

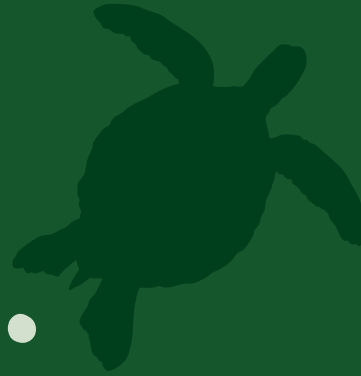
RESTORATION OF REEF ISLANDS PROJECT

BAJIGAL HABITAT RESTORATION PLAN

JANUARY 2025







**We acknowledge the Mandubarra people,
the Traditional Owners of the Sea Country
this project was conducted on and recognise
their continuing connection to lands,
waters and community.**

**We pay our respects to their Elders,
past, present and emerging.**

TABLE OF CONTENTS



TABLE OF CONTENTS	04	3.4 NATURAL SPRING RESTORATION	45
ACKNOWLEDGEMENT AND CITATION	05	3.5 IMPROVING CULTURAL RESOURCES	46
1. OVERVIEW OF BAJIGAL	07	3.6 EROSION CONTROL	47
1.1 BAJIGAL VALUES	08	3.7 SUPPORTING EVIDENCE-BASED DECISION MAKING	48
1.2 THREATS TO BAJIGAL	12	3.7.1 Baseline monitoring	49
2. OUR SHARED VISION	17	3.7.2 Biosecurity monitoring	51
2.1 PROCESS FOR DEVELOPING A SHARED VISION	22	3.7.3 Implementation reporting cycle	52
2.2 PRIORITISING RESTORATION ACTIVITIES	25	3.8 CAPABILITY BUILDING AND DEVELOPMENT	53
2.3 MEASURING PROGRESS TOWARDS THE SHARED VISION	26	3.8.1 Access management	53
2.4 IMPLEMENTATION GOVERNANCE ARRANGEMENTS	29	3.9 OPTIONAL ECOLOGICAL RESEARCH PROJECTS	54
2.5 ADAPTATIVE MANAGEMENT	31	4. MANAGEMENT ACTION CARDS	56
2.5.1 Updating values in the Plan	32	4.1 MANAGEMENT UNIT 1	57
2.5.2 Adaptative management triggers	32	4.2 MANAGEMENT UNIT 2	58
3. RESTORATION ACTION PLAN	36	4.3 MANAGEMENT UNIT 3	59
3.1 MORNING GLORY VINE CONTROL	38	4.4 MANAGEMENT UNIT 4	60
3.2 GUINEA GRASS CONTROL	39	4.5 MANAGEMENT UNIT 5	61
3.2.1 Tracks and canopy gaps	40	4.6 MANAGEMENT UNIT 6	62
3.2.2 Sensitive vegetation buffer zone	40	4.7 MANAGEMENT UNIT 7	63
3.2.3 Broadscale Guinea grass control techniques trial	41	4.8 MANAGEMENT UNIT 8	64
3.3 ADDITIONAL PRIORITY PREVENTATIVE WEED CONTROL	42	4.9 MANAGEMENT UNIT 9	65
3.3.1 Control of priority species on foredunes and littoral rainforest	43	4.10 MANAGEMENT UNIT 10	66
3.3.2 Control of shade tolerant species	43	5. REFERENCES	68
3.3.3 Control of post-disturbance opportunists	44		

ACKNOWLEDGMENT AND CITATION

This report was prepared as part of the Restoration of Reef Islands Project delivered by the Reef Joint Field Management Program (Great Barrier Reef Marine Park Authority and Queensland Parks and Wildlife Service) and sponsored by Reef Trust (Australian Department of Climate Change, Energy, the Environment and Water).

We acknowledge the Traditional Owners of Bajigal (Stephens Island), the Mandubarra people, and appreciate the advice, support and partnership provided by the Mandubarra Aboriginal Land and Sea Incorporated (MALSI) in progressing this project.

We would also like to thank all of the attendees at the management options planning meetings held in Kurrimine Beach, July and December 2024.

This report should be cited as follows: MALSI and Aestra, 2024, Bajigal Habitat Restoration Plan, prepared on behalf of the Reef Joint Field Management Program and the Great Barrier Reef Marine Park Authority, Commonwealth of Australia.



TITLE	PREPARED BY	REVIEWED BY	DATE PREPARED
Draft Bajigal Habitat Restoration Plan	Aestra	Reef Authority	30/10/2024
Draft Bajigal Habitat Restoration Plan	Aestra	MALSI, Reef Authority and QPWS	6/11/2024
Draft Bajigal Habitat Restoration Plan	Aestra	MALSI	6/11/2024
Final Draft Bajigal Habitat Restoration Plan	Aestra	Endorsed by MALSI	1/12/2024

BAJIGAL'S CURRENT STATE

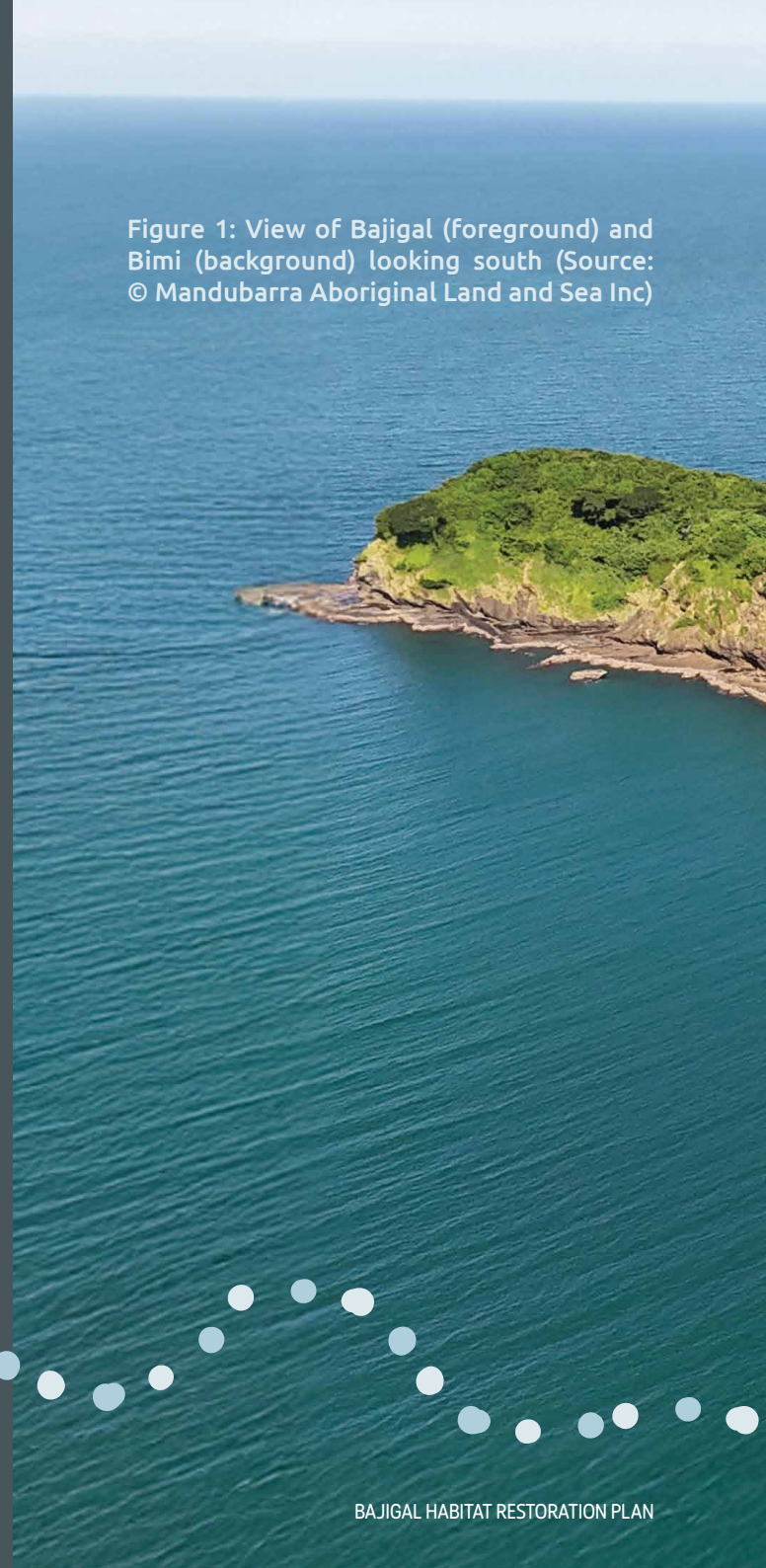


Figure 1: View of Bajigal (foreground) and Bimi (background) looking south (Source: © Mandubarra Aboriginal Land and Sea Inc)



1 OVERVIEW OF BAJIGAL

Bajigal (Stephens Island) is a high continental island located 6.7 km northeast of Kurrimine Beach on the wet tropical coast of north Queensland (Figure 1). The 10.6 ha island lies within the Sea Country of the Mandubarra people and is an important cultural place named after the green sea turtle (*Chelonia mydas*).

The island is part of the Barnard Island Group National Park managed by the Queensland Parks and Wildlife Service (QPWS) along with Bimi (Sisters Island), which is located 0.7 km south of Bajigal.

The Barnard Islands National Park Management Plan identifies Bajigal and Bimi as regionally significant nesting sites for seabirds including the bridled tern (*Onychoprion anaethetus*), lesser crested tern (*Thalasseus bengalensis*) and black-naped tern (*Sterna sumatrana*) (QPWS, 2023). The breeding area for seabirds is a Key Value for Bajigal.

Tropical Cyclones over the past 20 years have damaged Bajigal's rainforests and have caused eco-system changing weeds to grow. These weeds are now impacting important rainforest and seabird nesting values.

Developed under the Restoration of Reef Islands Project, this Bajigal Habitat Restoration Plan (the Plan) aims to create a shared vision of co-management for the future of Bajigal which reflects the shared values of the island. This Plan outlines an approach for the implementation of activities which work towards restoring and improving habitat on Bajigal.



1.1...

BAJIGAL VALUES

Bajigal has several ecological values that are important both internationally and in the context of the Great Barrier Reef World Heritage Area. These values include:

BRIDLED TERN

(Onychoprion anaethetus)

Bajigal is a regionally significant nesting site for seabirds including the bridled tern. This seabird breeding habitat is a Key Value under the QPWS Values Based Management Framework (VBMF). The Bajigal threat assessment identified factors limiting nest site use on the island, including exotic vine towers over the canopy and dense Guinea grass infestations, particularly on the northern side of the island.

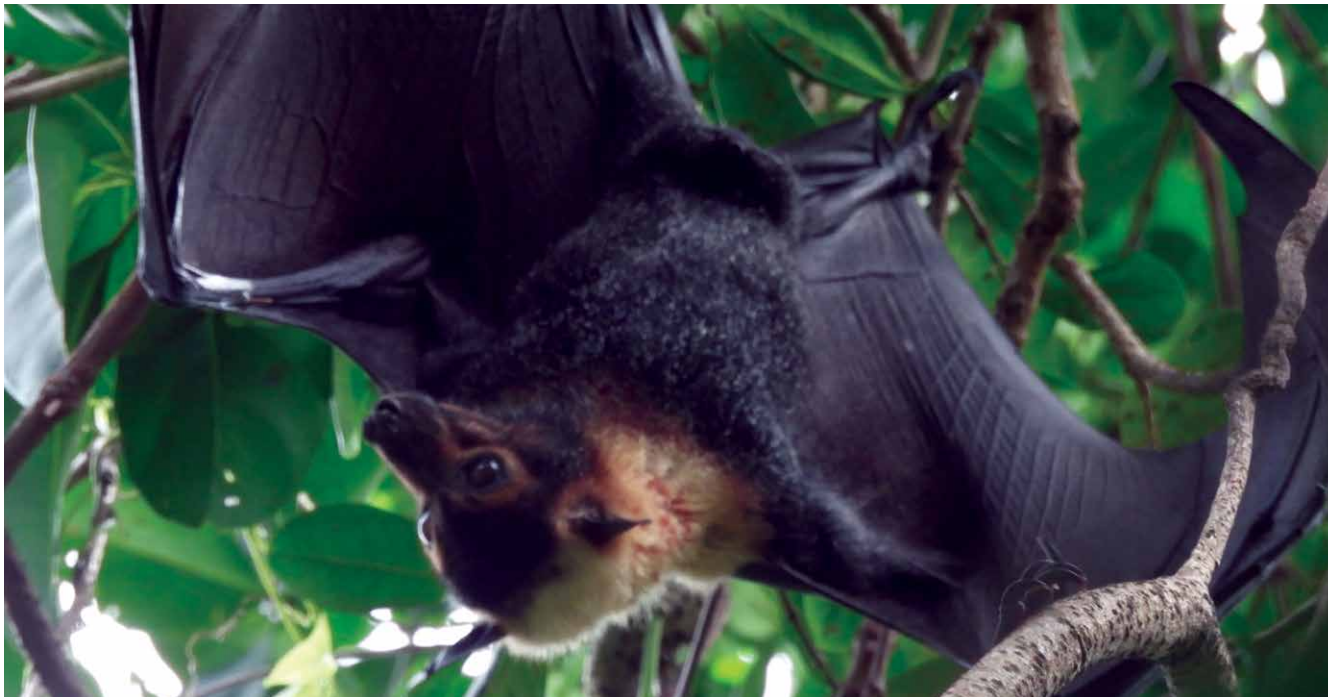
A desired outcome of this Plan is that Bajigal continues to provide breeding habitat for bridled tern.

LOWLAND TROPICAL RAINFOREST OF THE WET TROPICS

Bajigal's vegetation is ecologically unique and is consistent with two Threatened Ecological Communities (TECs) listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This includes the endangered lowland tropical rainforest of the Wet Tropics and the critically endangered littoral rainforest and coastal vine thickets of eastern Australia. Bajigal is the only known example of wet tropical rainforest on basaltic geology on an island. The Bajigal threat assessment identified that weed invasion as a key threat.

A desired outcome of this Plan is that Bajigal continues to support lowland tropical rainforest of the Wet Tropics and littoral rainforest and coastal vine thickets of eastern Australia.





FLYING-FOX

Flying-fox are a culturally significant species on Bajigal, with records of the spectacled flying-fox (*Pteropus conspicillatus*) with young present on the island over several years. The condition of their habitat is threatened by increasing temperatures and cyclones, which can lead to overheating, mortality and damage to critical breeding and roosting habitats.

A desired outcome of this Plan is that Bajigal continues to support habitat for a population of flying-fox.

NATURAL SPRING

The natural spring on Bajigal is an important cultural site. However, Guinea grass has altered the flow of the natural spring, which impacts the cultural value and allows exotic species like cane toads to spread.

A desired outcome of this Plan is that the cultural values of Bajigal are maintained and enjoyed, and the flow of the natural spring is returned to its correct course.



IMPORTANT FLORA SPECIES

Bajigal has important flora species including:

- *Pisonia grandis* (grand devils-claw)
- *Arenga australasica* (Bingil Bay palm or Australian arenga palm), and
- *Coleus batianoffii*.

The Bajigal threat assessment identified that Bajigal supports populations of these uncommon flora species. *Pisonia grandis* trees found in a single patch on the sandy spit on the western end of the island.

The Australian arenga palm was found scattered throughout the island (around 1,000 individuals across all life stages).

Coleus batianoffii was found on the eastern end of the island within a small area of remnant native grassland.

These important flora populations are threatened by invasive weeds like Guinea grass.

A desired outcome of this Plan is that Bajigal continues to provide habitat for important flora species.



1.2 THREATS TO BAJIGAL

One of the most effective ways to manage threats to Bajigal's values is to increase its 'resilience.' Ecological resilience is used to describe the ability of an ecosystem to absorb or manage disturbance and subsequently recover. This Plan aims to increase the island's ability to cope with threats, including climate change, by improving the current condition of the ecosystems.



ECOSYSTEM TRANSFORMING WEEDS

(E.g., Guinea grass – *Megathyrsus maximus*)

Ecosystem transforming weeds can change the habitats that they invade. On Bajigal, Guinea grass is invading areas of rainforest and canopy gaps created by tree fall which poses a fire risk.

Similarly, morning glory vine is at risk of impacting the value of habitat for fauna species such as the bridled tern by limiting access to nesting habitats.

Restoration activities to increase the resilience of Bajigal include staged removal of priority (ecosystem transforming) weeds across the island to protect rainforest habitat, bridled tern breeding habitat and populations of important flora species.



CLIMATE CHANGE

The climate for the Wet Tropics is expected to be hotter, drier, have more heat waves and higher intensity storms in the future. Predictions for the wet tropics (2020-2039) include:



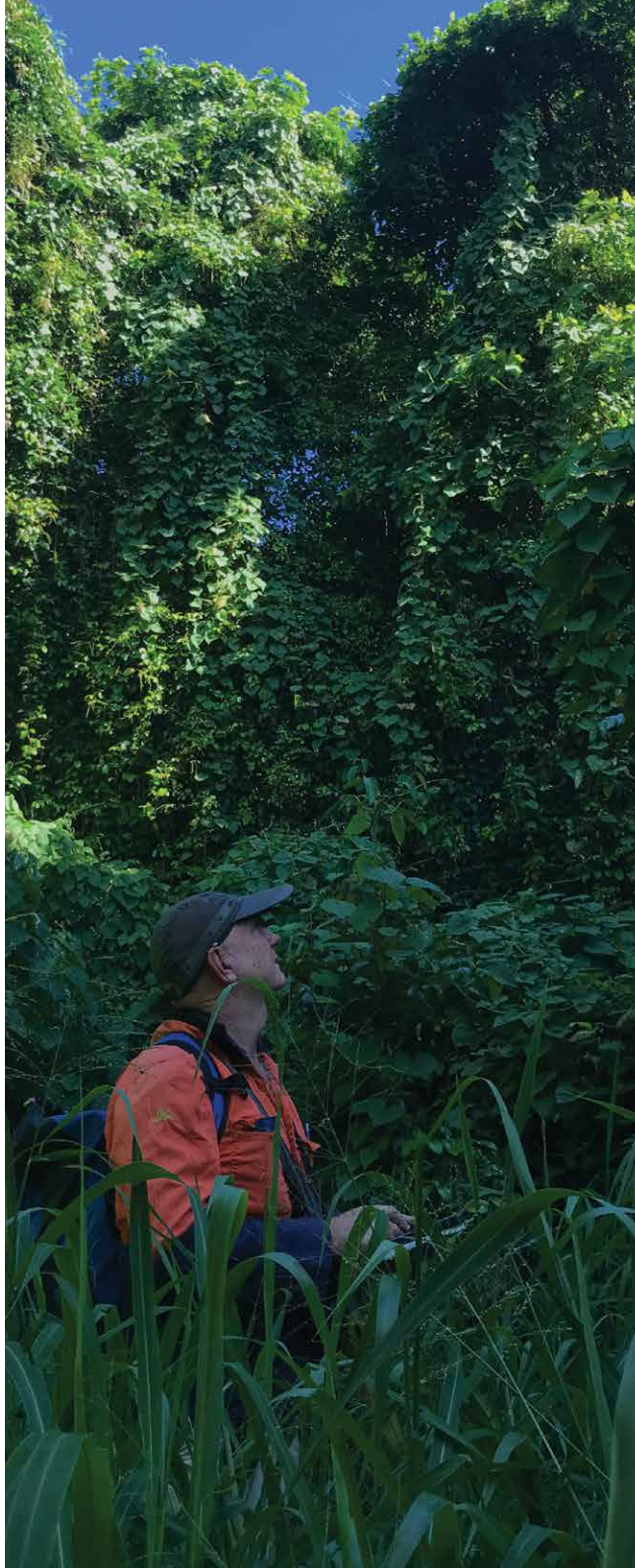
- **HOTTER DAYS** are expected. Maximum summer temperatures could rise by up to 1.4°C on average.



