



Northern Territory  
**NATURAL RESOURCE  
MANAGEMENT PLAN**  
2016-2020



**TOP END REGION**



# VISION

“Territorians working together to manage our environment’s natural, cultural and economic values for the benefit of all.”

## FOR MORE INFORMATION

This publication is available on request through contacting [info@territorynrm.org.au](mailto:info@territorynrm.org.au)

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<b>IV</b>	Foreword	
<b>1</b>	About this plan	
<b>2</b>	Top End regional profile	
<b>4</b>	Social and economic assets in NRM	
<b>5</b>	Land tenure	
<b>6</b>	How does this plan relate to you?	
<b>7</b>	How did we develop the plan?	<b>26</b>
<b>8</b>	Climate change in northern Australia	<b>28</b>
<b>9</b>	Climate change adaptation	<b>30</b>
<b>10</b>	Assets	<b>32</b>
<b>11</b>	Threats and assets	<b>36</b>
<b>12</b>	Asset and pressure descriptions	<b>38</b>
<b>24</b>	How to read the plan	<b>40</b>
<b>26</b>	Programs	<b>42</b>
<b>48</b>	Threatened species of the Top End	<b>46</b>
<b>49</b>	Sites of Conservation Significance in the Top End	
<b>50</b>	Weeds of the Top End	
<b>51</b>	Feral animals of the Top End	

<b>26</b>	PROGRAM 1: Managing fire
<b>28</b>	PROGRAM 2: Preventing and managing weeds
<b>30</b>	PROGRAM 3: Reducing the impacts of feral animals
<b>32</b>	PROGRAM 4: Industry adoption of sustainable practices
<b>36</b>	PROGRAM 5: Water resources and soil management
<b>38</b>	PROGRAM 6: NRM based economic opportunities
<b>40</b>	PROGRAM 7: Minimising ecological footprints of development
<b>42</b>	PROGRAM 8: Managing and protecting key natural and cultural assets
<b>46</b>	PROGRAM 9: Knowledge, capacity and engagement



# FOREWORD

## Welcome to the Natural Resource Plan 2016-2020

This plan is a comprehensive strategy for all Territorians. It is a plan for maintaining the health of our land, water, biodiversity and coastal resources for the next five years and because that health is a responsibility we all share, the TNRM team has consulted widely across the Territory in putting it together.

The plan builds upon our previous NRM plans through establishing a strong adaptive approach to natural resource management. This approach is one where we all learn by doing; it utilises science and traditional knowledge; it draws on the experiences of the many people and organisations that will be involved in delivering its strategies.

TNRM will again be active participants over the years of the plan. We will be encouraging collaboration and partnerships and shared and complimentary approaches from all involved in natural resource management – from governments to scientists, from business to community organisations and everybody in between. We'll also have an ongoing role in reviewing the progress of the plan.

Finally, with the renewed focus of the Australian Government on developing northern Australia, this NRM plan clearly demonstrates the links between a healthy and sustainable environment and the Territory's economic and social future.

As Chair, I look forward to being part of the effort in bringing to reality the many objectives outlined throughout the plan.



**Clare Martin**

*Chair, Territory Natural Resource Management*



The development of the Top End Regional Action Plan has been facilitated by Territory Natural Resource Management (TNRM) in collaboration with the primary stakeholders, including landholders, Traditional Owners, pastoralists, government, industry groups, researchers, Aboriginal organisations and community groups. The plan provides an integrated and collaborative approach to ensure sustainable management of our water, land, soils and biodiversity in the Top End built on strong partnerships between all stakeholders.

The purpose of the plan is to encourage investment from a diverse range of sources, build community capacity to engage in NRM through knowledge sharing, skills and partnerships and to identify strategies and priority actions that will help us better look after the Top End. By engaging multiple sectors, the plan aims to promote a shared vision and increase coordination across sectors for the management of the unique cultural and natural resources in the Top End.

This plan draws on the Northern Territory Natural Resource Management Plan (NRMP) and Top End Regional Action Plan 2010-2015. It is one of one of four Regional Action Plans for the NT. As part of the planning process, we have undertaken a review of the previous plan to reflect on the progress we have achieved and to improve the way we undertake and prioritise natural and cultural resource management activities in the Top End. The plan aims to support and build upon the good work that our stakeholders have conducted over many years.

## Our Vision

The vision of the plan is for

*“Territorians working together to manage our environment’s natural, cultural and economic values for the benefit of all.”*

## Our Assets

Assets have been classified and identified by the stakeholders in the Top End as the attributes that they want to protect and maintain. These include physical attributes such as intact grasslands, water holes and healthy populations of birds, reptiles and mammals and Aboriginal cultural sites and landscapes. They also include social assets such as knowledge, NRM networks, organisational capacity and people being in the landscape to manage it. Assets provide people in the Top End region with resources essential for day to day living, supporting economic initiatives in the region such as tourism and horticulture. They also support an important and often unrecognised customary economy for Aboriginal people as well as providing their cultural and spiritual well-being. We identified nine key assets in conjunction with our stakeholders for the Top End Region:



## Pressures on our Assets

Our assets are increasingly under pressure from the predicted impacts of climate change, inappropriate fire regimes, feral animals, weeds and more intensive resource use from development. Ten broad categories of critical pressures and uses for our assets were identified during the workshops relevant to this plan:



## Our Programs to Look After Country

Programs have been split into nine themes each containing strategies, priority actions and milestones for looking after our assets and minimising the impacts of the key pressures and uses.

- 1 Managing Fire
- 2 Preventing and Managing Weeds
- 3 Reducing the Impacts of Feral Animals
- 4 Industry Adoption of Sustainable Practices
- 5 Water Resources and Soil Management
- 6 NRM Based Economic Opportunities
- 7 Minimising Ecological Footprints of Development
- 8 Managing and Protecting Key Natural and Cultural Assets
- 9 Knowledge, Capacity and Engagement

## Monitoring our Success

This plan is designed to be a living document and used to promote stakeholder engagement and active involvement in NRM programs. It is intended to promote continual improvement and ongoing review of the approach to complex NRM issues over the life of this plan. It is also a useful tool to assist NRM stakeholders to adopt a ‘collaborative impact’ framework improving how many projects and partners align towards having a greater impact at the landscape scale.

# TOP END REGIONAL PROFILE

The Top End region covers 13% (176,500 km<sup>2</sup>) of the NT's land area. The coastal waters of the Top End account for about 84% (64,500 km<sup>2</sup>) of coastal regions within the NT. The vast majority of the coastal zone and the land is Aboriginal freehold title. Approximately 70% of Territorians reside in the Top End. Darwin is the main administrative and commercial centre of the NT with a population (including the city of Palmerston) of about 132,000 people. Located 12 degrees south of the equator, Darwin is often described as Australia's gateway to South-East Asia. With one eye on the land and another on the sea, Darwin has become the business hub for a range of resource-based industries that are rapidly expanding across the region. The surrounding Arnhem and Timor seas are dotted with coastal islands, including the Tiwi Islands, Croker Island, Wessel Islands and Groote Eylandt.

The Top End is characterised by extensive mangrove-lined coasts, wetlands and floodplains. The sandstone plateau of western Arnhem Land is known as the 'crown jewels' of the NT because it supports an unusually diverse biota, including many endemic plant and animal species. The Top End region contains many important breeding sites for marine turtles and colonial seabirds and roosting and feeding sites for migratory shorebirds in the area as well as numerous isolated islands which provide important refuge from processes that threaten mainland areas. National parks and reserves in the Top End region include the internationally renowned Kakadu National Park which is a World Heritage and Ramsar site. There are some Indigenous Protected Areas (IPAs) that also cover vast areas of the Top End region.

The climate is tropical monsoonal with a dry and wet season. The wet season is also known as the cyclone season in the Top End. Aboriginal people recognise many seasons in the Top End. For example, Kakadu's Aboriginal owners identify six different seasons.

There are 27 'Sites of Conservation Significance', almost all of which also have an international classification. There are 48 nationally listed and 81 Territory-listed threatened species including the Critically Endangered Bare-rumped Sheath-tailed Bat, Speartooth Shark, Quandong, Northern Quoll and Golden-backed Tree-rat. There are nine Weeds of National Significance (WoNS). Established feral animal species include seven exotic insects, 12 mammals, one bird, one reptile and one Cane Toad.

Aboriginal culture in the region dates back 50,000 to 60,000 years. The richness of Aboriginal cultures in the Top End is demonstrated by the diversity of Aboriginal languages in the area. Aboriginal languages are the primary language for many Aboriginal people in the Top End and a vast body of in-depth traditional ecological and cultural knowledge drives ceremonial and cultural practices that continue today. Both the stunning landscapes and Aboriginal culture of the region are major drawcards for both domestic and international visitors.

The area is unique in that it has not been subjected to the same development pressure of urban expansion or intensive agriculture as have other parts of Australia and thus the natural landscapes are still largely intact. However, the environmental and cultural values of the region have declined significantly over many years and a number of species are under increasing pressure from some threats such as wildfires and feral animals. These values underpin the livelihoods of people living in the region.

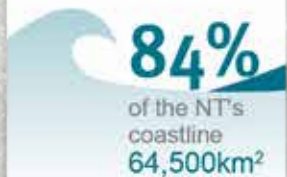


*Agile Wallaby*



*Heliconia*

## LAND



## PEOPLE

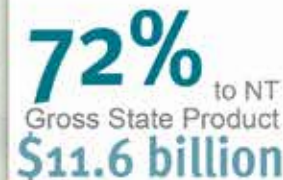


### MAJOR ABORIGINAL COMMUNITIES

- Nguiu
- Gunbalanya
- Maningrida
- Mililingimbi
- Galiwin'ku
- Gapuwiyak
- Yirrkala
- Umbakumba
- Angurugu/Umbakumba
- Ramingining
- Ngukurr
- Numbulwar

Majority of the population  
in "very remote" areas is  
**ABORIGINAL**

## ECONOMY



## NATURAL RESOURCES



Paperbark swamp

# SOCIAL AND ECONOMIC ASSETS IN NRM

## Socio-economic Status

The Top End is the main economic centre for the NT with a broad range of industries including mining, defence, agriculture, and the oil and gas industry. The economy is further supported by tropical horticulture, commercial fishing, tourism and public administration. The city of Darwin's Gross Regional Product is estimated at \$9.21 billion, which represents 45.6% of the state's Gross State Product. At both a Territory and national level there is growing debate about future economic development opportunities in the NT. Darwin is seen as playing a significant role in the development of northern Australia due to its proximity to Asia. The Port of Darwin is also the largest outlet for Australia's live cattle export trade into South-East Asia.

The monsoonal climate and remote nature of much of the Top End region present particular challenges regarding creating sustainable livelihoods and delivering NRM activities. Over 50% of the area is classified as "very remote", according to the Australian Bureau of Statistics (ABS) because of the vast distances needed to travel to access essential services and infrastructure. The tropical monsoonal climate means that road access is cut off to many communities and areas within the Top End for substantial periods of time. These factors have significant implications for the costs and extension services needed to deliver NRM activities, as well as the social resilience of Aboriginal people to cope with the impacts of disadvantage, which impacts on their ability to undertake NRM.

## Social Indicators

During the planning process it was often stressed that human social and cultural aspects of NRM were vital in the NT. Two vital asset categories identified in regional planning workshops related to the social sphere were Community Knowledge and People on Country. It is important to develop indicators that allows us to measure progress against social capacity in NRM activity. NRM activities often have substantial and sustained impact on working relationships, social networks, organisations and individuals beyond the immediate activity. It is important that this is captured and measured through the NRM plan. Therefore, throughout this NRM plan social indicators are embedded throughout the programs and capture aspects such as:

- Effective working relationships and social networks in NRM
- Engagement of regional stakeholders and partnerships developed and strengthened in delivery of NRM
- Organisational capacity
- Stakeholder satisfaction with regional NRM planning and implementation
- Participation, skill-development and employment of Aboriginal people in NRM
- Knowledge of sustainable practices
- Participation in environmental and cultural resource management programs



*Landholder stewardship program –  
Territory Conservation Agreements*



The Top End region is dominated by Aboriginal land, protected areas (including Indigenous Protected Areas), leasehold and some crown land. Large tracts of Aboriginal land are also managed as protected areas.

