



Groote Archipelago Threatened Species Management Plan 2019-2028

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Contents

Foreword	iii
A message from Traditional Owners.....	1
1 Background.....	2
2 Introduction	3
3 Vision	3
4 Scope	3
5 Approach.....	5
6 Threatened Species in the Groote archipelago.....	6
7 Threatened Species Management Goals	8
8 Threats	8
9 Objectives for addressing threats	11
Major actions and measures of success for delivery of the plan.....	12
10.1 Cane toads.....	12
10.2 Cats.....	12
10.3 Fire.....	12
10.4 Introduced livestock.....	13
10.5 Weeds	13
10.6 Myrtle Rust.....	13
10.7 Invasive Ants	14
10.8 Habitat disturbance.....	14
10.9 Threatened species knowledge gaps.....	14
10.10 Monitoring and evaluation	14
10.11 Governance and operations.....	15
11 Timeframe	15
12 Resources	15
13 Monitoring and Evaluation.....	15
14 Governance.....	15
15 Bibliography (Inclusive of references cited in appendices)	16
Appendix I. Threatened Species Profiles.....	19
Brush-tailed rabbit-rat (<i>Conilurus penicillatus</i>).....	19
Northern Hopping Mouse (<i>Notomys aquilo</i>).....	20
Pale field rat (<i>Rattus tunneyi</i>).....	21
Northern quoll (<i>Dasyurus hallucatus</i>)	22
Ghost bat (<i>Macroderma gigas</i>)	23
Masked owl (<i>Tyto novaehollandiae kimberli</i>).....	24
Mertens' water monitor (<i>Varanus mertensi</i>).....	25
Floodplain monitor (<i>Varanus panoptes</i>)	26

Appendix II. Known Threats to Threatened Fauna on the Groote archipelago	27
Habitat Loss and Disturbance.....	27
Inappropriate fire regimes	27
Feral Cats.....	30
Cane toads (<i>Rhinella marinus</i>)	31
Introduced pigs and feral herbivores	32
Weeds	32
Appendix III. Potential Threats to Threatened Fauna and other species on the Groote Archipelago.....	36
Invasive ants.....	36
Introduced rodents	36
Feral/roaming dogs.....	36
Introduced fish	37
Myrtle rust.....	37
Importation of horticultural plants	37
Feral animal baiting.....	37
Appendix IV. Threat rating details for each threatened species.....	38
Brush-tailed rabbit-rat	38
Northern Hopping Mouse.....	39
Pale field rat.....	39
Northern quoll.....	40
Ghost bat.....	40
Masked owl.....	41
Mertens' water monitor	41
Floodplain monitor	41
Appendix V. Action Plan	42
1. Cane toads.....	43
2. Cats.....	44
3. Fire.....	48
4. Introduced Livestock.....	50
5. Weeds	52
6. Myrtle Rust	54
7. Invasive ants	56
8. Habitat disturbance.....	58
9. Knowledge gaps.....	60
10. Monitoring and evaluation.....	62
11. Governance and operations.....	63

Foreword

Australia is host to thousands of remarkable islands each representing a unique regional example of our diverse natural and cultural heritage. Disconnected from the mainland, these natural arks can act as safe havens for the species that inhabit them. The Anindilyakwa Indigenous Protected Area (IPA) on the Groote Archipelago is one such special place. The islands and their surrounding waters are home to a rich array of native species and a history of Indigenous culture, tradition, and management practices dating back thousands of years.

Many changes have come to the islands since European settlement including intensified human activity and resource manipulation and the introduction of threats such as feral cats, weeds, and altered fire regimes. The future of Archipelago's native species and natural resources are now more than ever tied to the effective management of them.

The 'Groote Archipelago Threatened Species Management Plan' has been developed with support from the Northern Territory Government and the Australian Government. The planning process included close consultation with traditional owners and the local community that culminated with an extensive stakeholder workshop held on Groote Eylandt in October 2017. The Plan draws on traditional ecological knowledge and the best available science to provide a road map for the coordinated management of the island's terrestrial threatened species and the habitats they depend upon.

The Plan identifies key actions to reduce threats and support conditions for threatened species recovery. Many of the priority actions in the plan are directly targeted toward the needs of individual species like the Northern Hopping-mouse, Brush-tailed Rabbit-rat and Masked Owl. It will serve as an invaluable resource for Indigenous Rangers and other managers to help guide decision making and actions to preserve the Groote Archipelago as an important refuge for Northern Australian threatened species into the future.

Dr Sally Box
Threatened Species Commissioner

A message from Traditional Owners

We, the Traditional Owners of the land and sea of the Groote Archipelago, are determined to manage our country and to pass it on to our children and grandchildren in good condition so that it supports their lives and their spirits into the future.

Our country has been declared an Indigenous Protected Area, and we understand it needs to be managed carefully if it is to sustain our future. This includes careful management of the animals that live on it. Our country supports many different animals, including some species that have declined on mainland Australia and that need special protection here.

This Threatened Species Management Plan was developed with our input to help us look after these animals, in partnership with Government and other organisations. It will also help to raise awareness amongst our community about these species, the threats they face, and what we as Traditional Owners can do to help ensure they survive for future generations.



Tony Wurramarrba, Chairman, ALC Board



Phillip Mamarika, Senior Ranger



Jennifer Yantarrnga, Senior Ranger



Jocelyn Yantarrnga, Senior Ranger

1 Background

Groote Eylandt, along with its 40 satellite islands, is located in the Gulf of Carpentaria, approximately 650km south-east of Darwin and 50km from the Arnhem Land Coast. The archipelago has exceptionally high conservation values, and provides critical island refugia for many species. The archipelago contains at least 900 plant and 330 vertebrate species (excluding marine fish), of which twelve are considered threatened (Morris et al. 2018). It supports most of the world population of the northern hopping mouse *Notomys aquilo*, and is a key refuge for the northern quoll *Dasyurus hallucatus* and the brush-tailed rabbit rat *Conilurus penicillatus* (Woinarski et al. 2007). The archipelago supports important breeding areas for four threatened marine turtle species, foraging habitat for migratory shorebirds including at least four threatened species (two of which are listed as critically endangered), and rookeries for marine birds (Morris et al. 2018).

The Traditional Owners of the Groote archipelago are an amalgamation of two cultures, the Warnindilyakwa and the Nunggubuyu. The Traditional Owners are made up of 14 clan groups. Both cultures speak Anindilyakwa as their first language, and the land, people and culture are referred to by this term. The Anindilyakwa Land Council (ALC) represents the Traditional Owners of the Groote archipelago. The ALC promotes the wishes and opinions of the Anindilyakwa people relating to the management of the land in the Groote archipelago region. Their function is to protect the interests of the Traditional Owners, assist in the protection of sacred sites, to consult with the Traditional Owners on matters relating to the use of land, to assist the Traditional Owners in carrying out commercial activities and to supervise and provide administrative assistance for Land Trusts holding Indigenous land.

An Indigenous Protected Area has been declared over the land and sea of the archipelago. Indigenous Protected Areas (IPAs) are areas of land and sea country owned or managed by Indigenous groups, which are voluntarily managed as a protected area for biodiversity conservation through an agreement with the Australian Government. They are recognised by the Australian Government as an important part of the National Reserve System. The Anindilyakwa IPA was declared in 2006. The Anindilyakwa Land and Sea Rangers, who operate under the ALC, are responsible for overseeing the delivery of the IPA Plan of Management.

There is a large manganese mine and associated port and settlement on the west coast of Groote Eylandt, run by the Groote Eylandt Mining Company (GEMCO). The mine has been operating since 1964 and has been a significant driver of economic and infrastructure development. GEMCO has approved mining leases that cover approximately 50km² on the west coast of Groote Eylandt. The company is presently assessing the potential for exploration (and possibly mining) in the southern area of the island. In addition to Indigenous land uses and mining, tourism and recreational and commercial fishing occur in the IPA.

Many of the threatening processes operating across northern Australia are absent from, or at low levels across the Groote archipelago. The archipelago remains largely undisturbed and has no established agriculture, it is free of cane toads, has no large introduced herbivore or pig populations, and retains a relatively benign fire regime (Appendix II). These conditions have enabled threatened species that have otherwise suffered extensive declines throughout their ranges to persist. However, the archipelago is not immune – the danger of cane toad establishment persists, and feral cats that are present on Groote Eylandt pose a serious threat. Indeed, there is evidence that some species, such as the northern hopping mouse and brush-tailed rabbit-rat, may be declining (Heiniger and Gillespie 2017; GEMCO unpublished data). The manganese mine on Groote Eylandt imposes impacts on some threatened species, but also provides an opportunity to build capacity to address threats and to support sound conservation management across the archipelago.

2 Introduction

In response to the increasing pressures on threatened species on the Groote archipelago and their plight across northern Australia generally, the ALC and the Northern Territory (NT) Government have recognised the need for a strategic planning approach to address key threats to its biodiversity assets. This Threatened Species Management Plan has been developed with assistance from the NT Government, the federal Department of Environment and Energy and other stakeholders, to enable the ALC to tackle existing and emerging threats to terrestrial fauna and their habitats across the archipelago. This plan is the culmination of surveys and research on the archipelago, and a workshop convened on Groote Eylandt in October 2017 by the ALC with the NT Government to draw on both Indigenous and non-Indigenous knowledge and expertise on threatened species and threatening processes and how best to respond to them. The plan also builds from knowledge acquired through extensive surveys and research undertaken across northern Australia on various threatened species occurring on Groote Eylandt and the threatening processes they face.

Land and sea management across the Groote archipelago are currently guided by the Anindilyakwa IPA Plan of Management (ALC 2016). Indigenous rangers based at Umbakumba and Angurugu undertake a range of management activities, including removal of ghost nets and other marine debris; collaborative biodiversity surveys and research with scientists from the NT Department of Environment and Natural Resources, Australian Institute of Marine Science, and various universities; weed control; promoting cane toad awareness and other biosecurity activities. Rehabilitation of areas affected by mining operations is undertaken by GEMCO and guided by the mine's rehabilitation program.

This Threatened Species Management Plan is intended to complement the IPA Plan of Management. It provides direction for building on the existing capacity and management activities already being undertaken, and explicitly identifies priorities and actions needed to reduce threats to terrestrial threatened species across the IPA.

It is anticipated that biodiversity offsets resulting from the approved development of GEMCO's Eastern Leases tenements (ML31219 and ML31220) will provide significant support towards the implementation of this Plan in collaboration with the ALC and the NT and Federal Governments in the coming years.

3 Vision

The vision for this plan is to ensure that all species on the Groote archipelago are secure for all future generations, through careful and effective management.

4 Scope

This plan focusses on terrestrial threatened fauna species occurring across the Groote archipelago, and addresses the processes that threaten them. It maps out management, research and monitoring actions for the next ten financial years (FC 2019/20 to 2028/29). The Groote Archipelago also provides important habitat for populations of several threatened marine turtles and shore birds; however, the key threats facing these species are largely extraneous to the management of Groote Eylandt and are best addressed through broader regional policy and planning instruments.

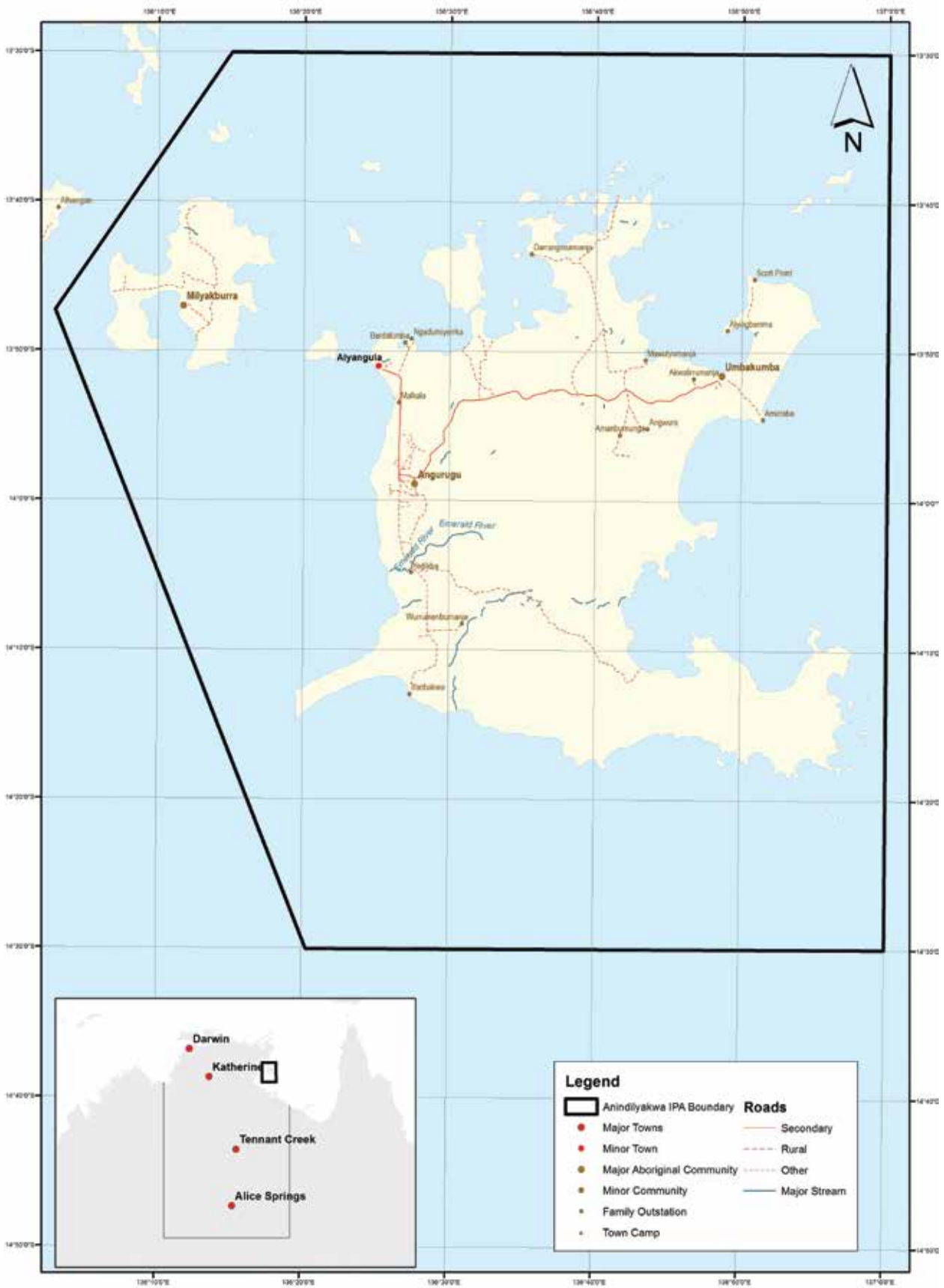


Figure 1. Groote Eylandt Archipelago

5 Approach

The Plan has been developed as follows:

1. Knowledge of threatened species was acquired.
 - Information from previous surveys and research on threatened species and threatening processes operating on Groote Eylandt and elsewhere across northern Australia was compiled, and knowledge gaps identified.
 - Further targeted research was undertaken to address critical knowledge gaps in status of selected threatened species (Heiniger and Gillespie 2017).
 - A detailed vegetation map for the Groote archipelago was prepared that provides a basis for well-informed habitat management, monitoring and future research (Flora and Fauna Division 2018).
2. Threats to terrestrial biodiversity assets were evaluated.
 - Information was compiled from the Groote archipelago and elsewhere across northern Australia on risks and impacts of known and plausible threatening processes.
 - Research on the status of feral cats and some key aspects of feasibility of management was undertaken on Groote Eylandt.
 - Preliminary fire regime mapping was undertaken.
 - Pathways and risk assessment of cane toad incursions has been undertaken by GEMCO as part of their preparation of a cane toad management plan.
 - A weed register was compiled and a risk assessment of weeds undertaken by the ALC with input from the Weeds Branch, Department of Environment and Natural Resources.
3. All partners and stakeholders were invited to a workshop on Groote Eylandt in October 2017 to compile both Indigenous and non-Indigenous knowledge and expertise on threatened species and threatening processes, and scope how best to manage them.
 - Goals for each threatened species in the IPA were identified.
 - Threatening processes were evaluated for each threatened species for their scope, severity and irreversibility, and 'key' threatening processes identified.
 - Objectives for all key threatening processes were identified.
 - Strategies were then developed to meet these objectives and their relative effectiveness evaluated.
 - Knowledge gaps critical to understanding the conservation and ecological requirements of threatened species, the nature of threats and how to address them, were identified.
 - Actions, milestones and measures of success were developed for each strategy.