- **RAINFALL WILL REDUCE** overall, with summer rainfall potentially reduced by up to 3.5 mm/day.



- **WET SEASON HEATWAVES** could become up to 10% more frequent and last two days longer. Per year, up to five more days could reach over 35°C. Flying-foxes and birds can overheat and die under extreme temperatures (42°C and above). Roost temperatures can sometimes be higher than recorded air temperature (Lopes, 2024).



- **CYCLONES** will be more severe and intensify more rapidly. Severe storm impacts will result in a reduction in the availability or quality of habitat for species such as the bridled tern and the spectacled flying-fox through loss of breeding or roosting habitat.



- **RAINFOREST STRUCTURE MAY CHANGE** due to reduced rainfall and more fires and impacts from severe storms. Changes in vegetation will impact rainforest ecosystems, with areas shifting to pioneer species and increased vine tower growth. Canopy gaps are likely to be colonized rapidly by invasive species such as Guinea grass, lantana and devil's fig.

Restoration activities to increase the resilience of Bajjigal include staged removal of priority weeds across the island to protect rainforest habitat from impacts associated with climate change.

CYCLONES

A changing climate means there will be more severe weather events. Cyclones may happen less often in the future, but they will likely be more severe.

Tropical cyclones have heavily impacted the vegetation on Bajigal and the nearby wet tropical coast. Past cyclones have created canopy gaps, allowing invasive weeds to spread.

Severe cyclones can cause the loss of emergent trees and large canopy gaps which can lead to changes in vegetation across the island. Pioneer and early successional species are likely to dominate larger areas of the island and can cause a shift in overall vegetation. This could reduce core habitat for species like the spectacled flying-fox and impact nesting sites for species like the bridled tern due to the thickening of dense mid and understory growth.

It may take decades or centuries for the vegetation to recover, but full restoration is not certain.

Restoration activities to increase the resilience of Bajigal are focused on reducing the pressure on rainforest habitat from non-native vining weeds like morning glory.



FIRE

A changing climate also means it will be hotter and drier with a greater number of high fire danger days.

More frequent fires can result in the spread of species which are more able to adapt to fires, such as grasses. This can cause a change in the type of vegetation away from rainforests to more grassy ecosystems. Fires on Bajigal are likely to increase the vulnerability of rainforests to invasive species and could change how habitat for species such as the bridled tern is used.

Competition from weed species after a fire has occurred would also impact the ability for the rainforest to recover and may increase fire risk in subsequent years. This has the potential to result in the permanent loss of rainforest in fire affected areas.

Restoration activities to increase resilience are focused on reducing the potential for fire to impact rainforest ecosystems by removing Guinea grass from tracks and internal areas of rainforest and creating a buffer between rainforest and Guinea grass areas.

OUR SHARED VISION



2

OUR SHARED VISION

The shared vision for Bajigal has been defined as:

**“Traditional Ecological Knowledge
and western science working
TOGETHER to support the
environment of BAJIGAL
to be healthy and resilient”**



The shared vision requires Traditional Owners and western science practitioners to work together to address threats on Bajigal and make the island more resilient to future conditions. The greatest threats affecting Bajigal are invasive plant species, which could spread and dominate larger areas of the island.

Current management is unable to fully address the threat of invasive weeds. Additional management action is needed to protect Bajigal’s environment and help it be resilient. Without additional management the health of the island is likely to decline further (Figure 2).

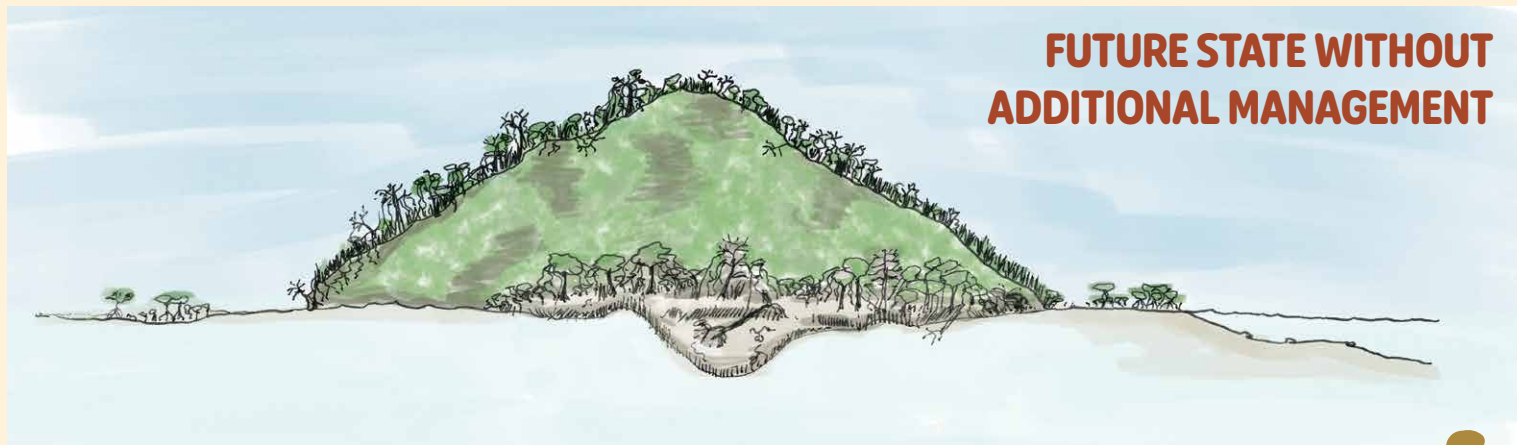
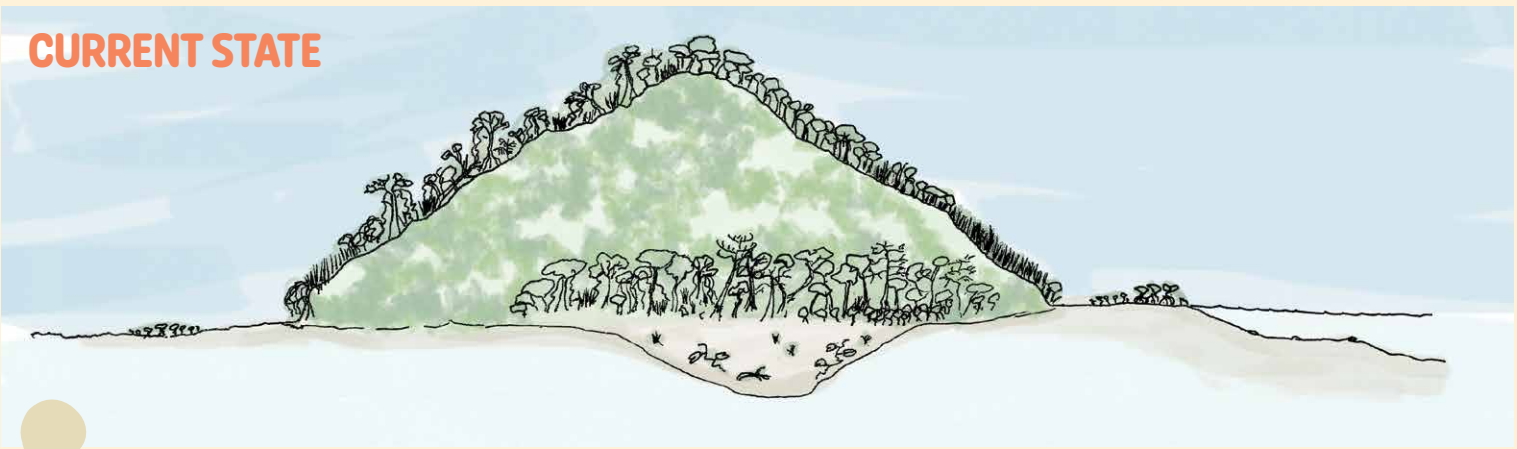


Figure 2: Diagram of potential changes in vegetation structure. (Images: David Fell, 2024).

Figure 3: Diagram of current state of Bajjal (Image: David Fell, 2024)

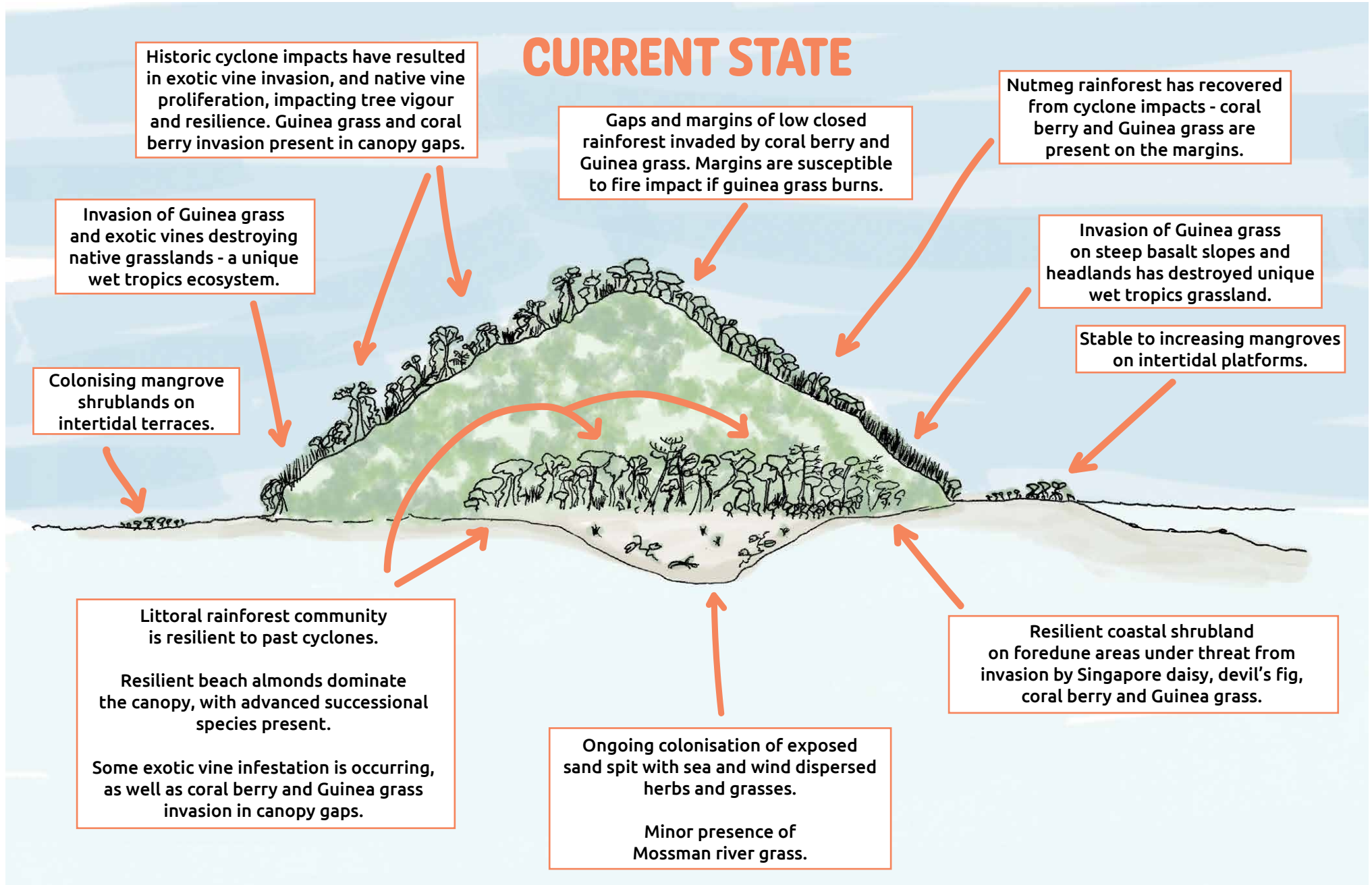


Figure 4: Diagram of Bajigal without additional management (Image: David Fell, 2024)

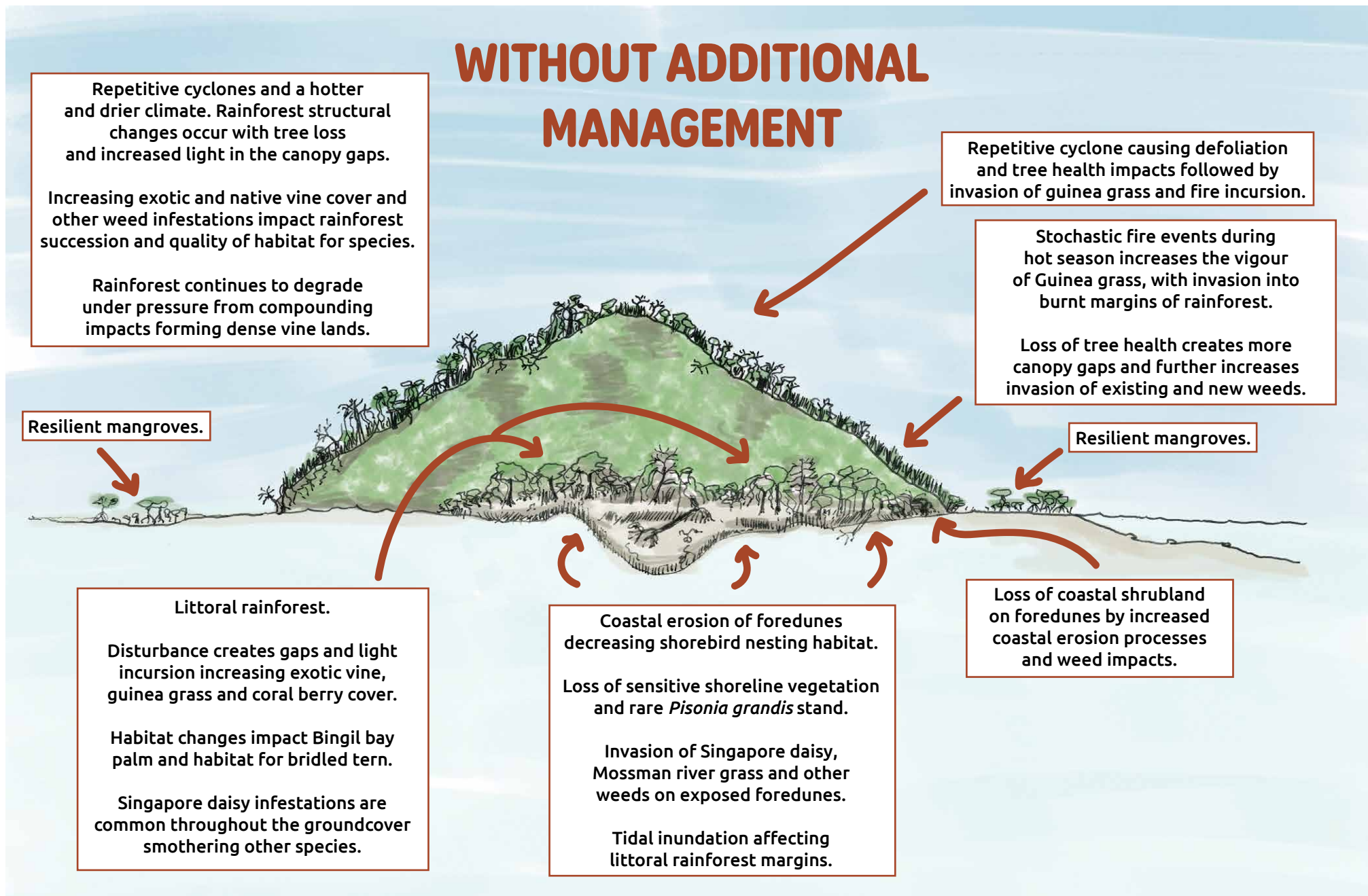
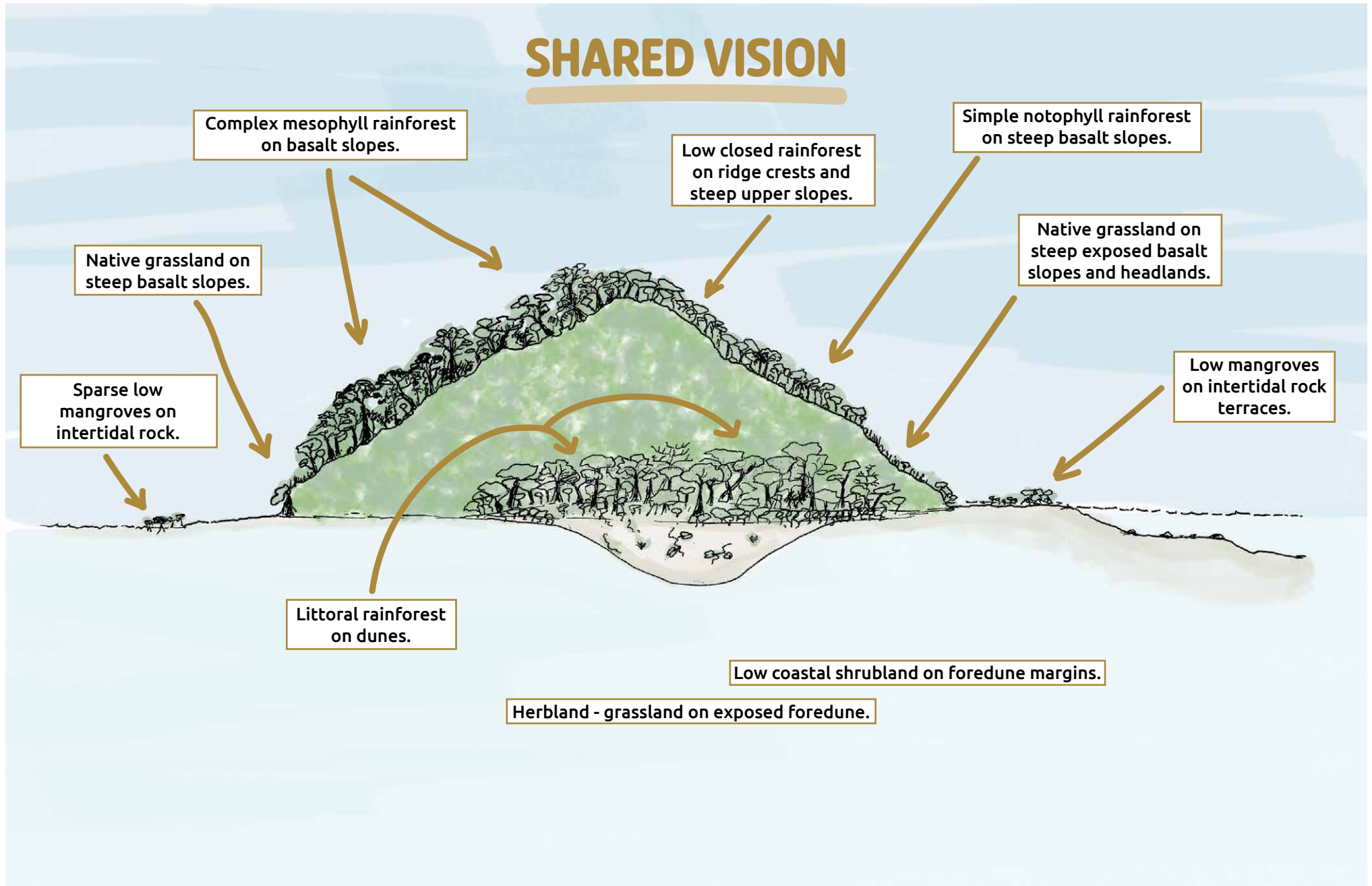