## Aboriginal Land

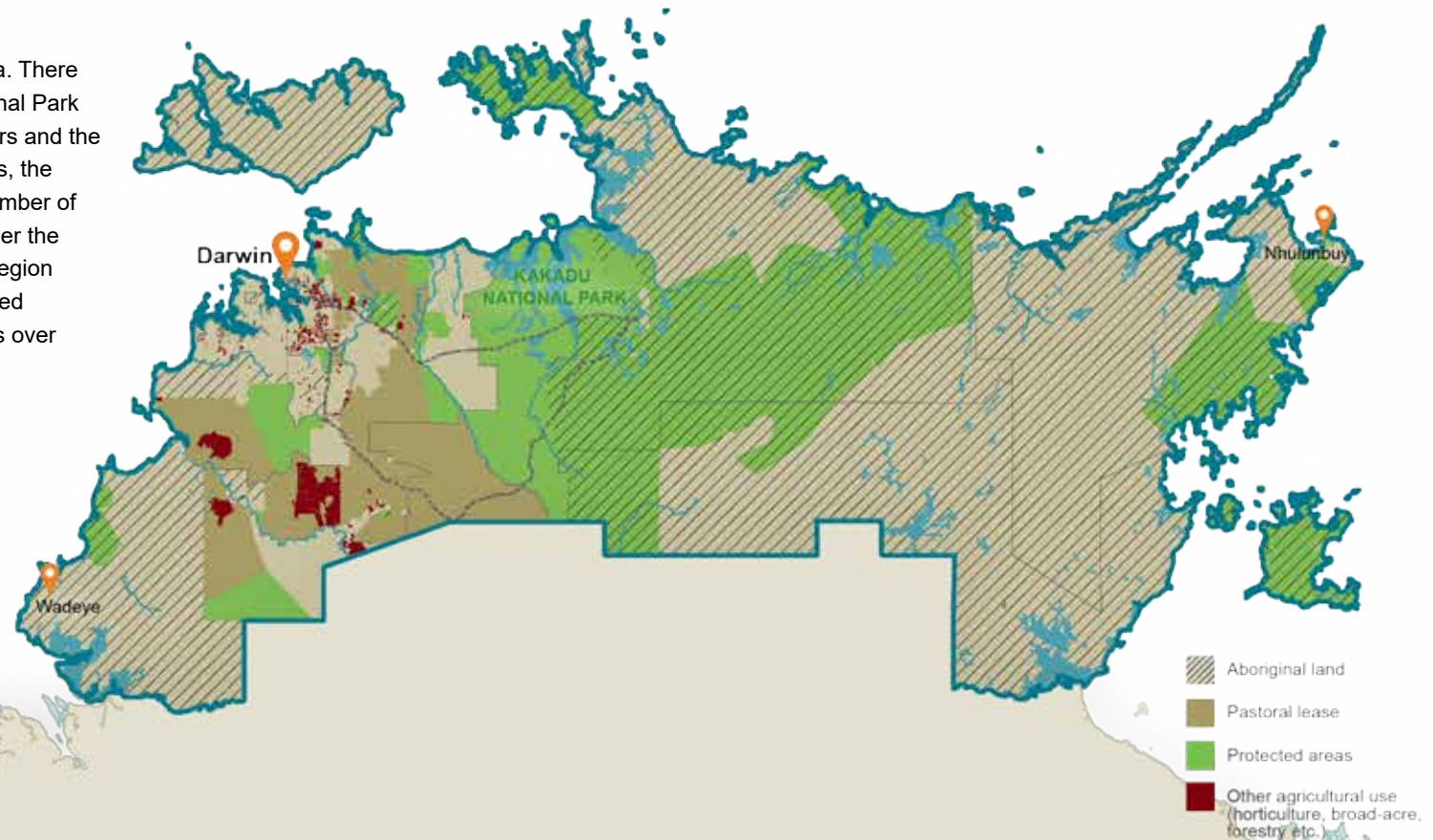
In terms of Aboriginal ownership, the Top End is a unique part of Australia because approximately 70% of the region is under Aboriginal freehold title including Arnhem Land, Groote Island and the Tiwi Islands. The majority of the coastline is also under Aboriginal ownership.

## Protected Areas

33% of the Top End is classified as a protected area. There is a mix of protected areas including: Kakadu National Park which is jointly managed between Traditional Owners and the Australian Government; Indigenous Protected Areas, the largest being Warddeken IPA (13388km<sup>2</sup>); and a number of NT Government Parks and Reserves managed under the Territory Parks and Wildlife Conservation Act. The region also contains Wongalara a non-government protected area established over a pastoral lease which covers over 1924km<sup>2</sup>.

## Crown Land and Private Land

In the Top End around Darwin there are also significant amounts of Crown Land, private residential land, pastoral leases and horticultural blocks.

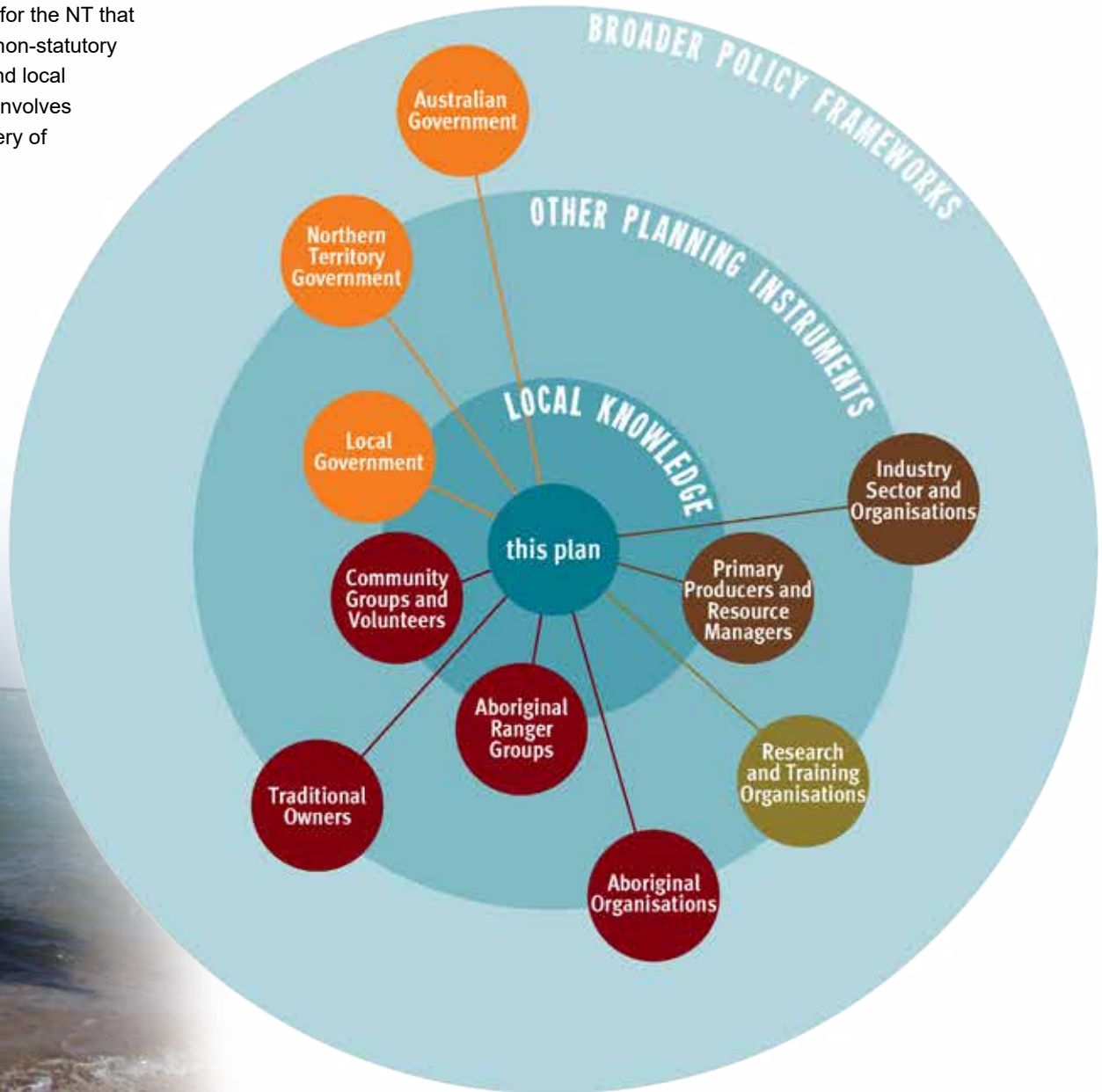


Source: TNRM

# HOW DOES THIS PLAN RELATE TO YOU?

The Top End Regional Action Plan is one of 4 Regional Action Plans for the NT that supports the broader NT NRM Management Plan 2016-2020. It is a non-statutory plan which takes into account broader policy frameworks, regional and local planning initiatives and local knowledge. Implementation of the plan involves many stakeholders and effective partnerships are critical to the delivery of investment in NRM.

This plan provides an integrated approach which aims to strengthen and develop strong partnerships and shared goals which are vital to ensure a collaborative approach to sustainable management of our water, land, soils and biodiversity in the Top End. This plan takes into account the wide range of perspectives and local knowledge from many local stakeholders who are involved in NRM. Importantly, it recognises that a strategic and integrated approach involving everyone with an interest in natural and cultural resource management at all levels is vital in caring for and managing the Top End.



Crocodile Islands Sea-Rangers at work

# HOW DID WE DEVELOP THE PLAN?

TNRM facilitated a planning process to review the NRM priorities in the region. Given the broad nature of NRM and the variety of stakeholders involved it was important to be participatory in our approach to planning. To do this, TNRM utilised the Open Standards for the Practice of Conservation (henceforth, Open Standards) planning framework as it utilises participatory methods that are useful for planning with multi-stakeholder and diverse groups. This planning framework is increasingly being used by a number of organisations in Australia and around the world and is sometimes also referred to as

“Healthy Country Planning” or “Conservation Action Planning”. It provides a systematic framework for developing, implementing, monitoring and improving NRM activities.

The development of this plan included planning workshops, interviews, meetings, submissions and review of other relevant plans involving a variety of organisations including Landcare groups, Aboriginal organisations, the pastoral industry, Parks and Wildlife, Government Departments, Industry representative groups and research institutions.

## 1 Review of 2010-2015 NRM Plan

Workshops, meetings and interviews were conducted with community groups, experts and organisational representatives to review the 2010-2015 NRM plan. The plan had a number of measures of achievement linked to the agreed targets. These were assessed and summarised in a Plan Review that was published in November 2014.



## 2 Regional Workshops

Two regional workshops were held, one in Bachelor for the western Top End and another in Darwin involving the Arnhem Land region to discuss stakeholders' concerns and priorities for NRM in the region and the most effective ways to address these. A process being run for the Greater Darwin Conservation Plan (coordinated by Greening Australia) was also useful for input into this plan.

## 3 Meetings with Local/Regional Experts

A number of meetings were held with local and regional experts to further assist in the development of draft strategies and priority actions.

## 4 Expert and Sector Input

Industry groups and key government agencies were consulted about the plan and provided input and feedback.

## 5 NT-wide Prioritisation Workshop

A two-day workshop was held in Darwin with local and regional experts from all regions of the NT was held, including stakeholders from the Top End to further review the plan and to prioritise which strategies and actions were the most feasible and likely to have the greatest impact on looking after our assets.

## 6 Public Comment for Plans

The Top End Regional NRM Plan was released for public comment and feedback.

## 7 Publication

Publication of the 2016-2020 NT-wide and Top End NRM Plan.



# CLIMATE CHANGE IN NORTHERN AUSTRALIA

The impacts of climate change will intensify the NRM challenges facing people in the Top End region. In 2012, the Australian Government established the regional NRM Planning for Climate Change Fund, with the aim of improving the capacity of regional NRM organisations and their stakeholders to plan for climate change. Updated climate change projections based on regional clusters around Australia were produced by the CSIRO and Bureau of Meteorology. The Top End region falls within the Monsoonal North cluster regional projections for climate change. A detailed analysis of climate change projections for Australia's NRM regions is provided at the Climate Change in Australia website:

[www.climatechangeinaustralia.gov.au](http://www.climatechangeinaustralia.gov.au)



## MONSOONAL NORTH CLIMATE PREDICTIONS



Average temperatures will continue to increase in all seasons.



More hot days and warm spells.



Changes to rainfall are possible but unclear.



