley | Open drain, 20 m wide, downstream of 4/2400x1200 RCBCs | $250,000 | 2 | Design plans completed |
| McCWet2 | 3 | Symons Property | Downstream of future urban area | $150,000 | N/A | N/A |
| McCWet3 | 3 | Symons Property | Downstream of future urban area | $120,000 | N/A | N/A |
| McCWet4 | 1 | Symons Property | Downstream of future urban area | $120,000 | N/A | N/A |
| McCWet5 | 22 | Symons Property | Downstream of future urban area | $150,000 | N/A | N/A |
| McCWet6 | 4 | Cain Property | Downstream of future urban area | $170,000 | N/A | N/A |
| McCWet7 | 2 | Shuttlewood Property | Downstream of future urban area | $150,000 | N/A | N/A |
| **Trash Racks** | | | | | | |
| McTR1 | 0 | George Fordyce Drive, Rural View | Discharge point of drainage system | $8,000 | 11 | Not started |
| McTr2 | 0 | George Fordyce Drive, Rural View | Discharge point of drainage system | $8,000 | 12 | Not started |
| McTr3 | 0 | George Fordyce Drive, Rural View | Discharge point of drainage system | $8,000 | 13 | Not started |
| McTr4 | 9 | Beaconsfield Road, Beaconsfield | Road Table Drain | $12,000 | 9 | Not started |
| McTr5 | 9 | Holts Road, Beaconsfield | Road Table Drain | $12,000 | 10 | Not started |

^ Cost includes estimated planning, design and construction costs.

# Appendix 5: Fauna Species List Blacks Beach Spit

* Bird records provided by the Queensland Wader Study Group
+ Fauna records from Blacks Beach Fauna Survey (2002)
^ Mackay Turtle Watch Association Records
# Incidental observation
All other records are species which are potentially in the Reserve based on Regional Ecosystems or Essential Habitat data.

NCA – *Nature Conservation Act* 1992 (E – endangered, V – vulnerable, NT – near threatened)
EPBC – *Environment Protection and Biodiversity Conservation Act* 1999 (V – vulnerable, M – migratory, m – marine)

| Family | Genus species | Common name | NCA Status | EPBC Status |
|---|---|---|---|---|
| **BIRDS** | | | | |
| Acanthizidae | *Gerygone magnirostris* | Large-billed Gerygone # | | |
| | *Gerygone levigaster* | Mangrove Gerygone+# | | |
| | *Gerygone palpebrosa* | Fairy Gerygone+# | | |
| Accipitridae | *Accipiter fasciatus* | Brown Goshawk+# | | M, m |
| | *Haliaeetus leucogaster* | White-bellied Sea-Eagle+*# | | M, m |
| | *Haliastur indus* | Brahminy Kite+*# | | M, m |
| | *Haliastur sphenurus* | Whistling Kite+# | | M, m |
| | *Milvus migrans* | Black Kite*# | | M |
| | *Pandion haliaetus* | Osprey+*# | | M, m |
| Alcedinidae | *Alcedo pusilla* | Little Kingfisher# | | |
| Anatidae | *Anas castanea* | Chestnut Teal* | | |
| | *Anas superciliosa* | Pacific Black Duck # | | |
| | *Cygnus atratus* | Black Swan* | | M |
| | *Tadorna radjah* | Radjah Shelduck* | NT | M, m |
| Ardeidae | *Ardea alba* | Great Egret*# | | M |
| | *Ardea intermedia* | Intermediate Egret* | | M |
| | *Ardea sumatrana* | Great-billed Heron# | | |
| | *Butorides striatus* | Striated Heron+*# | | |
| | *Egretta garzetta* | Little Egret# | | |
| | *Egretta sacra* | Eastern Reef Egret# | | |
| | *Egretta novaehollandiae* | White-faced Heron*# | | |
| Artamidae | *Artamus leucorynchus* | White-breasted Woodswallow+# | | |
| | *Cracticus nigrogularis* | Pied Butcherbird+# | | |
| | *Cracticus quoyi* | Black Butcherbird+# | | |
| | *Cracticus tibicen* | Australian Magpie+# | | |
| | *Strepera graculina* | Pied Currawong# | | |
| Burhinidae | *Burhinus grallarius* | Bush Stone-Curlew+# | | |
| | *Esacus giganteus* | Beach Stone-Curlew+*# | V | M |