This information was then synthesised to compile the Plan. The Plan focusses on management actions that are most likely to ameliorate impacts from key threats and identifies priorities for implementation. It also identifies critical knowledge gaps that need to be addressed in order to improve effectiveness, monitoring requirements to evaluate performance and report on progress, and potential funding sources. The draft plan was prepared and circulated for comment to all partners and stakeholders in March 2018. The final Plan was approved and adopted by the ALC in March 2019.

The Plan is structured as follows:

- Summary information on the threatened species occurring on the Groote archipelago and their current status (detailed descriptions of each species and key threats are presented in Appendix I).
- Overall management goals identified for each species over the duration of this Plan.
- Overview of key threatening processes operating or potentially operating on threatened species on the Groote archipelago (detailed descriptions of threats are presented in Appendices II - IV).
- Summary of objectives identified to address key threats.
- Overview of the major actions identified to achieve these objectives.

A detailed schedule of all actions required to achieve each objective is provided in Appendix V. The Action Plan in Appendix V is a working supplement to the Plan that should be reviewed and revised annually.

6. Threatened Species in the Groote archipelago

Eight terrestrial vertebrate species occurring in the Groote archipelago are currently listed as threatened under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999) and/or the Territory Parks and Wildlife Conservation Act 2014 (Table 1). Descriptions of each species and information about their occurrence in the Groote archipelago are provided in Appendix I.

These species have undergone discernible declines throughout other parts of their ranges in Australia. Relatively healthy populations of the northern quoll and Mertens' monitor persist on Groote Eylandt, but have undergone dramatic declines on the mainland from cane toad poisoning. The floodplain monitor has also suffered severe declines on the mainland due to cane toad poisoning but its population status on Groote Eylandt is unclear. Populations of the northern hopping mouse and brush-tailed rabbit-rat occur on Groote Eylandt but these species may be declining and the status of the pale field rat is in doubt. Populations of the masked owl, and ghost bat appear healthier in the Groote archipelago than those on the mainland; however, their conservation status is poorly known and these species may not be secure.

Table 1. Conservation status of threatened species on the Groote archipelago and assessment of their local population condition with respect to available information on population size, distribution and trends. Anindilyakwa names in parentheses

Species	Conservation Status		Status/condition on Groote
	National	Northern Territory	
Brush-tailed rabbit-rat (Wurrendinda) <i>Conilurus penicillatus</i>	Vulnerable	Endangered	Fair
Northern Hopping Mouse (Wurrendinda) <i>Notomys aquilo</i>	Vulnerable	Vulnerable	Poor
Pale field rat (Wurrendinda) <i>Rattus tunneyi</i>	Vulnerable	Not-listed	Unknown
Northern quoll (Yiniyerruwena) <i>Dasyurus hallucatus</i>	Endangered	Critically endangered	Very good
Ghost bat (Yiningumambalba) <i>Macroderma gigas</i>	Vulnerable	Near-threatened	Unknown
Masked owl (Warnikijjungw) <i>Tyto novaehollandiae kimberli</i>	Vulnerable	Vulnerable	Fair
Merten's water monitor (Dubulkuma) <i>Varanus mertensi</i>	Vulnerable	Not listed	Fair
Floodplain monitor (Yaraja) <i>Varanus panoptes</i>	Vulnerable	Not listed	Unknown

In addition to the listed threatened species above, the Groote archipelago is home to endemic species such as the recently discovered Groote Eylandt marbled gecko (*Oedura* sp.) (Fig. 2).

Groote Eylandt also supports important healthy populations of other species that have declined or are less common on the mainland, such as Wilkins' rock wallaby (*Petrogale wilkinsi*) (Fig. 3), the rock ringtail possum (*Petroseudes dahli*) (Fig. 4) and savannah glider (*Petaurus breviceps ariel*) (Fig. 5). Populations of Wilkins' rock wallaby on Groote Eylandt are distinctive from those on the mainland and research is currently underway to determine if they are a distinct, locally endemic species. If threats are not carefully managed some of these species may become threatened on the Groote archipelago in the future.



Figure 2. Grootie Marbled gecko (*Oedura* sp.) endemic to Grootie Eylandt (Photo: Graeme Gillespie).



Figure 3. Wilkins' rock wallaby (*Petrogale wilkinsi*) with joey from Grootie Eylandt. Likely to be described as a separate endemic species (Photo: Dave Webb).



Figure 4. Rock Ringtail Possum (*Petroseudes dahl*) (Photo: Dave Webb).



Figure 5. Savanna Glider (*Petaurus breviceps ariel*) (Photo: Dave Webb).

7 Threatened Species Management Goals

Overall goals for threatened species management fall into three categories: Recover, Maintain and Ascertain (Table 2), based upon current assessment of status and condition of species' populations and distribution trends on Groote Eylandt. These goals are designed to provide direction for identifying management priorities and addressing important knowledge gaps.

Table 2. Threatened species goals

Goal	Species	Measure of success
Recover Improve viability of populations on Groote Eylandt in five years	Brush-tailed rabbit-rat Northern hopping mouse	Statistically measurable increase in five years in occupancy from baseline established in 2016-2018 camera trap surveys, using appropriate survey methods (e.g. well-designed camera trap surveys).
Maintain Maintain a stable population at 2017 densities or occupancies across current range	Northern quoll	No decline in occupancy or extent of occurrence in five years, based on appropriate survey methods (e.g. well-designed camera trap surveys).
Ascertain Acquire a baseline for the population and evaluate status within two years.	Pale field rat Ghost bat Masked owl Floodplain monitor Mertens' water monitor	Distribution and population status of pale field rat and masked owl ascertained. Location(s) of ghost bat roost and maternity sites ascertained with no decline in occupancy. Baseline information on population status of monitors ascertained.

8 Threats

Several threatening processes operate in the Groote archipelago or pose a real risk of establishing if not managed properly (Table 3). These processes have contributed to declines of one or more of the threatened species that occur in the Groote archipelago, either elsewhere in those species ranges or on Groote Eylandt. Detailed accounts of each process are provided in Appendix II. A suite of other threatening processes either occur in the Groote archipelago, or could potentially occur in the future, that may adversely affect threatened species. If not managed properly these processes could also increase the number of species across the Groote archipelago that are considered threatened (Table 3). Detailed accounts of each threatening process are provided in Appendix II. All threats were evaluated for their scope, severity and irreversibility for each threatened species, summarised in Table 4. See Appendix V for detailed threat ratings for each species.

Table 3. Threats to threatened species on Groote and their mechanisms of impact. Known threats are those processes that have demonstrably adversely impacted threatened species, or increased the risk of species becoming threatened, either in the Groote archipelago or elsewhere in species' ranges. Potential threats are those that as yet have not demonstrably contributed significantly to increased risk of threatened species in the IPA or elsewhere in species' ranges, but have the potential to do so if not managed appropriately. Key threatening processes listed under the EPBC Act (1999) are identified.

Threats	Listed key threatening process (EPBC Act 1999)	Known/potential	Current situation in the Groote archipelago	Impacts
Habitat clearing and mining	Land clearance listed	Known	Present	Habitat loss, population reduction
Minor habitat clearance/alteration	Land clearance listed	Known	Present	Habitat loss, population reduction
Inappropriate fire regimes		Known	Emerging	Habitat degradation, productivity loss, increased predation
Predation by feral cats	Listed	Known	Present	Predation, potential spread of disease
Poisoning by cane toads	Listed	Known	Detected, but not established	Poisoning of predators
Feral herbivore populations	Unmanaged goats listed	Known	Only rusa deer on North East Isle	Habitat degradation, productivity loss, increased competition
Feral pig populations	Listed	Known	Emerging; individuals detected, but not established	Habitat degradation, productivity loss, increased competition and predation
Transforming weeds		Known	Emerging	Habitat degradation; productivity loss; deterioration of fire regimes
Invasive ants	Some species listed	Potential	Present	Competition; predation; habitat degradation
Introduced rodents	Listed	Potential	Present	Competition; predation; spread of disease
Roaming dogs		Potential	Present	Predation; competition with dingoes; disease spread
Introduced fish		Potential	Absent	Predation, competition, habitat degradation
Myrtle rust		Known	Recently detected	Habitat degradation; population reduction
Importation of horticultural plants	Escaped garden plants	Known	Present	Increased weeds, increased risk of cane toads and other invasive species
Feral animal baiting		Potential	Absent	Non-target species population reduction

Table 4. Summary of threat ratings for each threatened species. Summary ratings are the products of the scope, severity and irreversibility assessed for each threat to each species. Details of threat ratings for each species are presented in Appendix IV.

Threats	Masked owl	Northern Hopping Mouse	Ghost bat	Merten's water monitor	Floodplain monitor	Brush-tailed rabbit-rat	Northern quoll	Pale field rat	Summary Threat Rating
Poisoning by cane toads	●	●	●	●	●	●	●	●	●
Predation by feral cats	●	●	●	●	●	●	●	●	●
Weed invasion	●	●	●	●	●	●	●	●	●
Inappropriate fire regimes	●	●	●	●	●	●	●	●	●
Feral herbivores (deer / buffalo)	●	●	●	●	●	●	●	●	●
Potential invasive species (ants, myrtle rust)	●	●	●	●	●	●	●	●	●
Introduced rodents	●	●	●	●	●	●	●	●	●
Pigs	●	●	●	●	●	●	●	●	●
Major habitat loss/alteration	●	●	●	●	●	●	●	●	●
Minor habitat disturbance/alteration	●	●	●	●	●	●	●	●	●
Predation by feral/roaming dogs	●	●	●	●	●	●	●	●	●
Baiting	●	●	●	●	●	●	●	●	●
Summary threat rating for each species	●	●	●	●	●	●	●	●	

Threat level	
Very high	●
High	●
Medium	●
Low	●

9 Objectives for addressing threats

Based upon threat ratings and feasibility of successful implementation, the following key management objectives are identified for achieving threatened species goals across the Groote archipelago:

- Poisoning by cane toads: Prevent establishment of cane toads.
- Predation by feral cats: Reduce impact of feral cats
- Inappropriate fire regimes: Develop and implement a fire management regime that optimises outcomes for threatened species.
- Feral herbivores: Prevent establishment of buffalos, donkeys, horses and goats. Contain the existing population of deer; prevent establishment of additional populations.
- Pigs: Prevent establishment of pigs.
- Weed invasion: Contain existing priority weeds and prevent introduction of new weed species.
- Habitat clearing and disturbance: Minimise clearing and disturbance of threatened species habitats.
- Potential invasive species: Contain myrtle rust and invasive ant species.

Actions have been developed to:

- Best meet each of these objectives;
- address key knowledge gaps about threatened species;
- monitor and evaluate performance; and
- ensure effective governance of the Plan.

Priority will be given to the most effective actions (Table 5). Plausible actions considered to have limited or no impact and/or poor feasibility are considered ineffective, whereas actions likely to have a large impact that are relatively feasible are considered highly effective.

Table 5. The likely effectiveness of each action based upon potential to meet the threatened species goals and feasibility of successful implementation.

	Not (currently) Feasible	Feasibility Low	Feasibility	Merten's water monitor
High Impact	NE	E	HE	HE
Moderate Impact	NE	NE	E	HE
Limited Impact	NE	NE	LE	LE
No Impact	NE	NE	NE	NE

Effectiveness							
not effective	NE	less effective	LE	effective	E	highly effective	HE

Major actions and measures of success for delivery of the plan

The following outlines the major actions identified to achieve each key management objective, along with their relative effectiveness and measures of success HE – highly effective; E- effective; LE- less effective; NE – not effective.

A more detailed Action Plan is provided in Appendix V. The Action Plan in Appendix V is a working supplement to the Plan that should be reviewed and revised annually.