Increased intensity of extreme daily rainfall events.



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



Fewer but more intense tropical cyclones.

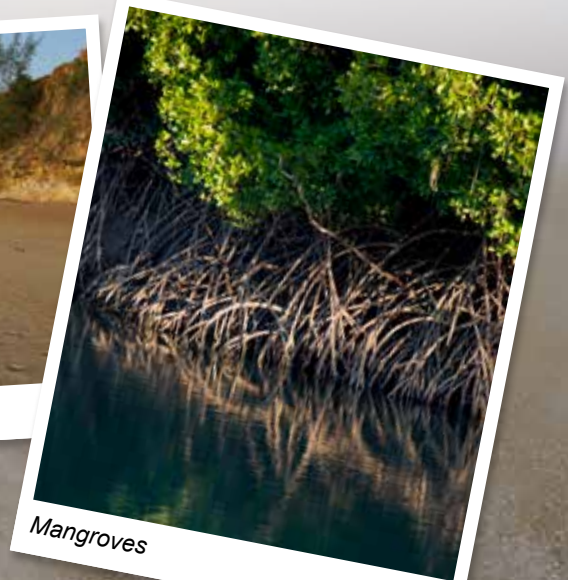
## AdaptNRM

### Climate Change Adaptation Tools and Resources for NRM

AdaptNRM is a national initiative that aims to support NRM groups in updating their NRM plans to include climate adaptation planning. CSIRO and the National Climate Change Adaptation Research Facility (NCCARF) have provided NRM groups with materials and data products about key individual topics that are regionally and nationally relevant. This plan utilises this information to improve the capacity and resilience of our stakeholders to deal with the impacts of climate change. More information relevant to adaptation and NRM is available through the AdaptNRM website: <http://adaptnrm.csiro.au>



Beach



Mangroves

Climate change adaptation is about the ways in which our planning and management approaches need to be continually adjusted to better cope with the challenges imposed by a changing climate. The Australian Government's Regional NRM Planning for Climate Change Fund supported researchers and NRM regional bodies to collaborate on developing adaptation priorities for NRM plans. Priorities for research were identified for the Monsoonal North cluster region against a number of relevant NRM issues and key adaptation strategies that have been included in this plan are summarised in the table. Whilst the climate change research has been incorporated into this plan it is also recognised that our knowledge, experience and approach to adaptation are rapidly evolving. It is recommended that through ongoing review of this plan and related strategic plans that stakeholder groups work through adaptation planning at the local and regional scale. It will be necessary to increasingly integrate adaptation strategies into NRM planning and management activities in the Top End.

Planning for climate change in the Top End encompasses many unique challenges including small remote populations, poor institutional and governance capacity, large distances and different seasonal cycles from temperate Australia. Climate change risks exacerbate many of the existing pressures on the region's natural and cultural assets. This will impact upon the natural resources and the livelihoods of people in the region creating the need for innovative solutions to NRM issues and increased resilience of stakeholders to adapt to changes over the life of this plan.

The full reports from the Monsoonal North Climate Change cluster research can be found at:  
[www.climatechangeinaustralia.gov.au/en/impacts-and-adaptation/monsoonal-north/](http://www.climatechangeinaustralia.gov.au/en/impacts-and-adaptation/monsoonal-north/).

## PRIORITY

## KEY ADAPTATION STRATEGY

Fire Risk	Fire regimes will be modified as warmer temperatures will both increase the duration of the fire season and the fire intensity. The predicted increase in grass fuel loads will also exacerbate the risk of fire and the potential damage that fire poses to infrastructure, ecosystems and human lives.
Cultural Sites	Increased temperatures and sea level rise will potentially damage places of cultural significance and prevent access following floods.
Coastal and Marine	Predicted sea level rises and severe weather will increase pressure on coastal habitats and species and will have significant environmental and economic impacts including on Aboriginal peoples' livelihoods. An increase in ocean temperature and acidification will also severely degraded marine ecosystems through coral bleaching and loss of calcium.
Freshwater Systems	Sea level rise affects coastal environments, through the loss of freshwater habitats and associated species. Freshwater systems are particularly vulnerable to salt water which can significantly alter and damage these unique ecosystems which are breeding grounds for significant aquatic species. Altered flow regimes are expected, with pronounced rainfall extremes leading to an increase in both flooding and low water levels. This is not only expected to cause changes in channel configuration and a redistribution of plant and animal communities, but also species extinctions.
Biodiversity	Temperature rises, an increased cyclone intensity, floods, increased fire intensity and sea level rise will adversely affect the Top End's biodiversity. How species and communities will respond and which are most vulnerable is still uncertain.
Knowledge/Social Resilience	Adaptation to climate change requires access to information and knowledge. We must invest in developing the knowledge systems of local landholders so that they can cope and adapt to climate change impacts and sustain the land upon which they live.
People	Extreme weather and climate will put more pressure on the livelihoods of all people in the Top End. These difficulties are likely to intensify as the climate changes, with an increase in temperature and the number of hot days. Climate change will have significant impacts in low lying coastal Aboriginal communities and the livelihoods of all Aboriginal people living in remote areas.

Source: This is based on research undertaken for the Monsoonal North NRM cluster.

# ASSETS



## People on Country

Includes remote livelihoods of Aboriginal people, pastoralists and others living throughout the region



## Community Knowledge

Includes Indigenous and non-Indigenous knowledge and skills and scientific knowledge



## Coastal and Marine

Includes mangroves, estuaries, coastal floodplains, intertidal areas, seagrass and coral reef habitat



## Freshwater Systems

The Top End's freshwater aquatic habitats include rivers, wetlands, lakes, swamps, underground aquifers and their associated values, functions and ecosystem services



## Healthy Soils

Includes soil fertility, structure, health and productivity



## Grasslands/Rangelands

Includes the dominant Eucalypt woodlands and open woodlands with an understorey of perennial and annual grasses



## Cultural Landscapes and Sites

Includes Aboriginal sacred sites, heritage places, cultural landscapes and iconic World Heritage sites



## Biodiversity and Conservation Sites

Includes threatened species, Sites of Conservation Significance, key conservation sites and healthy habitat












## Ranges

All ranges including sandstone escarpments, plateaus, cliffs and gorges, notably the Arnhem Land escarpment and Tabletop Plateau are often associated with high biodiversity and endemic species



# THREATS AND ASSETS

During regional planning workshops participants were asked to identify the main threats and then rank these according to the scope, severity and irreversibility as per the criteria used in the Open Standards planning framework. The highest ranking threats to assets were then identified and strategies and objectives formed to minimise this threat or pressure on an asset. Strategies were also prioritised in terms of likely impact and feasibility. For example, whilst a threat may have scored very high in some instances a feasible strategy was not identified to minimise that threat. This table is intended to be a useful tool for NRM plan review community meetings where there is a diversity of interests. This process formed the basis of the development of the Regional NRM plan.

Threats	 People on Country	 Community Knowledge	 Coastal and Marine	 Freshwater Systems	 Healthy Soils	 Grasslands/Rangelands	 Cultural Landscapes and Sites	 Biodiversity and Conservations Sites	 Ranges	Summary threat rating
Climate change/extreme weather	medium		high	very high	medium		high		high	very high
Saltwater intrusion	high		very high	very high			medium	medium		very high
Grassy weeds	high			high		very high	medium	high	low	very high
Loss of knowledge	high	high					high	low		high
Unmanaged grazing				high	medium	high	medium	medium		high
Large feral herbivores	medium			high	high	medium	medium	medium	high	high
Inappropriate fire regimes	medium	medium		medium	medium	high	high	high	high	high
Feral cats	medium		medium			high		very high	high	high
Feral pigs	medium			very high			high	medium		high
Other weeds	medium		low	high	medium	medium	medium	medium	low	high
Exotic pests/diseases	medium				medium	medium		medium		medium
Cane Toads	low			medium		medium	low	high	medium	medium
Recreation and other activities			medium	medium		medium	low			medium
Lack of access to country	medium	medium					high			medium
Overharvesting of resources	medium		high	medium	low			low		medium
Mining pollution and erosion	medium		medium	medium	medium		low			medium
Development/infrastructure		medium	medium	medium	low		medium			medium
Poaching/illegal hunting and fishing	low	high	low	low				low		medium
Pollution/rubbish	low		medium				low			low

# ASSET AND PRESSURE DESCRIPTIONS



## PEOPLE ON COUNTRY

**GOAL:** *By 2030, the number of people living in the Top End region has been maintained or increased with well-established viable remote communities gaining livelihoods through the sustainable use of natural resources.*

People on country refers to the livelihoods of Aboriginal landowners, pastoralists and others in the broader NRM support network. People are integral to the viability and success of NRM programs. This goal is broad and encompasses strategies throughout the NRM plan aiming to strengthen local and regional support networks, government policies and community engagement in the Top End

People are needed on country in the Top End to manage fire, weeds and feral animals. This includes both community groups and landowners in the urban and peri-urban areas as well as landowners in the vast and remote regions of the Top End. Outside greater Darwin the overwhelming majority of the population is Aboriginal people. They have customary obligations to care for their custodial land and sea country. A broad range of socio-economic benefits as well as conservation outcomes are attributed to Aboriginal people living on and caring for country. There are over 24 Aboriginal land and sea ranger groups in the Top End, many of which have been operating successfully for many years. These ranger groups provide paid employment for a significant amount of Aboriginal people as well as training opportunities and future employment paths for younger generations.

### Pressure/Uses



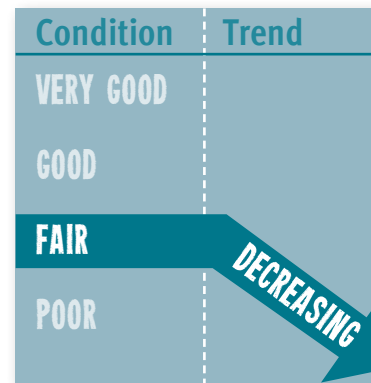
#### Loss of Knowledge/Lack of Access

Difficulties in being able to access custodial lands and culturally significant places due to the remoteness of the region and lack of appropriate resourcing to facilitate this hinders the ability of Aboriginal people to visit country and carry out cultural and natural resource management. Policies and resources that support Aboriginal people to live in remote communities and to undertake NRM activities are critical, as is remote area infrastructure such as roads and communications that assist Aboriginal communities and other landholders in the region.



#### Climate Change and Severe Weather

Extreme weather and climate will put more pressure on the livelihoods of all people in the Top End. These difficulties are likely to intensify as the climate changes, with an increase in temperature and the number of hot days. Climate change will have significant impacts in low lying coastal Aboriginal communities and the livelihoods of all Aboriginal people living in remote areas.



### Indicators

- Economic status of communities and outstations
- Number of Aboriginal ranger groups engaged in cultural and natural resource management
- Level of funding for Aboriginal ranger programs
- Policies and funding supporting outstation living
- Population statistics, particularly around people living in remote areas
- The number of NRM enterprises developed in the region

*Crocodile Islands Rangers recording ghost nets information*







## COMMUNITY KNOWLEDGE

**GOAL:** By 2030, access to and sharing of local landholder knowledge, data, scientific information and Aboriginal knowledge (where appropriate) has improved and is utilised to make informed NRM decisions.

Cultural and natural resource management require knowledge and skills, whether this is to restore or protect biodiversity values, to undertake sustainable production or to undertake custodial obligations. The diminishment of this body of knowledge has led to a degradation of other assets described in this plan and impedes our capacity to manage the environment and operate successful businesses based on natural resources. It is imperative that the expertise and insight of stakeholders in the region be captured, valued and shared, so practices and decisions are informed by these knowledge systems. As part of this process stakeholders need to share innovation, improved practices and new information. Formal training and education also have a role in ensuring natural resource managers have the understanding they need to manage effectively.

Aboriginal people possess a wealth of knowledge about the Top End and their management practices have shaped the Top End for many thousands of years. This knowledge has been handed down through generations and today is contributing to our understanding of species declines and extinctions. A critical step to ensure the maintenance of this knowledge is to recognise and support Aboriginal people to be able to pass on their knowledge to younger generations through supporting on country visits and other innovative ways to record their knowledge. Collaborative projects between scientists and Aboriginal people to document traditional knowledge are also of vital importance. Today, Aboriginal ranger groups are increasingly incorporating new technology and modern approaches into their management of country.