| | | | | |
|---|---|---|---|---|
| Cacatuidae | *Calyptorhynchus banksii* | Red-tailed Black-Cockatoo# | | |
| | *Cacatua galerita* | Sulphur-crested Cockatoo# | | |
| | *Eolophus roseicapilla* | Galah# | | |
| Campephagidae | *Coracina novaehollandiae* | Black-faced Cuckoo-Shrike+ | | M |
| | *Lalage leucomela* | Varied Triller+# | | |
| Centropodidae | *Centropus phasianinus* | Pheasant Coucal+# | | |
| Charadriidae | *Charadrius leschenaultii* | Greater Sand Plover*# | | M, m |
| | *Charadrius mongolus* | Lesser Sand Plover*# | | M, m |
| | *Charadrius ruficapillus* | Red-capped Plover+*# | | M, m |
| | *Pluvialis fulva* | Pacific Golden Plover*# | | M, m |
| | *Pluvialis squatarola* | Grey Plover# | | M, m |
| | *Vanellus miles* | Masked Lapwing+*# | | M |
| Ciconiidae | *Ephippiorhynchus asiaticus* | Black-necked Stork+# | NT | |
| Colluricinclidae | *Colluricincla megarhyncha* | Little Shrike-Thrush+# | | |
| | *Colluricincla harmonica* | Grey Shrike-Thrush# | | |
| Columbidae | *Geopelia humeralis* | Bar-shouldered Dove+# | | |
| | *Geopelia striata* | Peaceful Dove +# | | |
| | *Ducula bicolor* | Pied Imperial Pigeon# | | M |
| | *Spilophelia chinensis* | Spotted Turtle-Dove *(exotic)*# | | |
| | *Ptilinopus regina* | Rose-crowned Fruit-Dove# | | |
| | *Macropygia amboinensis* | Brown Cuckoo-Dove+ | | |
| Corvidae | *Corvus orru* | Torresian Crow+# | | |
| Coraciidae | *Eurystomas orientalis* | Dollarbird# | | M |
| Cuculidae | *Cacomantis flabelliformis* | Fan-tailed Cuckoo# | | M |
| | *Chalcites lucidus* | Shining Bronze-Cuckoo# | | M |
| | *Chrysococcyx minutillus* | Little Bronze-Cuckoo# | | M |
| | *Chrysococcyx russatus* | Gould's Bronze-Cuckoo# | | M |
| | *Cuculus optatus* | Oriental Cuckoo# | | m, M |
| | *Eudynamys scolopacea* | Eastern Koel# | | M |
| | *Scythrops novaehollanidae* | Channel-billed Cuckoo# | | M |
| Dicaeidae | *Dicaeum hirundinaceum* | Mistletoebird+# | | |
| Dicruridae | *Dicrurus bracteatus* | Spangled Drongo+# | | M |
| | *Grallina cyanoleuca* | Magpie Lark+# | | m |
| | *Myiagra rubecula* | Leaden Flycatcher+# | | |
| Estrildidae | *Taeniopygia bichnovii* | Double-barred Finch# | | |
| | *Lonchura punctulata* | Nutmeg Mannikin# | | |
| Falconidae | *Falco berigora* | Brown Falcon# | | |
| | *Falco longipennis* | Australian Hobby# | | |
| Gruidae | *Grus rubicunda* | Brolga# | | |
| Haematopodidae | *Haematopus fuliginosus* | Sooty Oystercatcher* | NT | |
| | *Haematopus longirostris* | Pied Oystercatcher+*# | | |
| Halcyonidae | *Dacelo novaeguineae* | Laughing Kookaburra# | | |