10.1 Cane toads

Actions and milestones	Rating
1.1 Develop a management plan to keep Groote Eylandt cane toad-free	HE
1.2 Develop management plans to keep Bickerton and Winchelsea Islands cane toad-free	HE
Measure of success	
No cane toads established in the Groote Archipelago	

10.2 Cats

Actions and milestones	Rating
2.1 Reduce the numbers and impact of cats in communities and industrial areas across the Groote archipelago.	E
2.2 Eradicate cats on Groote Eylandt	NE
2.3 Explore establishment of (fenced) cat-free areas within Groote Eylandt	LE
2.4 Suppress feral cat density in large-scale important threatened species habitats	E
2.5 Evaluate the efficacy and application options of Grooming Traps to support activities to reduce impacts of cats on threatened species on Groote	LE
2.6 Improve understanding of relationships between cat population density, predation impact on threatened species, and other environmental factors, such as fire and habitat disturbance	E
Measure of success	
Impact of feral cats on threatened species is measurably reduced	

10.3 Fire

Actions and milestones	Rating
3.1 Develop and implement a Fire Management Plan	HE
3.2 Improve understanding of fire regimes and management	HE
Measure of success	
Fire regimes are implemented that optimise outcomes for threatened species	

10.4 Introduced livestock

Actions and milestones	Rating
4.1 Improve community understanding and appreciation of the threats posed by introduced livestock	E
4.2 Prevent further incursions	E
4.3 Acquire capability to respond to, and remove incursions	E
Measure of success	
No pigs or feral herbivores on Groote	
No movement of rusa deer to Groote or other islands	

10.5 Weeds

Actions and milestones	Rating
5.1 Develop an integrated Weed Management Plan for the Groote Archipelago	E
5.2 Update priorities and plans through maintaining shared information, planning and reporting systems	E
Measure of success	
Impacts of current weeds in the archipelago minimised	
Further weed incursions are prevented	

10.6 Myrtle Rust

Actions and milestones	Rating
6.1 Develop a Myrtle Rust Management Plan for the Groote Archipelago	E
6.2 Update priorities and plans through maintaining shared information, planning and reporting systems	E
Measure of success	
Impacts of myrtle rust in the archipelago minimised	
Further incursions are prevented	

10.7 Invasive Ants

Actions and milestones	Rating
6.1 Develop an invasive ant Management Response Plan for the Groote Archipelago	E
6.2 Update priorities and plans through maintaining shared information, planning and reporting systems	E
Measure of success	
Impacts of invasive ants in the archipelago minimised	
Further incursions are prevented	

10.8 Habitat disturbance

Actions and milestones	Rating
8.1 Minimise further disturbance of threatened species habitat	HE
8.2 Reduce impacts of existing habitat disturbance on threatened species	LE
Measure of success	
Habitat disturbance impacts on threatened species across the archipelago are minimised	

10.9 Threatened species knowledge gaps

Actions and milestones	Rating
9.1 Address knowledge gaps in population status, distributions and habitat associations and ecological requirements of threatened species	E
9.2 Improve understanding of impacts of key threatening processes in the IPA and how to manage them effectively	E
9.3 Resolve conservation status of other potentially threatened taxa in the IPA	LE
Measure of success	
Knowledge of population status and ecology of threatened species is adequate to inform effective management	

10.10 Monitoring and evaluation

Actions and milestones	Rating
10.1 Evaluate responses of threatened species to management	E
Measure of success	
Information on trends in threatened species adequate to evaluate performance of the management plan	

10.11 Governance and operations

Actions and milestones	Rating
11.1 Establish Governance arrangements to oversee the implementation and evaluation of this Plan	HE
11.2 Ensure that adequate operational capacity and arrangements are in place to implement this Plan.	HE
Measure of success	
All milestones achieved, evaluated and reported	

11 Timeframe

This plan will be implemented over a ten year period, from the start of the 2019-20 financial year, to the end of the 2028-29 financial year. A major revision of this plan will be undertaken in 2024.

12 Resources

Implementation of actions in this plan will be prioritised based upon their assessed relative effectiveness, which considers relative impact and feasibility of successful implementation, and availability of necessary resources. Implementation of some components of this plan will be supported through existing ALC, GEMCO and Northern Territory Government capacity and operational budgets. However, these resources are insufficient to implement all actions. It is anticipated that biodiversity offsets from the approved development of GEMCO's Eastern Leases tenements (ML31219 and ML31220) will be allocated to supporting the implementation of this plan.

Other sources of funding and assistance will also be sought from the Northern Territory and Federal Governments and relevant grant programs. Where appropriate collaborations and partnerships will be sought with government agencies, research institutions and other stakeholders to augment achieving objectives in this plan.

13 Monitoring and Evaluation

Monitoring and evaluation are essential for assessing the success and relative effectiveness of actions implemented to achieve desired objectives, as well as reporting progress and refining objectives, priorities and methods over the life of the plan.

A monitoring program will be implemented to evaluate and report on the status of threatened species and threatening processes in relation to implementation of this plan. Evaluation and progress will be linked to annual reporting to IPA Management and IPA Advisory Committees.

14 Governance

A Threatened Species Steering Committee will be established to oversee implementation of this plan. The Committee will be responsible for setting priorities, evaluating and reporting on progress, and reviewing and revising the Management Plan. It will develop Terms of Reference and report to the IPA Management Committee and the ALC Board. The Committee will comprise, at the minimum, representatives from ALC, DENR and GEMCO. Other stakeholders and technical experts will be engaged by the Committee as needed.

Formal agreements (Statements of Intent / Memoranda of Understanding) will be established when required for collaborations between organisations. Wherever possible, actions initiated by this Plan will be subject to prior consultation with, and endorsement by, Traditional Owners and other relevant stakeholders and regulatory authorities.

The Committee will revise the Action Plan annually. A major review of the Plan will be undertaken every five years.

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Appendix I. Threatened Species Profiles

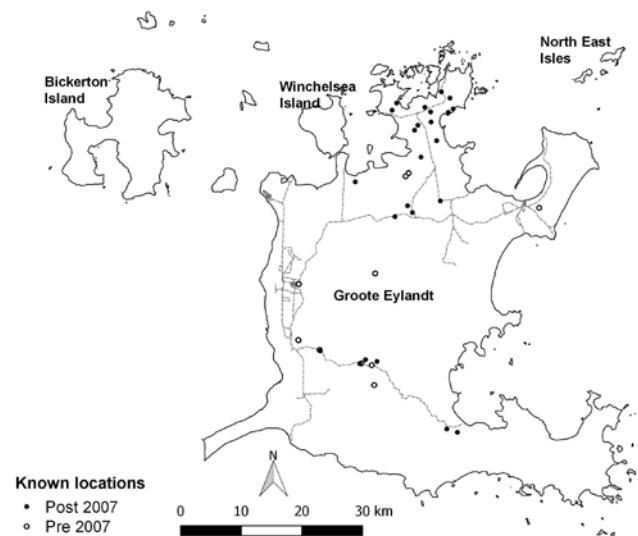
Brush-tailed rabbit-rat (*Conilurus penicillatus*)



Photo: Kym Brennan

A medium sized (150g), predominantly granivorous rodent that dens in tree hollows and logs (Firth et al. 2006a). Most records are from lowland Eucalyptus tetrodonta-dominated forests and woodlands; however, it also occurs in open coastal woodlands, grasslands and littoral rainforests (Firth et al. 2006b, Davies et al. 2017a). The species is patchily distributed throughout lowland woodland and forest habitats on Groote, with a relative stronghold on the northern peninsula (Heiniger and Gillespie 2017). It is associated with areas with high shrub density and distal to settlements and mining areas (Heiniger and Gillespie 2017).

Formerly widespread across the northern NT, now currently known to persist on Cobourg Peninsula, Tiwi Islands, Groote Eylandt and Inglis Island. Beyond the NT it also persists in a small near-coastal area of north Kimberley (WA), Bentinck Island Qld (last record – 1963) and a small area of southern New Guinea (Woinarski et al. 2014). Groote Eylandt supports one of four relatively large populations. Populations on the Cobourg Peninsula and Melville Island are declining. Many of the threats thought to be responsible for declines are absent or at lower levels on Groote Eylandt. However, the population is restricted and patchy; and the species is absent from extensive areas of seemingly suitable habitat. Potential habitat for the species exists on Winchelsea Island but surveys have failed to confirm its presence (ALC unpublished data).



Key threats

- habitat loss/major alteration
- feral cats
- inappropriate fire regimes
- invasive transforming weeds
- feral herbivores

Northern Hopping Mouse (*Notomys aquilo*)

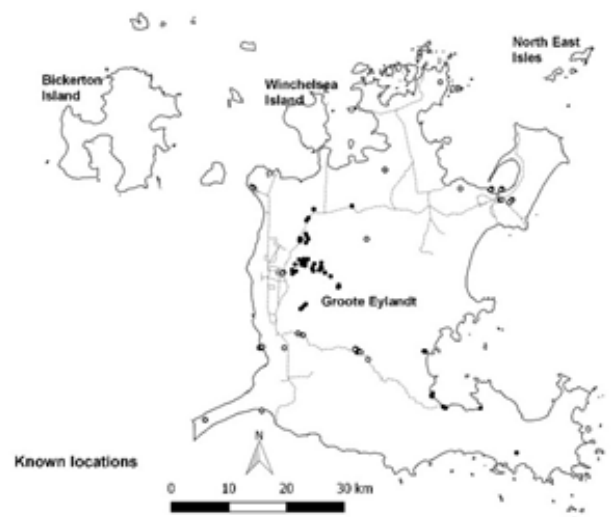


Photo: Dave Webb

The northern hopping mouse is a small (30-40g) nocturnal terrestrial rodent that constructs complex burrow systems in which it shelters. It is found in a range of habitats with sandy substrate including eucalypt open forest, heathlands and dune fields (Diете et al. 2016). It feeds mainly on seeds, but also some vegetation and insects. Records on Groote Eylandt are sparsely scattered across woodland, coast heathland and shrubland habitats (Woinarski et al. 2014), with most recent records from woodland surrounding the foot of rocky sandstone hills (Anindilyakwa Land & Sea Rangers unpublished data).

Historically, this species was found to be common at several locations on Groote Eylandt. The species is also historically known from north-east and central Arnhem Land, and Cape York Peninsula; however, there have been no recent records from the mainland (Woinarski et al. 2007). Since the early 2000s there have been numerous reports of sand mounds ('spoils') and foot prints made by hopping mice on Groote Eylandt, but there is uncertainty around many of these records due to potential confusion with delicate mice (*Pseudomys delicatulus*), which are common and widespread on the island. Recent extensive camera trap surveys on Groote Eylandt as well as spoil and pop holes searches combined with camera trapping in 2018 have only located the northern hopping mouse at a few localities (Diете et al. 2016, Heiniger and Gillespie 2017; GEMCO unpublished data); Anindilyakwa Land & Sea Rangers unpublished data). Further surveys of woodland at the foot of rocky hills as well as historic localities in far eastern and south-eastern regions of Groote are required to fully ascertain its current status. Potential habitat for the species exists on Winchelsea Island recent surveys have failed to confirm its occurrence there (ALC unpublished data).

Most small and medium-sized mammals have suffered marked declines across mainland northern Australia and this species may have similarly declined (Woinarski et al. 2007). The Groote Eylandt population is the largest and possibly only extant population worldwide.



Key threats

- habitat loss/major alteration
- feral cats
- inappropriate fire regimes
- invasive transforming weeds
- feral herbivores

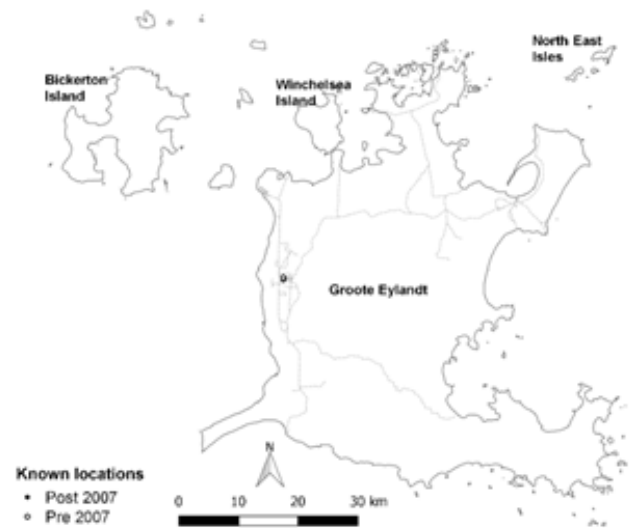
Pale field rat (*Rattus tunneyi*)



Photo: Kym Brennan

A medium sized (90g) terrestrial rodent that shelters in extensive shallow burrows with a diet consisting of roots, grass stems and seeds. Found throughout higher rainfall areas of northern Australia, extending from the Kimberley to south-eastern Queensland, including the Top End of the NT. Formerly the range extended into arid and semi-arid areas and temperate south-western Australia but retracted into higher rainfall areas in the north (Braithwaite and Griffiths 1996). The pale field-rat is typically associated with dense riparian vegetation and shrublands (Braithwaite and Griffiths 1996, Firth et al. 2006b). It is one of a suite of mammal species that have declined considerably across the Top End of the NT over the past ten years.

Its status on Groote is uncertain. A single record of this species exists from Groote in 1972, with no specimen for verification. Subsequent surveys have failed to detect the species (Heiniger and Gillespie 2017).



Key threats

- habitat loss/major alteration
- feral cats
- inappropriate fire regimes
- invasive transforming weeds
- feral herbivores

Northern quoll (*Dasyurus hallucatus*)

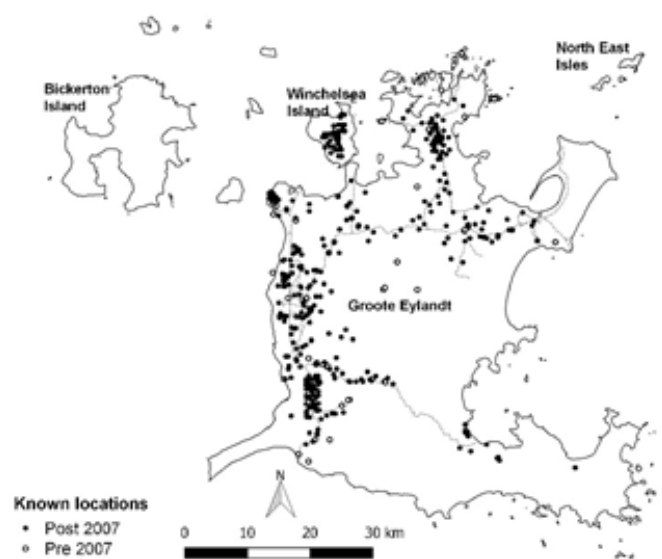


Photo: Jonathan Webb

A medium sized (300-1100g) carnivorous marsupial that feeds predominantly on insects. It is nocturnal, denning in tree hollows, logs, termite mounds or rock crevices by day. The species is common and widespread throughout a broad range of habitats on Groote Eylandt, including rocky areas, forest and woodlands, grassland and coastal shrublands, although it tends to occur at higher densities in rocky areas (Braithwaite and Griffiths 1994, Oakwood 2000, Cameron 2016).