The scientific community and community groups also hold a wealth of invaluable expertise and on-ground understanding vital to carrying out NRM work. Further scientific research in partnership with land managers and owners is required to continue building the knowledge base.

### Pressure/Uses



#### Loss of Knowledge/Lack of Access

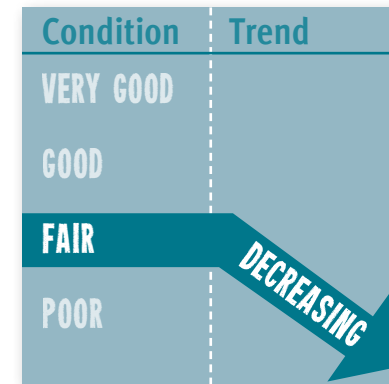
Traditional Aboriginal knowledge is reaffirmed by continually being on country and the diminishment of this has had a significant impact on the capacity of Aboriginal people to manage cultural landscapes and sites. Access to ancestral land is difficult in rugged and remote areas.

A loss of technical staff in support organisations, researchers and NRM practitioners can lead to a loss of knowledge without adequate systems to share, record and utilise this knowledge. This can lead to the duplication of effort or repeatedly making similar mistakes in our approaches to NRM. Also, short-term approaches to long-term NRM issues can threaten success of programs.



#### Lack of Capacity and Resources

Knowledge building takes resources, time, commitment and appropriate policies to support this. Effective extension is costly and increased funding is required, if it is to be strategically delivered with follow-up support.



### Indicators

- Number of Indigenous Ecological Knowledge projects
- Number of Agricultural knowledge-sharing projects
- Number of opportunities for intergenerational knowledge transfer
- Number of properties/land trusts with property/NRM plans
- Utilisation of traditional and scientific knowledge systems in NRM



Ethnobotanical work

# ASSET AND PRESSURE DESCRIPTIONS



## COASTAL AND MARINE


**GOAL:** *By 2030, the condition of the coastal and marine environment has improved*

The Top End encompasses the majority of coastal waters and islands within the NT including vast tracts of mangrove forest, estuaries, coastal floodplains, intertidal areas, seagrass meadows and coral reef habitats. These ecosystems are amongst the world's most intact marine and coastal environments and have extremely high cultural, environmental and commercial value. There are over 22 internationally significant coastal and marine sites listed in the region. They have a very high diversity of species and provide critical habitat to some of the world's most threatened marine animals including fish, whales and turtles. Many species, such as dugongs, turtles and dolphins, which have declined elsewhere, both in Australia and internationally, are found in the region.

The intact coral reefs, seagrass meadows and mangrove forests are also recognised as hot spots for biodiversity and they provide critical feeding or nursery areas for many species. The extensive mangrove forests are the largest in Australia and support an enormous range of species.

The beaches of the region provide critical habitat for nesting seabirds and six species of sea turtles and the mudflats support millions of migratory waders and coastal floodplains and wetlands for large congregations of waterbirds, notably Magpie Geese. Estuarine systems are home to Saltwater Crocodiles, three species of threatened sawfish and two species of threatened river sharks.

The region includes Darwin Harbour and vast, remote coastal areas of Arnhem Land. Significant islands in the area include the Tiwi Islands, Croker Island, Wessel Islands and Groote Eylandt. 85% of the Territory's coast is Aboriginal freehold title and 'sea country' is a vital part of cultural, spiritual and economic livelihoods. The coastal and marine environments are major attractions for both Territorians and tourists. Key industries in the NT such as tourism, recreational and commercial fisheries and Aboriginal livelihoods depend upon the maintenance of productive and healthy marine environments.

Condition	Trend
VERY GOOD	
<b>GOOD</b>	<b>STEADY</b> 
FAIR	
POOR	

### Indicators

- Coastal and marine Sites of Conservation Significance being managed
- Number of Aboriginal ranger groups actively managing coastal and marine areas
- Number of active management plans covering sustainable use of coastal and marine resources
- Catchment, estuarine and coastal water quality
- Fish stocks
- Turtle and dugong numbers



## Pressure/Uses



### Problem Species

The introduction and spread of marine pests are constant threats to the NT's marine environment. This occurs through the dumping of ballast water and marine weeds or inadequate hull anti-fouling measures by ships and boats. The remote nature of the coastline is also a potential source of introduction of invasive species and diseases to Australia from neighbouring countries.



### Climate Change and Severe Weather

Climate change, predicted sea level rises and severe weather will increase pressure on coastal habitat and species and will have significant environmental and economic impacts including Aboriginal peoples' livelihoods. Sea level rise affects coastal environments, with the loss of freshwater habitats and associated species. An increase in ocean temperature and acidification will also severely degrade marine ecosystems through coral bleaching and loss of calcium.



### Residential and Commercial Development

Urban and industrial developments place pressure on coastal areas, first through clearance of native vegetation and changes made to drainage; and then through the associated water use and disposal of waste water and sewerage. Several of the significant coastal sites near Darwin are suffering from these impacts.



### Mining And Energy Production

Mining and energy production bring many risks to marine and coastal environments and these need to be well managed. Impacts include vegetation clearance and, in some cases, drainage diversions to enable resources to be accessed. Discharged water from mining operations can have a significant impact with the potential for toxins to accumulate in sediments.



### Primary Industries

Agriculture, aquaculture and horticulture also have the potential to pollute the marine environment with silt loads, nutrients and toxins.



### Pollution

In remote coastal areas of Arnhem Land marine debris (predominantly discarded foreign fishing nets) is a significant issue. This is linked to the death of marine turtles, dugongs and cetaceans.



### Harvesting of Natural Resources

Unsustainable commercial and recreational fishing practices have a detrimental impact on marine species. Inappropriately managed fishing can adversely affect marine biodiversity and aquaculture can cause water quality problems. The consequences of poor fishing practices include habitat destruction and bycatch of non-target species. Illegal fishing and poaching can also impact on significant marine species, particularly those that are economically important for fisheries.



### Tourism and Recreation

Coastal areas attract tourists and recreational fishers and highly frequented sites may be polluted by litter and waste. Off-road use of vehicles can cause erosion and unrestricted vehicle access to nesting beaches is a problem and disrupts the breeding of seabirds and marine turtles. Weeds can be spread by boats, vehicles and trailers.



### Feral Animals

Pig predation of seabird and turtle nests is also an issue. Some islands are free of introduced pests and are therefore important refuges for native mammals. Most species can be excluded through effective port quarantine, but this is a challenge for the hundreds of small islands with no formal port facilities.



Darwin Harbour

# ASSET AND PRESSURE DESCRIPTIONS



## FRESHWATER SYSTEMS

**GOAL:** *By 2030, the condition of the freshwater systems in the Top End has been maintained.*

The Top End's freshwater aquatic habitats include rivers, wetlands, lakes, swamps, underground aquifers, aquatic refugia and their associated values, functions and ecosystem services. They support high levels of species diversity including plants, fish and aquatic invertebrates many of which are found nowhere else. Compared to other parts of Australia, the freshwater systems remain in a relatively pristine condition as they have not been subjected to the same development pressures as elsewhere in Australia. The wetlands are internationally significant and are considered amongst the most important in Australia. Kakadu National Park is listed both as a World Heritage Area and Ramsar Site. The Arafura Swamp

is also of international significance because of its waterbird aggregations. The region sustains some of the largest areas of intact river systems in Australia. Rivers and riparian zones have a fundamental role in the functioning of ecosystems. Four rivers in the Top End are of international significance.

Maintaining ground and surface water quality for public drinking supplies is important as well as for recreational, environmental and economic purposes. Aboriginal people value freshwater systems for their livelihoods, for their cultural and spiritual significance and to support economic development. Major regional industries including agriculture, mining, Aboriginal enterprises, fishing and tourism are dependent on healthy and available water sources. There is an increasing focus on the development of northern Australia's water resources because of the view that northern Australia has an abundance of these assets. The diverse and complex cultural, ecological and social values associated with the Top End's water resources need to be addressed to ensure sustainable water management in the Top End.

### Pressure/Uses

#### Feral Animals

Introduced animals such as pigs, buffalo, donkeys, horses and cattle can degrade wetland areas, riparian zones and other aquatic resources and reduce water quality. Exotic fish species can invade waterways and impact native species. Water buffalo are a particular concern in the Top End because they contribute to salt water intrusion into wetland areas by creating channels and breaching natural barriers. Other species that have adverse effects on aquatic systems include Cane Toads, which change the balance of native predators and prey.

#### Invasive Plants

Riparian areas and wetlands are particularly subject to invasion by exotic weeds. Weeds that have detrimental impacts on floodplains and wetlands include Mimosa, Olive Hymenachne, Gamba Grass (all Weeds of National Significance), Para Grass, Rubber Vine and Candlebush.

#### Climate Change and Severe Weather

The impacts of climate change on freshwater systems are likely to be significant. Freshwater systems are particularly vulnerable to salt water intrusion which can significantly alter and damage these unique ecosystems. Altered flow regimes are expected, with pronounced rainfall extremes leading to an increase in both flooding and low water levels.

#### Inappropriate Fire

Fire can significantly affect the condition of riparian habitats, waterways, wetlands and other water dependent ecosystems and can increase erosion and the flow of sediments into aquatic habitats when followed by high intensity wet season rainfall. Many plants in these areas are fire sensitive and cannot tolerate intense fires leading to a reduction in the diversity of plants and animals. Control of weeds in these environments is difficult.

#### Commercial and Residential Development

In urban areas, water quality can be affected by wastewater, stormwater, sewage and catchment modification for industrial and housing developments. Licensing schemes to regulate discharge to waterways apply in some instances, but their effectiveness needs to be assessed.

#### Mining and Energy Production

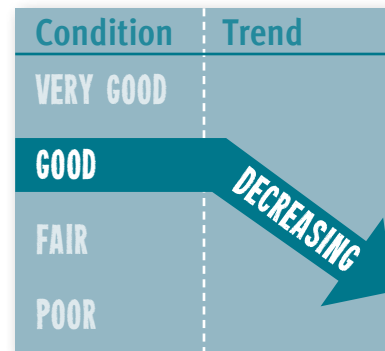
As well as water extraction, the impacts of mining can include hydraulic fracturing or fracking. Concerns have been raised over the environmental impacts of fracking, particularly on groundwater levels and contamination. Pollution from abandoned mines can also impact on freshwater systems.

#### Primary Industries

Rivers, riparian areas and wetlands are potentially sensitive to surface water and groundwater extraction for agricultural use. Land clearing for the expansion of agriculture impacts on the water catchment.

## Indicators

- River discharge and flooding
- Density and diversity of birds using wetlands for nesting and breeding
- Commercial catches of Barramundi and prawns
- Presence and absence of indicator species, e.g. freshwater turtles and snakes
- Extent of floodplain and riparian weeds mapped in areas being actively managed
- Feral animal management effort and impact mapped
- Water quality



Top End river system



## HEALTHY SOILS

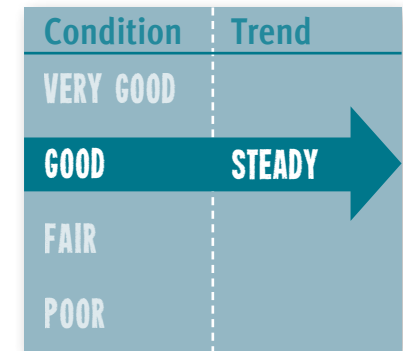
**GOAL:** *By 2030, soil condition and structure is maintained in horticultural areas and supports the biodiversity values of the Top End.*

Healthy soils in the Top End refers to the fertility, structure, health and productivity of the soils for maintaining biodiversity and vital habitats and for commercial uses such as horticulture and pastoralism. In general, most soils in the Top End are relatively shallow, weathered and have low fertility. Due to the intense tropical storms and extreme weather, erosion is a typical feature of the landscape in the Top End with severe erosion risk existing on slopes of greater than 1.5%. Erosion affects the production and environmental values of the plants and animal species they support. There are some areas of the Top End region that support horticulture such as the arable land in the Douglas Daly region and areas in the greater Darwin region.

Management practices to maintain and improve soil condition are well understood. Retention of vegetation cover, ground cover and crop residues are management techniques that assist in reducing the risk of wind and water erosion, lower greenhouse gas emissions and improve water use efficiency. Control of feral animals to reduce total grazing pressure and prevent erosion is important across the region.