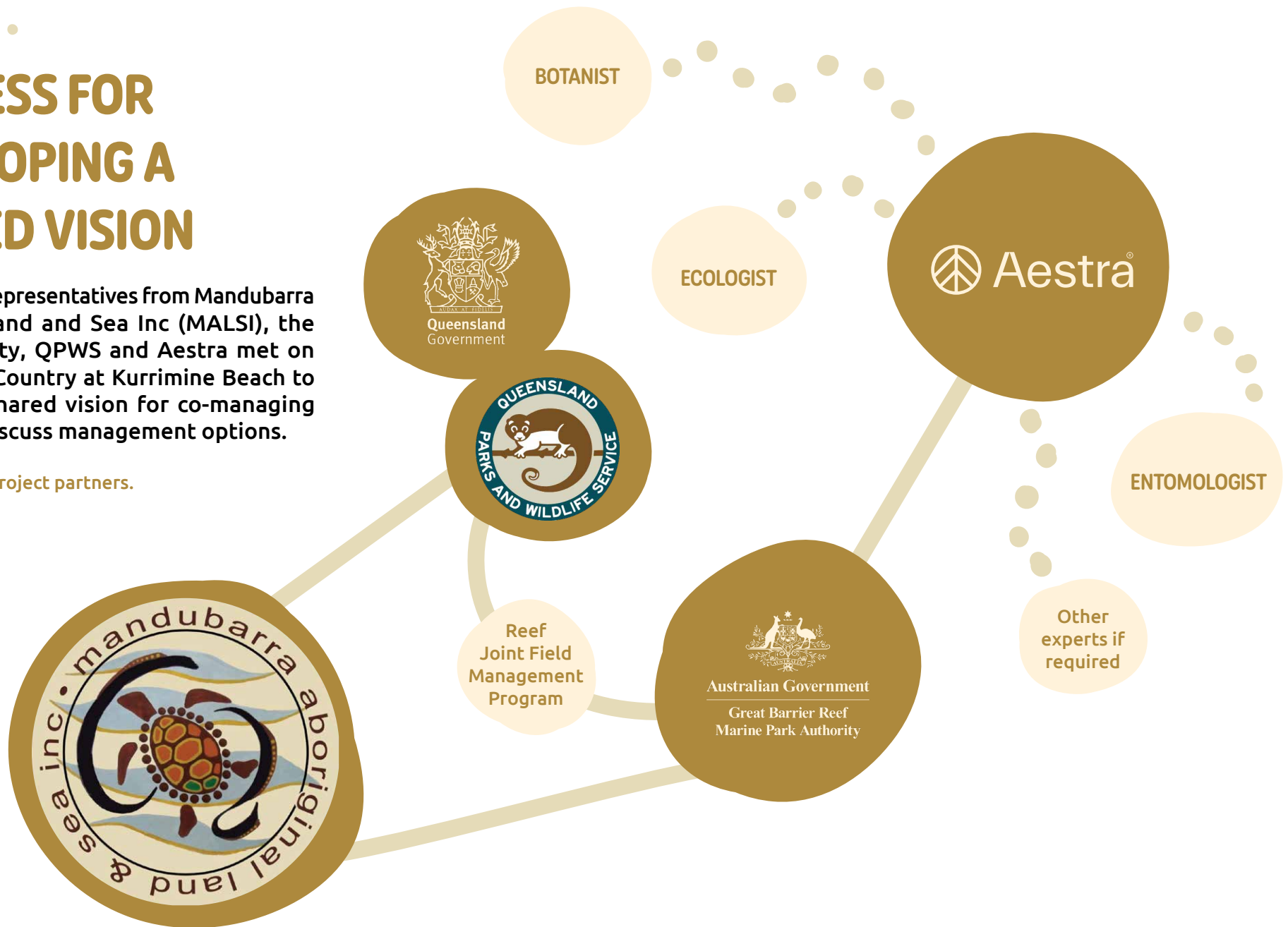
Figure 5: Diagram of the shared vision for Bajigal (Image: David Fell, 2024)



2.1..... PROCESS FOR DEVELOPING A SHARED VISION

In July 2024, representatives from Mandubarra Aboriginal Land and Sea Inc (MALSI), the Reef Authority, QPWS and Aestra met on Mandubarra Country at Kurrimine Beach to agree on a shared vision for co-managing Bajigal and discuss management options.

Figure 6: RORI Project partners.



Bajigal is currently managed by QPWS with some biosecurity and values monitoring activities also conducted by MALSI Rangers. QPWS undertake various activities on the island including, weed mapping and control works, acoustic monitoring of seabirds, management of the campground and surveys for introduced rodents. However, QPWS's ability to expand these efforts is limited by their capacity, as they cover a large area of the Great Barrier Reef.

MALSI Rangers would like to return land management to the Mandubarra people through partnerships and co-management arrangements, combining Traditional Ecological Knowledge and western science to support a shared vision of healthy and resilient Country. Co-management aims to support Mandubarra-led restoration activities in line with the QPWS framework. The benefits include:



- Greater support for Traditional Owner led management of Country in accordance with the Reef Authority's principles of co-management.
- Ability to leverage local MALSI Rangers to boost management capacity and support more frequent activity on the island to improve outcomes.
- Support for MALSI to leverage QPWS systems to enable safe and efficient work.
- Opportunities for MALSI to build

their capability in western science techniques and support compliance and enforcement activities on Country.

- Opportunities for the Reef Joint Field Management Program to improve understanding of Traditional Ecological Knowledge to support co-management activities.
- Increased local presence on the island will also support greater community awareness of the requirements for respectful, compliant use of Sea Country.

A set of principles to govern progress towards the shared vision have been developed (Table 1). The principles were derived from the outputs of workshops held during the development of this Plan.

Table 1: Principles for implementation of restoration activities on Bajigal.

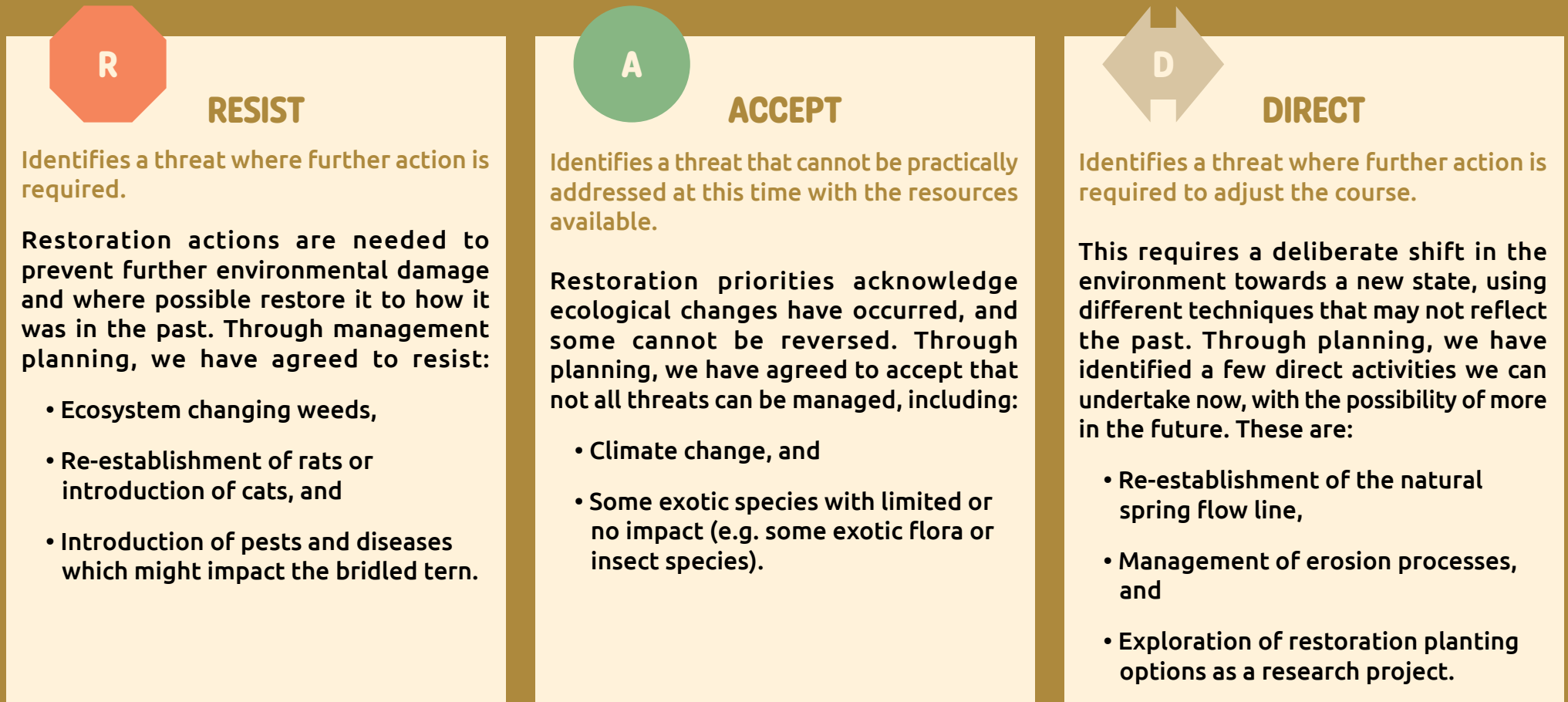
PRINCIPLES FOR RESTORATION ACTIVITIES ON BAJIGAL
1. MALSI should be supported to lead restoration activities where possible.
2. Traditional Ecological Knowledge and western science need to be integrated to support effective management.
3. Environmental delivery partner should transfer western science expertise to MALSI Rangers to support capability building.
4. Bajigal and Bimi are related. Management of Bajigal must consider what's happening on Bimi.
5. Broad-scale chemical application on the island should be limited as far as practical to protect Country.
6. When planning activities, work outwards from healthy areas. The environment is resilient but needs some support.
7. Ecological monitoring is important to understand the effect of activity implementation and allow for adaptive management of activities over time.
8. Shared data access supports understanding and transparency between partners. Spatial data relating to activities on Bajigal needs to be shared between MALSI, QPWS and the Reef Authority.
9. All treatments require follow up. Prioritise activities which can continue - don't start what you can't continue to support.
10. Restoration and ecosystem change are slow processes which occur over ecological time scales (decades), however, small steps are still a valuable contribution to this outcome.
11. To be effective, rate of control needs to be greater than rate of spread. If a technique isn't working, review implementation approach in accordance with adaptive management processes.

2.2 . . .

PRIORITISING RESTORATION ACTIVITIES

The Resist-Accept-Direct (RAD) approach was used to prioritise restoration activities (Figure 7). The approach will be used in the future to reprioritise restoration activities after a trigger event. The current priorities are a point-in-time and can change in future. For example, some 'accepts' may become 'resists' if there is more funding available.

Figure 7: RAD approach under the Plan.



2.3 MEASURING PROGRESS TOWARDS THE SHARED VISION

Understanding the impact of restoration activities is important so they are effective, efficient and support the shared vision.

Establishing a framework to measure restoration activities supports land managers to make informed decisions about adjusting management targets or methods. This helps activities to be effective, efficient, aligned with Bajigal's environmental needs and promotes transparency in the use of public money.

A series of objectives, outcomes and key performance indicators (KPIs) have been set

to support the shared vision of effective co-management (Figure 8).

The objectives reflect the reasons for doing the RORI Project. Measurable outcomes identify the targets and restoration activities needed to achieve these objectives. Efficiency and effectiveness KPIs provide a mechanism to assess whether the outcomes are being achieved. These can be used to identify whether adaptive management is required.

The objectives, outcomes, management targets and KPIs are outlined in Table 2.

Figure 8: Approach to measuring progress towards the shared vision.

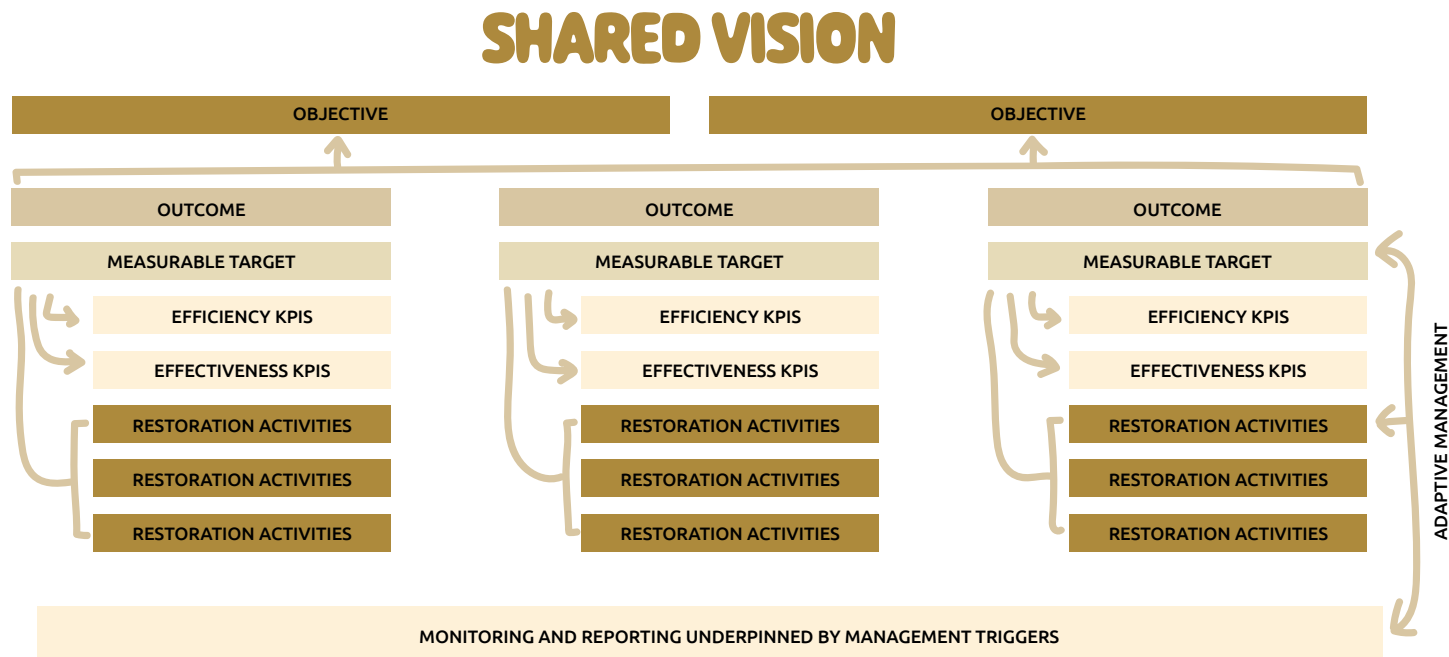


Table 2: Objectives, outcomes, management targets and measures

OBJECTIVE / OUTCOME	MANAGEMENT TARGET	EFFICIENCY AND EFFECTIVENESS KEY PERFORMANCE INDICATORS (MEASURES)
1. THE ENVIRONMENT OF BAJIGAL IS HEALTHY AND RESILIENT.		
1.1 Bajigal continues to provide breeding habitat for bridled tern	<ul style="list-style-type: none"> • Availability of bridled tern nesting habitat is increased (% increase). • No new threats to bridled tern breeding habitat established (e.g. rats, cats). 	<p>Efficiency:</p> <ul style="list-style-type: none"> • Area (% ha) of nesting habitat for the bridled tern treated/managed for threats. • All (100%) activities on Bajigal have biosecurity protocols implemented. <p>Effectiveness:</p> <ul style="list-style-type: none"> • Area of nesting habitat utilised by the bridled tern is maintained or increased (from baseline). • All (100%) of new threats to the bridled tern detected are eradicated within 12 months of approval.
1.2 Bajigal continues to support lowland tropical rainforest of the Wet Tropics and littoral rainforest and coastal vine thickets of eastern Australia.	<ul style="list-style-type: none"> • Large canopy trees are protected and maintained. <ul style="list-style-type: none"> - Fire risk for sensitive vegetation communities is decreased. - 50% of emergent trees identified with a high vine load are treated within the first 24 months. • Weed coverage for priority species is reduced across each management unit. <ul style="list-style-type: none"> - Refer to management action plans for management unit sub-targets. 	<p>Efficiency:</p> <ul style="list-style-type: none"> • Proportion (%) of buffer zones for Guinea grass control (10 m) around sensitive vegetation that were implemented or maintained. • Number of emergent / large canopy trees treated during the reporting period. • Area treated per species unit within the reporting period. <p>Effectiveness:</p> <ul style="list-style-type: none"> • Sub-targets met or on track to be met for each management unit. • Number (%) cover of gaps in canopy are closed.
1.3 Bajigal continues to support habitat for a population of flying-fox.	<ul style="list-style-type: none"> • Condition of habitat for flying-fox species on Bajigal is maintained. 	<p>Efficiency:</p> <ul style="list-style-type: none"> • Monitoring activities were undertaken within the reporting period which included observations for the flying-fox. <p>Effectiveness:</p> <ul style="list-style-type: none"> • Habitat trees are free of smothering exotic vines.
1.4 Bajigal continues to provide habitat for important flora.	<ul style="list-style-type: none"> • Population of monitored flora species is maintained (<i>Pisonia grandis</i>, <i>Arenga australasica</i>, <i>Coleus batianoffii</i>). 	<p>Efficiency:</p> <ul style="list-style-type: none"> • Number of monitoring activities completed within each management unit over the reporting period. <p>Effectiveness:</p> <ul style="list-style-type: none"> • Population (% or standard deviation) is maintained within an acceptable range
1.5 Cultural values are maintained and enjoyed	<ul style="list-style-type: none"> • The flow of the natural spring is returned to its correct course. • Bajigal provides opportunities for cultural practices and knowledge sharing. 	<p>Efficiency:</p> <ul style="list-style-type: none"> • Number of people hours worked during the reporting period related to spring management works. <p>Effectiveness:</p> <ul style="list-style-type: none"> • Spring rehabilitation works restore flow to its historical path. • MALSI report the work on Bajigal is supporting greater opportunities to practice culture.