Formerly widespread across northern Australia, this species has suffered widespread declines and local extinctions through poisoning from the westward dispersal of the cane toad (*Rhinella marina*). However, northern quolls were in decline in the NT prior to the arrival of cane toads (Braithwaite and Muller 1997), possibly due to inappropriate fire regimes (Begg 1981, Braithwaite 1996). The northern quoll will decline further throughout its entire mainland range as cane toads continue to disperse throughout north-western Australia. Northern quolls are now absent, or persist patchily in very low densities, across north Qld and the NT mainland, with the exception of a small number of toad-free offshore islands, including Groote Eylandt, Winchelsea Island and several smaller northern islands.

Groote Eylandt supports the largest remaining population of northern quolls in the NT. Once cane toads colonise the rest of north-west WA, Groote Eylandt may support the largest and healthiest population of northern quolls globally.



Key threats

- Cane toads
- Inappropriate fire regimes
- Invasive transforming weeds

Ghost bat (*Macroderma gigas*)



Photo: Bruce Taubert

The ghost bat is Australia's largest (150g) microchiropteran bat. It is primarily insectivorous, but also feeds on other bats, small terrestrial mammals, birds, frogs and reptiles (Milne et al. 2016). The ghost bat occurs throughout tropical regions of Qld, NT and WA, but is extinct in central Australia (Churchill and Helman 1990). It forages in a wide range of habitats including rainforest, open woodlands and arid areas, and roosts in caves, rock crevices and old mines by day. Populations disperse widely, but concentrate in only a few maternity roost sites when breeding (Department of the Environment and Energy 2017b), the locations of which strongly influence the distribution of the species. Only 10 maternity sites are currently known across Australia.

The total population of ghost bats is estimated to have declined by more than 30% in the last 25 years, and may now be less than 10,000 adults. Records of this species are sparsely scattered across Groote and most likely indicate the presence of one or more maternity roosts on the island and/or elsewhere in the archipelago. The potential presence of a previously undocumented maternity roost, combined with the absence or reduced levels of key threats to this species, makes the Groote archipelago highly important for the conservation of this species.



Key threats

- Habitat loss and alteration
- Cane toads
- Fence collision
- Noise pollution

Masked owl (*Tyto novaehollandiae kimberli*)

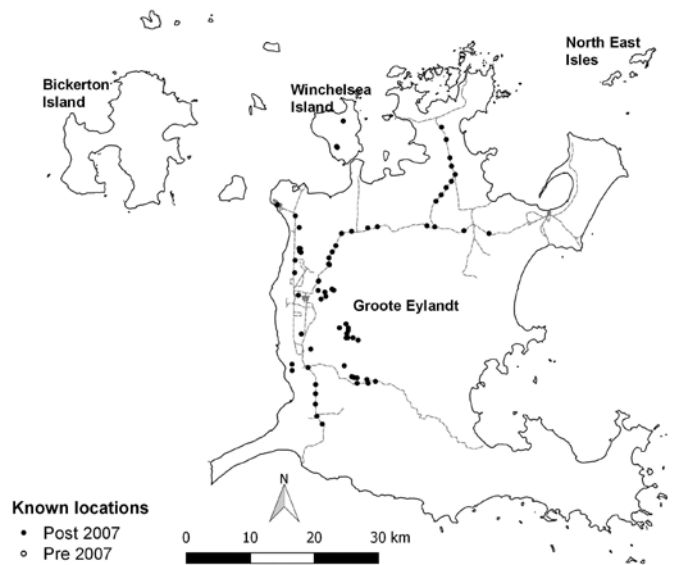


Photo: Dave Webb

A large (600-1000g) owl; mammals up to the size of possums constitute the bulk of its diet (Higgins 1999). It occurs mainly in eucalypt tall open forests, especially those dominated by *Eucalyptus miniata* and *Eucalyptus tetradonta*, but also roosts in monsoon rainforests, and forages in more open vegetation, including grasslands (Woinarski et al. 2014). It typically roosts, and nests, in tree hollows. The species distribution is poorly known with records sparsely distributed from the Kimberley region of WA, across the Top End of the NT to north-west Qld (Woinarski et al. 2014).

Like other large owls, this species occurs at low population density, and other subspecies typically occupy large exclusive home ranges of 5-10 km² (Kavanagh and Murray 1996). There is some evidence of population declines on the NT mainland (Ward 2010), which may be a result of declining food resources (small and medium-sized mammals) or suitable tree hollows for breeding.

Based on the numerous records across Groote Eylandt and records from Winchelsea Island, the Groote archipelago population may be more secure than mainland populations, due to relatively higher densities of small and medium sized mammals and extensive availability of large, hollow-bearing trees, resulting from a relatively benign fire history.



Key threats

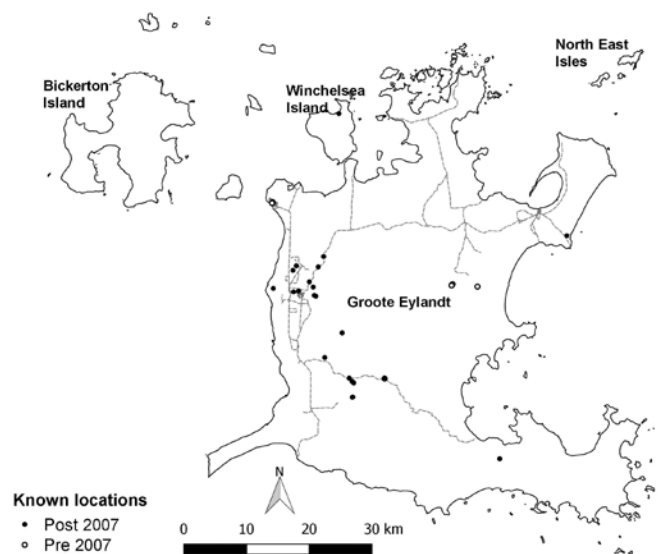
- Habitat loss/major alteration
- inappropriate fire regimes
- invasive transforming weeds
- decline of mammalian prey species

Mertens' water monitor (*Varanus mertensi*)



Photo: Tom Lawton

Merten's water monitor is a medium to large (total length up to 1.1m) semi-aquatic monitor. It occupies coastal and inland waters and feeds on fish, frogs, insects and small terrestrial vertebrates. It was formerly common and widespread along watercourses throughout monsoon tropical regions of northern Australia. This species is vulnerable to poisoning from ingestion of cane toads, and has suffered significant population declines on the mainland as cane toads have dispersed west across northern Australia (Shine 2010). Groote Eylandt is thought to support a healthy population of this species due to the absence of toads; however, no targeted surveys have been undertaken to establish its size and extent.



Key threats

Cane toads

Floodplain monitor (*Varanus panoptes*)



Photo: Georgia Ward-Fear

A large (total length up to 1.4m), robust, ground dwelling monitor that feeds mostly on small vertebrates and insects. It has a wide distribution across tropical northern Australia and occupies a broad range of habitats including coastal beaches, floodplains, grasslands, and woodlands (Blamires 2004). This species is vulnerable to poisoning from ingestion of cane toads, and has suffered severe population declines on the mainland as cane toads have dispersed across northern Australia (Doody et al. 2007, Shine 2010).

The declines of the floodplain monitor have been more severe than the Merten's water monitor, and it is now rare or absent from all areas of the NT and Kimberley where cane toads have established (Doody et al. 2007; Doody et al. 2009; Shine 2010). In the Top End of the Northern Territory this species is easily confused with Gould's sand monitor, *Varanus gouldi*, which is common and widespread on Groote Eylandt and some offshore islands. Most records of floodplain monitors reported from the Groote archipelago have been only visual sightings and can not be verified. The only four specimens labelled floodplain monitors from Groote Eylandt held in Australian museums, all juveniles, are mis-identified Gould's sand monitors. Therefore, at this stage it is unconfirmed as to whether or not the floodplain monitor occurs on the Groote archipelago.



Key threats

Cane toads

Appendix II. Known Threats to Threatened Fauna on the Groote archipelago

Habitat Loss and Disturbance

Clearing of native vegetation and other habitat features for any purpose results in habitat loss for species, and usually a proportional reduction in their populations. Physical habitat disturbance results in alteration that can disadvantage some species, either directly, or indirectly by benefiting competitors, predators or other invasive species. Habitat clearance is listed as Key Threatening Process under the Commonwealth EPBC Act (1999).

Significant habitat clearing and disturbance have occurred on Groote as a result of the development of the manganese mine, associated port and town infrastructure, major sealed roads and track networks, and communities. Strip mining, sealed road construction, and industrial and urban infrastructure development result in removal and/or extensive alteration of native habitat. These changes have, and most likely will continue to, have adverse impacts on threatened species that live or forage in affected areas. In the event that such areas are rehabilitated, it is highly unlikely that the original habitat will be recovered adequately to support threatened and other sensitive species, because of changes in soil profile, soil compaction, hydrology, and landscape-scale effects of habitat fragmentation.

Smaller scale, less intense, habitat clearing and disturbance associated with minor roads and exploration has occurred across much of the lowland regions of Groote Eylandt, and to a lesser extent on Bickerton Island. Although the direct geographic habitat footprint is relatively small, such disturbance processes have indirect adverse effects including facilitating dispersal of weeds and other invasive species, and increasing human access to otherwise less-accessible areas, which in turn may influence fire regimes.

Further habitat clearing and disturbance are expected to occur on Groote Eylandt with expansion of the mine and associated infrastructure. While some habitat loss and alteration is unavoidable, it can be minimised, and additional steps can be taken to reduce impacts on threatened species.

Inappropriate fire regimes

Fire regimes across northern Australia have changed significantly since European settlement. The breakdown of traditional Indigenous burning practices, centralisation of Aboriginal people in permanent settlements, combined with expansion of livestock and exotic pastoral grasses, have resulted in seasonal shifts, and increases in frequency, intensity and extent of fires (Russell-Smith et al. 2003, Russell-Smith and Edwards 2006). These shifts in turn have altered vegetation structure and floristic composition, promoting the expansion of annual native sorghum (*Sorghum stipoideum*) and other fuel-enhancing species in many areas, which in turn augment more frequent and hotter fires.

Increased frequency and intensity of fires alters floristic composition, removes coarse woody debris, simplifies understorey and mid-story vegetation structure; and ultimately removes large, old, trees. These changes disadvantage many fauna species through reduced food resources (e.g. perennial grass seeds, nuts and fruit), breeding habitat (e.g. tree hollows and hollow logs), and habitat complexity, increasing predation vulnerability. These effects are exacerbated by increased size and extent of fires, which reduce the otherwise mosaic nature of habitat attributes and diversity of resources at the landscape scale. Altered fire regimes have contributed to declines of small and medium sized mammal species and some bird species across northern Australia (Legge et al. 2011b, Lawes et al. 2015a,b).

Groote Eylandt and other islands in the archipelago have retained a relatively benign fire regime with many, mostly inaccessible, areas unburnt for at least five years (Fig. 1). Nevertheless, although perhaps less pronounced, the fire regimes on Groote Eylandt have altered since cessation of traditional Indigenous burning practices. Higher-frequency burning occurs in localised areas south of Angurugu and along the Umbakumba highway, where some areas are burnt every year. The majority of recent fires on Groote Eylandt have occurred in the late dry season because the maritime environment results in at least some rainfall in all months of the year. These fires are often small and patchy, but every 3rd or 4th year an extensive fire burns out about half of the island. The annual area burnt is highly variable ranging from 1.5 to 40.1%.

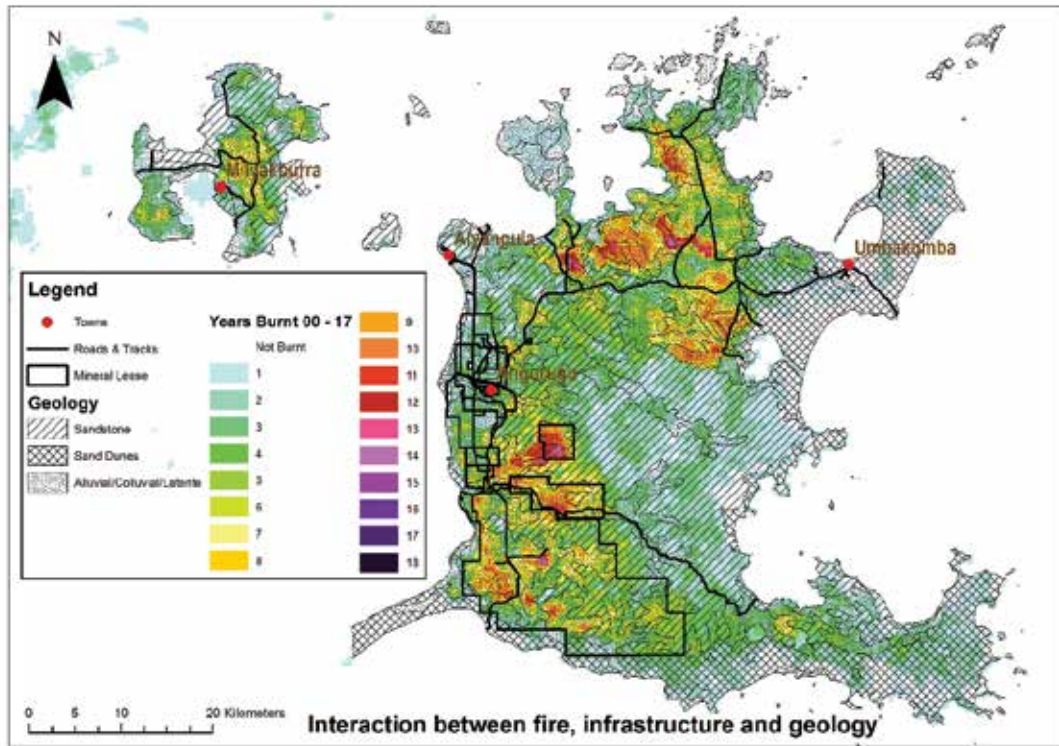


Figure 1. Fire frequency across the Groote Eylandt Archipelago between 2000 and 2017 and its relationship with 1) towns and roads; 2) location of mineral leases; and 3) underlying geology.

There is an association between geology /underlying landform and fire frequency; the alluvial/colluvial/lateritic substrates burning on average every second year, sandstone burning every fifth year and the Aeolian sand dunes burning every tenth year (Fig. 1). Most fire occurs in August, September and October because of the late start to the dry season relative to the mainland. There is a strong correlation between area burnt annually and amount of rainfall during the dry season.