## Indicators

- Adaption of best practices in the horticultural industry
- Sediment load in watercourses
- Integrated land use plans that consider and address land degradation issues
- % ground cover – soil stability
- Productivity and health of soils in horticultural areas



## Pressure/Uses



### Feral Animals

Feral animals such as buffalo and pigs can contribute to erosion of soils which causes the pollution of waterways.



### Residential and Commercial Development

Land that is seasonally waterlogged or poorly drained is a significant land management issue in the region which leads to issues for urban housing, rural living and horticulture. Management of drainage in residential and industrial areas is essential to prevent erosion and soil waterlogging and to avoid seepage of sewerage into the soil profile.



### Road and Infrastructure Construction

Poorly constructed roads and fence-lines are a potential source of soil erosion.

# ASSET AND PRESSURE DESCRIPTIONS



## GRASSLANDS/RANGELANDS

**GOAL:** *By 2030 the condition of the grasslands and rangelands are stabilised with no further decline of flora and fauna species associated with these habitats.*

The Top End is part of the world's largest intact tropical savanna that is dominated by Eucalyptus woodlands with an understorey of perennial and annual grasses. The Top End's vast savannas have not been as intensively developed compared with other parts of the world and therefore still retain large areas of natural habitat. The tropical savannas in the Top End are home to an incredibly diverse array of plants, mammals, birds, reptiles and amphibians. Tens of thousands of different types of invertebrates are also found in the Top End savannas. A large proportion of these species are found nowhere else in the world. Termite mounds are also a recognizable feature in the scenery of the tropical savannas. There is a very long history of fire management by Aboriginal people and most species are adapted to periodic burning.

### Pressure/Uses



#### Inappropriate Fire

Changes to fire regimes are an important threatening process that alter the landscape and habitats of threatened species, including granivorous birds such as the Gouldian Finch and Partridge Pigeon and some mammals such as the Northern Quoll and Brush-tailed Phascogale. The spread of invasive grassy weed is also fuelling hotter fires later in the dry season leading to hot fires that destroy canopy trees.



#### Invasive Plants

Several introduced grasses such as Gamba Grass and Mission Grass have become a problem because of their ability to replace native vegetation and produce high fuel loads. They promote high intensity, late dry season fires leading to ecosystem degradation, habitat loss and species declines.

Condition	Trend
VERY GOOD	
GOOD	
<b>FAIR</b>	<b>STEADY</b>
POOR	

### Indicators

- Condition of native pastures, notably perennial grass cover
- Fire extent, season and patchiness
- Condition of flora and fauna in savanna areas
- Extent of long-unburnt areas
- Presence/absence and density of weed species





## RANGES

**GOAL:** *By 2030 the condition of the ranges in the Top End are stabilised with no further decline of flora and fauna species associated with these habitats.*

The ranges of the Top End include spectacular sandstone escarpments, plateaus, cliffs and gorges that attract visitors from all over the world who come to see the dramatic vistas and landscapes and the famous Aboriginal rock art of the region. The Arnhem Land Plateau is recognised as being internationally significant for both its natural and cultural values. It is widely regarded as ‘the crown jewel of NT biodiversity’ and a site of international biodiversity significance. It provides habitat for over 30 threatened species. The rugged nature of the plateau and its gullies and gorges provide refuge for moisture-loving and fire-sensitive plants and animals. The primary ecological community of the Plateau is the endangered Arnhem Plateau Sandstone Shrubland Complex. The Plateau also supports a high proportion of rainforest including almost all of the distinctive rainforest associations dominated by the endemic tree *Allosyncarpia ternata*.

The rock art galleries of the Arnhem Plateau have been described as “one of the world’s supreme art galleries” and are renowned as the most extensive and complex body of rock art in the world. The art describes the history of human civilisation in Australia. The earliest paintings date to over 50,000 years ago. Most of the Plateau is included in protected areas through Kakadu and Nitmiluk National Parks and the Warddeken Indigenous Protected Area. Other significant range areas include Tabletop Plateau in Litchfield National Park providing gorges and waterfalls that attracts hundreds of thousands of tourists annually.

### Pressure/Uses



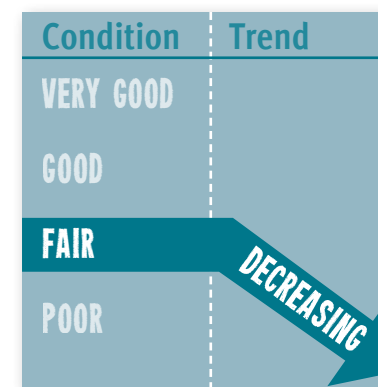
#### Inappropriate Fire

The most significant management issue is the frequency and extent of destructive late dry season fires. On the Arnhem plateau, fires have reduced the size of rainforest patches and are a key threat to heathlands.



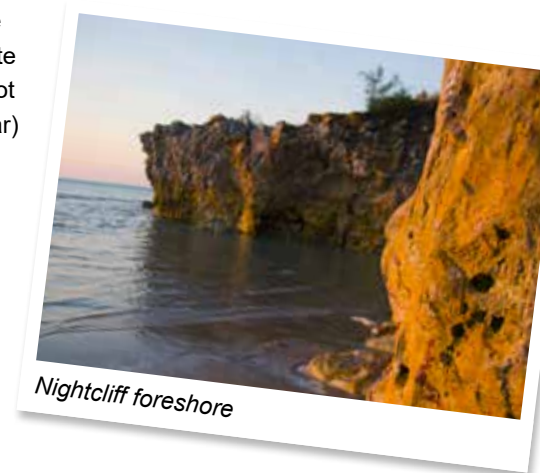
#### Lack of Access and Resources

The region’s sparse population and limited access to resources are significant impediments to managing the ranges, including fire management. These threats are magnified by the logistical difficulties and costs of undertaking management in such a remote and rugged landscape. Aboriginal ranger groups are involved in land management activities including fire management.



### Indicators

- Number of ranges identified as Sites of Conservation Significance being managed for conservation values
- Number of Aboriginal ranger groups actively managing these sites
- Number of active weed management plans and codes of practice on these sites
- Patterns of fire seasonality and extent in ranges
- Appropriate fire regimes - no late season fires (not burnt every year)
- Presence and abundance of native mammals
- Percentage of native tree cover



Nightcliff foreshore

# ASSET AND PRESSURE DESCRIPTIONS




## CULTURAL LANDSCAPES AND SITES

**GOAL:** *By 2030, culturally significant sites are being managed to reduce the impacts of threats and cultural knowledge is maintained.*

The whole landscape of the Top End region has cultural significance for Aboriginal people in the area. Traditional Owners refer to the creation period when ancestral beings created the landscape and its wildlife as they travelled. Many important cultural elements manifest themselves in the Top End as identifiable geographic forms. Today, the region remains alive with the spirits of these ancestral beings and traditional law that informs ceremony, songs, stories and dances that guide how country is looked after. Places or sites of cultural significance may also be ceremonial grounds, rock art galleries or pigment deposits used for cultural practices. The cultural values of the Top End region are internationally recognised, such as the Arnhem Land Plateau rock art galleries that are renowned as the most complex and extensive body of rock art in the world. Kakadu National Park is also internationally recognised as a World Heritage Cultural Landscape.

A sacred site has particular significance and refers to a place within the landscape that is sacred to Aboriginal people. They include places within the landscape such as hills, rocks, waterholes, trees, plains, lakes and other natural features. Sacred sites are connected with creation stories and may have significance to several tribal groups across vast areas. They provide special meaning to the natural landscape. Custodians of sacred sites are responsible for protecting and maintaining them. Aboriginal sacred sites are protected and recognised as an integral part of the NT's and Australia's cultural heritage through the Northern Territory Aboriginal Sacred Sites Act. The Top End is also incredibly linguistically diverse. Language is inextricably linked to Aboriginal cultural landscapes and these languages hold a wealth of tradition about the environment and culture.

Condition	Trend
VERY GOOD	
<b>GOOD</b>	<b>STEADY</b> 
FAIR	
POOR	

### Indicators

- Statutory protection and management of sacred sites
- Programs supporting intergenerational transfer of knowledge
- Number of sites recorded and listed under legislation
- Condition of sacred sites
- Knowledge and management of sites
- Access and support to visit and live on country
- Condition of Aboriginal languages



## Pressure/Uses



### Loss of Knowledge and Lack of Access

Loss of knowledge and access is considered one of the main pressures on cultural landscapes and sites. A lack of appropriate resources and support for Traditional Owners to be able to access and manage country threatens this asset. Restoration of cultural landscapes and protection of cultural sites requires active management and appropriate resources. Access to custodial land and sea can be difficult in rugged and remote areas, or in the wet season, when roads are cut off.



### Recreation and Other Activities

Many sites are threatened by human disturbance from tourism and other recreational activities. Unrestricted access to rock art sites may breach customary law or result in sites being damaged and their environments degraded. Aboriginal people in the region are also concerned about the management of fisheries in coastal waters and illegal access to Aboriginal land and coastal areas.



### Feral Animals

Feral animals such as pigs and buffalo degrade springs and waterholes, many of which are sacred sites. Some introduced animals have significance in Aboriginal culture, so it is important that understanding the animals' values and impacts are considered in consultative control programs.



### Mining and Energy Production

Inappropriate mining activities and oil and gas developments can directly and indirectly impact on sacred sites and sites of cultural significance.



### Inappropriate Fire

Disruption to Aboriginal fire management has degraded cultural landscapes. Inappropriate fire regimes (fuelled by Gamba Grass) can threaten sites, for example, rock art sites.



### Residential and Commercial Development

Inappropriate residential or commercial development can put pressure on cultural sites and landscapes. Water quality of sacred sites can also be affected by poor management of wastewater, stormwater, sewage and catchment modification associated with such developments.



### Climate Change

Climate change projections such as increased temperatures and sea level rise will potentially damage cultural significance sites and prevent access following floods.



### Weeds

Mimosa prevents accessibility to hunting and fishing areas and sacred sites. Grassy weeds can change the nature of cultural landscapes and sites.



# ASSET AND PRESSURE DESCRIPTIONS



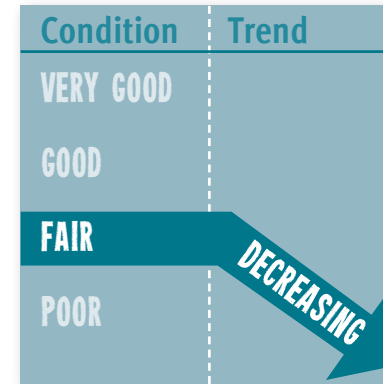
## BIODIVERSITY AND CONSERVATION SITES

**GOAL:** *By 2030, diverse populations of threatened species are maintained and Sites of Conservation Significance are maintained in good condition.*

The Top End is renowned for its extensive natural environments, with abundant biodiversity and key conservation sites. Low levels of vegetation clearance and development have largely protected the Top End from the biodiversity loss that has occurred in other parts of Australia. The Top End provides habitat for the Territory's unique biodiversity as well as refuges for healthy populations of many species that have disappeared or are threatened elsewhere in Australia. The islands are home to several endemic plants and provide predator-free environments for threatened mammals.

The Top End region has 27 Sites of Conservation Significance encompassing islands, coastal wetlands, Darwin Harbour and the Western Arnhem Plateau. Of

these, 26 sites are of international significance. These sites include one World Heritage Area, two Ramsar sites. Five vegetation communities in the Top End are recognised as sensitive and in need of protection by the NT Government. The Top End has 58 threatened plant species (17 listed nationally and 56 listed in the NT). There are 59 threatened animal species (38 listed nationally and 32 NT listed). Severely threatened species include the Bare-rumped Sheath-tailed Bat, Speartooth Shark, Northern Quoll and Golden-backed Tree-rat. Key marine species in the region include the Heart Urchin, Narrow Sawfish, Flatback Turtle, Brown Booby and Australian Snubfin Dolphin. Iconic species include Barramundi, turtles, dugongs and dolphins. Six of the seven species of marine turtles found in the world are located in the Top End.