| | | | | |
|---|---|---|---|---|
| | *Dacelo leachii* | Blue-winged Kookaburra# | | |
| | *Todiramphus sanctus* | Sacred Kingfisher+# | | m |
| | *Todiramphus chloris* | Collared Kingfisher# | | m |
| Hirundinidae | *Hirundo nigricans* | Tree Martin# | | |
| | *Hirundo neoxena* | Welcome Swallow+# | | m |
| Laridae | *Chroicocephalus novaehollandiae* | Silver Gull+*# | | m |
| | *Sterna albifrons* | Little Tern+* # | E | M, m |
| | *Sterna bengalensis* | Lesser Crested Tern* | | m |
| | *Sterna bergii* | Crested Tern+*# | | m |
| | *Sterna caspia* | Caspian Tern+*# | | m |
| | *Sterna hirundo* | Common Tern# | | m, M |
| | *Sterna nilotica* | Gull-billed Tern+*# | | m |
| Maluridae | *Malurus melanocephalus* | Red-backed Fairy-Wren+# | | |
| Megapodiidae | *Alectura lathami* | Australian Brush-Turkey+# | | |
| | *Megapodius reinwardt* | Orange-footed Scrubfowl+# | | |
| Meliphagidae | *Entomyzon cyanotis* | Blue-faced Honeyeater+# | | |
| | *Lichmera indistincta* | Brown Honeyeater+# | | |
| | *Lichenostromus flavus* | Yellow Honeyeater# | | |
| | *Meliphaga lewinii* | Lewin's Honeyeater# | | |
| | *Melithreptus albogularis* | White-throated Honeyeater+# | | |
| | *Myzomela obscura* | Dusky Honeyeater+# | | |
| | *Philemon buceroides* | Helmeted Friarbird+# | | |
| | *Philemon citreogularis* | Little Friarbird# | | |
| Meropidae | *Merops ornatus* | Rainbow Bee-Eater+# | | M, m |
| Monarchidae | *Monarcha melanopsis* | Black-faced Monarch+# | | |
| | *Monarcha trivirgatus* | Spectacled Monarch+# | | |
| | *Myiagra alecto* | Shining Flycatcher# | | |
| Nectariniidae | *Nectarinia jugularis* | Yellow-bellied Sunbird+# | | |
| Oriolidae | *Oriolus sagittatus* | Olive-backed Oriole# | | |
| | *Sphecotheres viridis* | Australasian Figbird+# | | |
| Pachycephalidae | *Pachycephala melanura* | Mangrove Golden Whistler# | | |
| | *Pachycephala rufiventris* | Rufous Whistler+# | | |
| Pardalotidae | *Pardalotus striatus* | Striated Pardalote+# | | |
| | *Sericornis frontalis* | White-browed Scrubwren# | | |
| Pelecanidae | *Pelecanus conspicillatus* | Australian Pelican+*# | | m |
| Petroicidae | *Poecilodryas superciliosa* | White-browed Robin+# | | |
| Phalacrocoracidae | *Phalacrocorax carbo* | Great Cormorant*# | | |
| | *Phalacrocorax melanoleucos* | Little Pied Cormorant*# | | |
| | *Phalacrocorax sulcirostris* | Little Black Cormorant* | | |
| | *Phalacrocorax varius* | Pied Cormorant+*# | | |
| Podargidae | *Podargus strigoides* | Tawny Frogmouth# | | |