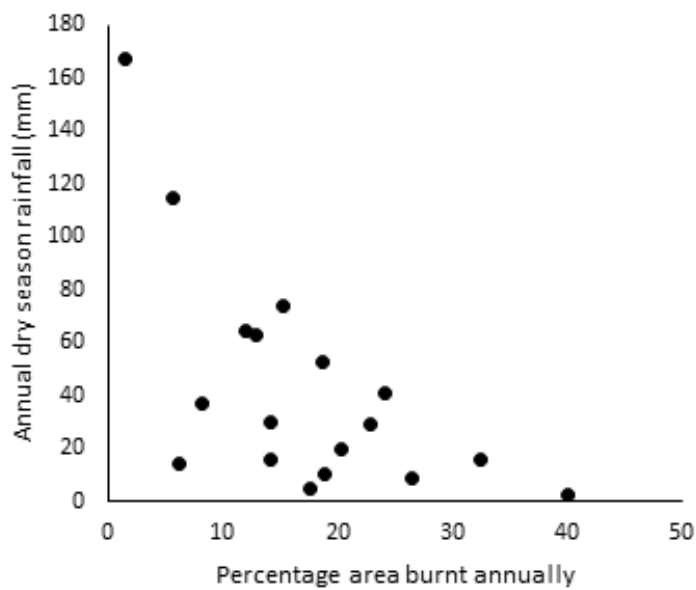


Figure 2. Relationship between dry season rainfall from June to October and extent of area burnt on Groote annually, from 2000 to 2017.

Fire frequencies across much of the lowlands on Groote Eylandt are not that different from eastern Arnhem mainland, and may be a key factor in the apparent decline of some threatened mammal species (Heiniger and Gillespie in review). Although less pronounced than the mainland, changes in fire regimes have/are occurring, with potentially adverse effects on threatened species, but at slower and more subtle rates than on the mainland. This pattern has recently been uncovered on Melville Island, which was previously considered a relatively safe refuge for mammals (Davies et al. 2017a, Davies et al. 2017b). For instance, there may have been changes in frequency coupled with an increased fire intensity and extent in some areas, which may be sub-optimal for some species.

Appropriate fire management is necessary to maintain and enhance the terrestrial biodiversity values of the Groote archipelago. However, these values will become harder to sustain or recover if fire regimes are allowed to deteriorate. Appropriate fire regimes for the Groote archipelago need to be determined with consideration of the local environmental and cultural settings, which may differ from the mainland. Irrespectively, in order for appropriate fire management to be sustainable, it needs to be developed in collaboration with all stakeholders.

Feral Cats

Feral cats are versatile predators that can switch their diet as their preferred prey is depleted. Even at low densities cats can have large impacts on native species (Frank et al. 2014). Predation by feral cats has been implicated as a major driver of mammal declines across northern Australia (Burbidge and Manly 2002, Woinarski et al. 2011b, Woinarski et al. 2015, Ziembicki et al. 2015), and is listed as a Key Threatening Process under the Commonwealth EPBC Act (1999). Inappropriate fire regimes that reduce ground cover and understorey complexity also facilitate increased habitat access and predation efficiency by feral cats (Leahy et al. 2015, McGregor et al. 2015).



Photo: NT Department of Natural Resources and Environment

Cats probably arrived on Groote Eylandt when the island was first settled by Europeans in 1921 (Taylor and ALC 2016). Although not officially permitted in the Anindilyakwa IPA, pet cats are present in all communities on the Groote archipelago except Alyangula, where the prohibition on cat ownership is actively enforced. Large numbers of owned and stray cats may be present in some communities. Feral cats are widespread on Groote Eylandt and potentially Bickerton Island; however, they appear to be at very low densities compared to the mainland (Heiniger and Gillespie 2017), the reason for which is unclear. Prey appears abundant on Groote Eylandt, but what other factors may regulate feral cat populations in the wet-dry tropics is unknown. Several hypotheses include that:

- (i) The relatively benign fire regimes and complex understorey do not favour feral cats. Feral cats are known to be more efficient hunters in frequently burnt savannas, but this does not explain their low density in infrequently burnt environments with high food resource availability;
- (ii) Monitor lizard, and possibly olive python and dingo populations on Groote may be healthier than the mainland and may suppress feral cat populations. Anecdotal information exists of olive pythons and monitor lizards preying on feral cats; however, there is no evidence that large native reptile predators are able to significantly regulate prey populations. Some evidence exists that dingoes can exert significant predation pressure on cats in arid environments of central Australia (Dickman et al. 2009), but this has not been shown for tropical savannas where cats can readily evade dingoes by climbing trees, and evidence that dingoes can suppress cat population is equivocal (Allen et al. 2014).
- (iii) Feral cats have not yet fully established and their populations may still be increasing on the island. Several source populations of cats exist in communities on Groote Eylandt. However, given the length of time cats have been present on Groote Eylandt, and their intrinsic population growth rates and dispersal abilities, it is likely that carrying capacity would have already been attained across the island by now.

Despite their apparent low density on Groote Eylandt, feral cats may still exert significant predation on some species. The rarity and patchy distribution of the northern hopping mouse may be due to predation by feral cats. Vulnerability to predation by cats may be exacerbated by inappropriate fire regimes, and the optimal fire regime for this species is not yet known with certainty.

It is not feasible to eradicate feral cats from the Groote archipelago with current technology. However, the impact of cats can be reduced by limiting source populations from communities, or excluding or suppressing cat populations in high conservation-value habitats.



Photo: Chris Jolly

Cane toads (*Rhinella marina*)

The arrival of the cane toad (*Rhinella marina*) in the NT caused severe declines of northern quolls, large monitor lizards, blue-tongue and frill-necked lizards, several elapid snake species, including death adders and the mulga snake, and some freshwater crocodile populations (Shine 2010). Cane toads have also been implicated in declines of ghost bats and northern phascogales. The cascading effects of the loss of these predators is poorly understood but other indirect adverse effects on some other species have been documented (Doody et al. 2007, 2009). It is plausible that declines of large monitors and mulga snakes may result in an increased abundance of feral cats or snakes that could then in turn exert increased pressure on small mammals. The biological effects, including lethal toxic ingestion, caused by cane toads is listed as a Key Threatening Process under the Commonwealth EPBC Act (1999).

Cane toads have not yet established on Groote Eylandt, enabling healthy populations of species such as the northern quoll to persist. Some biosecurity procedures have been established by the Anindilyakwa Land & Sea Rangers and GEMCO, including inspections of barges using a specially trained cane toad detection dog. However, there have been incursions; GEMCO have detected nine individual cane toads on Groote Eylandt in recent years (GEMCO unpublished data 2017). Several vectors exist for cane toad arrival on Groote Eylandt, including barge freight to Groote Eylandt from Darwin and Cairns, air travel from Darwin, Cairns and Gove to Groote Eylandt, and private boat travel from the mainland.

It is feasible to keep cane toads from establishing on the Groote archipelago. However, if cane toads manage to successfully establish, it will be impossible to eradicate them or control their spread with current technology.

Introduced pigs and feral herbivores

Introduced herbivores and pigs can reduce food resources for native herbivores and omnivores, and over time can reduce overall productivity and diversity of terrestrial and riparian ecosystems (Kutt and Woinarski 2007, Legge et al. 2011a). Foraging and trampling by feral herbivores and pigs can alter floristic composition, reduce habitat structural complexity, cause erosion and foul waterways. Furthermore, feral pigs prey on some native fauna species and may spread pathogens harmful to native species. In particular feral pigs can exert significant predation pressure on marine and freshwater turtle eggs. Although not documented, pigs may impose significant resource and interference competition on some native mammal species. Introduced livestock combined with frequent, large and intense fire regimes may have adverse compounding, or synergistic, effects on fauna, through reduced productivity and increased vulnerability to predation from feral cats and predators generally. Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs is listed as a Key Threatening Process under the Commonwealth EPBC Act (1999).

Feral herbivores and pigs are not established on mainland Groote Eylandt, which is a likely contributing factor to its relative ecological health. However, rusa deer (*Cervus timorensis*) are established on Northeast Island, resulting in significant understorey vegetation alteration. Individual pigs have, on occasion, been brought to communities as pets. There is currently one pig in Angurugu on Groote Eylandt, and one at Milyakburra on Bickerton Island. Buffalo have on occasion swum to Bickerton Island from the mainland during the dry season, but appear to have swum back at the wet season onset.

It is feasible to keep feral herbivores and pigs from further establishment on the Groote archipelago. However, if pigs, deer or other feral herbivores manage to successfully establish on Groote Eylandt it will be impossible to eradicate them or control their spread with current technology.

Weeds

Invasive plants can affect biodiversity by outcompeting and displacing native flora. They can also increase fuel loads and result in more frequent and intense fire. Both pathways can affect habitat structure and floristic diversity, which can alter food and shelter resources for fauna. Transforming weeds such as gamba grass and mission grass pose potentially significant threats to threatened species on the Groote archipelago because they facilitate fire and the deterioration of natural fire regimes. Invasion of northern Australia by gamba grass and other introduced grasses is listed as a Key Threatening Process under the Commonwealth EPBC Act (1999).

Weed invasion on the Groote archipelago is largely restricted to Groote Eylandt and Bickerton Island. Weeds are generally spread via contaminated vehicles and machinery, animals and watercourses. The establishment and spread of weeds is also facilitated by physical disturbances from civil works, track establishment, and land disturbance.

Approximately 130 non-native flora species have been recorded on the Groote archipelago, of which 19 are declared weeds in the NT and five are Weeds of National Significance (Table 5; URS 2012; Taylor and ALC 2016, Northern Territory Government 2017). An assessment was undertaken for these species on Groote Eylandt (Taylor and ALC 2016), which considered legislative requirements; species distribution; likelihood of spread and infesting undisturbed areas; threat to mine rehabilitation; ability to promote wildfires; and potential to damage culturally and recreationally important places (Table 5).

It may be feasible to contain some existing weed species and stop new species from establishing on the archipelago. However, for some weed species, once established, it will be difficult to eradicate them or control their spread with current technology (Panetta 2015). Gamba grass is possibly the biggest threat to threatened species in the Groote archipelago because of its transforming abilities to significantly alter fire regimes and vegetation structure and composition. Invasion of northern Australia by gamba grass is listed as a threatening process under the EPBC Act (1999) (TSSC 2009).

Table 5. Weeds recorded in the Groote Archipelago. Northern Territory and National declaration class: A - to be eradicated; B - growth and spread to be controlled; C - not to be introduced into the NT. WoNS - Weed of National Significance; ALC management – Priority for management assigned in current Anindilyakwa IPA Plan of Management.

Scientific name	Common name	Weed Risk	Declared	WoNS	ALC management	Comments from NT Weeds Branch
<i>Alternanthera brasiliana</i>	Joyweed					Environmental weed, difficult to control, so prevent spread.
<i>Alternanthera pungens</i>	Khaki weed	Low	B			Typically confined to disturbed areas
<i>Andropogon gayanus</i>	Gamba grass	Very high	A/B	X	Highest priority	Few isolated incidences. Likely brought in on contaminated fill or vehicles during constructions. Currently eradicated
<i>Azadirachta indica</i>	Neem	Very high	B		High priority	This plant will invade riparian areas if not removed from cultivation
<i>Cascabela thevetia</i>	Yellow oleander	High				Sometimes cultivated in gardens, recommend removal. Highly toxic
<i>Cenchrus echinatus</i>	Mossman river grass	Medium	B			Low priority to WMB
<i>Cenchrus pedicellatus</i>	Annual mission grass	Very high			High priority	Difficult to control, very high risk
<i>Centrosema pubescens</i>	Centro					Problematic if let go but not high priority
<i>Clitoria ternatea</i>	Blue pea					Problematic if let go but not high priority
<i>Crotalaria goreensis</i>	Gambia pea	Low			Priority	
<i>Cryptostegia grandiflora</i>	Rubber vine	Very high	A	X	Priority	Alert weed not currently in NT

Table 5. Weeds recorded in the Groote Archipelago. Northern Territory and National declaration class: A - to be eradicated; B - growth and spread to be controlled; C- not to be introduced into the NT. WoNS - Weed of National Significance; ALC management – Priority for management assigned in current Anindilyakwa IPA Plan of Management.

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<i>Andropogon gayanus</i>	Gamba grass	Very high	A/B	X	Highest priority	Few isolated incidences. Likely brought in on contaminated fill or vehicles during constructions. Currently eradicated
<i>Azadirachta indica</i>	Neem	Very high	B		High priority	This plant will invade riparian areas if not removed from cultivation
<i>Cascabela thevetia</i>	Yellow oleander	High				Sometimes cultivated in gardens, recommend removal. Highly toxic
<i>Cenchrus echinatus</i>	Mossman river grass	Medium	B			Low priority to WMB
<i>Cenchrus pedicellatus</i>	Annual mission grass	Very high			High priority	Difficult to control, very high risk
<i>Centrosema pubescens</i>	Centro					Problematic if let go but not high priority
<i>Clitoria ternatea</i>	Blue pea					Problematic if let go but not high priority
<i>Crotalaria goreensis</i>	Gambia pea	Low			Priority	
<i>Cryptostegia grandiflora</i>	Rubber vine	Very high	A	X	Priority	Alert weed not currently in NT
<i>Cryptostegia madagascariensis</i>	Ornamental Rubber Vine		A		Priority	Found in gardens around Alyangula. High impact difficult to control when established
<i>Hyptis suaveolens</i>	Hyptis	High	B		Priority	
<i>Ipomoea pes-tigridis</i>	Ipomoea					can get problematic if let go but not high priority
<i>Ipomoea quamoclit</i>	Star of Bethlehem					can get problematic if let go but not high priority
<i>Ipomoea triloba</i>	Morning Glory					can get problematic if let go but not high priority

Scientific name	Common name	Weed Risk	Declared	WoNS	ALC management	Comments from NT Weeds Branch
<i>Jatropha gossypifolia</i>	Bellyache bush	Very High	A/B	X	High priority	Extensive ornamental planting in Umbakumba. Mine site had large infestation near processing facility. Also believed to be in and around Angurugu. Sometimes cultivated in gardens. High priority for control and spread minimisation.
<i>Lantana camara</i>	Lantana	Very High	B	X		
<i>Leucaena leucocephala</i>	Coffee bush	Very High			Priority	Difficult to control once established
<i>Macroptilium atropurpureum</i>	Siratro					can get problematic if let go but not high priority
<i>Macroptilium lathyroides</i>	Phasey Bean					can get problematic if let go but not high priority
<i>Megathyrsus maximus</i>	Guinea grass	Very high			High priority	Not declared but prevalent in coastal Arnhem land communities
<i>Passiflora foetida</i>	Wild Passion Fruit					widespread, typically only control when affecting amenity or asset
<i>Sansevieria trifasciata</i>	Mother in laws tongue	Low				Does not spread quickly, but difficult to control when established
<i>Senna alata</i>	Candlebush	Low	B		Priority	Impacts wet areas
<i>Senna occidentalis</i>	Coffee senna		B		Priority	Aggressive in disturbed areas across community and roadsides over island
<i>Sida acuta</i>	Sida	High	B			Biocontrol agent available
<i>Sida cordifolia</i>	Flannel weed	High	B			
<i>Sida rhombifolia</i>	Paddy's lucerne	High	B			Biocontrol agent available
<i>Stachytarpheta cayennensis</i>	Snake weed		B		Priority	Difficult to control once established
<i>Stachytarpheta jamaicensis</i>	Snake weed		B		Priority	Difficult to control once established
<i>Themeda quadrivalvis</i>	Grader grass	Very high	B	X	High Priority	Highly mobile on vehicles; difficult to control and difficult to identify. Extensive near Angurugu and local waste facilities.
<i>Tribulus cistoides</i>	Caltrop	Low	B		Priority	Amenity weed
<i>Tribulus terrestris</i>	Caltrop	Low	B		Priority	Amenity weed
<i>Urochloa mutica</i>	Para grass	Very high			Priority	Not declared pasture species

Appendix III. Potential Threats to Threatened Fauna and other species on the Groote Archipelago

The following processes have the potential to contribute to declines of one or more of the threatened species occurring on the Groote archipelago if not managed carefully. They either already operate on the archipelago, or there is some risk of them occurring in the future.