### Indicators

- Conservation status of threatened species
- Number of threatened species for which conservation actions have been identified and implemented
- Number of sites of conservation sites being managed for conservation values
- Number of Indigenous Protected Areas being managed for conservation values
- Number of Aboriginal ranger groups actively managing for conservation values
- Patterns of fire seasonality and extent
- Number of active weed management plans and codes of practice
- Number of active feral animal management plans



Saltwater crocodile



Green tree frog

## Pressure/Uses

### Inappropriate Fire

Altered fire regimes have been identified as a key threatening process that has changed the landscape and detrimentally impacted on populations of small mammal, granivorous bird and fire-sensitive plant species. A shift in fire regimes has resulted in a loss of habitat, resource and structural diversity and a decline in biodiversity values.

### Feral Animals

Feral animals can significantly impact on native plants and animals. Predation, habitat degradation, competition and disease transmission by feral pigs is recognised as a key threatening process to biodiversity conservation. Poisoning by Cane Toads is also a significant issue for native wildlife. Predation by feral cats is identified as a key threatening process affecting biodiversity. Cats are implicated in the decline of small to medium-sized marsupials.

### Weeds

Exotic plants with the capacity to transform entire habitats pose one of the greatest threats to biodiversity in the Top End. In recognition of this, Gamba Grass, Para Grass, Olive Hymenachne, Perennial Mission Grass and Annual Mission Grass have been listed as key threatening processes to biodiversity conservation under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

### Climate Change

Temperature rises, increased cyclone frequency, increased fire intensity and sea level rise will adversely affect the Top End's biodiversity. How species and communities will respond and which are most vulnerable is still uncertain.

### Knowledge Gaps

A significant challenge in managing biodiversity is understanding what strategies and actions are most effective for addressing threats. Further research is needed to establish the causes of biodiversity decline and how best to address them. Monitoring is required to determine whether management is being undertaken as intended and to understand whether these efforts are being effective. There has been a dramatic collapse in small mammal populations across the Top End which is associated with several factors in combination. While each species is likely to have been affected by a different combination of factors, predation by feral cats, extensive and frequent fires and poisoning by Cane Toads have been shown to be contributing factors.



Coastal estuary

# HOW TO READ THE PLAN

## Background

The background provides a brief summary of the purpose of the program including the overall issues and challenges in delivering it. It also refers to how the program relates to other programs in the plan.

## Strategies

Strategies are related management activities or approaches intended to achieve an objective in the plan. A number of strategies are combined in a program to achieve the program objectives.

## Priority Activities

Within each strategy there is a series of priority activities that need to be completed to implement the strategy and achieve the objective. Only the main activities are listed here.

## Milestones

Milestones are outcomes that we would expect to achieve if the strategy and activities were being delivered. Milestones are 'signposts' that we are moving towards achieving an overall objective. They tell us whether the assumptions made in developing the strategy are correct and whether the activities are being delivered and achieving the intended results.

PROGRAM 5 WATER RESOURCES AND SOIL MANAGEMENT			
Background	Strategies	Priority Activities	Milestones
Water resources and productive soils are essential to the livelihoods of people and ecosystems within the Top End region. Compared to other areas within Australia they have not been subject to the same development pressures, which is in part	<b>VERY HIGH PRIORITY</b> Water resource planning and management is undertaken in collaboration with a diverse range of stakeholders based on an equitable and transparent process	<ul style="list-style-type: none"> <li>Identify and quantify competing demands for water resources and the impacts of different activities on water resources</li> <li>Involve multiple stakeholders and users representing a range of interests, in water allocation planning in the region</li> <li>Support water stewardship through involving the community in monitoring and in implementing new water monitoring technology and communication materials targeted at behaviour change</li> <li>Support research and innovation (including the impacts of climate change) that increase our understanding of water resources.</li> </ul>	<ul style="list-style-type: none"> <li>By 2018, water resources planning is informed from input and ongoing adaptive management processes involving a range of diverse stakeholders and underpinned by the best available scientific knowledge</li> <li>Increased understanding and incorporation into decision making of the likely impacts on climate change on our water resources by 2018.</li> </ul>

## Objectives

An objective is a statement that details a desired outcome of a project, such as reducing a critical threat. If the project is well thought out and designed, achieving the objectives should help improve asset condition (make them better).

## Assets Improved

Assets are the priority things we want to see in good condition to achieve our vision. Different strategies are targeted towards different assets. Only the main relevant assets are listed against each strategy. Each asset has a goal and if the plan is achieved it should lead to achieving the asset goals.



People on Country



Freshwater Systems



Cultural Landscapes and Sites



Community Knowledge



Healthy Soils



Biodiversity and Conservation Sites



Coastal and Marine



Grasslands/Rangelands



Ranges

## Key Measures of Achievement

Key measures of achievement are the things we actually measure that indicate whether the key strategies are being implemented in this program. They indicate activity and actions as well as impact and outcome.

## Key Collaborators

The key collaborators are the main groups that are considered responsible for the delivery of the strategies in the plan. In most cases, the full list of stakeholders is very long, however those listed are considered the primary stakeholders to implement and review the program.

TOP END  
NRM PLAN 

Objectives	Assets Improved	Key Measures of Achievement	Key Collaborators
<p>By 2020, water resources are managed and monitored with input from all stakeholders through a water allocation framework which includes monitoring and ensures that cultural, environmental and production values are maintained</p>		<ul style="list-style-type: none"> <li>Survey of contractors and land managers and awareness and adoption of soil management practices</li> <li>Number of people/groups involved in water stewardship</li> </ul>	<p>NTG (Water Resources), NTG (DPIF), NTG (DME), TNRM, researchers, industry representative groups (Water Resources and LMU, NT Cattlemen's Association, NT Farmers Association, NT Minerals Council, etc.), Aust. Govt</p>

# PROGRAM 1 MANAGING FIRE

## Background

Fire is an essential feature of the Top End region for natural and cultural management activities, infrastructure protection, wildfire mitigation and landscape health.

The overall objective of this program is to implement a fine-scale patch mosaic across the landscape to improve vegetation condition, biodiversity quality and provide cultural knowledge transfer and economic benefits. This program recognises that fire objectives vary amongst stakeholders and in different contexts (i.e. peri-urban areas, cattle stations and national parks). The program aims to integrate these interests through regional and sub-regional cross tenure fire management planning.

## Strategies

### VERY HIGH PRIORITY

Collaborative approaches to strategic fire management are extended across the Top End region

### HIGH PRIORITY

Increase use of spatial fire management tools, knowledge systems, safe burning practices and equipment throughout the Top End

### HIGH PRIORITY

Increase application of fire management techniques that promote biodiversity and ecosystem function and minimise risk to infrastructure and human health across the Top End

### HIGH PRIORITY

Promote policies and market forces that support collaborative fire management approaches that provide social/cultural benefits in the Top End

## Priority Activities

- Strengthen multi-stakeholder regional fire management working groups and establish new ones where necessary to manage cross tenure fire management and planning that also improves integrated management of grassy weeds and fires
- Focus on heavily burnt areas such as western Top End and integrate Gamba Grass control programs (2016-20)
- Conduct annual reviews and annual implementation of fire plans at a regional level
- Deliver training and capacity building for NRM practitioners in the utilisation of fire management tools such as NAFI and other GIS fire planning tools
- Provide more firefighting equipment to land managers and support access to country for fire management activities
- Research the impacts of fire regimes on ecosystem health, develop indicators, conduct ongoing monitoring and communication, and adapt management approaches
- Build capacity of fire managers to measure ecological impacts of fire to improve knowledge base and introduce fire management goals at a finer scale (i.e. specific to ecosystem type)
- Support tools and communication products to inform community about fire management
- Increase and support the collaboration of fire planning and burning with Traditional Owners and use traditional knowledge in fire management
- Continue to strengthen the role of Bushfires NT and particularly the support they give to landholders to prevent and control bushfires to help protect life and property in the NT
- Develop and lobby for adoption of clear policies that support market-based approaches (i.e. carbon credits) to collaborative fire management
- Increase communication of fire management success to funding bodies
- Use fire management as a tool to maintain and support access to and cultural connection to country
- Establish clear governance processes to support the best use of income from fire management activities

## Milestones

- Increased area of floodplains, range and other key ecosystems under improved fire regime each year
- Stakeholders plan and manage fire more collaboratively by 2018
- Loss of pastoral production from fire is reduced significantly by 2018
- Land managers improve their capacity to utilise NAFI and other GIS fire planning tools by 2018
- Land managers have improved access to equipment and country
- Increased strategic fire management approaches utilising traditional and contemporary tools are extended across the region by 2018
- Information is made available to all land managers about implementing fire regimes that promote ecosystem health by 2018
- Improved fine scale burning occurs based on the ecosystem type, land-use and seasonal conditions by 2018
- Carbon methodologies for carbon sequestration are finalised by 2018
- Offsets are utilised to support collaborative fire management by 2018
- Participation from land owners/managers in carbon abatement fire management increases every year

## Objectives

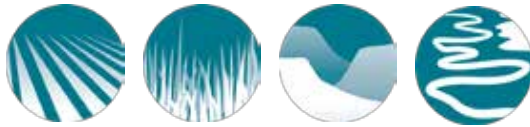
By 2020, fire regimes are improved in the Top End region, resulting in fewer late dry season fires, and managed at a finer scale according to different habitat and ecosystem type

By 2020, fire is being planned and monitored using GIS and remote sensing across the entire Top End region by all stakeholders

By 2020, fire regimes are demonstrably based on knowledge of cultural, biodiversity and production values, threats and the best management options

By 2020, policies support long-term fire management in the Top End through economic incentives and ongoing and consistent resourcing

## Assets Improved



## Key Measures of Achievement

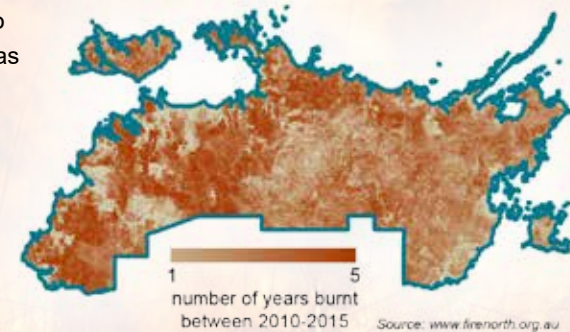
- Number of people and organisations involved in collaborative fire management programs
- Trends in fire extent and seasonality in areas with collaborative fire management programs
- Trends in fire extent and severity monitored and reported
- Number of regions planning for and implementing optimum fire regimes
- Number of Traditional Owners involved in fire management
- Economic contribution of fire management activities to regional and remote areas

## Key Collaborators

Western Arnhem Land Fire Abatement Program (WALFA), Aboriginal ranger groups, pastoralists, NTG (Bushfires NT), northern Australian Fire Information (NAFI) service, Northern Land Council, Parks and Wildlife, researchers, landholders, Regional Shires, NTG (Weeds), Defence, Parks Australia

*“It is cool burning, encouraged for grass and plants to be reborn again and so that the animals would be much happier to come and feed on the burnt ground as well, especially kangaroos”*

## Fire History for the Top End 2010-2015



# PROGRAM 2 PREVENTING AND MANAGING WEEDS

## Background

Weeds are an increasing threat to the Top End region's natural, economic and cultural assets despite considerable time and effort already invested in weed management across the region by various stakeholders. The overall objective of this program is to support a coordinated approach to managing weeds across the region through the improvement of current management initiatives, preventing the introduction of new weeds and the spread of current weeds into relatively 'weed free' areas. The 'priority weeds' of the region that require management attention as identified by the NTG's Darwin (Top End) Weed Management Regional Plan are Gamba Grass, Bellyache Bush, Mimosa, Olive Hymenachne, Parkinsonia, Mission Grass and Grader Grass. This program also focuses on 'Alert Weeds' which are weeds that are not yet naturalised in the region but have high potential impact and likelihood of becoming established such as Pond Apple, Cabomba, Rubber Vine, Water Hyacinth and Water Mimosa. Gamba Grass is a major issue in the Top End and is considered an ecosystem transformer due to its ability to produce hot intense fires once established. Thus, an important strategy is to prevent the spread of Gamba Grass into areas where it has not yet taken hold, particularly Arnhem Land, Litchfield National Park and Wadeye area.

## Strategies

**HIGH PRIORITY**  
Collaborative approaches for strategic control of high priority weed species are extended across the Top End

**VERY HIGH PRIORITY**  
Prevent the introduction of new weeds and the spread of the region's priority weeds

**HIGH PRIORITY**  
Improve adaptive weed management through monitoring, research and utilising data, training and capacity building

**MEDIUM PRIORITY**  
Increase the region's awareness of its priorities and capacity to manage the impacts of weeds

## Potential Activities

- Promote regional weeds committees encouraging collaboration from multiple stakeholders and monitor management effectiveness
- Weed management industry standards are collaboratively developed and implemented
- Develop collaborative and strategic approaches to managing or eradicating high risk weed species with a high feasibility for control.