OBJECTIVE / OUTCOME	MANAGEMENT TARGET	EFFICIENCY AND EFFECTIVENESS KEY PERFORMANCE INDICATORS (MEASURES)
2. TRADITIONAL ECOLOGICAL KNOWLEDGE IS COMBINED WITH WESTERN SCIENCE TO DELIVER EFFECTIVE CO-MANAGEMENT ACTIVITIES.		
2.1 Project partners work collaboratively to co-manage Bajigal.	<ul style="list-style-type: none"> • Clear governance and administrative processes and implementation arrangements are established and implemented effectively. 	<p>Efficiency:</p> <ul style="list-style-type: none"> • Governance and implementation arrangements are established and periodically reviewed to support co-management. <p>Effectiveness:</p> <ul style="list-style-type: none"> • >80% satisfaction of parties (or another figure to be agreed based on baseline). • All parties are aware of implementation activities occurring on Bajigal ahead of time and biosecurity / compliance and enforcement incidents within 1 week.
2.2 MALSI has capability in Traditional Ecological Knowledge and western science to co-manage Bajigal.	<ul style="list-style-type: none"> • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken. 	<p>Efficiency:</p> <ul style="list-style-type: none"> • Number of hours environmental delivery partners and MALSI are delivering implementation activities jointly to facilitate capability transfer. • Number of hours MALSI are delivering implementation activities. <p>Effectiveness:</p> <ul style="list-style-type: none"> • MALSI report utilising experience gained through RORI on other projects. • Increase (%) in the number of hours MALSI are delivering implementation activities on Bajigal. • Decrease (%) in the number of hours environmental delivery partners are delivering implementation activities on Bajigal.
2.3 Maintained RJFMP stewardship of National Park	<ul style="list-style-type: none"> • Stewardship from QPWS and the Reef Authority is maintained and enables agency reporting processes to be completed. 	<p>Efficiency:</p> <ul style="list-style-type: none"> • Number of activities lodged in QPWS system. <p>Effectiveness:</p> <ul style="list-style-type: none"> • Decrease (%) requirement for QPWS involvement in activities against baseline.

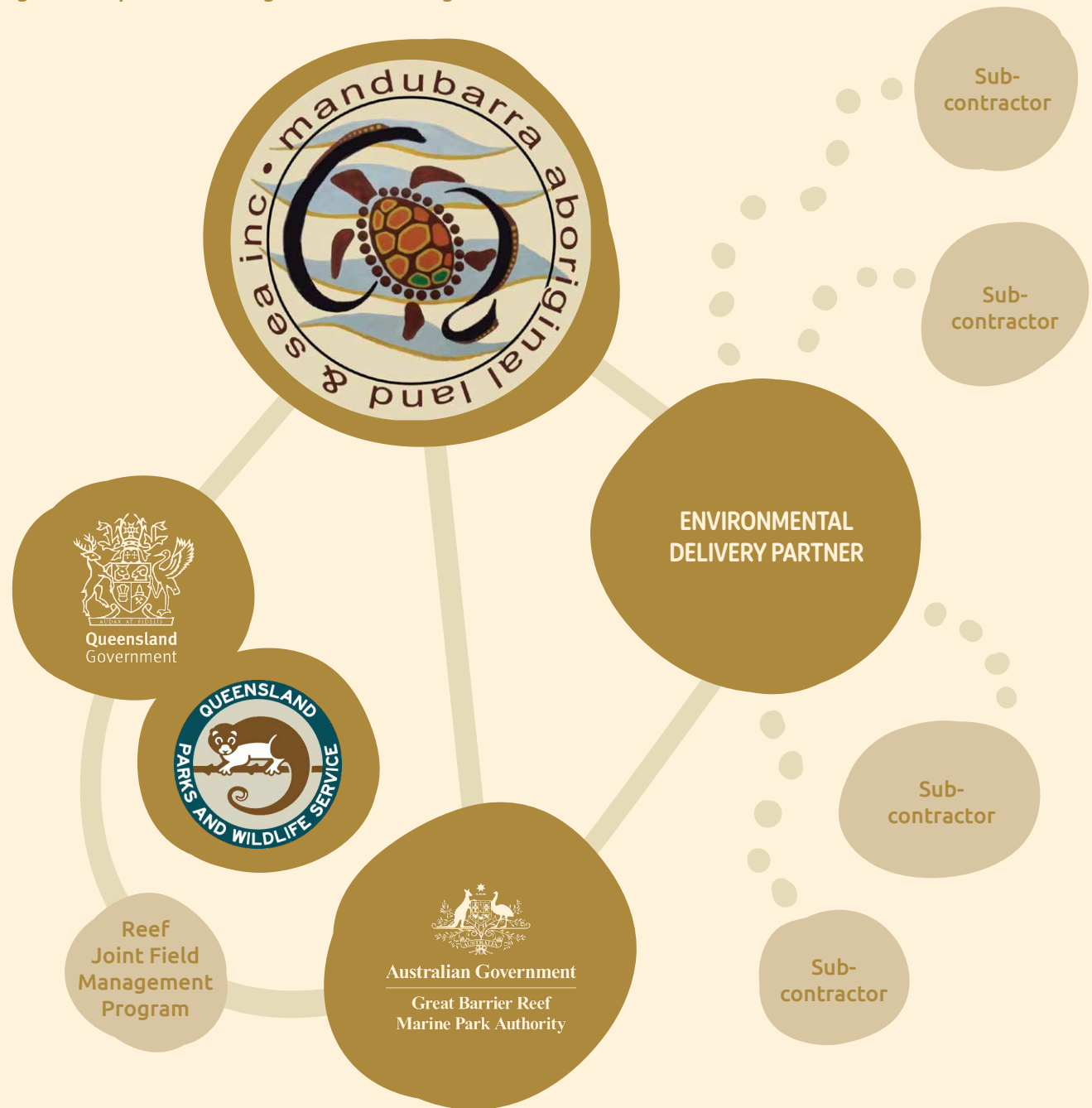
2.4

IMPLEMENTATION GOVERNANCE ARRANGEMENTS

Implementing restoration activities in a multi-jurisdictional context is challenging without consensus on what needs to be achieved and how success is measured. The Plan outlines the shared vision, governance, performance metrics and an adaptive management process to guide and measure the success of restoration on Bajigal.

The delivery of the RORI Project on Bajigal is the responsibility of the Reef Authority, MALSI, QPWS and the environmental delivery partner. The project is funded by the Reef Trust and the Reef Authority and is required to provide regular reports on progress and outcomes achieved with the grant funding. Figure 9 provides an indication of the governance relationship between the parties.

Figure 9: Implementation governance arrangements.



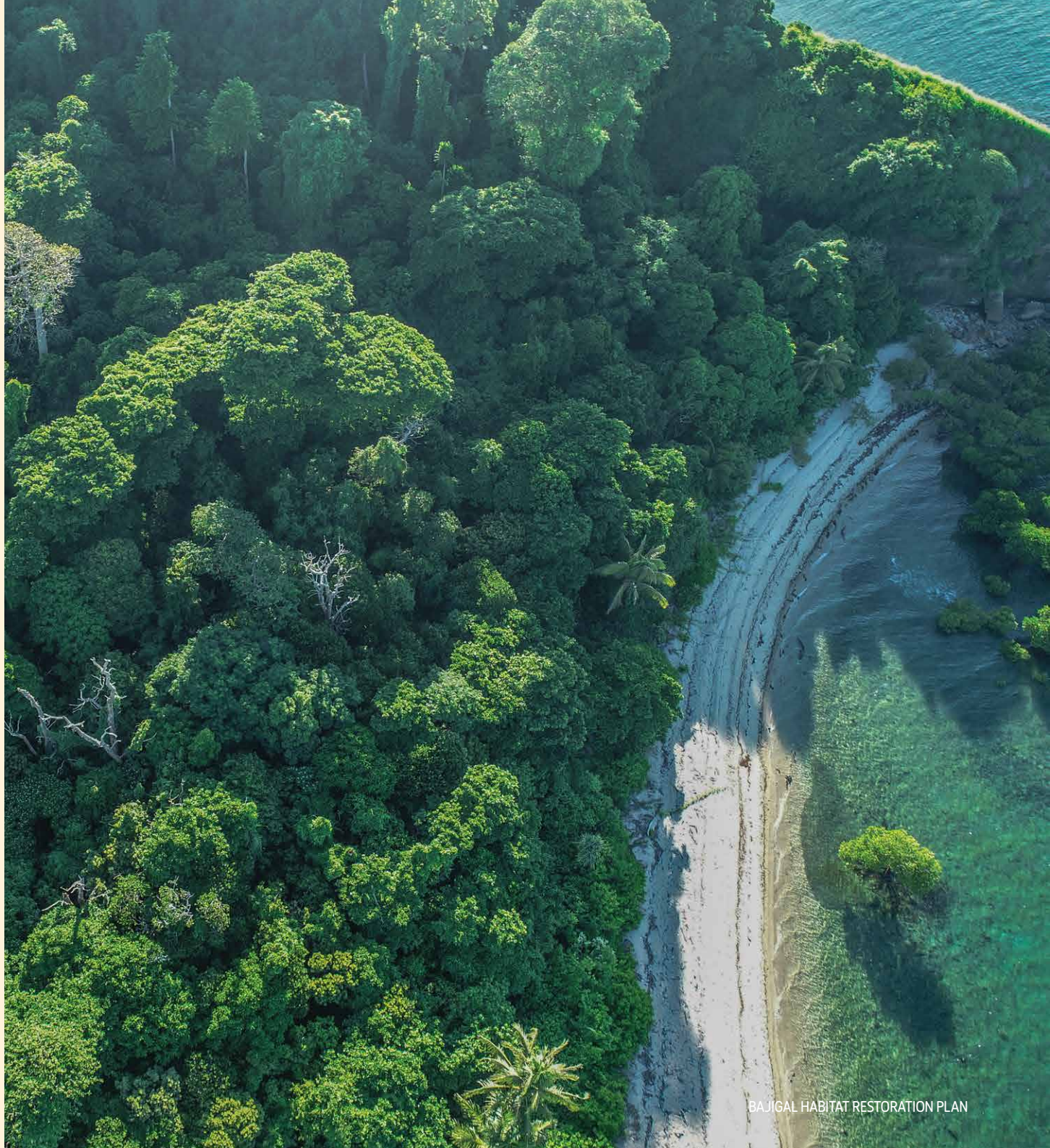
A formal agreement will be developed to outline tasks, responsibilities and communication between parties. It will also clearly explain and protect MALSI's rights to cultural and intellectual property. Key arrangements may include:

Update to TUMRA Schedule or Memorandum of Understanding (or similar): this will guide co-management activities on Bajigal between MALSI, the Reef Authority and QPWS. It is recommended that the MoU or similar agreement outlines the process for agreeing that activities included in this Plan can be funded by alternative funding sources (e.g., government grants, private funding).

- Cultural protocols should be developed between the Project partners to provide a respectful and structured approach to engagement between the parties and support restoration activities.

RORI Project Contract: procurement of MALSI and an implementation partner will require a contract to be developed. The form of this procurement, and the selection of the environmental delivery partner, is the responsibility of the Reef Authority.

Periodic performance and outcomes reporting: periodic performance and outcomes reporting under the MoU and contract will be required to track progress, account for the expenditure of public funds and provide government land managers with information about activities on island.



2.5

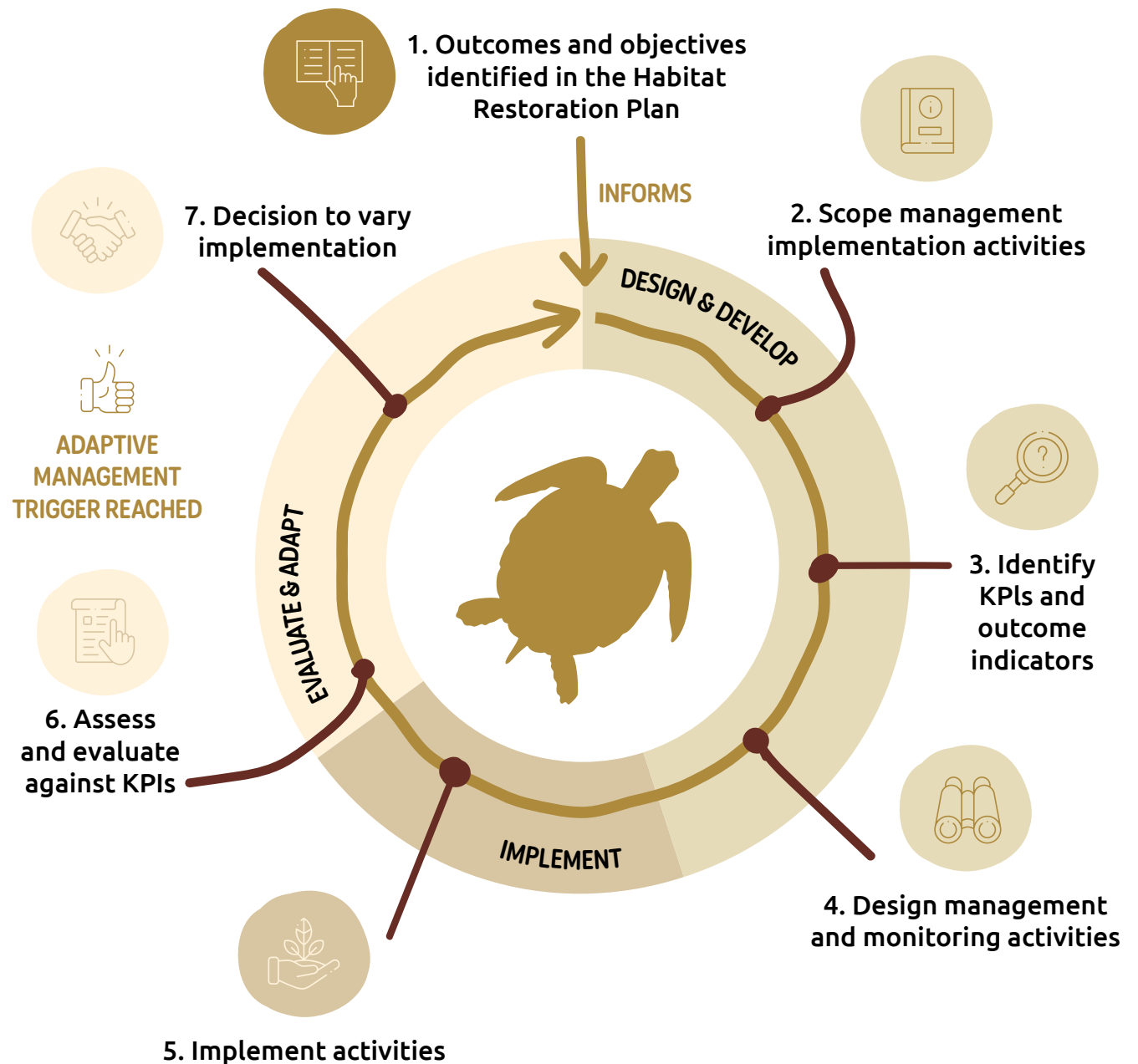
ADAPTIVE MANAGEMENT

Uncertainty is a part of conservation projects. Uncertainty is increased further by climate change. This Plan has processes to help manage uncertainty and make decisions based on available information. Key components include:

- An adaptive management framework supported by performance measures,
- Focus on increasing island resilience considering future climate change scenarios, and
- The RAD approach to help prioritise restoration activities.

Adaptive management (Figure 10) is important to make sure restoration activities are fit-for-purpose and responsive to change. It means new values can be included and uses monitoring data to guide future decision making.

Figure 10: Adaptive management cycle.



2.5.1 UPDATING VALUES IN THE PLAN

The values in this Plan are based on surveys completed by the Project (Fell *et al*, 2024) and engagement with project partners. The surveys were relatively rapid and were not designed to cover all values on the island. It is expected this Plan may need to be updated over time to reflect new values. A process has been developed to ensure that key Project partners agree on the updated values and any implications for intervention activities under the Plan:

1. Value is identified.
2. Information regarding the value is circulated to all project partners.
3. Project partners agree that the new value is important.
4. Risks and restoration activities are reviewed in context of the new value to ensure that the risk assessment is comprehensive and appropriately addresses all relevant risks. New risks are to be raised as needed.
5. Plan updated to reflect new value with a brief discussion presented in Section 1.1.
6. In consultation with Project partners, new restoration activities are identified (if required) and updated in the Plan.



2.5.2 ADAPTIVE MANAGEMENT TRIGGERS

Adaptive management triggers have been set based on the performance measures to provide review points in the event of unforeseen circumstances, climate events or poor results from proposed restoration activities.

ECOLOGICAL ADAPTIVE MANAGEMENT TRIGGERS:

- Area of nesting habitat utilised by the bridled tern decreases by >20% compared with baseline conditions over two consecutive years.
- New threat to bridled tern identified and resulting in impact to breeding success.
- Unexplained number of dead bridled tern detected on island (i.e., evidence of attack / illness).
- Biosecurity protocols not implemented on more than two occasions during the reporting period, or a new threat is detected which is likely to be the result of restoration activities.
- Significant (beyond seasonal / inter-annual variation) change in the structure or composition of the TEC or monitoring indicates that a diagnostic criteria will not be met.
- A fire event is recorded on Bajigal or Bimi.
- Cover (%) of morning glory recorded in a management unit decreases relative to baseline.
- Severe storm event (e.g. Severe Tropical Cyclone) affects Bajigal.
- Large canopy gap of >20m width identified.
- Cover (%) of priority species increasing in more than two management units.
- Multiple new outbreaks of priority weed species or outbreaks in areas where priority weed species have not previously been recorded.
- New erosion points identified that are impacting values.
- Trials indicate that it is cost and/or time prohibitive to control Guinea grass.
- Soft scale outbreak recorded resulting in a decrease in condition of *Pisonia grandis*.
- Population reductions observed in *Arenga australasica* or *Coleus batianoffii*.

GOVERNANCE ADAPTIVE MANAGEMENT TRIGGERS:

- Dispute registered through the governance arrangements between one or more parties remains unresolved for >12 months.
- Project partner unaware of implementation activities under the Plan being delivered prior to activities commencing.
- Mandatory review of the Habitat Restoration Plan in 2027.
- Bi-annual satisfaction surveys show either:
 - <50% satisfaction of one or more partners captured through survey.
 - 20% decrease in satisfaction of project partner.
- Increased (%) reliance on environmental delivery partners and government relative to baseline.
- New capability required to deliver restoration activities.

Business as usual standard of management for Bajigal not met as a result of implementing the Plan (based on average annual effort delivered by QPWS prior to the Plan).

A decorative graphic consisting of a series of white and orange dots forming a wavy line that curves across the top of the page. To the right of this line is a dark brown silhouette of a sea turtle swimming towards the right.

RESTORATION ACTION PLAN



3

RESTORATION ACTION PLAN

To support the implementation of restoration activities on Bajigal, the island has been divided into ten management units (Figure 11).

Figure 11: Management units, Bajigal.





Restoration activities in each Management Unit have been given a timeframe based on Table 3. Restoration activities in the Plan can be updated over time as needed.

Table 3: Indicative timeframe description.