Invasive ants

Invasive ant species can displace native ant species, replace small predators and eat eggs and larvae of other invertebrates. This disruption to invertebrate food webs can affect plant pollination and seed dispersal. Invasive ants can also damage plants by eating fruits and seeds and tunnelling into stems. Severe invasions of some species can result in vegetation dieback with flow-on effects to other species. Although not on Groote, two invasive ant species, yellow crazy ant (*Anoplolepis gracilipes*) fire ant, (*Solenopsis invicta*), and electric ant (*Wasmannia auropunctata*) are listed as Key Threatening Process under the Commonwealth EPBC Act (1999).

Seven invasive ant species have been confirmed on Groote Eylandt: *Monomorium floricola*, *M. pharaonic*, *Paratrechina longicornis*, *Pheidole megacephala*, *Trichomyrmex destructor*, *Solenopsis geminata* and *Tetramorium simillimum* (Anderson et al. 2012; ALC unpublished data). There are likely to be more introduced species present in urban areas, such as *Tapinoma melanocephalum*, and *M. mayri*. Other species with reasonable probability of occurring or arriving are *Tetramorium bicarinatum* and *Plagiolepis alluaudi* (A. Anderson, Charles Darwin University pers. comm.). Most of these species are cosmopolitan and occur throughout northern Australia, and do not pose any serious conservation threat. However, *Pheidole megacephala* and *Solenopsis geminata* are major transformative species that can invade native habitats and displace native species (CABI 2018). Both species are listed amongst the world's most invasive species. Based on recent surveys in Alyangula, infestations of *Pheidole megacephala* do not appear to have established in areas of native vegetation. A sizable infestation of *Solenopsis geminata* was detected by the Anindilyakwa Land and Sea Rangers in August 2018 at the Angurugu Market Garden. *Solenopsis geminata* are more commonly known as ginger ants or tropical fire ants.

Introduced rodents

The house mouse (*Mus musculus*) and black rat (*Rattus rattus*) can affect biodiversity directly by eating plants (seeds and roots), insects, reptiles and birds and their eggs. They may also compete with native species, particularly small mammals, for food and can carry disease. Furthermore, introduced rodents act as additional prey for feral predators, such as feral cats, potentially increasing their density, resulting in increased predation pressure on native fauna. Predation by exotic rats on Australian offshore islands of less than 1000 km² (100,000 ha) is listed as Key Threatening Process under the Commonwealth EPBC Act (1999).

Both rodent species have been recorded within the mine rehabilitation areas on Groote Eylandt, and are likely to occur in human-inhabited areas. However, as yet neither species appears to have dispersed widely into native habitats (Heiniger and Gillespie 2017, in review; GEMCO unpublished data). Black rats have successfully colonised some areas of native habitat on the mainland of the Top End in recent decades (NT Government unpublished data), and have been implicated as a potential contributing factor to mainland mammal declines. Alternatively, black rats may simply be back-filling habitat vacated by declining native rodent species.

Feral/roaming dogs

Roaming dogs living in and around communities on Groote Eylandt and Bickerton Island may have localised predatory effects on wildlife. They also have the potential to seed feral dog populations, which may operate over wider areas. Feral dogs behave differently to dingos and may potentially adversely impact threatened fauna species through predation. Stray and feral dogs may also interact adversely with the dingo population on Groote Eylandt, spreading disease and/or interbreeding with them. Adverse changes to dingo populations may have significant cascading effects on threatened species and other fauna, through mesopredator release, whereby other predators such as feral cats benefit from reduced predation or interference from dingos.

Introduced fish

There are currently no known invasive fish species on Groote Eylandt or elsewhere in the archipelago. Three introduced species recorded in some northern Australian freshwater systems could potentially establish: the mosquito fish (*Gambusia holbrooki*), Mozambique tilapia (*Oreochromis mossambicus*) and spotted tilapia (*Tilapia mariae*).

Mosquito Fish (*Gambusia holbrooki*) is an extremely hardy species that has colonised a wide range of habitats across many regions of Australia. They have high reproductive outputs and dispersal capabilities, are aggressive, and will prey on native fish, amphibian eggs and aquatic insects, and will compete with native species for food and space. In Australia they have contributed to the decline of 9 native fish species and over 10 frog species.

The Mozambique and spotted tilapia have highly efficient reproductive strategies whereby they can reach sexual maturity at small sizes in poor conditions or when overcrowded. They protect their eggs and young inside their mouth, where the young can survive for a considerable time after the adult dies. This can lead to establishment when a single live or dead fish is released into a waterway. These species are also aggressive and effective invaders and disrupters of a wide range of freshwater systems.

Myrtle rust

Myrtle rust is a disease caused by the exotic fungus *Puccinia psidii*. It threatens trees and shrubs in the Myrtaceae family, which includes native bottlebrush (*Callistemon* spp.), tea tree (*Melaleuca* spp.) and eucalypts (*Eucalyptus*, *Angophora* and *Corymbia* spp.). As of April 2016, approximately 350 native species have proved susceptible to myrtle rust. The disease can cause deformed leaves, heavy defoliation of branches, reduced fertility, stunted growth, plant death and result in dieback (Department of the Environment and Energy 2017a). Spores can spread easily via contaminated clothing, hair, skin, infected plant material and equipment. Spores can also be spread by insect and animal movement, and wind dispersal. These characteristics make it extremely hard to eradicate from natural settings. Myrtle rust has recently been detected on Groote Eylandt and may spread if not managed carefully.

Importation of horticultural plants

The importation of horticultural plants onto the island can provide a pathway for weeds, cane toads, invasive ants and disease to enter Groote Eylandt and threaten biodiversity. Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants is listed as Key Threatening Process under the Commonwealth EPBC Act (1999).

Feral animal baiting

Poison baits containing either sodium monofluoroacetate (compound 1080) or para-aminopropiophenone (PAPP) are used across Australia to suppress or eradicate pest species, such as feral cats, pigs and wild dogs. These baits have potentially significant adverse effects on populations of non-target species such as quolls, dingoes, and monitor lizards. Currently there are no programs using these baits on Groote Eylandt; however, if this changes in the future then impacts on threatened species will need to be considered.

Baits have been developed to target feral cats that are designed to reduce the risk of baiting to non-target species. Hisstory® contains 1080 encapsulated within a hard shelled delivery vehicle (HSDV) embedded within a specially formulated meat attractant. Native animals that chew their food more thoroughly avoid poisoning by eating around the HSDV. Trials were recently conducted on Groote Eylandt with non-toxic experimental versions of this bait to evaluate the risk of potential feral cat baiting programs to non-target species, in particular northern quolls and northern brown bandicoots. These trials demonstrated negligible risk to these species (Heiniger and Gillespie 2018). Monitors and other reptiles have low sensitivity to 1080, and dingoes need to consume a large number of these baits to receive a lethal dose. Consequently Hisstory® offers a potential low risk method of managing cats in the Groote archipelago.

Anticoagulant rodenticides are used to control introduced rats and mice. These toxins are typically delivered in grains, pastes, wax blocks or fumigants. It is likely that residents of Alyangula and other communities undertake localised rodent baiting. This has potential to adversely impact secondary, non-target species such as the northern quoll, threatened masked owl, ghost bat and monitor species that prey on poisoned rodents. Native rodents, including the three threatened species recorded on the Groote archipelago would also potentially be susceptible to poisoning.

Appendix IV. Threat rating details for each threatened species

The following tables summarize the workshopped assessments of scope, severity and irreversibility of each threat for each threatened species currently occurring in the Groote archipelago. These assessments are used to generate an overall summary rating of each threat for each species. Only threats that rated more than 'Low' in any category for each species are presented.

Potential invasive species (rodents, ants, myrtle etc.) have been grouped because their respective scopes, severities and irreversibility are relatively similar for each threatened species at this stage. Feral pigs have been treated differently from other feral livestock because they have distinct ecological differences from feral herbivores, and their scope and severity are expected to differ for various threatened species. Habitat loss/alteration/disturbance has been categorised in two different ways:

- (i) *Major habitat loss* - broad-scale clearing for mining, industrial or urban development, from which recovery of original ecological condition is unlikely; and
- (ii) *Minor habitat alteration/disturbance*, such as roads and tracks, and other localised physical disturbance associated with human activities, from which there is potential recovery of original ecological condition.

It was recognised in the workshop that that these two categories generally have different levels of scope, severity and irreversibility.

Definitions:

Scope - How much of the asset can reasonably be expected to be affected by the threat within ten years given the continuation of current circumstances and trends. Measured as the proportion of the asset's occurrence or the proportion of the asset's population.

Severity - *Within the scope*, the level of damage from the threat that can reasonably be expected given the continuation of current circumstances and trends. Typically measured as the degree of destruction or degradation or the degree of reduction of the population.

Irreversibility – How much the effects of a threat can be reversed and the asset affected by the threat restored.

Summary – Calculated from the Scope, Severity and Irreversibility assessments.

Table 4. Summary of threat ratings for each threatened species. Summary ratings are the products of the scope, severity and irreversibility assessed for each threat to each species. Details of threat ratings for each species are presented in Appendix IV.

Brush-tailed rabbit-rat

Threat	Scope	Severity	Irreversibility	Summary
Predation by feral cats	●	●	●	●
Weeds	●	●	●	●
Inappropriate fire regimes	●	●	●	●
Feral herbivores (deer / buffalo)	●	●	●	●
Other invasive spp. (ants, myrtle rust.)	●	●	●	●
Introduced rodents	●	●	●	●
Pigs	●	●	●	●
Major habitat loss/alteration	●	●	●	●
Minor habitat loss/disturbance	●	●	●	●

Northern Hopping Mouse

Threat	Scope	Severity	Irreversibility	Summary
Predation by feral cats	●	●	●	●
Weeds	●	●	●	●
Inappropriate fire regimes	●	●	●	●
Feral herbivores (deer / buffalo)	●	●	●	●
Other invasive spp. (ants, myrtle rust.)	●	●	●	●
Introduced rodents	●	●	●	●
Pigs	●	●	●	●
Major habitat loss/alteration	●	●	●	●
Minor habitat loss/disturbance	●	●	●	●

Pale field rat

Threat	Scope	Severity	Irreversibility	Summary
Predation by feral cats	●	●	●	●
Weeds	●	●	●	●
Inappropriate fire regimes	●	●	●	●
Feral herbivores (deer / buffalo)	●	●	●	●
Other invasive spp. (ants, myrtle rust.)	●	●	●	●
Introduced rodents	●	●	●	●
Pigs	●	●	●	●
Major habitat loss/alteration	●	●	●	●
Minor habitat loss/disturbance	●	●	●	●

Northern quoll

Threat	Scope	Severity	Irreversibility	Summary
Cane toads	●	●	●	●
Predation by feral cats	●	●	●	●
Weeds	●	●	●	●
Inappropriate fire regimes	●	●	●	●
Feral herbivores (deer / buffalo)	●	●	●	●
Other invasive spp. (ants, myrtle rust.)	●	●	●	●
Introduced rodents	●	●	●	●
Pigs	●	●	●	●
Major habitat loss/alteration	●	●	●	●
Minor habitat loss/disturbance	●	●	●	●
Feral/roaming dogs	●	●	●	●

Ghost bat

Threat	Scope	Severity	Irreversibility	Summary
Cane toads	●	●	●	●
Predation by feral cats	●	●	●	●
Other invasive spp. (ants, myrtle rust)	●	●	●	●
Major habitat loss/alteration	●	●	●	●
Minor habitat loss/disturbance	●	●	●	●

Masked owl

Threat	Scope	Severity	Irreversibility	Summary
Predation by feral cats				
Weeds				
Inappropriate fire regimes				
Other invasive spp. (ants, myrtle rust)				
Major habitat loss/alteration				
Minor habitat loss/disturbance				

Mertens' water monitor

Threat	Scope	Severity	Irreversibility	Summary
Cane toads				
Predation by feral cats				
Pigs				
Major habitat loss/alteration				
Other invasive spp. (ants, myrtle rust)				
Baiting				





Floodplain monitor

Threat	Scope	Severity	Irreversibility	Summary
Cane toads				
Predation by feral cats				
Other invasive spp. (ants, myrtle rust)				
Pigs				
Minor habitat loss/disturbance				
Major habitat loss/alteration				
Baiting				

Appendix V. Action Plan

This schedule identifies all actions and anticipated timing of implementation commencing from financial year 2019-20.

The relative effectiveness rating is provided for each action:

Effectiveness	
not effective	
less effective	
effective	
highly effective	

Note: actions currently considered not effective may become effective at a later time. Grey shading indicates the timing of commencement and completion for each action. Milestones are identified to evaluate performance in achieving each objective (). Overall measures of success are identified for addressing each threatening process.