| | | | | |
|---|---|---|---|---|
| Psittacidae | *Platycercus adscitus* | Pale-headed Rosella# | | |
| | *Trichoglossus chlorolepidotus* | Scaly-breasted Lorikeet# | | |
| | *Trichoglossus haematodus* | Rainbow Lorikeet+ | | |
| Rhipiduridae | *Rhipidura albiscapa* | Grey Fantail+# | | |
| | *Rhipidura leucophrys* | Willie Wagtail# | | |
| | *Rhipidura rufifrons* | Rufous Fantail# | | m |
| Scolopacidae | *Actitis hypoleucos* | Common Sandpiper# | | M, m |
| | *Arenaria interpres* | Ruddy Turnstone*# | | M, m |
| | *Calidris acuminata* | Sharp-tailed Sandpiper+*# | | M, m |
| | *Calidris ferruginea* | Curlew Sandpiper*# | | M, m |
| | *Calidris ruficollis* | Red-necked Stint*# | | M, m |
| | *Calidris tenuirostris* | Great Knot*# | | M, m |
| | *Tringa brevipes* | Grey-tailed Tattler*# | | M, m |
| | *Limosa lapponica* | Bar-tailed Godwit+*# | | M, m |
| | *Numenius madagascariensis* | Eastern Curlew+*# | NT | M, m |
| | *Numenius minutus* | Little Curlew+# | | M, m |
| | *Numenius phaeopus* | Whimbrel+* | | M, m |
| | *Tringa nebularia* | Common Greenshank*# | | M, m |
| | *Xenus cinereus* | Terek Sandpiper*# | | M, m |
| Strigidae | *Ninox novaeseelandiae* | Southern Boobook Owl# | | |
| Sylviidae | *Cisticola exilis* | Golden-headed Cisticola+ | | M |
| | *Megalurus timoriensis* | Tawny Grassbird+# | | M |
| Threskiornithidae | *Threskiornis molucca* | Australian White Ibis+# | | m |
| | *Threskiornis spinicollis* | Straw-necked Ibis+# | | m |
| Zosteropidae | *Zosterops lateralis* | Silvereye+# | | m |
| **MAMMALS** | | | | |
| Dasyuridae | *Planigale maculata* | Common Planigale | | |
| Felidae | *Felis catus* | Cat *(exotic)*+ | | |
| Macropodidae | *Aepyprymnus rufescens* | Rufous Bettong | | |
| | *Macropus agilis* | Agile Wallaby+ | | |
| | *Macropus giganteus* | Eastern Grey Kangaroo+ | | |
| Muridae | *Melomys* sp. | Melomys+ | | |
| | *Melomys burtoni* | Grassland Melomys | | |
| | *Melomys cervinipes* | Fawn-footed Melomys | | |
| | *Pseudomys gracilicaudatus* | Eastern chestnut mouse | | |
| | *Uromys caudimaculatus* | Giant White-tailed Rat+ | | |
| | *Xeromys myoides* | Mangrove Mouse | V | V |
| Peramelidae | *Isoodon* sp. | Bandicoot+ | | |
| Phalangeridae | *Trichosurus vulpecular* | Common Brush-tail Possum | | |
| Pteropodidae | *Pteropus* sp. | Flying Fox+ | | |
| | *Pteropus alecto* | Black flying fox | | |
| | *Pteropus scapulatus* | Little Red Flying Fox | | |