TIME FRAME	DESCRIPTION
Now	Activities identified for an immediate start 2025.
Next	Activities identified for a mid-term start (~2026-2027) based on available resources, project timeframes and outcomes of immediate activities.
After next	Activities identified as a future management opportunity following monitoring subject to funding availability and need.

3.1

MORNING GLORY VINE CONTROL

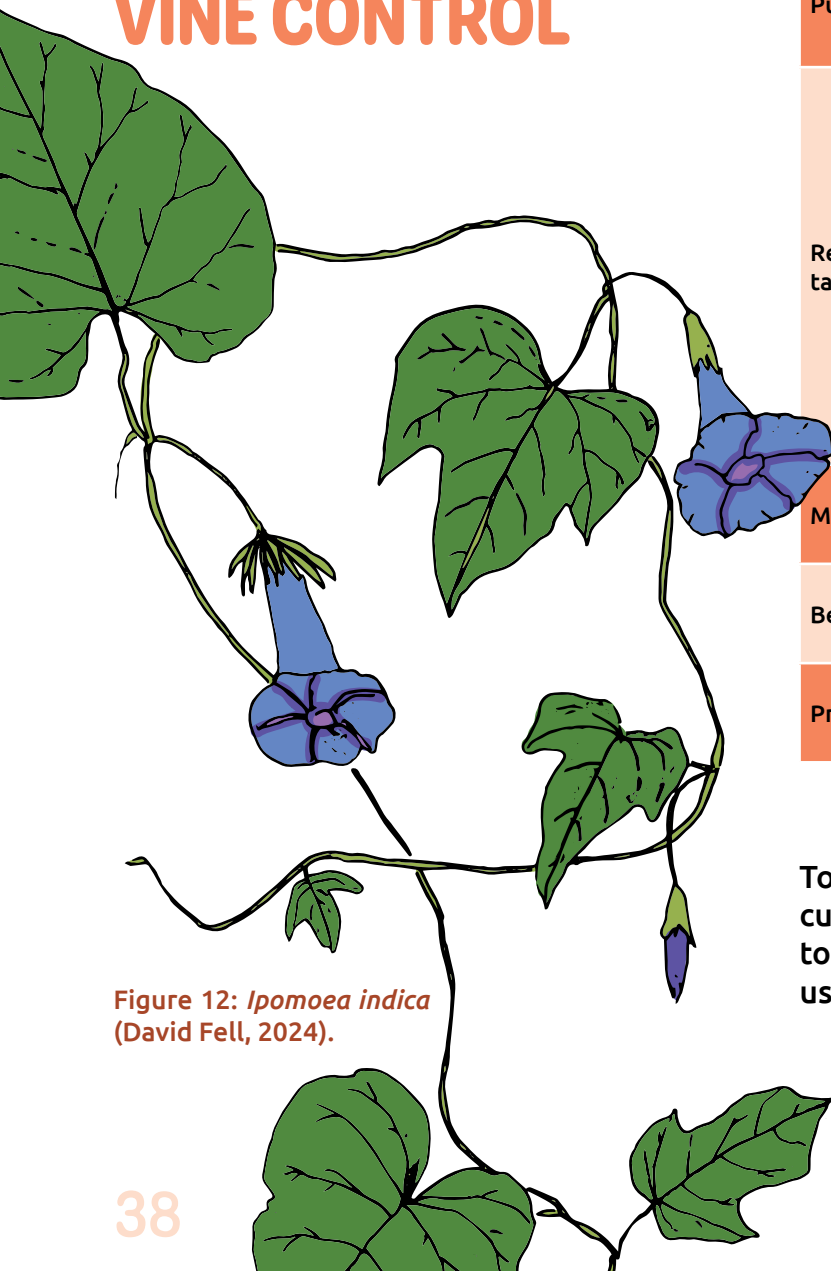


Figure 12: *Ipomoea indica* (David Fell, 2024).

MORNING GLORY VINE CONTROL	
Control target	<i>Ipomoea purpurea</i> , <i>I. indica</i> and <i>I. cairica</i>
Purpose	<ul style="list-style-type: none"> To control morning glory vines on the northern side of the island to: <ul style="list-style-type: none"> • Reduce pressure on the rainforest canopy in the event of a cyclone, • Provide increases in 'canopy windows' to allow for ingress of nesting terns, and • Allow for successional processes / recruitment of rainforest.
Relevant management targets	<ul style="list-style-type: none"> • Availability of nesting habitat including improved access for the bridled tern is increased compared to baseline (% increase). • Large canopy trees are protected and maintained. <ul style="list-style-type: none"> - 50% of emergent trees identified with a high vine load are treated within the first 24 months. • Weed coverage for priority species is reduced across each management unit. <ul style="list-style-type: none"> - Refer to management action plans for management unit sub-targets. • Condition of habitat for flying-fox species on Bajigal is maintained. • Population of monitored flora species is maintained (<i>Pisonia grandis</i>, <i>Arenga australasica</i>, <i>Coleus batianoffii</i>). • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken.
Methods	<ul style="list-style-type: none"> • Manual cutting and removal at base of plant (not preferred) • Scrape and paint or cut-stem using suitable herbicides as informed by current practitioners.
Benefiting values	<ul style="list-style-type: none"> • Rainforest ecosystems. • Bridled tern and other nesting seabirds.
Priority control locations	<ul style="list-style-type: none"> • Management Unit 2 - western end of Bajigal. • Northern side of the island – Management Units 2, 3 and 6

To minimise the application of herbicide on Country, it is proposed that scrape and paint or cut-stem control techniques using an appropriate herbicide are the primary control method to be implemented. The location of control activities should be tagged using a GPS or logged using field portable GIS to ensure regular monitoring is undertaken.

Local experts with experience in the control of morning glory vines should be consulted to make sure the technique is fit for purpose and the most effective approach for control on Bajigal.

GUINEA GRASS CONTROL

Control target	<i>Megathyrsus maximus</i>
Purpose	To reduce the risk of fire on Bajigal by reducing the area dominated by Guinea grass and allows for rainforest successional processes and expansion of edges.
Relevant management targets	<ul style="list-style-type: none"> • Availability of nesting habitat including improved access for the bridled tern is increased compared to baseline (% increase). • Large canopy trees are protected and maintained. <ul style="list-style-type: none"> - Fire risk for sensitive vegetation communities is decreased. • Weed coverage for priority species is reduced across each management unit <ul style="list-style-type: none"> - Refer to management action plans for management unit sub-targets. • Population of monitored flora species is maintained (<i>Pisonia grandis</i>, <i>Arenga australasica</i>, <i>Coleus batianoffii</i>). • The flow of the natural spring is returned to its correct course. • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken.
Methods	<ul style="list-style-type: none"> • Primary control method is manual control noting that foliar application of herbicides on the island is not desirable. Manual control will need to be performed every 4-6 weeks to be effective. This process requires cutting off seed heads, bagging it, and removing it from the site • Targeted application of herbicide such as Roundup Biactive and Weedmaster Duo will be considered through the trial in selected areas in conjunction with manual control techniques to achieve the objectives of this Plan.
Benefiting values	<ul style="list-style-type: none"> • Rainforest ecosystems. • Nesting seabirds – potential. Trials and research to determine options.
Priority control locations	<ul style="list-style-type: none"> • Tracks and canopy gaps through Management Units 2, 3, 6, 7, 8. • Eastern and northern edges of Bajigal including Management Unit 9 and 10, and adjacent sections of Management Units 6, 7 and 8.

3.2 GUINEA GRASS CONTROL



Figure 13: Guinea grass
(David Fell, 2024)

On Bajigal, Guinea grass is widespread on the northern and eastern ends of the island extending into rainforest areas along tracks and gaps. The complete removal of Guinea grass from the island is not feasible in the short or medium term. This Plan focuses on controlling the current extent of Guinea grass and attempting to push back encroachment on the island.

3.2.1 TRACKS AND CANOPY GAPS

Guinea grass is invading tracks and canopy gaps on Bajigal, which could lead to further spread. The priority is to control this by manually removing the grass or targeted chemical control. To prevent the spread of Guinea grass, it is important to avoid moving from infested areas to clear areas to support control efforts. This would be followed by regular monitoring and removal of seedlings and any re-sprouts. Herbicide use for seedlings may also be considered.

Care should be taken to avoid any off-target impact to native seedlings or saplings in canopy gap areas as these will be critical for closing the gap over time and eliminating Guinea grass through shading.

Infestations along tracks and in canopy gaps should be mapped using a GPS with photos taken. Control activities should also be tracked using a GPS to support ongoing regular monitoring.

3.2.2 SENSITIVE VEGETATION BUFFER ZONE

A buffer zone around sensitive vegetation (e.g., rainforest edges and native grasslands) is recommended to control Guinea grass spread and provide a baseline for future removal.

To create this buffer zone, Guinea grass should be manually removed within 10 m of the vegetation edge. Manual removal is labour-intensive and involves removing tussock rootballs to prevent re-sprouting. Herbicide could be considered for managing seedling re-growth or clearing the buffer zone. Steep terrain may limit the establishment of the 10m buffer.

Guinea grass grows rapidly throughout the year. Control works should prioritise areas where consistent follow up can be managed effectively with the resources available.

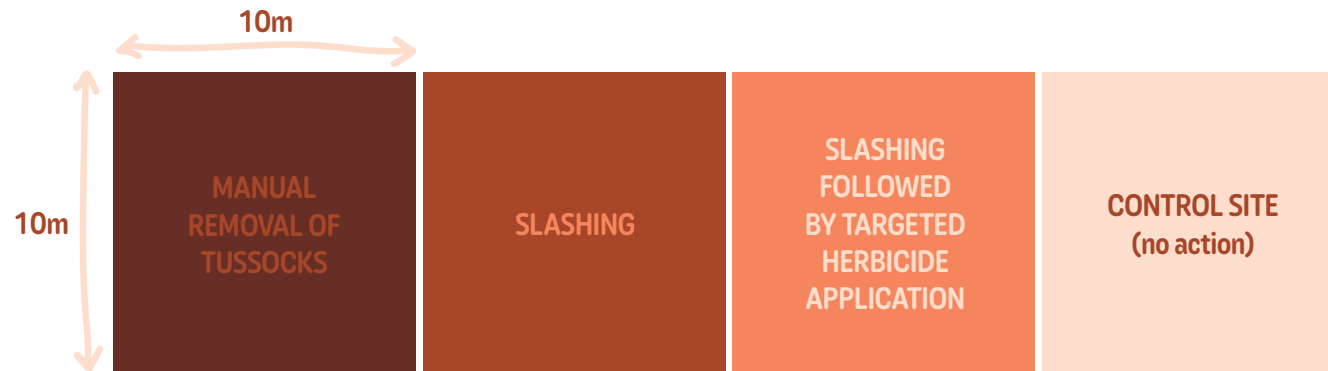


3.2.3 BROADSCALE GUINEA GRASS CONTROL TECHNIQUES TRIAL

There is uncertainty about how species such as the bridled tern interact with Guinea grass on Bajjigal. To better understand this, it is recommended that a trial should be set up to test control techniques for Guinea grass and examine how species such as the bridled tern use or interact with the habitat.

The trial should include techniques like manual control and targeted herbicide application on Guinea grass areas (Figure 14). Trial plots should be a minimum of 100m² and should be treated with either manual removal of tussocks, slashing or slashing followed by targeted herbicide application.

Figure 14: Conceptual Guinea grass trial plot design.



A remote camera should be placed at each trial site to monitor fauna interactions for at least six weeks.

Control sites should be set up in October or November before the bridled tern breeding season and monitored twice during the six weeks to assess Guinea grass cover, soil erosion and regeneration of other species.

A research plan will be created before the trial to outline objectives and data analysis methods. This plan will be developed in partnership with MALSI Rangers and experts (as required) ahead of implementation of the trial.

3.3 ADDITIONAL PRIORITY PREVENTATIVE WEED CONTROL

PRIORITY PREVENTATIVE WEED CONTROL	
Control target	<ul style="list-style-type: none"> • Coral berry (<i>Rivina humilis</i>) • Mossman river grass (<i>Cenchrus echinatus</i>) • Devil's fig (<i>Solanum torvum</i>) • Lantana (<i>Lantana camara</i>) • Singapore daisy (<i>Sphagneticola trilobata</i>)
Purpose	<p>Priority species for control are either ecosystem changing species which are present on Bajigal in low numbers or are shade tolerant species which have the potential to dominant understory areas of rainforest and outcompete native species. These outbreak infestations are considered to be time critical for control before they establish further on the island or in the case of coral berry spread to new areas of the island.</p>
Relevant management targets	<ul style="list-style-type: none"> • Availability of nesting habitat including improved access for the bridled tern is increased compared to baseline (% increase). • Weed coverage for priority species is reduced across each management unit. <ul style="list-style-type: none"> - Refer to management action plans for management unit sub-targets. • Flying-fox are recorded utilising Bajigal. • Population of monitored flora species is maintained (<i>Pisonia grandis</i>, <i>Arenga australasica</i>, <i>Coleus batianoffii</i>). • The flow of the natural spring is returned to its correct course. • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken.
Methods	<ul style="list-style-type: none"> • Primary control method is manual control noting the application of herbicides is not preferred. • However, targeted application of herbicide such as glyphosate, Fluroxypr or Vigilant II gel could be used to address isolated individuals of lantana using a cut and paint application.
Benefiting values	<ul style="list-style-type: none"> • Rainforest ecosystems
Priority control locations	<ul style="list-style-type: none"> • Management Unit 1 • Management Unit 2 • Management Unit 4 • Management Unit 5

3.3.1 CONTROL OF PRIORITY SPECIES ON FOREDUNES AND LITTORAL RAINFOREST

The foredune and littoral rainforest areas of Bajigal have two priority species of concern; Mossman river grass and Singapore daisy, that should be controlled to prevent the spread of ecosystem-transforming weeds. Both species are highly invasive and can quickly dominate areas of understory in sandy soils.

Infestations of these species should be removed immediately to prevent spread. Both species can be hand pulled and care should be taken to make sure all seed heads of the Mossman river grass are removed. It is also important that all parts of the plant are removed. The species will rapidly establish in shaded sandy areas and actively outcompetes other understory species. Removed material for both species should be placed into thick black plastic bags for disposal off island.

3.3.2 CONTROL OF SHADE TOLERANT SPECIES

Coral berry is widespread on Bajigal. It grows well in shaded rainforest and can outcompete native plants. It produces many seeds and has numerous seedlings under mature plants. A systematic approach to removing coral berry is recommended, particularly in areas with limited plants like MU4 and MU5. These areas should be cleared first with control zones around their edges to prevent spread.

Coral berry can be hand pulled. Care should be taken to remove all berries and place pulled material into black plastic bags for disposal off island.

3.3.3 CONTROL OF POST-DISTURBANCE OPPORTUNISTS

Bajigal has small populations of devil's fig and lantana which are priority species to control. Both these species were widespread after previous cyclone events. If a cyclone occurs, these species may spread and establish in new areas. Lantana is particularly concerning as it can grow under canopy and act as a fire carrier during dry periods.

To prevent spread after disturbances, it is recommended to prioritise controlling small infestations of devil's fig and lantana on Bajigal using manual methods or cut and paint for lantana if needed. Removed fruits, flowers or seeds should be placed in thick black plastic bags for disposal off island. Note that devil's fig seeds remain viable even after herbicide treatment.

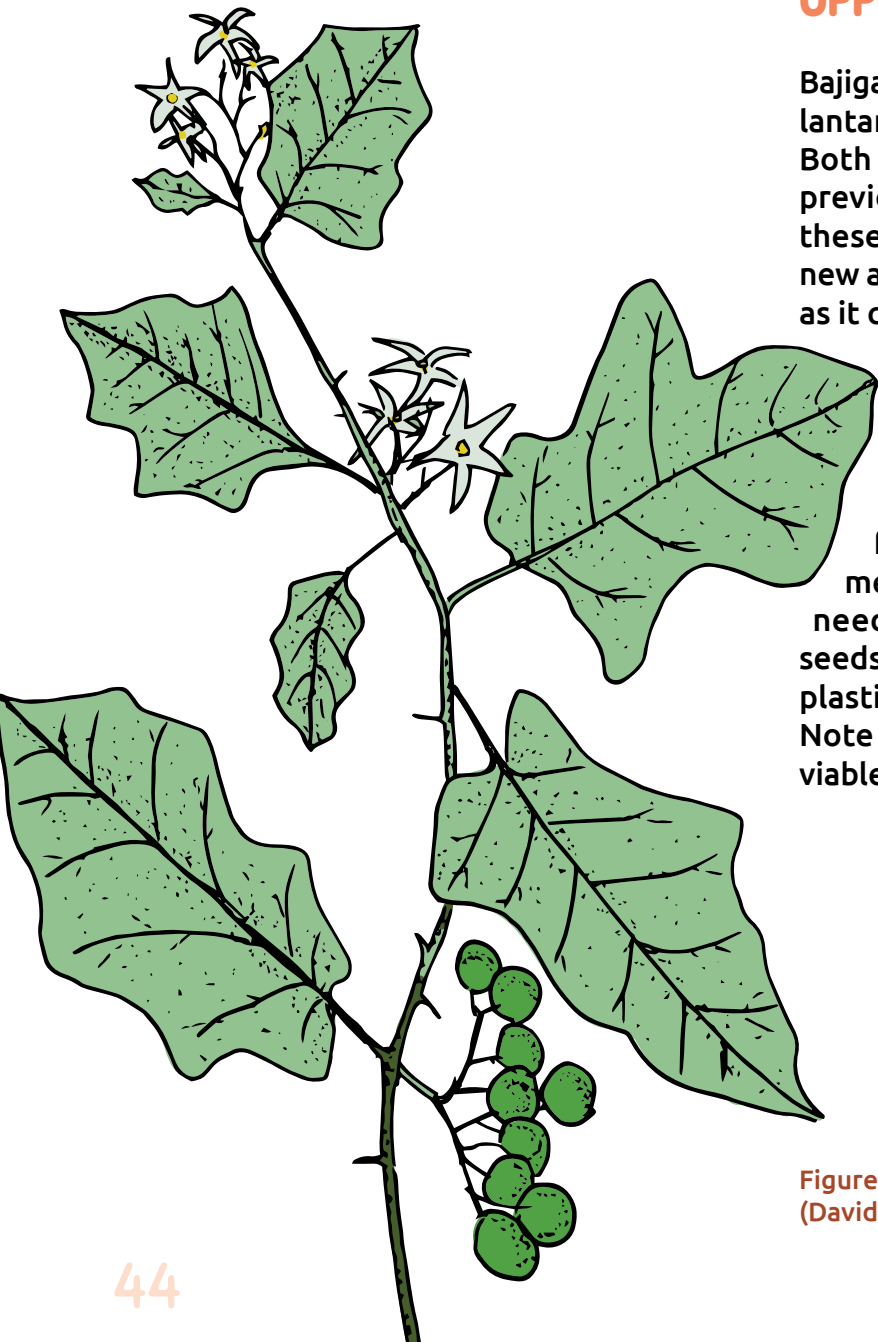


Figure 15: Devil's fig
(David Fell, 2024)