Responsible organisations:

ALC – Anindilyakwa Land and Sea Council

GEMCO – Groote Eylandt Mining Company

NTG – Northern Territory Government

AUG – Australian Government

SC – Threatened Species Plan Steering Committee.

1. Cane toads

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
1.1 Develop a management plan to keep Groote Eylandt cane toad-free	HE	Whole of island exclusion is the only viable approach to mitigating impacts of cane toads										
1.1.1 Implement an adequate suite of quarantine and biosecurity measures to greatly reduce the likelihood of cane toads arriving on Groote Eylandt	HE	GEMCO, ALC										
1.1.2 Implement a suite of monitoring and surveillance measures on Groote with adequate sensitivity to detect any toads that arrive on the island in time for containment.	HE	GEMCO, ALC, NTG										
1.1.3 Implement a response plan with an adequate suite of measures to ensure that any toads detected on Groote are contained	HE	GEMCO, ALC, NTG										
1.1.4 Implement adequate education and engagement programs to ensure that all communities, business, partners and stakeholders are appreciative of the risk and impacts of cane toads, and know what steps to take to minimise these	HE	GEMCO, ALC, NTG										
1.1.5 Investigate and support development of emerging and new technologies for detection and control of cane toads (such as eDNA surveillance), and incorporate into management applicable actions	HE	GEMCO, NTG										
Milestones												
Revised cane toad management plan finalised			✓									
Adequate suite of quarantine and security measures are in place			✓									
All toads are detected on Groote, contained and removed			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1.2 Develop management plans to keep Bickerton and Winchelsea Islands cane toad-free	HE											
1.2.1 Undertake a risk assessment for cane toad establishment on Bickerton and Winchelsea	HE	ALC										
1.2.2 Implement relevant quarantine, surveillance and response measures identified in the Groote Cane Toad Management Plan for Bickerton and Winchelsea	HE	ALC										
Milestones												
Risk assessment completed			✓									
Adequate suite of quarantine and security measures are in place				✓								
All toads are detected on islands, contained and removed				✓								
Measure of success												
No cane toads established in the Groote Archipelago			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

2. Cats

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2.1 Reduce the numbers and impact of cats in communities and industrial areas across the Groote archipelago	E	Cat populations in towns, communities and industrial areas can attain high densities and be sources of dispersal to native habitats										
2.1.1 Continue to maintain Alyangula as cat-free	E	GEMCO, ALC										
2.1.1.1 Expand and maintain awareness and engagement throughout the community and relevant transport companies to ensure high awareness that cats are prohibited	E	GEMCO, ALC, Council										
2.1.1.2 Expand and maintain surveillance and enforcement activities to detect and remove cats from Alyangula and surrounding areas	LE	ALC, GEMCO										
2.1.2 Develop and undertake surveillance and targeted cat control at all mine industrial and Plant sites	LE	GEMCO										
2.1.3 Investigate occurrence of cats at tip sites and develop cat eradication plans. Explore the feasibility of excluding cats from tip sites with cat proof fences that incorporate Grooming Traps for containment of immigrating cats (cat sinks)	E	ALC, GEMCO, NTG										
2.1.4 Reduce the numbers and impacts of cats in other communities and outstations	LE	ALC										
2.1.4.1 Maintain up to date register of cats in communities; establish a cat register and regularly monitor	E	ALC										
2.1.4.2 Implement a community engagement and education programs to: (i) evaluate community members' motivations for keeping cats; (ii) increase awareness about the impact of cats on cultural heritage; (iii) discourage transport of cats and kittens from the mainland and (iii) develop options for reducing community cat ownership	E	ALC										
2.1.4.3 Engage with the ALC Board and senior Traditional owners to build support for designating communities as cat-free, for cat control around communities, and restricting movement of cats from the mainland	LE	ALC										
2.1.4.4 Explore the development of incentive schemes for reducing cats in communities (e.g. cat de-sexing, euthanasia, handover or pet exchange)	E	ALC										
2.1.4.5 Implement incentive schemes to reduce cat ownership and increase containment	E	ALC										
2.1.4.6 Implement follow-up surveys of cat ownership and attitudes to evaluate effectiveness of above actions	E											

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Milestones												
Alyangula remains cat-free			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cat ownership reduced in Angurugu, Umbakumba, Milyakburra and outstations				✓	✓	✓	✓	✓	✓	✓	✓	✓
Cat eradication and exclusion trial completed at Alyangula Tip					✓							
No un-owned cats in any communities					✓	✓	✓	✓	✓	✓	✓	✓
All remaining owned cats are contained and de-sexed							✓	✓	✓	✓	✓	✓
2.2 Eradicate cats on Groote Eylandt	NE	Not yet feasible with current technology, not cost effective, but this may change in the future										
2.2.1 Maintain current awareness of emerging cat control methods and technologies as they emerge, and evaluate potential application to Groote Archipelago.	HE	NTG										
Milestones												
Up to date awareness of any new technologies maintained and evaluation of efficacy on Groote			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.3 Explore establishment of (fenced) cat-free areas within Groote Eylandt	LE	Maintaining cat-free areas for threatened species conservation can only be achieved with construction and maintenance of large cat-proof fencing. The feasibility of this on Groote is low										
2.3.1 Identify potentially suitable locations with populations of brush-tailed rabbit-rat and northern hopping mouse and evaluate the feasibility and cost	LE	ALC										
2.3.2 If deemed technically feasible undertake consultations with Traditional owners to seek approval												
2.3.3 Develop cat eradication and fencing plans	LE	ALC, NTG										
2.3.4 Acquire approvals for baiting and other mitigation measures (e.g. APVMA)	LE	ALC, NTG										
2.3.5 Establish baseline density of feral cats	E	ALC, NTG										
2.3.6 Construct cat-free fenced area	E	ALC										
2.3.7 Implement eradication program	E	ALC										
2.3.8 Monitor and evaluate effectiveness	E	ALC, NTG										
Milestones												
Area approved and plan developed							✓					
Approvals for baiting and other mitigation measures acquired								✓				
Cat-proof fence constructed								✓				
Cat eradication implemented.									✓			
Effective monitoring and evaluation of cats and threatened species implemented								✓	✓			

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2.4 Suppress feral cat population density over a large-scale area(s) with supporting threatened species populations	E	Feasibility of reducing cat densities sufficiently to protect threatened species conservation is unknown, and requires on-going aerial baiting										
2.4.1 Assess potential impacts of aerial (Hisstory) baiting on non-target species (dingoes and goannas)	E	NTG										
2.4.2 Identify suitable locations and undertake consultations	LE	ALC										
2.4.3 Acquire approvals for aerial (Hisstory) baiting (e.g. APVMA)	E	ALC, NTG										
2.4.4 Implement annual - ongoing aerial baiting	LE	ALC										
2.4.5 Monitor and evaluate cat density and threatened species	LE	ALC, NTG										
Milestones												
Approvals for baiting acquired						✓						
Cat baiting implemented						✓						
Effective monitoring and evaluation of cats and threatened species implemented					✓							
2.5 Evaluate the efficacy and application options of Grooming Traps to support activities to reduce impacts of cats on threatened species on Groote	LE											
2.5.1 Undertake non-toxic trials to evaluate the performance of grooming traps to (a) detect cats, (b) avoid non-target species, such as young dingoes, and (c) cope with disturbance. (Trial best conducted in areas with relatively high cat density, such as tip site)	LE	ALC										
2.5.2 If successful, acquire approvals for active operation of Grooming Traps on Groote	LE	ALC										
2.5.3 Establish experimental management trials to evaluate the efficacy of an array of grooming traps to reduce impact of feral cats on threatened mammal species	LE	ALC, NTG										
2.5.4 Subject to community approval (Action 2.1.4), trial use of grooming traps to reduce dispersal of cats from communities or outstations	LE	ALC, NTG										
Milestones												
Efficacy of using Grooming Traps on Groote understood			✓									
Grooming traps deployed to reduce impacts of cats						✓						

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2.6 Improve understanding of relationships between cat population density, predation impact on threatened species, and other environmental factors, such as fire and habitat disturbance	E	Uncertainty exists about the relative impact of feral cats on threatened mammals in different environmental and management settings, and the cost effectiveness of managing their populations										
2.6.1 Conduct research to ascertain factors influencing feral cat density on Grootie	E	NTG										
2.6.2 Conduct research to evaluate density-impact relationships between feral cats and mammals on Grootie. In particular examine the relationships between cat population density and demography of brush-tailed rabbit-rats and northern hopping mice	E	NTG										
Milestones												
Relationships and impacts understood						✓						
Measure of success												
Impact of feral cats on threatened species is measurably reduced							✓					

3. Fire

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
3.1 Improve understanding of fire regimes and management	HE	The environmental and management settings on Groote differ from the mainland, so understandings and assumptions from the mainland may not all apply										
3.1.1 Characterise and map existing and historical fire regime	HE	ALC, NTG, CDU										
3.1.2 Seek expert advice and undertake research to gain understanding of optimal fire regimes for threatened mammal species	HE	ALC, NTG, CDU										
3.1.3 Improve understanding of how fire interacts with other factors such as traditional practices and threatening processes	HE	ALC, NTG, CDU										
3.1.4 Understand the fire management requirements of mine rehabilitation areas and implications for adjacent habitats and threatened species	E	GEMCO										
3.2 Develop and implement a Fire Management Plan	HE	There is currently no strategic approach to fire management in the Groote Archipelago										
3.2.1 Engage all stakeholders about fire to: <ul style="list-style-type: none"> identify values, management aims and fire objectives; raise awareness of the relationship between fire and threatened species conservation, and particularly the implications of current fire regimes; and gain support for a fire management regime that promotes threatened species conservation 	HE	ALC, NTG, CDU										
3.2.2 Based upon current knowledge, identify ecologically ideal fire regime for threatened species. Identify priority areas for targeting to optimize fire regimes for threatened species	HE	NTG										
3.2.3 Based upon current and traditional knowledge, document other management practices and identify all other fire objectives	HE	NTG, ALC										
3.2.4 Integrate objectives into a Fire Management Plan for the Archipelago	HE	ALC, NTG, GEMCO										
3.2.5 Develop and implement community fire awareness program based on objectives in the Plan	E	ALC										
3.2.6 Embed fire management into existing land management, education and governance programs	E	ALC										

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
3.2.7 Support stakeholders to implement fire management activities in a collaborative fashion with a focus on developing capacity and resilience <ul style="list-style-type: none"> • Undertake appropriate training to build and maintain capacity to implement the Plan • Secure expert advice and collaborations to guide and refine the Plan 	E											
3.2.8 Monitor and evaluate fire regimes on annual basis	HE	ALC, NTG										
Milestones												
Stakeholder consultation complete				✓								
Fire Management Plan completed and implementation underway				✓								
Community awareness program in place												
Fire management embedded into existing land management, education and governance programs					✓							
Fire regimes well understood and documented				✓								
Knowledge of fire regimes and how to management them adequate to optimize for threatened species					✓							
Measure of success												
Fire regimes are implemented that optimise outcomes for threatened species							✓					

4. Introduced Livestock

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
4.1 Improve community understanding and appreciation of the threats posed by introduced livestock	E	Community appreciation of the potential impacts of introduced livestock on environment and culture assets is inadequate										
4.1.1 Implement community engagement and education program about threats of introduced livestock, including demonstrating the damage to environmental and cultural values off-island	E	ALC										
4.1.2 Engage with the ALC Board and other Senior Traditional Owners about threats of introduced livestock to seek their support for keeping the Archipelago free of feral pigs and herbivores	E	ALC										
4.1.3 Secure agreement and support from all communities to not acquire pigs or feral herbivores	E	ALC										
4.1.4 Consult with relevant communities and stakeholders to assess feasibility of removal of deer from North East Island	LE	ALC										
Milestones												
Communities do not want pigs or feral herbivores							✓					
ALC has a clear policy on pigs and feral herbivores				✓								
Capability to respond to incursions in place				✓	✓	✓	✓					
4.2 Prevent further incursions	E											
4.2.1 Remove or desex any existing livestock from communities	E	ALC										
4.2.2 Undertake regular surveillance of communities and other locations where there is risk or likelihood of livestock emerging, such as swamps and lagoons on Groote and Bickerton Islands	E	ALC										
4.2.3 Explore the efficacy of eDNA methods for enhancing early detection and mitigation response to feral pig incursions	E	ALC, NTG										
Milestones												
All (if any) further incursions detected			✓	✓	✓	✓	✓					

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
4.3 Acquire capability to respond to, and remove incursions	E											
4.3.1 Develop an incursion response plan	E	ALC										
4.3.2 Ensure that ALC relevant staff are trained and equipped to respond to any incursions, such as fire-arms training	E	ALC										
4.3.3 Secure approval from ALC for baiting and culling	E	ALC										
4.3.4 Build relationships and networks with other feral animal management teams and agencies and organizations to advise and assist with livestock management when required	E	ALC										
Milestones												
Plan prepared				✓								
Approvals and capabilities in place				✓	✓	✓	✓					
Effective eradication if incursion occurs				✓	✓	✓	✓					
Measure of success												
No pigs or feral herbivores on Groote			✓	✓	✓	✓	✓					
No movement of rusa deer to Groote or other islands			✓	✓	✓	✓	✓					

5. Weeds

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
5.1 Develop an integrated Weed Management Plan for the Groote Archipelago	E											
5.1.1 Ensure appropriate quarantine and hygiene systems and protocols are in place to detect and prevent arrival of weeds	E	ALC, GEMCO, NTG										
5.1.1.1 Undertake adequate quarantine and biosecurity inspections of all plants, horticultural products and plant materials imported to the archipelago	HE	ALC, GEMCO										
5.1.1.2 Undertake adequate quarantine and biosecurity inspections of all machinery, vehicles, trailers and other industrial plant equipment brought to the archipelago	HE	ALC, GEMCO										
5.1.1.3 Establish biosecurity procedures for transport of all machinery, vehicles, trailers and other plant equipment across Groote and between islands within the archipelago	HE	ALC, GEMCO										
5.1.1.4 Undertake regular surveys and risk assessments of residential communities, industrial areas and other high-risk weed establishment sights	HE	ALC, GEMCO										
5.1.1.5 Ensure that adequate staff are available, trained, equipped and authorised to undertake the above inspection and surveillance activities	HE	ALC, GEMCO										
5.1.1.6 Establish industry and community wash down facilities at appropriate locations to reduce potential for weed incursions and spread of existing weeds	HE	ALC, GEMCO										
5.1.2 Develop and implement management response plans for high risk, invasive weeds, such as gamba grass and mission grass	HE	ALC, GEMCO, NTG										
5.1.3 Develop and implement management plans for high risk weed establishment areas, such as communities, transport points, road sides	HE	ALC, GEMCO										
5.1.4 Ensure that relevant staff are available, trained and equipped to implement response plans and undertake other weed management activities	HE	ALC, GEMCO										
5.1.5 Implement community and stakeholder engagement and education program and tools to: <ul style="list-style-type: none"> raise awareness of the environmental impacts of weeds, and the importance of preventing their spread/incursion Improve awareness of weeds that are a priority for control reduce the risk of importation and spread Improve reporting and recording of incursions 	HE	ALC										