| | | | | |
|---|---|---|---|---|
| Suidae | *Sus scrofa* | Wild Pig *(exotic)*+ | | |
| Tachyglossidae | *Tachyglossus aculeatus* | Short-beaked Echidna | | |
| **REPTILES** | | | | |
| Agamidae | *Diporiphora australis* | Dragon | | |
| | *Pogona barbata* | Bearded Dragon | | |
| Cheloniidae | *Natator depressus* | Flatback Turtle^ | V | V, M, m |
| | *Chelonia mydas* | Green Turtle^ | V | V, M, m |
| Colubridae | *Dendrelaphis punctulata* | Common Tree Snake | | |
| Crocodylidae | *Crocodylus porosus* | Estuarine Crocodile | V | M, m |
| Gekkonidae | *Gehyra dubia* | Dtella | | |
| | *Heteronotia binoei* | Bynoe's Gecko | | |
| | *Oedura tryoni* | Southern Spotted Velvet Gecko | | |
| Pygopodidae | *Delma labialis* | Strip-tailed Delma | V | V |
| Pythonidae | *Morelia spilota* | Carpet Python# | | |
| Scinidae | *Anomalopus verreauxii* | Reduced Limb Skink | | |
| | *Carlia schmeltzii* | Schmeltz's Skink | | |
| | *Carlia pectoralis* | Rainbow Skink | | |
| | *Cryptoblepharus littoralis* | Littoral Skink | | |
| | *Cryptoblepharus virgatus* | Arboreal Skink | | |
| | *Ctenotus robustus* | Eastern Striped Skink | | |
| | *Ctenotus taeniolatus* | Copper-tailed Skink | | |
| | *Egernia frerei* | Major Skink | | |
| | *Eulamprus brachysoma* | Skink | | |
| | *Glaphyromorphus punctulatus* | Mulch Skink | | |
| | *Lygisaurus foliorum* | Tree-base Litter-Skink | | |
| Typhlopidae | *Ramphotyphlops polygrammicus* | Blind Snake+ | | |
| Varanidae | *Varanus semiremex* | Rusty Monitor | NT | |
| | *Varanus goldii* | Sand Monitor | | |
| | *Varanus varius* | Lace Monitor | | |
| **AMPHIBIANS** | | | | |
| Bufonidae | *Bufo marinus* | Cane Toad *(exotic)*+ | | |
| Hylidae | *Litoria rubella* | Ruddy Treefrog | | |
| Myobatrachidae | *Limnodynastes convexiusculus* | Marbled Frog | | |
| | *Limnodynastes ornatus* | Ornate Burrowing Frog+ | | |
| | *Limnodynastes peronii* | Striped Marsh Frog | | |
| | *Limnodynastes tasmaniensis* | Spotted Grass Frog | | |
| | *Limnodynastes terraereginae* | Scarlet-sided Pobblebonk | | |

# Appendix 6: Proposed Revegetation Activities Blacks Beach Spit

Weed control to promote the natural regeneration of native plants is always the preferred method of ecosystem rehabilitation in natural areas. However, minor revegetation along one section of Blacks Beach Spit that does not currently have a tree line is proposed (Figure 18), to speed up the process of recovery to directly improve the habitat for nesting and hatchling marine turtles on Blacks Beach Spit. In the absence of a continuous canopy along the dune system, the revegetation proposed is intended to provide a screening function to improve the capacity for hatchling marine turtles to find their way to the sea using the natural light of the ocean horizon.

Revegetation is to reinstate Regional Ecosystem 8.2.1 (Table 1, Figure 4, 5). Recommended density for revegetation of this ecosystem is 1,000 plants per hectare with Coastal She-oaks (*Casuarina equisetifolia*). Approximately 2,000m$^2$ is proposed for revegetation (Figure 19), requiring 200 trees at approximately 3 metre spacing. Revegetation should occur behind the crest of the frontal dune, leaving room for turtle nesting and potential migration of the sand dune to occur. Revegetation should take place during the wet season, to increase the rate of establishment and reduce the initial maintenance required, and be coupled with a maintenance program of watering and weed control for the first three to four years depending on weather conditions experienced.

| Area for revegetation, currently lacking a tree line to prevent light pollution for nesting and hatchling marine turtles. | Where a complete tree line exists, marine turtles are better able to navigate their way to the water using the natural light of the ocean horizon. |
|---|---|

**Figure 18: Comparison of area for revegetation (left) versus intact area (right)**


**Acknowledgements:** 0.1 metre imagery 2012 supplied by Mackay Regional Council. Digital Cadastral Data 2012 supplied by Queensland Government.

**Figure 19: Proposed revegetation Blacks Beach Spit**