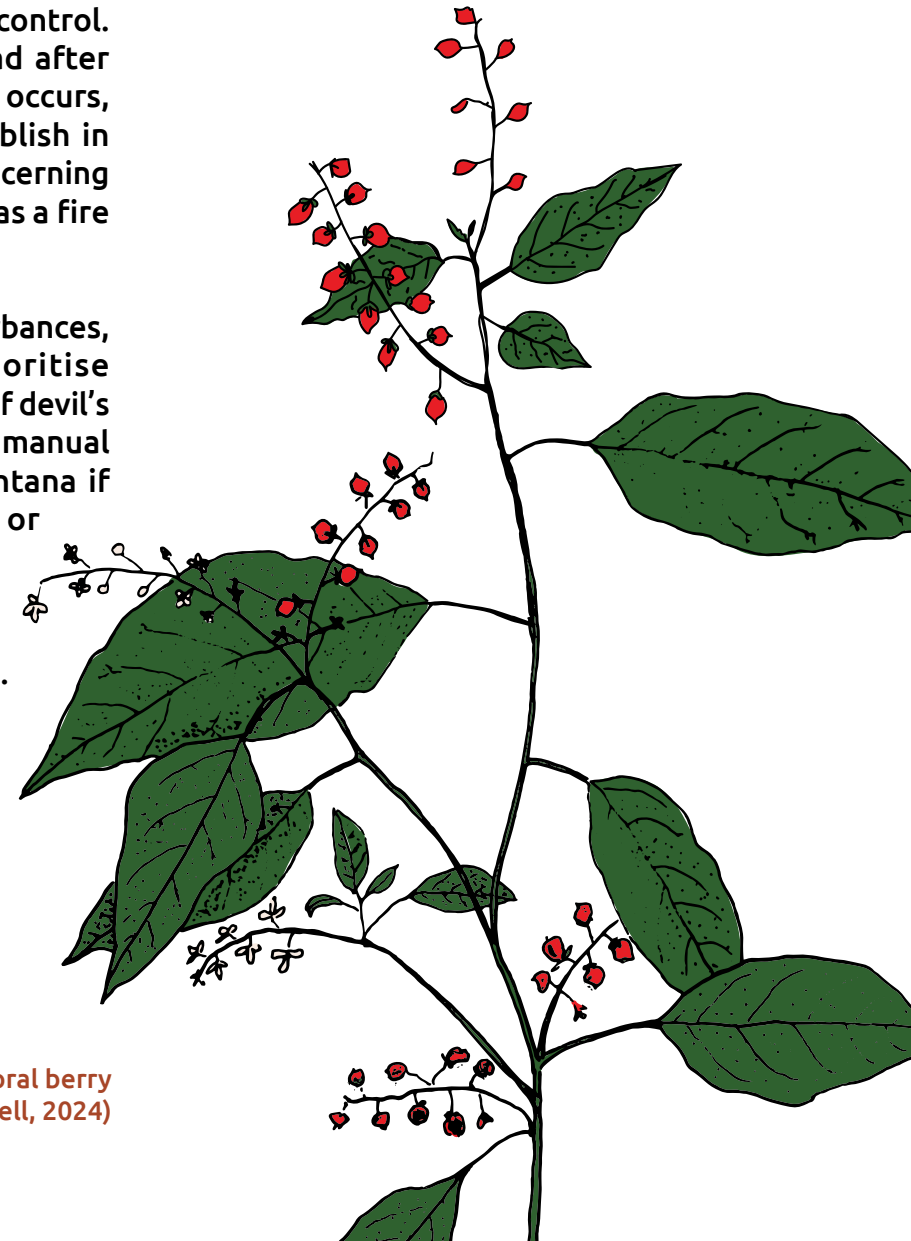


Figure 16: Coral berry
(David Fell, 2024)

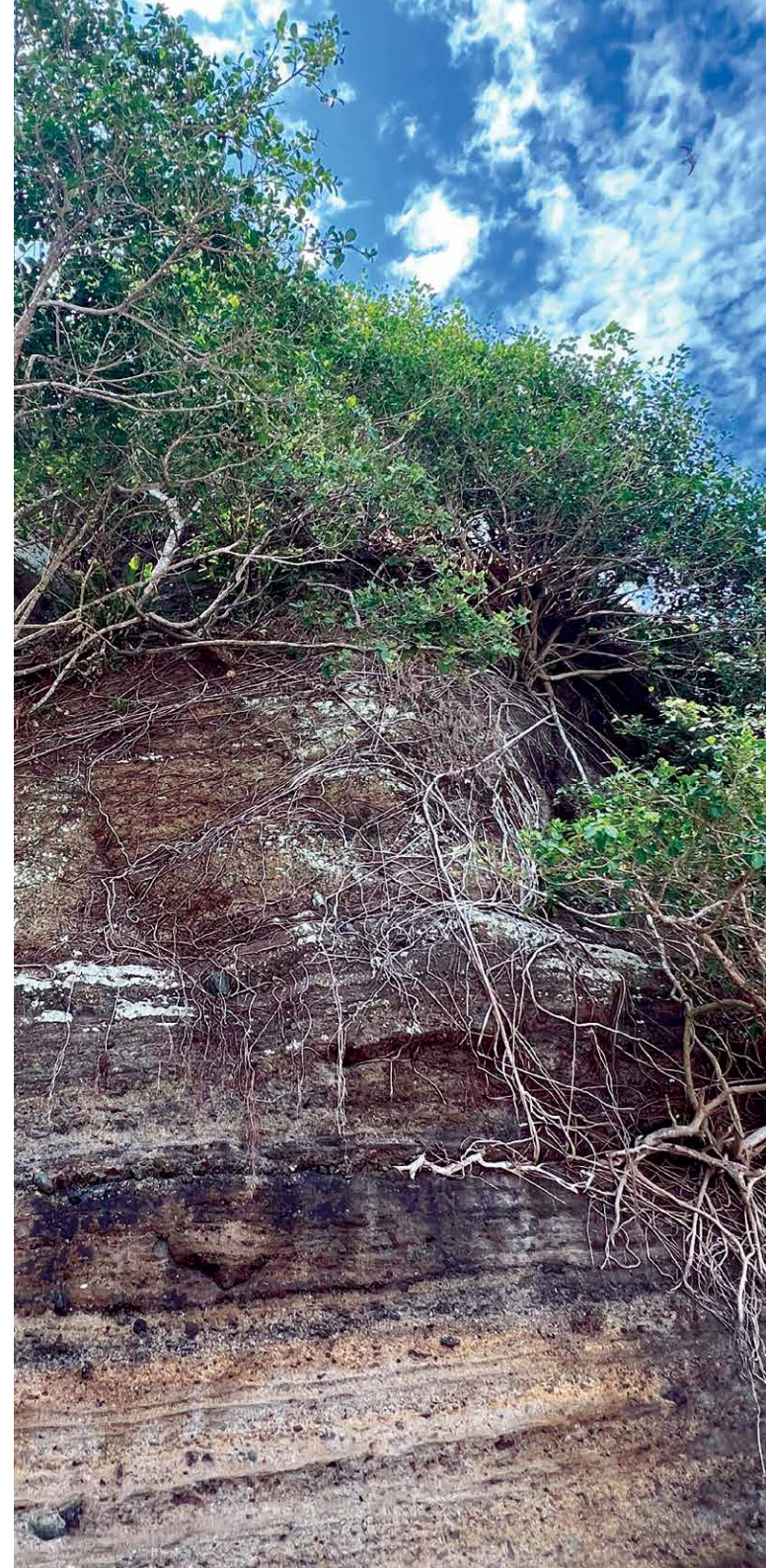
3.4

NATURAL SPRING RESTORATION

The natural spring on Bajigal is an important cultural site, but Guinea grass has altered its flow. This impacts the cultural value and allows exotic species like the cane toads to spread.

A targeted planning exercise that is supported by MALSI and experts is recommended to ensure safe restoration. This should include landform design, plantings if needed, and cost estimates. Given the spring's location, all work must be done by hand and in a culturally sensitive manner to preserve island values.

NATURAL SPRING RESTORATION	
Control target	Natural spring
Purpose	To re-establish the flow path of the spring.
Relevant management targets	<ul style="list-style-type: none"> • Weed coverage for priority species is reduced across each management unit. - Refer to management action plans for management unit sub-targets • The flow of the natural spring is returned to its correct course. • Bajigal provides opportunities for cultural practices and knowledge sharing. • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken.
Methods	<ul style="list-style-type: none"> • Manual removal of Guinea grass tussocks. • Re-establishment of the natural spring flow path through hand-dug earth works.
Benefiting values	<ul style="list-style-type: none"> • Rainforest ecosystems
Priority control locations	<ul style="list-style-type: none"> • Management Unit 2.





3.5

IMPROVING CULTURAL RESOURCES

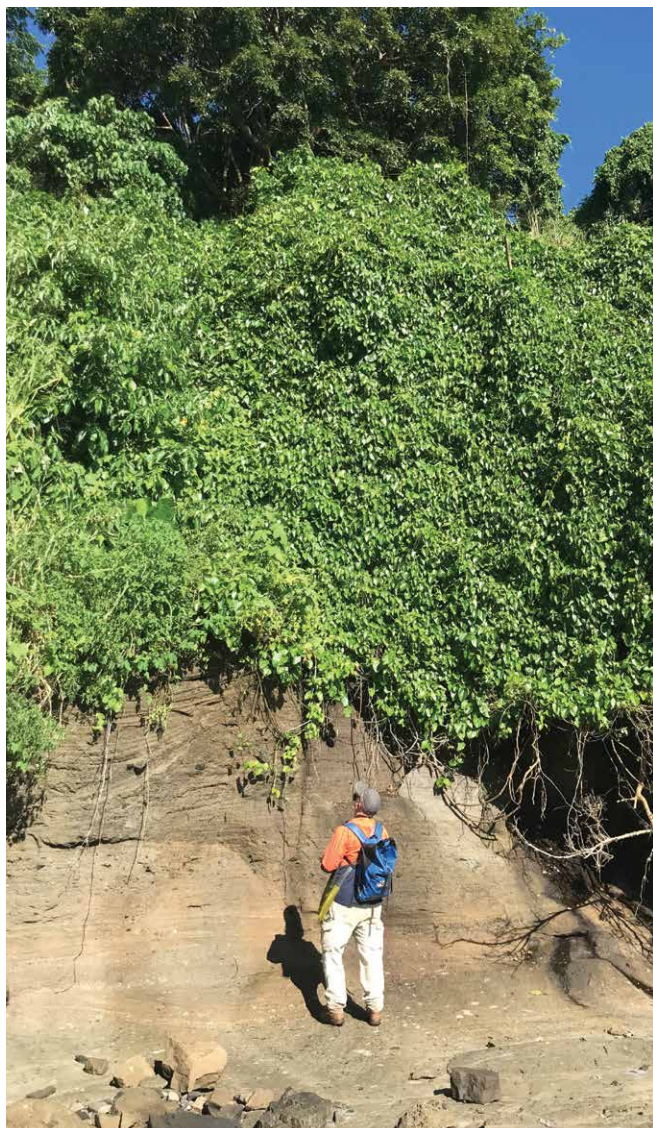
IMPROVING CULTURAL RESOURCES	
Control target	Cultural use species, including as food resources, medicine and materials.
Purpose	To improve the abundance and accessibility of cultural use species on Bajigal.
Relevant management targets	Bajigal provides opportunities for cultural practices and knowledge sharing.
Methods	The preferred approach to the management of cultural use species on Bajigal is to be determined by MALSI Rangers in accordance with the Mandubarra Sea Country Cultural Values Plan (Second Edition, 2024).
Benefiting values	<ul style="list-style-type: none"> • Rainforest ecosystems
Priority control locations	<ul style="list-style-type: none"> • All

Bajigal is an important cultural site for the Mandubarra people with important cultural values, including the spring and fish traps, and cultural resources, including food resources, medicine and materials.

Over time, the availability of these resources has declined due to limited access and loss of traditional management. The Plan aims to support MALSI Rangers in using Traditional Ecological Knowledge to restore the island’s cultural values and resources as guided by the Mandubarra Sea Country Cultural Values Plan.

3.6

EROSION CONTROL



EROSION CONTROL	
Control target	Erosion points located on the northern side of the island.
Purpose	<ul style="list-style-type: none"> • Restore structural integrity to the erosion point and prevent the spread of further erosion at the head cut.
Relevant management targets	<ul style="list-style-type: none"> • Large canopy trees are protected and maintained. - 50% of emergent trees identified with a high vine load are treated within the first 24 months. • Weed coverage for priority species is reduced across each management unit. - Refer to management action plans for management unit sub-targets. • Bajigal provides opportunities for cultural practices and knowledge sharing. • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken.
Methods	<ul style="list-style-type: none"> • Manual earth works. • Stabilizing plantings.
Benefiting values	<ul style="list-style-type: none"> • Rainforest ecosystems
Priority control locations	<ul style="list-style-type: none"> • Management unit 3.

Erosion is occurring in MU3 on the north-western side of the island. This may be caused by changes in surface water flows due to the spread of morning glory vine. This erosion could expand and threaten nearby rainforest and create conditions for invasive species to establish.

It is recommended that the site is monitored to determine if the erosion is active. Photos should be taken before and after the wet

season. If the erosion is active, a restoration plan should be made with support from MALSI and experts. If the site is stable, it should be monitored and left to recover naturally.

Controlling morning glory upslope may help reduce water flow. This may not be enough if the erosion is active. In the meantime, invasive species should be controlled to stop the site from spreading weeds without making the erosion worse.

3.7

SUPPORTING EVIDENCE-BASED DECISION MAKING

The Plan supports evidence-based decision making as a core principle of its implementation. Two components support evidence-based decisions: ecological monitoring program and the implementation reporting cycle.



ECOLOGICAL MONITORING	
Control target	All values and threats
Purpose	To provide information on the status of values and threats on the island and their trajectory to support evidence-based management
Relevant management targets	<ul style="list-style-type: none"> • Availability of nesting habitat for the bridled tern including improved access for the bridled tern is increased compared to baseline (% increase). • No new threats to bridled tern breeding habitat established (e.g., rats, cats, avian flu). • Large canopy trees are protected and maintained. <ul style="list-style-type: none"> - Fire risk for sensitive vegetation communities is decreased. - 50% of emergent trees identified with a high vine load are treated within the first 24 months. • Weed coverage for priority species is reduced across each management unit. <ul style="list-style-type: none"> - Refer to management action plans for management unit sub-targets. • Condition of habitat for flying fox species on Bajigal is maintained. • Population of monitored flora species is maintained (<i>Pisonia grandis</i>, <i>Arenga australasica</i>, <i>Coleus batianoffii</i>). • The flow of the natural spring is returned to its correct course.
Methods	<ul style="list-style-type: none"> • Ecological monitoring methods will be developed into an ecological monitoring program. • Indicative methods are provided below.
Benefiting values	• All identified values
Priority control locations	• All management units to be monitored.

To support the implementation of this plan, a Bajigal Ecological Monitoring Program will need to be developed in consultation with MALSI and QPWS. The Bajigal Ecological Monitoring Program will be a core component

of the implementation of this Plan and will be critical for measuring outputs under the Plan against the key performance indicators and assessing the overall outcomes achieved.

3.7.1 CONTROL OF POST-DISTURBANCE OPPORTUNISTS

Baseline information is important for evidence-based decision making. It provides a reference to measure ecological changes overtime and assess the environment after disturbances. Comparing against baseline data shows if restoration is effective or if adjustments are needed to achieve better outcomes.

The Bajjigal Ecological Monitoring Program will outline the methods and approach for gathering baseline data and monitoring ecological health by using the indicators in Table 4 below. The indicators and methods will be refined during the program's development.

Baseline ecological monitoring will be completed in 2025 ahead of the implementation of works on island.



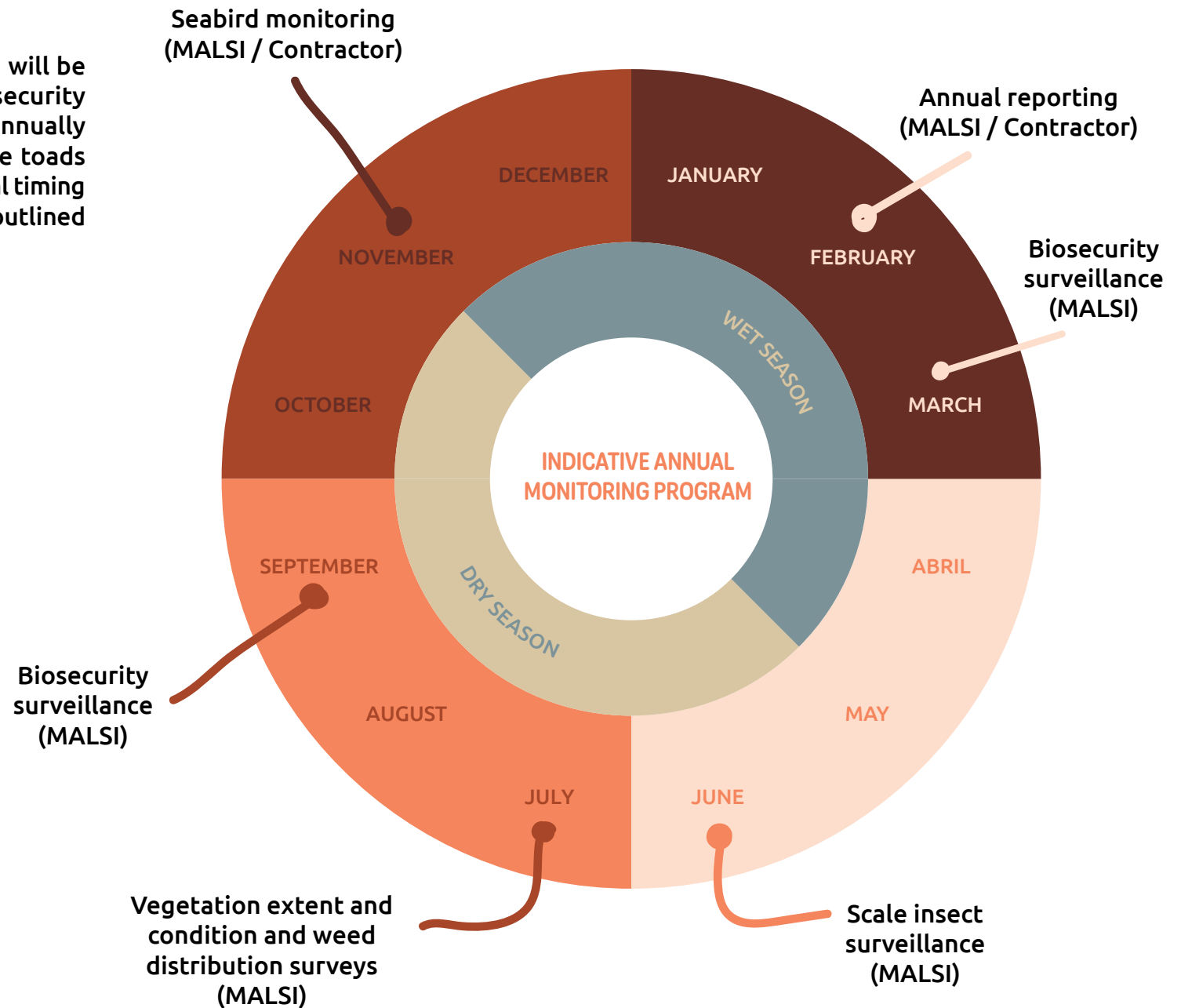
Table 4: Bajigal Ecological Monitoring Program indicators and methods