- Map all occurrences of Gamba Grass in the region and control new infestations particularly the spread into Arnhem Land and into Wadeye
- Support implementation of strategic approaches to weed spread prevention detailed in NTG Plan, 'Preventing Weed Spread is Everybody's Business'
- Monitor and manage new weed incursions in the region particularly highly invasive plants that are potentially suitable for Top End conditions that are present in neighbouring regions (QLD, WA, Asia/Pacific)

- Identify knowledge gaps and prioritise future research and link to improving the capacity of weed management stakeholders
- Trial new weed management techniques and communicate results with land managers
- Deliver training to develop skills and tools to record and interpret weed distributions and treatment (GPS, Cyber Tracker, GIS)
- Support Aboriginal rangers and Traditional Owners to undertake surveys to detect new infestations of significant weeds (Gamba Grass and Water Mimosa)
- Undertake aerial mapping of infestations to inform control program and detect outlier populations of highest priority invasive weeds (Gamba Grass and Water Mimosa)
- Increase the effort and resources put into measuring management effectiveness of weed control and utilise information to continually improve weed management practices

- Implement education and awareness programs on weed ID and control for land managers, contractors and community members in the region
- Raise awareness of 'Alert Weeds', as potential high impact weeds should they become established
- Provide training of land managers in effective control methods and strategic weed management approaches
- Communicate weed management success stories to the wider community to encourage support and further activity

## Milestones

- Organisations are strategically and collaboratively investing in weed management and weed spread prevention
- Increase the number of catchments in the Top End region being managed for priority weeds by 2018.

- Minimise ability of Gamba Grass to spread by addressing pathways of spread (such as machinery, roads, etc.) by 2018
- High fuel load grasses are managed to minimise fire hazard and environmental impact
- More people are aware of the impacts of Gamba Grass on fire and biodiversity and are actively managing it and minimising its spread by 2018
- No new weeds established in region by 2018

- Research partnerships are strengthened and continue to inform best practice weed management by 2018
- Each year, GIS and remote sensing is increasingly utilised in strategic weed management
- Data is captured, shared, analysed and utilised to inform weed management by 2018.

- An increase in number of land managers and options for weed control by 2018
- A 'working together' approach to weed management is achieved with all the key stakeholders by 2018



## Objectives

By 2020, stop the spread of new incursions and contain current infestations of the region's priority weeds and 'Alert Weeds'

By 2020, establish the distribution of Gamba Grass and confine it to stop the spread into new areas

By 2020, no new weed threats have established themselves in the Top End region

By 2020, best practice including new innovative tools are adopted throughout the region and delivering improved strategic catchment based weed management in the Top End

By 2020, land users are increasingly responsible and taking more action for weed management

## Assets Improved



## Key Measures of Achievement

- Number of priority weeds being strategically managed at the catchment scale
- Number of groups/individuals involved in weed spread prevention
- Availability of communication materials for stakeholders
- Extent of utilisation of weed distribution data by natural resource managers
- Effectiveness of weed management effort and presence of adaptive management processes

## Key Collaborators

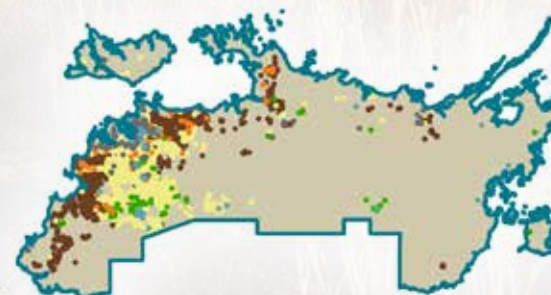
NTG Weeds Branch, Aboriginal ranger groups, pastoralists, Northern Land Council, Parks and Wildlife, Parks Australia (Kakadu NP), researchers, Defence, TNRM, landholders, Local Government, Contractors, NTG (transport, Infrastructure), Landcare groups

*“It is a simple grass, Gamba Grass, that may pose the greatest threat to the integrity of the northern savannas, we need to tackle the problem now before it gets much, much worse”*

## Weeds

Distributions of some priority weed species for the Top End

- Bellyache Bush
- Gamba Grass
- Grader Grass
- Mimosa
- Mission Grass spp
- Olive Hymenachne



Source: Data from NT Government – Weeds Branch

Gamba Grass

# REDUCING THE IMPACTS OF FERAL ANIMALS

## Background

To reduce the impacts of feral animals it is important to have a shared goal, common approach and a coordinated effort in feral animal programs. Therefore, a key objective of this program is to develop an NT-wide feral animal management strategy. There are a number of feral animals impacting on Top End ecosystems and livelihoods. Large feral herbivores, horses, donkeys and buffalos reduce ground cover and expose the soil to erosion. Cane Toads have also spread right across the Top End impacting ecosystems. Pigs are identified as a threat particularly around freshwater systems and in coastal areas. Insects can also potentially pose great potential risk to the Top End's terrestrial environments and primary production. Cats also pose a threat to native small mammals in the Top End. The objective of this program is to reduce the impact of feral animals at the landscape scale, with high value assets prioritised and with long-term multi-stakeholder commitments. This program aims to raise the awareness of feral animal damage and support training in control and management techniques, as well as promote the sharing of knowledge and data, whilst supporting economic opportunities for the community on feral animal control.

## Strategies

### VERY HIGH PRIORITY

Strengthen regional feral animal management programs through coordinated and collaborative action

3.1

### HIGH PRIORITY

Use common measures and analysis to monitor, evaluate and report on and adapt the feral animal management program

### HIGH PRIORITY

Support research and innovation in techniques, training and motivation to control feral animals

3.3

### MEDIUM PRIORITY

Promote policies, legislation and commercial utilisation that supports objectives in collaborative feral animal control programs

### HIGH PRIORITY

Strengthen the coordination and delivery of biosecurity surveillance and response to potential pest animals, such as insects and marine pests

## Priority Activities

- Develop a Feral Animal Control Strategic Plan for the NT involving multiple stakeholders and regionally specific agreed priorities
- Establish a 'backbone' group to support implementation of landscape feral animal management approaches
- Plan and undertake regional meetings with key stakeholders leading effective collaboration between Fire, Weed and Feral Animal programs
- Develop field indicators that can be readily used by land managers to quantify the damage and impact of feral herbivores
- Establish data management framework and share results through regular reporting to all stakeholders
- Trial feral cat control techniques and assess for effectiveness and for practical application in savanna ecosystems
- Research and trial new pig control methods and support coordinates and strategic approaches in high value and vulnerable ecosystems
- Establish demonstration sites showing the impacts of feral herbivores on key ecosystems aiming to motivate landholders to increase effort
- Support Traditional Owners and Aboriginal rangers in early detection measures (including new technology) to keep offshore islands Cane Toad free
- Implement ongoing cat management and eradication on high value offshore islands
- Support pilot initiatives that allow for economic development through the commercial utilisation of feral animals (i.e. buffalo) and integrate with other control methods
- Develop communication materials on biosecurity in northern Australia
- Build capacity of the NRM community to detect new and emerging pests
- Increase awareness of the link between economic livelihoods and biosecurity
- Maintain communication and awareness as part of biosecurity measures to prevent Cane Toads from reaching offshore islands

## Milestones

- By 2017, a Feral Animal Strategy for the NT has been developed and is guiding strategic action
- By 2018, regional feral animal advisory committees are functioning across the NT
- Coordinated landscape-scale feral herbivore management programs are implemented by 2018
- By 2018 consistent and ongoing monitoring programs are being introduced and coordinated across the Top End and feeding into NT-wide feral animal strategies
- Innovative technologies are utilised by more land managers in the early detection of Cane Toads by 2018
- Effective and viable control techniques for pigs and cats are increasingly known and applied by 2018
- Interest and motivation to control feral animals is increased across the region by 2018
- Key islands such as Groote Eylandt become cat free and others have reduced densities by 2018
- Key priority islands become Cane Toad free in the Top End by 2018
- By 2018 a trial has been completed and evaluated commercially
- Partnerships strengthened between government agencies, ranger groups, communities and industry bodies on biosecurity related activities by 2018

## Objectives

By 2020, feral animal control programs are prioritised and targeted through an NT-wide feral animal strategy that establishes an agreed understanding of the problem, shared measurement and review of actions

By 2020, the impacts of buffalo and horse numbers are reduced from 2015 levels with ongoing control programs in place

By 2020, monitoring data is being consistently collected from a range of sources consistently and informing strategic action in feral animal management programs

By 2020, the impact of cat predation is reduced in sites of conservation value and offshore islands with healthy small mammal populations

By 2020, innovative feral animal control techniques are being applied to pigs, cats and Cane Toads in the Top End

By 2020, offshore islands in the Top End become Cane Toad free

By 2020, feral animal control programs are supported through a range of legislation, policies and commercial harvest programs

By 2020, collaborative biosecurity programs are in place to reduce the likelihood of new pest animals becoming established in the Top End

## Assets Improved



## Key Measures of Achievement

- Number of groups/individuals involved in feral animal management programs
- Trends in feral animal distribution and evaluation of feral animal impact on conservation values as a result of management programs
- Number of landscape scale feral animal management programs
- Availability and utilisation of feral animal distribution data to NRM stakeholders
- Systems to involve NRM community in pest and disease detection and eradication in place
- Economic benefit from commercial utilisation of feral animals
- Effectiveness of innovative feral animal control approaches

## Key Collaborators

NTG (DLRM), NTG (Parks and Wildlife Service), Northern Land Council, Aboriginal ranger groups, pastoralists, Australian Quarantine Inspection Service, NTG (DPIF – Biosecurity), landholders, researchers, feral animal contractors

*“Can't camp on the floodplains because there is no clean water left because of the buffalo. People are driving to get water from the tap”*

Feral herbivore damage to riparian areas

# PROGRAM 4 INDUSTRY ADOPTION OF SUSTAINABLE PRACTICES

## Background

This program will support industry-driven extension programs to promote best practices and demonstrate that there can be both economic and environmental incentives to adopting sustainable practices. As well as assisting in the development and delivery of these programs, it will improve our understanding of what constitutes sustainable practices. This program aims to build on good relations with industry bodies and draw upon good intentions of industry members to ensure primary industries are managed sustainably, efficiently and profitably. It will do this by delivering best practice extension programs across the NT and by identifying and communicating solutions and opportunities to improve practices. The "Developing the North" agenda highlights a significant push to expand agricultural and other industries in northern Australia. Within this context, this program must focus on promoting sustainable development of industry based on lessons learnt from past practices and new technologies and developments.

## Strategies

**HIGH PRIORITY**  
Engage with industry to encourage sustainable approaches to "Developing the North" policies and programs

**MEDIUM PRIORITY**  
Ensure resources are increased for biosecurity support services in line with increased agricultural development

**HIGH PRIORITY**  
Support best practice grazing management through delivery of regional monitoring programs and promoting practices that promote both productivity and ecological outcomes

**HIGH PRIORITY**  
Support best practice horticulture and broad scale agriculture through knowledge sharing, adoption of new technology and training and innovation

## Priority Activities

- Strengthen linkages between NRM managers, researchers and the government agencies and industry bodies responsible for future strategic economic development in the Top End
- Raise awareness of development projects and policies for the Top End and their potential impacts on environmental and cultural values

- Implementation of the 2015-2025 NT Biosecurity Strategy particularly increasing the NRM community's involvement in biosecurity
- Develop enhanced surveillance and effective capability to detect and respond to biosecurity emergencies

- Develop case studies and demonstration sites showcasing best practice grazing management for biodiversity conservation and production
- Facilitate the adoption of new technology in rangelands management and sustainable grazing and encourage pastoralists to conduct their own monitoring to inform grazing practices
- Use existing frameworks to develop a unified national rangeland condition assessment tool and implement annual monitoring program
- Develop local management plans and landholder stewardship programs for high value conservation assets
- Develop more information on best practices in more intensive cattle production and the efficient use of water relevant to the NT
- Encourage diversification of income streams on pastoral land through alternative activities that support sustainable stocking rates

- Quantify the damage to crops by Magpie Geese to develop a balanced management approach
- Conduct a mixture of extension approaches targeting improved horticultural practices – one on one extension, group training, best practice manuals and knowledge sharing and mentoring within the industry
- Attract more workers to the horticulture industry and focus on potential Indigenous employment opportunities
- Improve access to training especially promoting soil and water management best practice
- Increase the use of new and emerging technologies such as the use of drone aircraft, GIS and remote sensing, better land-use planning and soil health plans to improve productivity and sustainability
- Trial the use of biochar and other organic farming techniques in a variety of horticultural contexts

## Milestones

- NRM stakeholders have an increased understanding of future strategic development policies by 2018
- Partnerships are increasingly developed between key NRM stakeholders/ research institutions and industry and government to ensure best practice in future development in the Top End.
- By 2018, partnerships strengthened between agencies, ranger groups, communities and industry on biosecurity related activities

- Promotion and uptake of sustainable and efficient grazing management tools by 2018
- Each year more property management plans are developed based on sustainable NRM principles and implemented on pastoral properties
- Link rangelands monitoring and research programs to document the biodiversity benefits of sustainable grazing.