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Milestones												
Existing weed infestations reduced or contained					✓							
Adequate incursion prevention measures are in place					✓	✓	✓	✓	✓	✓	✓	✓
Further weed incursions are prevented			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
All major weed incursions are successfully responded to			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community and stakeholder engagement and education programs in place			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5.2 Update priorities and plans through maintaining shared information, planning and reporting systems												
5.2.1 Develop and maintain a 'point of truth' database of weed incursions and management response actions	E	ALC, NTG										
5.2.2 Develop and maintain a spatial database of weeds and where management has been undertaken	E	ALC, NTG										
5.2.3 Provide regular reports to all stakeholders and the general community of the archipelago	E	ALC										
5.2.4 Build and maintain networks with other regional expertise, including NTG Weeds Branch and Arnhem Land natural resource managers to build capacity for weed management activities	E	ALC, NTG										
Milestones												
Up to date and accurate information on weeds				✓	✓	✓	✓	✓	✓	✓	✓	✓
Communication and cooperation amongst all stakeholders supporting implementation of Plan				✓	✓	✓	✓	✓	✓	✓	✓	✓
Measures of success												
Impacts of current weeds in the archipelago minimised			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Further weed incursions are prevented			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

6. Myrtle Rust

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
6.1 Develop a Myrtle Rust Management Plan for the Groote Archipelago	E											
6.1.1 Ensure appropriate quarantine and hygiene systems and protocols are in place to detect and prevent arrival of myrtle rust	E	ALC, GEMCO, NTG										
6.1.1.1 Undertake adequate quarantine and biosecurity inspections of all plants, horticultural products and plant materials imported to the archipelago	HE	ALC, GEMCO										
6.1.1.2 Undertake adequate quarantine and biosecurity inspections of all machinery, vehicles, trailers and other industrial plant equipment brought to the archipelago	HE	ALC, GEMCO										
6.1.1.3 Establish biosecurity procedures for transport of all machinery, vehicles, trailers and other plant equipment across Groote and between islands within the archipelago	HE	ALC, GEMCO										
6.1.1.4 Undertake regular surveys and risk assessments of high-risk establishment sights	HE	ALC, GEMCO										
6.1.1.5 Ensure that adequate staff are available, trained, equipped and authorised to undertake the above inspection and surveillance activities	HE	ALC, GEMCO										
6.1.1.6 Establish industry and community wash down facilities at appropriate locations to reduce potential for incursions and spread	HE	ALC, GEMCO										
6.1.2 Develop and implement a management response plan for incursions	HE	ALC, GEMCO, NTG										
6.1.3 Ensure that relevant staff are available, trained and equipped to implement response plan	HE	ALC, GEMCO										
Milestones												
Management plan in place					✓							
Adequate incursion prevention measures are in place					✓	✓	✓	✓	✓	✓	✓	✓
Further incursions are prevented			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community and stakeholder engagement and education programs in place			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
6.2 Update priorities and plans through maintaining shared information, planning and reporting systems	E											
6.2.1 Provide regular reports to all stakeholders and the general community of the archipelago	E	ALC										
6.2.2 Build and maintain networks with other regional expertise, including NTG Weeds Branch and Arnhem Land natural resource managers to build capacity for weed management activities	E	ALC, NTG										
Milestones												
Communication and cooperation amongst all stakeholders supporting implementation of Plan				✓	✓	✓	✓	✓	✓	✓	✓	✓
Measures of success												
Impacts of myrtle rust in the archipelago minimised			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Further incursions are prevented			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

7. Invasive ants

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
7.1 Develop an invasive ant Management Response Plan for the Groote Archipelago	E											
7.1.1 Ensure appropriate quarantine and hygiene systems and protocols are in place to detect and prevent arrival of invasive ants	E	ALC, GEMCO, NTG										
7.1.1.1 Undertake adequate quarantine and biosecurity inspections of all plants, horticultural products and plant materials imported to the archipelago	HE	ALC, GEMCO										
7.1.1.2 Undertake regular surveys and risk assessments of high-risk establishment sights	HE	ALC, GEMCO										
7.1.1.3 Ensure that adequate staff are available, trained, equipped and authorised to undertake the above inspection and surveillance activities	HE	ALC, GEMCO										
7.1.2 Develop and implement a management response plan for incursions	HE	ALC, GEMCO, NTG										
7.1.3 Ensure that relevant staff are available, trained and equipped to implement response plan	HE	ALC, GEMCO										
7.1.4 Implement community and stakeholder engagement and education program and tools to: <ul style="list-style-type: none"> Raise awareness of the environmental impacts of invasive ants, and the importance of preventing their spread/incursion Improve awareness of ants that are a priority for control reduce the risk of importation and spread Improve reporting and recording of incursions 	E	ALC										
Milestones												
Management plan in place					✓							
Adequate incursion prevention measures are in place					✓	✓	✓	✓	✓	✓	✓	✓
Further incursions are prevented			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community and stakeholder engagement and education programs in place			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
7.2 Update priorities and plans through maintaining shared information, planning and reporting systems	E											
7.2.1 Provide regular reports to all stakeholders and the general community of the archipelago	E	ALC										
7.2.2 Build and maintain networks with other regional expertise, including NTG Weeds Branch and Arnhem Land natural resource managers to build capacity for invasive ant management activities	E	ALC, NTG										
Milestones												
Communication and cooperation amongst all stakeholders supporting implementation of Plan				✓	✓	✓	✓	✓	✓	✓	✓	✓
Measures of success												
Impacts of invasive ants in the archipelago minimised			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Further incursions are prevented			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

8. Habitat disturbance

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
8.1 Minimise further disturbance of threatened species habitat	HE											
8.1.1 Complete surveys to map and/or model distributions and habitat associations of disturbance-sensitive threatened species (Table 4)	HE	ALC, NTG										
8.1.2 Use habitat mapping and modelling, information on important populations, and other important ecological attributes to identify Special Protection Zones (SPZs) for threatened species sensitive to habitat disturbance	HE	ALC, GEMCO										
8.1.3 Avoid any habitat disturbance to SPZs	LE	ALC, GEMCO										
8.1.4 Where avoiding disturbance to other mapped habitat of disturbance-sensitive threatened species is not achievable, develop prescriptions for each species to minimise disturbance impacts. These should include: <ul style="list-style-type: none"> • Minimum buffers from critical habitat attributes such as large trees and burrow, roost or breeding sites • Landscape attributes such as patch size and connectivity with undisturbed habitat • Seasonal timing of disturbance activities to account for breeding or dispersal 	E	ALC, GEMCO										
8.1.5 Maintain a spatial database of threatened species records, mapped distributions and habitat attributes, and SPZs to augment future risk assessments for threatened species in planning and development processes	HE	NTG, ALC										
Milestones												
Key habitats for disturbance-sensitive threatened species identified						✓						
SPZ's for disturbance sensitive threatened species identified						✓						
Prescriptions for minimising disturbance of other habitat developed and applied						✓	✓	✓	✓	✓	✓	✓
Spatial database established and up to date				✓	✓	✓	✓	✓	✓	✓	✓	✓

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
8.2 Reduce impacts of existing habitat disturbance on threatened species	LE											
8.2.1 Undertake appropriate fire and weed management in and around disturbed areas, particularly communities, mining and other industrial areas, as per respective plans	LE	ALC, GEMCO										
8.2.2 Evaluate the existing road and track network with respect to mapped threatened species distributions and SPZs, and where possible undertake closures and rehabilitation	E	ALC, GEMCO										
8.2.3 Ensure that rehabilitation and closure plans for mining areas and mining roads consider management of off-site impacts on threatened species	E	GEMCO										
8.2.4 Develop explicit realistic criteria for measuring success of closure rehabilitation plans in regards to threatened species	E	GEMCO, NTG										
Milestones												
Edge effects and offsite impacts of disturbed areas are managed effectively for threatened species					✓	✓	✓	✓	✓	✓	✓	✓
Low priority roads and tracks that pose a risk to threatened species are closed						✓						
Measures of success for threatened species that are realistic and achievable are incorporated into mine rehabilitation and closure plans				✓								
Governance in place and best-practices employed			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Measures of success												
Habitat disturbance impacts on threatened species across the archipelago are minimised.			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

9. Knowledge gaps

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
9.1 Address knowledge gaps in population status, distributions and habitat associations and ecological requirements of threatened species	E											
9.1.1 Develop a portfolio of priority research projects and foster partnerships with Research Institutions to augment their delivery	E	NTG, ALC, SC										
9.1.2 Undertake further surveys with appropriate methods to fully ascertain the distributions and environmental associations of threatened rodent species	E	ALC, NTG										
9.1.3 Determine population size and model distribution and environmental requirements of masked owls	E	ALC, NTG										
9.1.4 Locate maternity caves and map roost sites of ghost bats	E	ALC, NTG										
9.1.5 Improve understanding of factors limiting the distribution and recovery of threatened rodents on Groote, in particular the interactive effects of fire management and predation	E	ALC, NTG										
Milestones												
Portfolio of priority research projects developed and disseminated to appropriate research institutions.			✓	✓								
Adequate knowledge of populations and ecology of threatened species to inform effective management is acquired					✓	✓	✓					
9.2 Improve understanding of impacts of key threatening processes in the IPA and how to manage them effectively	E											
9.2.1 Ascertain factors limiting population density of feral cats on Groote	E	ALC, NTG										
9.2.2 Evaluate the role of communities and other high density sites such as tips as source populations for feral cats	E	ALC, NTG										
9.2.3 Document historic and current fire regimes. Use vegetation ecological attributes and vegetation mapping to inform optimal fire regimes	E	NTG, ALC										
9.2.4 Investigate application of emerging technologies such as eDNA for surveillance and response to invasive species	E	NTG										
Milestones												
Adequate knowledge of impacts of key threatening processes and how best to manage them effectively in the archipelago is acquired							✓					

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
9.3 Resolve conservation status of other potentially threatened taxa in the IPA	LE											
9.3.1 Conduct surveys to determine the status of the yellow-spotted monitor on Groote Eylandt	LE	ALC, NTG										
9.3.2 Resolve systematics of Groote archipelago rock wallabies and small dasyurids	LE	ALC, NTG										
9.3.3 Resolve systematics for Groote Eylandt death adders and sandstone outcrop geckos and monitor lizards	LE	ALC, NTG										
9.3.4 Ascertain distributions and status of threatened and range-restricted plant species	LE	NTG										
Milestones												
Conservation status of other potentially threatened species in the IPA resolved						✓						
Measures of success												
Knowledge of species and threats are adequate to inform effective management and recovery of threatened species							✓					

10. Monitoring and evaluation

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
10.1 Evaluate responses of threatened species to management	E											
10.1.1 Establish and implement monitoring programs for all threat-ened mammal species with adequate sensitivity to detect 10% change in population size, density or occupancy over 5 years	E	ALC, NTG										
10.1.2 Use distribution surveys to ascertain baselines, then design and implement monitoring programs for the Masked owl and ghost bat	E	ALC, NTG										
10.1.3 Establish surveillance monitoring of other threatened species and species groups of concern (e.g. small and medium-sized mammals)	E	ALC, NTG										
10.1.4 As management interventions are initiated, ensure that adequate monitoring of both the threat and the target species are developed to enable effective evaluation	E	ALC, GEMCO, NTG										
10.1.5 Irrespective of timing and forms of intervention, establish and implement surveillance monitoring of trends in key threats, including fire regimes, feral cat densities, priority weeds and cane toads	E	ALC, GEMCO, NTG										
10.1.6 Build capacity (expertise and resources) of ALC staff to undertake this work	E	ALC										
Milestones												
Adequate monitoring in place for all threatened species				✓	✓	✓	✓	✓	✓	✓	✓	✓
Effective monitoring and evaluation of management interventions in place				✓	✓	✓	✓	✓	✓	✓	✓	✓
Adequate capacity of ALC rangers to undertake monitoring and surveillance in place					✓	✓	✓	✓	✓	✓	✓	✓
Measures of success												
Information on trends in threatened species and threaten-ing processes is adequate to evaluate performance of the management plan						✓	✓	✓	✓	✓	✓	✓

11. Governance and operations

Actions and milestones	Rating	Who	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
11.1 Establish Governance arrangements to oversee the implementation and evaluation of this Plan	HE											
11.1.1 Establish a steering committee with representation from key stakeholders to oversee and guide the delivery of this Plan	HE	ALC, NTG, GEMCO, AUG										
11.1.2 Develop Terms of Reference for the Steering Committee to be endorsed by the ALC Board, to determine the structure, roles and responsibilities of the Steering Committee	HE	ALC, NTG, GEMCO, AUG										
11.1.3 Steering Committee develop a reporting and evaluation framework for the Plan	HE	SC										
11.1.4 Undertake a major review of the Plan after 5 years	HE	SC										
Milestones												
Steering Committee with Terms of Reference established			✓									
Regular reporting and evaluation of progress occurring				✓	✓	✓	✓	✓	✓	✓	✓	✓
Major review and update of objectives and actions under-taken								✓				
11.2 Ensure that adequate operational capacity and arrangements are in place to implement this Plan	HE											
11.2.1 Establish dedicated Threatened Species capability in the ALC ranger program to implement work programs from this Plan	HE	ALC										
11.2.2 Identify gaps in expertise and capability within Groote need-ed to deliver the Plan and establish partnerships with other organisations to leverage necessary capacity.	HE	ALC, NTG, GEMCO										
11.2.3 Establish a coordinator role within the ALC to identify and develop capacity needs, manage the delivery of Plan Actions, liaise with relevant stakeholders and collaborators and report to the Steering Committee	HE	ALC										
Milestones												
Threatened species coordinator role established			✓									
Capacity of ALC adequate to deliver the Plan work program				✓	✓	✓	✓	✓	✓	✓	✓	✓
Partnerships established are productive and supporting delivery of Plan actions				✓	✓	✓	✓	✓	✓	✓	✓	✓
Measures of success												
All milestones achieved, evaluated and reported			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