MONITORING FACTOR	INDICATIVE INDICATOR	INDICATIVE METHOD	FREQUENCY / TIMING
Yarning point	Environmental change	<ul style="list-style-type: none"> • One yarning point per management unit to be established. • Each yarning point should include a video or audio record of what is observed. 	Annually or as desired
Rainforest vegetation communities	Change in vegetation community extent	<ul style="list-style-type: none"> • Detailed vegetation mapping. • LiDAR vegetation plots 	Annually initially, with surveys every three (3) years from year five onwards or after major disturbance event – July timing preferred
	Change in vegetation structure and condition	<ul style="list-style-type: none"> • Vegetation monitoring plots in high-risk areas (e.g., adjacent to forest edges) with control sites. • Drone canopy surveys. 	Annually initially, with surveys every 3 years from year five (5) onwards or after major disturbance event – July timing preferred
	Weed distribution, cover and density	<ul style="list-style-type: none"> • Grid survey of weed distribution, cover and density across each MU. 	Annually – July preferred
Preventative biosecurity	Cane toad population size	<ul style="list-style-type: none"> • Cane toad – Toadinator surveys or song meters. 	Annually – July preferred
	Invasive rodent presence	<ul style="list-style-type: none"> • Chew cards • Camera traps 	Annually prior to seabird nesting – September
	Tramp ant surveillance	<ul style="list-style-type: none"> • Biosecurity ant sampling protocol 	Bi-annually – March / September
	Scale insects on <i>Pisonia grandis</i>	<ul style="list-style-type: none"> • Annual surveying of scale density 	Annually – dry season (June indicative)
Seabird nesting habitat	Extent of nesting area utilized and nest density.	<ul style="list-style-type: none"> • Annual seabird population surveys 	Annually – November / December
	Change in population estimate against baseline.	<ul style="list-style-type: none"> • Annual seabird population surveys 	Annually – November / December
Rare and uncommon flora	Population estimates for important flora species. <ul style="list-style-type: none"> • <i>Pisonia grandis</i> • <i>Arenga australasica</i> • <i>Coleus batianoffii</i> 	<ul style="list-style-type: none"> • Population estimates and tagging/geolocating of individuals (<i>P. grandis</i> and <i>C. batianoffii</i> only) using GPS. 	3 yearly or after disturbance event – July preferred
	Condition assessment for important flora species.	<ul style="list-style-type: none"> • Assessment of flora health and threats 	3 yearly or after disturbance event – July preferred
Opportunistic monitoring	Evidence of visitation or human induced impacts (e.g. fires, rubbish, marine debris)	<ul style="list-style-type: none"> • Natural Values Health Check • Rubbish removal • Marine debris removal 	Opportunistically
	Fauna species (including observations of fauna species of concern such as snakes)	<ul style="list-style-type: none"> • Opportunistic records during field surveys or restoration activities • Camera trap records 	Opportunistically

3.7.2 BIOSECURITY MONITORING

Preventative biosecurity monitoring will be part of the ecological surveys. Biosecurity surveys should be completed twice annually to detect tramp ants, rats, cats, cane toads and avian influenza. Indicative seasonal timing for potential monitoring activities is outlined in Figure 17 below.

Figure 17: Seasonal monitoring calendar.



3.7.3 IMPLEMENTATION REPORTING CYCLE

IMPLEMENTATION REPORTING	
Control target	All activities completed under the RORI Project
Purpose	To guide the delivery of the Plan and gather information needed to support informed, evidence-based decision making.
Relevant management targets	<ul style="list-style-type: none"> • Clear governance and administrative processes and implementation arrangements are established and implemented effectively. • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken. • Stewardship from QPWS and the Reef Authority is maintained and enables agency reporting processes to be completed.
Methods	Information on implementation governance will be collected through annual surveys, quarterly financial reporting and a biannual satisfaction survey.
Benefiting values	The governance arrangements will benefit the implementation of the Plan across all aspects.

The implementation reporting cycle includes annual implementation reporting, quarterly financial reporting and biannual satisfaction survey.

3.7.3.1 ANNUAL IMPLEMENTATION REPORTING

The annual implementation report will track the effectiveness of activities in the Plan. It will measure KPIs and be used alongside ecological monitoring data to assess progress.

3.7.3.2 QUARTERLY FINANCIAL REPORTING

The quarterly financial reporting will provide an overview of expenses and services delivered. This will support reporting obligations for the Reef Authority back to Reef Trust and ensure transparency in public fund spending. It will also include reporting on the efficiency KPIs set in the Plan.

3.7.3.3 BI-ANNUAL SATISFACTION SURVEY

The biannual satisfaction survey will be used to identify issues early in the Plan's implementation. It will initially be conducted twice a year for the first two years and frequency will decrease if no problems are identified. Survey timing will then be determined by all parties.

3.8

CAPABILITY BUILDING AND DEVELOPMENT

CAPABILITY BUILDING AND DEVELOPMENT	
Control target	MALSI ranger capability and skill set
Purpose	To support MALSI Rangers develop western science capabilities to manage Country.
Relevant management targets	<ul style="list-style-type: none"> • Clear governance and administrative processes and implementation arrangements are established and implemented effectively. • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken.
Methods	Various.
Benefiting values	All.

The planning discussions identified several ways to support MALSI Rangers to care for Country by using Traditional Ecological Knowledge underpinned by western science.

This can include formal courses or on the job learning with technical experts. The Plan will focus on building capability in the following areas:

- Plant identification.
- Bush regeneration techniques.
- Herbicide application licensing and training.
- Compliance and enforcement training to enable Rangers to safely and effectively undertake compliance

checks on their Sea Country.

- Ecological monitoring and survey design.
- Pest management and biosecurity surveillance activities.

Building capability for MALSI will benefit other areas and create economic opportunities. Benefits include:

- Project management and contract management experience to support future grant applications.
- Hands-on skills development.
- Integration of Traditional Ecological Knowledge and western science to deliver on ground outcomes.

3.8.1

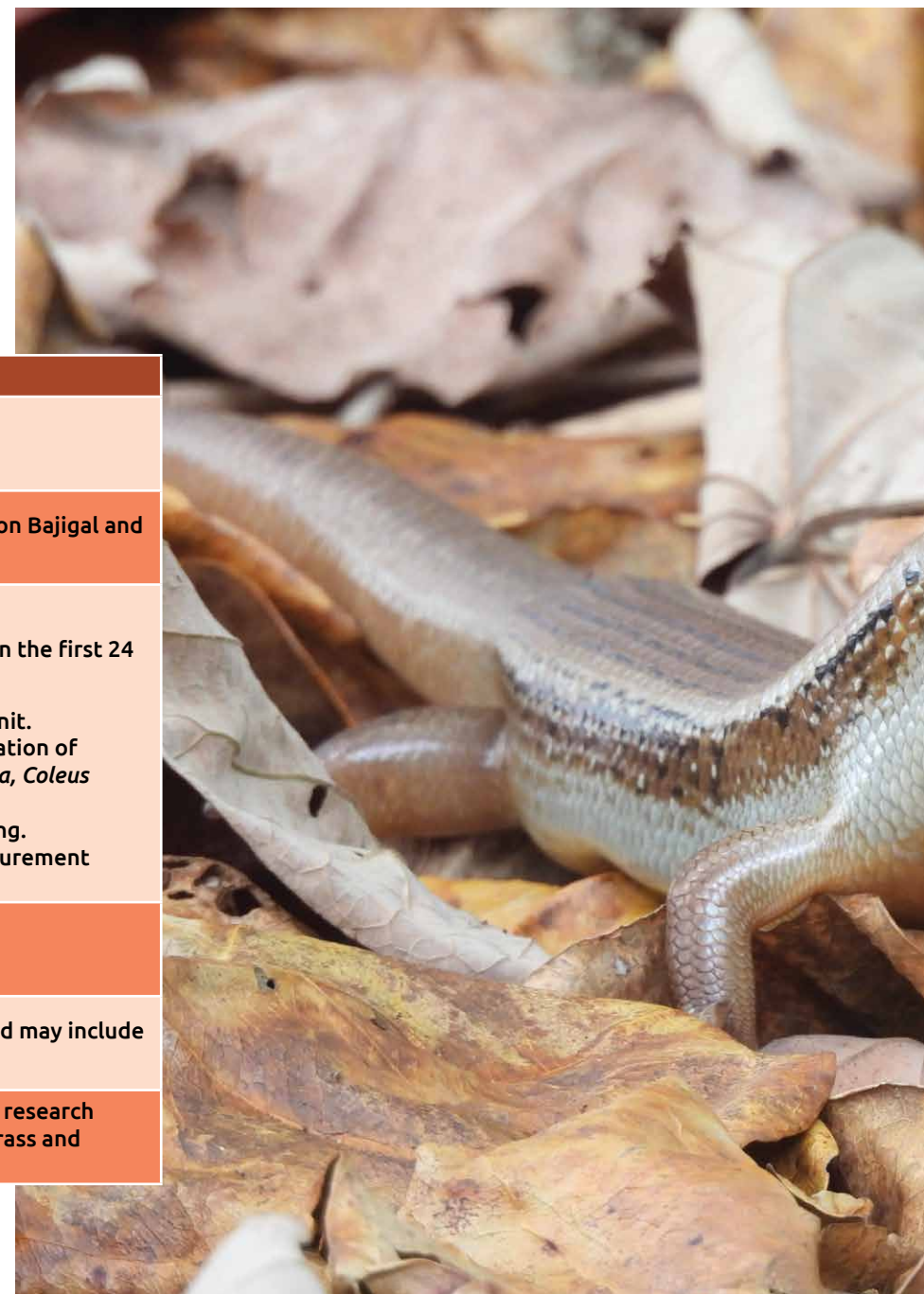
ACCESS MANAGEMENT

Management of access to Bajigal is an important issue. Unrestricted access to Bajigal could result in several threats to the island's ecosystems including:

- Establishment of new pests and diseases because of poor adherence to biosecurity protocols from visitors
- Increased potential for wildfires due to unmanaged campfires or arson, and
- Intentional use of the island for illegal activities including drug crops.

There is a desire to explore options to restrict access to Bajigal to manage pests and diseases. There are also opportunities for Traditional Owner run businesses to provide tourism services that could support economic development and island management. A targeted scoping and feasibility study to explore potential options to deliver the desired outcomes could be undertaken in consultation with QPWS and MALSI.

3.9 OPTIONAL ECOLOGICAL RESEARCH PROJECTS



ECOLOGICAL RESEARCH PROJECTS	
Control target	Species and environments of Bajigal
Purpose	To develop a better understanding of the ecosystems and species present on Bajigal and trial restoration techniques.
Relevant management targets	<ul style="list-style-type: none"> • Large canopy trees are protected and maintained. - 50% of emergent trees identified with a high vine load are treated within the first 24 months. • Weed coverage for priority species is reduced across each management unit. • Condition of habitat for flying fox species on Bajigal is maintained. Population of monitored flora species is maintained (<i>Pisonia grandis</i>, <i>Arenga australasica</i>, <i>Coleus batianoffii</i>). • Bajigal provides opportunities for cultural practices and knowledge sharing. • Capability building opportunities for MALSI are incorporated into all procurement activities and effectively undertaken.
Methods	Various.
Benefiting values	Benefiting values will be targeted in the design of the research projects and may include any species or ecosystem type present.
Priority locations	Locations for research projects would need to be determined based on the research requirements. Key areas for research include areas dominated by Guinea grass and rainforest ecosystems.



There are several research projects that could support Bajigal's environment if funding is available, including:

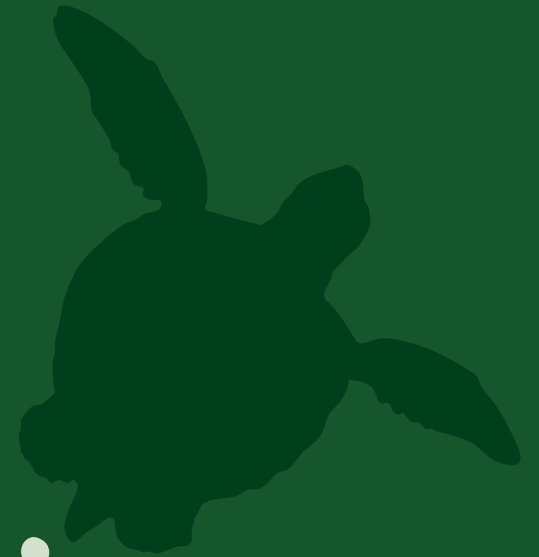
- Propagating and restoring grassland remnants including methods for planting *Coleus batianoffii*.
- Development of an approach for trialling planting of rainforest species on Bajigal to support recovery of rainforest ecosystems post disturbance.
 - Propagation programs would require the establishment of a nursery and research into appropriate propagation techniques.
 - Biosecurity risks and the development of appropriate protocols for the transfer of any plants grown on the mainland to Bajigal.
- Research projects to determine the utilisation of Bajigal by specific species:
 - Determining if Bajigal is utilised by any species of microbat. A targeted assessment to determine what species are currently utilising the island.

- Targeted surveys could assess reptile populations on the island, including the slatey-grey snake, which is a recent record. This could also include determining whether the snake is preying on seabird eggs or affecting their nesting success.

- The orange-footed scrub fowl was widespread on the island. A research project could monitor the population to determine if the population is increasing due to a particular event or if it is affecting the island's environment.

- Research could explore the impact of restoration works, particularly the removal of native or exotic vines from large canopy trees, or changes in understory conditions. These studies could contribute to broader studies on rainforest restoration in the wet tropics.

MANAGEMENT ACTION CARDS



4.1 MANAGEMENT UNIT 1

MANAGEMENT UNIT 1



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Morning glory vine control	<p>Removal of vines on northern side of the unit is the first priority.</p> <p>Removal of vines in southern or central areas to be undertaken once the northern side has been completed.</p> <p>Vines are to be treated manually or using cut and paint techniques with an appropriate herbicide to prevent re-sprouting.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of morning glory vines reduced by 30%. 	2	Now
Priority preventative weed control	<p>Targeted removal of highly invasive species to avoid establishment and spread of infestations.</p> <p>Priority preventative control species in MU1 are:</p> <ul style="list-style-type: none"> • Singapore daisy • Mossman river grass <p>Control of other priority weed species such as coral berry are a second order priority.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • 100% of Singapore daisy and Mossman river grass treated and removed. • Cover of coral berry across management unit reduced by 50%. 	1	Now
Guinea grass control	<p>Removal of Guinea grass along tracks and in canopy gaps.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • 100% of isolated patches of Guinea grass removed. 	3	Now

4.2 MANAGEMENT UNIT 2

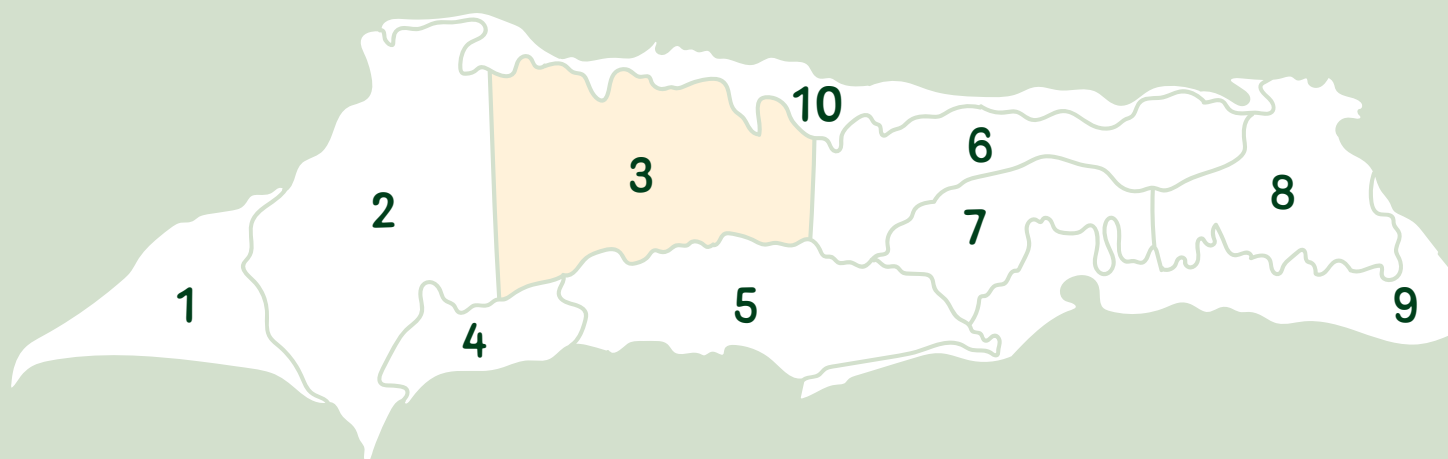
MANAGEMENT UNIT 2



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Morning glory vine control	Removal of vines on northern side of the unit is the first priority. Removal of vines in southern or central areas to be undertaken once the northern side has been completed. Vines are to be treated manually or using cut and paint techniques with an appropriate herbicide to prevent re-sprouting. TARGET: • Cover of morning glory vines reduced by 30%.	1	Now
Priority preventative weed control	Targeted removal of highly invasive species to avoid establishment and spread of populations TARGET: • 100% of devil's fig and lantana treated and removed. • Cover of coral berry across management unit reduced by 50%.	2	Now
Guinea grass control	Removal of Guinea grass along tracks and in canopy gaps. TARGET: • 100% of isolated patches of Guinea grass removed.	3	Now
Erosion control works	Erosion control works to be implemented on the northern side of the island following control of morning glory vines to prevent worsening of erosion conditions. TARGET: • Active erosion points stabilised.	5	After next
Natural spring restoration	Removal of Guinea grass and other invasive flora species from the spring and redirection along previous flow path. TARGET: • Natural spring direction restored.	4	Next

4.3 MANAGEMENT UNIT 3

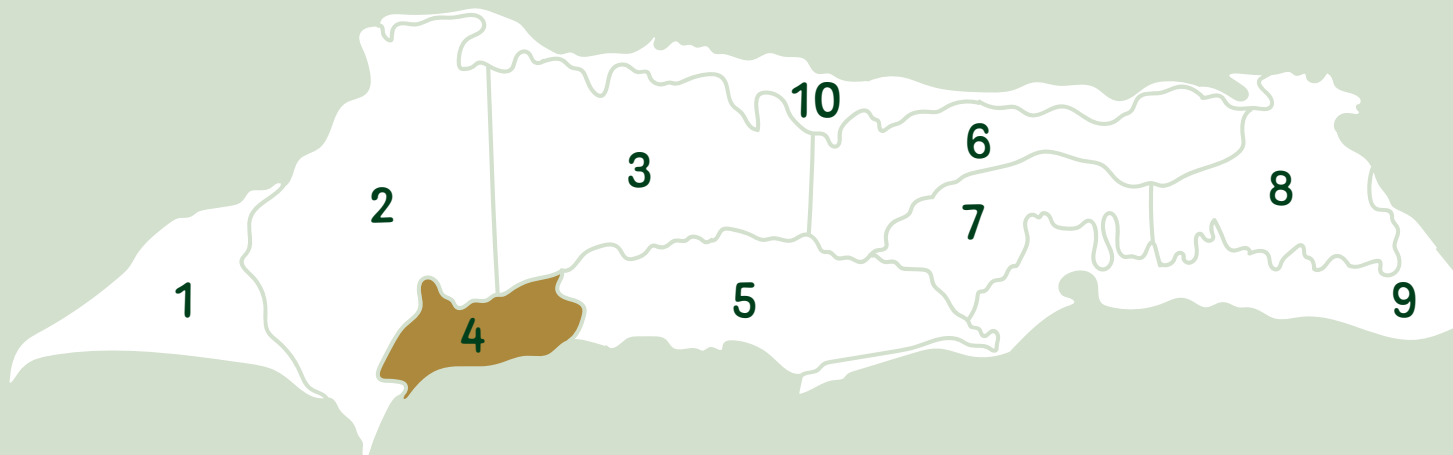
MANAGEMENT UNIT 3



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Morning glory vine control	<p>Removal of vines on northern side of the unit is the first priority.</p> <p>Removal of vines in southern or central areas to be undertaken once the northern side has been completed.</p> <p>Vines are to be treated manually or using cut and paint techniques with an appropriate herbicide to prevent re-sprouting.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of morning glory vines reduced by 20%. 	1	Next
Priority preventative weed control	<p>Targeted removal of highly invasive species to avoid establishment and spread of populations.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of coral berry across management unit reduced by 50%. • 100% of isolated patches of Guinea grass removed. 	3	After Next
Guinea grass control	<p>Removal of Guinea grass along tracks and in canopy gaps.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • 100% of isolated patches of Guinea grass removed. 	2	After Next

4.4 MANAGEMENT UNIT 4

MANAGEMENT UNIT 4



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Morning glory vine control	<p>Removal of vines on northern side of the unit is the first priority.</p> <p>Removal of vines in southern or central areas to be undertaken once the northern side has been completed.</p> <p>Vines are to be treated manually or using cut and paint techniques with an appropriate herbicide to prevent re-sprouting.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of morning glory vines reduced by 80%. 	1	Next
Priority preventative weed control	<p>Targeted removal of highly invasive species to avoid establishment and spread of populations.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of coral berry across management unit reduced by 70%. • 100% of isolated patches of Guinea grass removed. 	3	Next
Guinea grass control	<p>Removal of Guinea grass along tracks and in canopy gaps.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • 100% of isolated patches of Guinea grass removed. 	2	Next

4.5 MANAGEMENT UNIT 5

MANAGEMENT UNIT 5



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Morning glory vine control	<p>Removal of vines on northern side of the unit is the first priority.</p> <p>Removal of vines in southern or central areas to be undertaken once the northern side has been completed.</p> <p>Vines are to be treated manually or using cut and paint techniques with an appropriate herbicide to prevent re-sprouting.</p> <p>TARGET: • Cover of morning glory vines reduced by 80%.</p>	1	Next
Priority preventative weed control	<p>Targeted removal of highly invasive species to avoid establishment and spread of populations.</p> <p>TARGET: • Cover of coral berry across management unit reduced by 70%</p>	2	Next

4.6 MANAGEMENT UNIT 6

MANAGEMENT UNIT 6



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Morning glory vine control	<p>Removal of vines on northern side of the unit is the first priority.</p> <p>Removal of vines in southern or central areas to be undertaken once the northern side has been completed.</p> <p>Vines are to be treated manually or using cut and paint techniques with an appropriate herbicide to prevent re-sprouting.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of morning glory vines reduced by 20%. 	1	After Next
Priority preventative weed control	<p>Targeted removal of highly invasive species to avoid establishment and spread of populations.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of coral berry across management unit reduced by 50%. 	3	After Next
Guinea grass control	<p>Removal of Guinea grass along tracks and in canopy gaps.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • 100% of isolated patches of Guinea grass removed. 	2	After Next

4.7 MANAGEMENT UNIT 7

MANAGEMENT UNIT 7



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Morning glory vine control	<p>Removal of vines on northern side of the unit is the first priority.</p> <p>Removal of vines in southern or central areas to be undertaken once the northern side has been completed.</p> <p>Vines are to be treated manually or using cut and paint techniques with an appropriate herbicide to prevent re-sprouting.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of morning glory vines reduced by 20%. 	1	After Next
Priority preventative weed control	<p>Targeted removal of highly invasive species to avoid establishment and spread of populations.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • Cover of coral berry across management unit reduced by 50%. 	3	After Next
Guinea grass control	<p>Removal of Guinea grass along tracks and in canopy gaps.</p> <p>TARGET:</p> <ul style="list-style-type: none"> • 100% of isolated patches of Guinea grass removed. 	2	After Next

4.8 MANAGEMENT UNIT 8

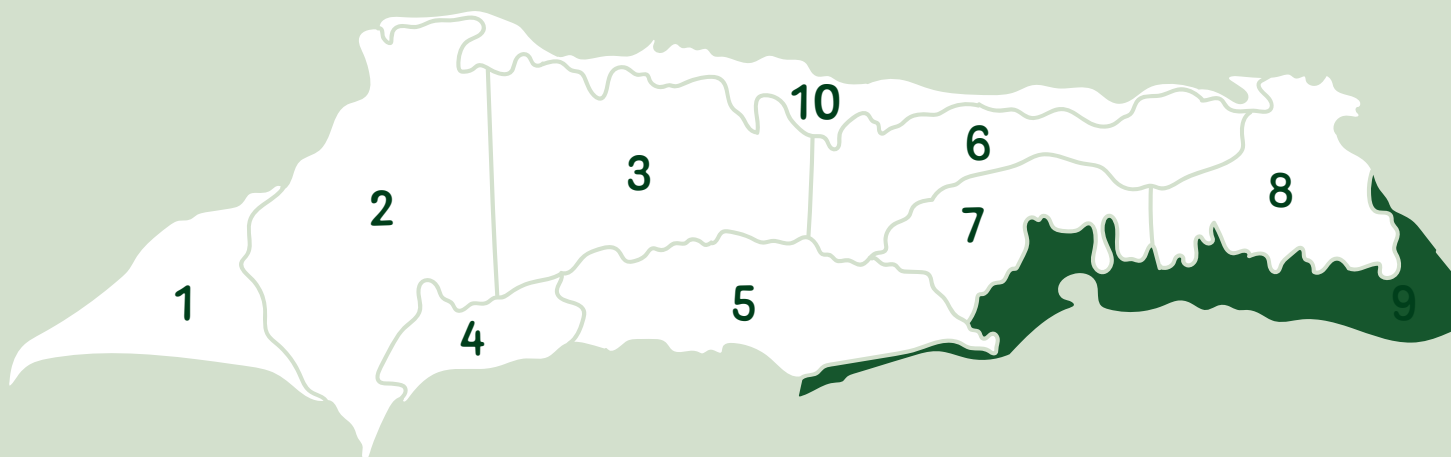
MANAGEMENT UNIT 8



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Morning glory vine control	<p>Removal of vines on northern side of the unit is the first priority.</p> <p>Removal of vines in southern or central areas to be undertaken once the northern side has been completed.</p> <p>Vines are to be treated manually or using cut and paint techniques with an appropriate herbicide to prevent re-sprouting.</p> <p>TARGET: • Cover of morning glory vines reduced by 20%.</p>	2	After Next
Priority preventative weed control	<p>Targeted removal of highly invasive species to avoid establishment and spread of populations.</p> <p>TARGET: • Cover of coral berry across management unit reduced by 50%.</p>	3	After Next
Guinea grass control	<p>Guinea grass control trial, including to create a buffer around native grassland and other native remnants.</p> <p>TARGET: • 100% of isolated patches of Guinea grass removed.</p>	1	Now

4.9 MANAGEMENT UNIT 9

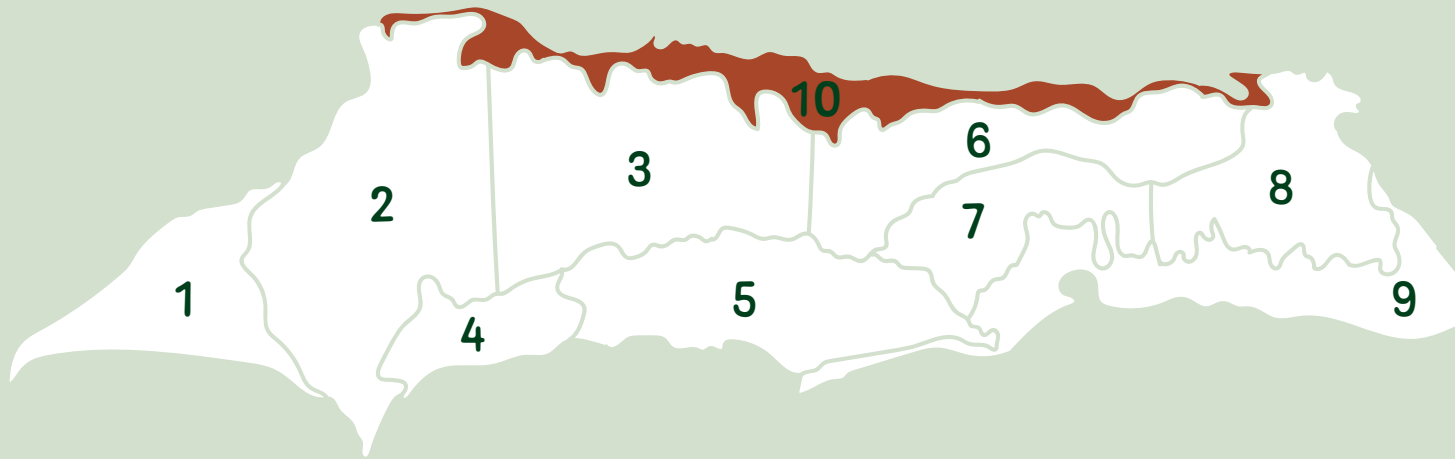
MANAGEMENT UNIT 9



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Guinea grass control	Implementation of a buffer between Guinea grass edge and sensitive vegetation where possible TARGET: • 10m buffer zones around sensitive vegetation communities implemented across >60% of the management unit.	2	After Next
Guinea grass control	Control Guinea grass around native grassland remnants to reduce encroachment. TARGET: • Guinea grass does not reduce the area of native grassland identified on Bajjigal.	1	Next

4.10 ···· MANAGEMENT UNIT 10

MANAGEMENT UNIT 1



ACTIVITY	DESCRIPTION OF WORKS	PRIORITY WITHIN MU	TIMING
Guinea grass control	Implementation of a buffer between Guinea grass edge and sensitive vegetation where possible. TARGET: • 10m buffer zones around sensitive vegetation communities implemented across >60% of the management unit.	2	After Next
Guinea grass control	Control Guinea grass around native grassland remnants to reduce encroachment. TARGET: • Guinea grass does not reduce the area of native grassland identified on Bajigal.	1	After Next



REEF
AUTHORITY



5

REFERENCES

- Baucom, R. S. and Mauricio, R., 2004. Fitness costs and benefits of novel herbicide tolerance in a noxious weed. *Proceedings of the National Academy of Sciences*, 101 (36), 13386–13390.
- Breed, M.F., Stead, M.G., Ottewell, K.M., Gardner, M.G. and Lowe, A.J., 2013. Which provenance and where? Seed sourcing strategies for revegetation in a changing environment. *Conservation Genetics*, 14, pp.1-10.
- Brooks, S. J. and Galway, K. E., 2006. Progress towards the eradication of two tropical weeds. In: *Proceedings of the 15th Australian Weeds Conference*. Presented at the Weed Society of South Australia, Adelaide: eds. C. Preston, J. Watts & N. D. Crossman.
- Bureau of Meteorology. 2019. Changes to Fire Weather in Queensland: a report from the Australian Bureau of Meteorology, prepared for Queensland Fire and Emergency Services. Melbourne, Australia.
- Camarero, P., 2019. Exotic vine invasions following cyclone disturbance in Australian Wet Tropics rainforests: A review. *Austral Ecology*, 44 (8), 1359–1372.
- Centre for Invasive Species Solutions (CISS), 2024a, *WeedsAustralia Profile database – Mossman river grass*, accessed 4 October 2024.
- Centre for Invasive Species Solutions (CISS), 2024b, *WeedsAustralia Profile database – Mossman river grass*, accessed 4 October 2024.
- Crowe K, Parker W (2008) Using portfolio theory to guide reforestation and restoration under climate change scenarios. *Clim Change* 89:355–370.
- D’Antonio C, Vitousek PM, 1992, *Biological invasions by exotic grasses, the grass/fire cycle and global change*, *Annu. Rev. Ecol. Syst* 23: 63-87.
- Epong J, 2024, Personal communication, Management Options Planning workshop, Kurrimine, Queensland.
- Fell D, 2024, Diagram of potential changes in vegetation structure, Kurrimine, Queensland.
- Fletcher, M.-S., Cadd, H. R., Mariani, M., Hall, T. L., & Wood, S. W. (2020). The role of species composition in the emergence of alternate vegetation states in a temperate rainforest system. *Landscape Ecology*, 35, 2275–2285.
- Goosem, S. & Tucker, N.I.J. (2013). *Repairing the Rainforest (second edition)*. Wet Tropics Management Authority and Biotropica Australia Pty. Ltd. Cairns.
- Hilbert D. W. (2010) *Threats to Ecosystems In The Wet Tropics Due to Climate Change And Implications For Management*. CSIRO *Climate Adaptation Flagship*, Canberra.
- Hilbert, D.W., Hill, R., Moran, C., Turton, S.M., Bohnet, I., Marshall, N.A., Pert, P.L., Stoeckl, N., Murphy, H.T., Reside, A.E. and Laurance, S.G., (2014). Climate change issues and impacts in the Wet Tropics NRM cluster region. *James Cook University*, Cairns.
- Knutson, T., Camargo, S.J., Chan, J.C., Emanuel, K., Ho, C.H., Kossin, J., Mohapatra, M., Satoh, M., Sugi, M., Walsh, K. and Wu, L., 2020. Tropical cyclones and climate change assessment: Part II: Projected response to anthropogenic warming. *Bulletin of the American Meteorological Society*, 101(3), pp.E303-E322.
- Lin, B, Melbourne-Thomas, J, Hopkins, M, Hill, R, Sheppard, M, Meyers, J, Thomas, L, Visschers, L, Dunlop, M, McNeair, B, Syme, L, Grant, C, Pedrocchi, N, Oakley, P, Stevens, A, Rose, D, Rose, E, Gould, J, Locke, J, & Maybanks, L. (2022), *Climate change toolkit for World Heritage properties in Australia: handbook for property managers*, Department of Climate Change, Energy, the Environment and Water, Canberra.
- Lopes, C., Firth, C. and Laurance, S.G., 2024. Occupancy of urban roosts by spectacled flying-foxes (*Pteropus conspicillatus*) is not affected by diurnal microclimate. *Austral Ecology*, 49(2), p.e13487
- Lynch AJ, Thompson LM, Morton JM, Beever EA, Clifford M, Limpinsel D, Magill RM,

Magness DR, Melvin TA, Newman RA, Porath MT, Rahel FJ, Reynolds JH, Schuurman GW, Sethi SA, Wilkening JL, 2022, RAD Adaptive Management for Transforming Ecosystems, *BioScience* 72(1): p45-56.

Mandubarra Aboriginal Land and Sea Incorporated (2024), *Mandubarra Sea Country Cultural Values 2nd Edition*, Kurrimine Beach.

McKechnie, A.E. and Wolf, B.O., (2019). The physiology of heat tolerance in small endotherms. *Physiology*, 34(5), pp.302-313.

Mentzel, S., Nathan, R., Noyes, P., Brix, K.V., Moe, S.J., Rohr, J.R., Verheyen, J., Van den Brink, P.J. and Stauber, J. 2024. Evaluating the effects of climate change and chemical, physical, and biological stressors on nearshore coral reefs: A case study in the Great Barrier Reef, Australia. *Integr Environ Assess Manag*, 20: 401-418.

Murphy, H. T., Metcalfe, D. J., Bradford, M. G., Ford, A. F., Galway, K. E., Sydes, T. A. and Westcott, D. J., 2008. Recruitment dynamics of invasive species in rainforest habitats following Cyclone Larry. *Austral Ecology*, 33 (4), 495–502.

Ooi, M. K. J., Auld, T. D., & Denham, A. J. (2012). Projected soil temperature increase and seed dormancy response along an altitudinal gradient: Implications for seed bank persistence under climate change. *Plant and Soil*, 353, 289–303.

Sgrò CM, Lowe AJ, Hoffmann AA (2011) Building evolutionary resilience for conserving biodiversity under climate change. *Evol Appl* 4:326–337.

Soti P, Thomas V, 2022, *Review of the invasive forage grass, Guinea grass (Megathyrus maximus): Ecology and potential impacts in arid and semi-arid regions*, *Weed Research*, 62(1), p68-74.

Standards Reference Group SERA (2021) *National Standards for the Practice of Ecological Restoration in Australia*. Edition 2.2. Society for Ecological Restoration Australasia. Available from URL: www.seraustralasia.org

Thorogood R, Mustonen V, Aleixo A, Aphalo PJ, Asiegbu FO, Cabeza M, Cairns J, Candolin U, Cardoso P, Eronen JT, Hällfors M, Hovatta I, Juslén A, Kovalchuk A, Kulmuni J, Kuula L, Mäkipää R, Ovaskainen O, Pesonen A, Primmer CR, Saastamoinen M, Schulman AH, Schulma L, Strona G, Varnhatalo J, 2023, *Understanding and applying biological resilience, from genes to ecosystems*, *npj biodiversity* 2, 16.

Trancoso, R., Syktus, J., Toombs, N., Ahrens, D., Wong, K.K.H. and Dalla Pozza, R., 2020. Heatwaves intensification in Australia: A consistent trajectory across past, present and future. *Science of the total environment*, 742, p.140521.

Turner, M. and Batianoff, G.N, 2007, *Vulnerability of island flora and fauna in the Great Barrier Reef to climate change*. In: Johnson, Johanna E., and Marshall, Paul A., (eds.) *Climate Change and the Great Barrier Reef: a vulnerability assessment*. Great Barrier Reef Marine Park Authority and Australian Greenhouse Office, Townsville, QLD, Australia, 667-716.

Wallace, J. and McJannet, D., 2012. Climate change impacts on the water balance of coastal and montane rainforests in northern Queensland, Australia. *Journal of hydrology*, 475, pp.84-96.

Welbergen, J.A., Klose, S.M., Markus, N. and Eby, P., (2008). Climate change and the effects of temperature extremes on Australian flying-foxes. *Proceedings of the Royal Society B: Biological Sciences*, 275(1633), pp.419-425.

Zhang, L. Y., Ye, W. H., Cao, H. L. and Feng, H. L., 2004. *Mikania micrantha* H. B. K. in China – an overview. *Weed Research*, 44 (1), 42–49.







RESTORATION OF REEF ISLANDS PROJECT

BAJIGAL HABITAT RESTORATION PLAN