- Sustainable practice principles are incorporated into industry strategies and enterprise planning by 2018
- Improvements to management practices are implemented and greater engagement with NRM programs is achieved by 2018

## Objectives

By 2020, policies and programs for development in the Top End are informed by best available science and knowledge to ensure the protection of cultural and natural assets

By 2020, our biosecurity system is integrated and risk-based with strong community involvement that minimises the establishment of exotic pests and diseases

By 2020, increase skills and knowledge of land managers to implement sustainable grazing practices

By 2020, industry driven horticultural extension programs developing understanding of ecosystems and sustainable management are delivered in the NT

## Assets Improved



## Key Measures of Achievement

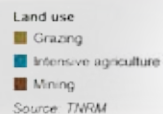
- Level of input from environmental research into 'Developing the North' policies
- Number of industry driven extension programs for improving sustainability and profitability developed and implemented
- Attendance at and feedback from, industry-driven extension programs
- Response of survey indicating knowledge and adoption of management options
- Amount of resources dedicated to NRM from industry partnerships
- Level of consideration of climate change in industry development plans

## Key Collaborators

NTG (DPIF), TNRM, researchers, industry representative groups (NT Cattlemen's Association, NT Farmers Association, NT Seafood Council, NT Amateur Fishing Association, NT Minerals Council, etc.), NTG (Water Resources), NTG (DME), Aust. Govt. (Agriculture), Northern Land Council

## Land Use

Land use map shows the predominant industry in the Top End is cattle grazing

Land use  
  
 Source: TNRM



Brahman in the cattle yards



# INDUSTRY ADOPTION OF SUSTAINABLE PRACTICES

Background	Strategies	Priority Activities	Milestones
<p><b>MEDIUM PRIORITY</b> Support ecologically sustainable fisheries management through monitoring and improved technology</p>		<ul style="list-style-type: none"> <li>• Develop and improve current fisheries data collection and systems by commercial fishing industry, amateur fishing groups and Aboriginal people</li> <li>• Consolidate and implement environmental management systems for the commercial fishing industry</li> <li>• Facilitate stakeholder groups to collaborate on important fisheries related NRM activities</li> </ul>	<ul style="list-style-type: none"> <li>• Stock assessments of commercial, amateur and Aboriginal fishing data are undertaken at least once every five years</li> <li>• Improved and reliable data and collaborative partnerships between stakeholder groups informs fisheries management decisions by 2018</li> </ul>
<p><b>HIGH PRIORITY</b> Support and promote partnerships between the NRM community and the mining industry regarding mine rehabilitation and offset programs</p>		<ul style="list-style-type: none"> <li>• Establish a working group or advisory committee that includes DME, NT EPA and DLRM, Land Councils and key NGOs such as TNRM to engage with the mining industry to strengthen links and involvement in NRM activity</li> <li>• Encourage the use of the environmental levy from mining companies to engage NRM stakeholders in legacy mine rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>• Each year mining offsets are increasingly utilised for NRM programs and activities</li> <li>• Mine sites are increasingly rehabilitated to best NRM practices and standards by 2018.</li> </ul>
<p><b>MEDIUM PRIORITY</b> Develop and implement a forestry management and assessment framework</p>		<ul style="list-style-type: none"> <li>• Develop a framework for plantation forestry operations in the NT to help understand water use and impacts and resource use efficiencies particularly as the industry expands rapidly</li> <li>• Progress adoption of best practice through an industry code of practice that encourages self-regulation with clear links to government regulations through land clearing and other forestry specific legislation, policy and planning frameworks</li> </ul>	<ul style="list-style-type: none"> <li>• Develop guidelines including suitability of species, soil, water and weed management by 2017</li> <li>• Forestry operations use best practices minimising environmental degradation and incorporating offsets by 2018</li> </ul>
<p><b>MEDIUM PRIORITY</b> Carry out adaptation planning on the likely impacts of climate change with industry</p>		<ul style="list-style-type: none"> <li>• Consult community to develop strategies for industry and communities to adapt to likely impacts of climate change</li> <li>• Encourage government and other stakeholders to develop strategies to adapt to climate change especially in 'Developing the North' considerations</li> </ul>	<ul style="list-style-type: none"> <li>• Increased consideration of climate change in industry planning by 2018</li> </ul>

## Objectives

## Assets Improved

By 2020, fishing stocks continue to be healthy and data collection and analysis is improved and informing fisheries management



By 2020, increase the involvement of the mining industry in natural resource management



By 2020, plantation forestry activities are more regulated and adopting best practice



By 2020, industry targeted climate adaptation plans have been completed with strategies for natural resource industries to cope with increased climate variability and extremes



*“NRM is integral to the sustainability and viability of primary industries because it’s what underpins primary production. Good farm, irrigation or grazing practice is the result of good NRM.”*

Windmill for pumping groundwater



# PROGRAM 5 WATER RESOURCES AND SOIL MANAGEMENT

## Background

Water resources and productive soils are essential to the livelihoods of people and ecosystems within the Top End region. Compared to other areas within Australia they have not been subject to the same development pressures, which is in part due to the sparse population and remoteness of the region. However, there is increasing attention and policies are being developed which focus on developing northern Australia by improving the productivity of our pastoral sector, expanding irrigated agriculture, developing new aquaculture ventures and developing new mining and oil and petroleum industries. The expansion of these industries will place unprecedented pressure on the NT's water resources. The objective of this program is to ensure best practice in water resource planning and allocation and soil management in collaboration with multiple stakeholders and to increase our knowledge of the impacts of industries such as oil and gas on groundwater.

## Strategies

### VERY HIGH PRIORITY

Water resource planning and management is undertaken in collaboration with a diverse range of stakeholders based on an equitable and transparent process

### HIGH PRIORITY

Increase resources available to increase our knowledge and understand and manage the impacts on ecosystems and groundwater from mining, pastoral, agricultural and domestic use

### HIGH PRIORITY

Support training and extension services on sustainable soil management

## 5.3

### MEDIUM PRIORITY

Identify areas with potential for agricultural development through assessments of soil and water resources

## Priority Activities

- Identify and quantify competing demands for water resources and the impacts of different activities on water resources
- Involve multiple stakeholders and users representing a range of interests, in water allocation planning in the region
- Support water stewardship through involving the community in monitoring and in implementing new water monitoring technology and communication materials targeted at behaviour change
- Support research and innovation (including the impacts of climate change) that increase our understanding of water resources.
- Continue to research the impacts of water extraction on water resources, including use for domestic, pastoral, mining and agricultural activities
- Continue to implement more broader water use monitoring on both surface and groundwater (including bore meters) to more accurately assess water use
- Research and trial water efficiency techniques for pastoral and agricultural industries
- Monitor water quality and aquatic ecosystem health to maximise chance of early detection of pollution
- Raise the awareness of the importance of soil erosion, soil fertility, soil health and soil moisture for primary industries productivity
- Collate existing soil information and develop communications materials particularly targeting contractors on soil conservation promoting improved soil management practices for roadworks, fence-lines, mining exploration activities and other developments in the landscape
- Utilise rangelands remote sensing tools to encourage improved grazing management and enhance production efficiency to minimise soil erosion issues
- Continue the requirement for erosion and sediment control plans and adherence for all developments
- Land clearing guidelines continue to be reviewed and adapted with new information and to deal with potential increased development in northern Australia
- Develop acid sulfate soil management guidelines identifying and managing areas at risk.
- Immediately undertake research and assessments for areas that are being proposed for new and intensified agricultural development
- Link physical assessments of soil and water resources with crop suitability, land tenure and market considerations in developing new agricultural zones.

## Milestones

- By 2018, water resources planning is informed from input and ongoing adaptive management processes involving a range of diverse stakeholders and underpinned by the best available scientific knowledge
- Increased understanding and incorporation into decision making of the likely impacts on climate change on our water resources by 2018.
- Increased uptake of water stewardship and monitoring programs by key stakeholders by 2018
- Best available science increasingly informs planning and management of groundwater resources for industrial developments in the Top End by 2018
- Water efficiency techniques are increasingly utilised by the pastoral and agricultural sectors by 2018.
- Soil information and soil management tools are being utilised to improve soil management techniques by 2018
- Increased understanding of the limitations and parameters for appropriate agricultural development and expansion in the Top End by 2018.



## Objectives

By 2020, water resources are managed and monitored with input from all stakeholders through a water allocation framework which includes monitoring and ensures that cultural, environmental and production values are maintained

## Assets Improved



By 2020, our knowledge of the impacts of water use from key industrial and domestic uses of water resources has increased and a regulatory framework exists to minimise pollution of groundwater



By 2020, soil loss, soil function and land degradation are being prevented and, where necessary, addressed



By 2020, areas for agricultural development have been identified with thorough understanding on limitations of soil and water resources



### Key Measures of Achievement

- Survey of contractors and land managers and awareness and adoption of soil management practices
- Number of people/groups involved in water stewardship
- Number of water resources or allocation plans developed and number of people/groups involved in developing the plans
- Water allocation plans involve a diverse range of stakeholders
- Water resources have a moderate to high level of development relative to the water available for development (in consideration of non-consumptive uses)
- Number of new sustainable agricultural developments identified based on assessments of soil and water resources

### Key Collaborators

NTG (Water Resources), NTG (DPIF), NTG (DME), TNRM, researchers, industry representative groups (Water Resources and LMU, NT Cattlemen's Association, NT Farmers Association, NT Minerals Council, etc.), Aust. Govt (Environment and Agriculture), Northern Land Council, horticultural industry, Northern Environmental Science Program

*“If we don't have our soil in check with our Landcare practices there is no point in being here and we want to be able to hand it over to our children in a much better condition than we received it”*

### Total Relative Risk and Vulnerabilities of River Catchments

(Flow regime, water quality, riparian vegetation, biodiversity)



Source: <https://terranova.org.au/repository/monsoonal-north-nrm-collection/northern-australian-aquatic-assesses-geodatabase-v2.0/close-et-al-2015-vulnerability-and-risk-assessment.pdf>



Urban landcare rehabilitation works

# PROGRAM 6 NRM BASED ECONOMIC OPPORTUNITIES

## Background

NRM based economic opportunities aims to increase the contribution of the conservation economy to the livelihoods and well-being of the people in the Top End region. NRM based economic opportunities support people to live on country throughout the region. Opportunities that are particularly relevant to the Top End are participating in emerging carbon markets particularly from savanna burning projects, rehabilitation of mine sites and other degraded lands, carrying out environmental offsets, traditional wildlife harvest, diversification of activities on pastoral lands and potentially work associated with valuing of ecosystem services. This strategy is mostly about continuing to identify opportunities in the region but recognises the importance of governance, policy and marketing of products to take advantage of emerging opportunities.

## Strategies

**MEDIUM PRIORITY**  
Develop NRM based economic enterprises based on the harvest of native species

**MEDIUM PRIORITY**  
Develop capacity for fee for service opportunities for local NRM groups

**HIGH PRIORITY**  
Support projects and research to develop and participate in national, NT and regional initiatives to develop carbon market programs













**MEDIUM PRIORITY**  
Investigate, progress and communicate emerging primary industry and economic diversification opportunities on Aboriginal and pastoral lands including horticulture, aquaculture and tourism

**MEDIUM PRIORITY**  
Link new and emerging opportunities with NRM stakeholders in the NT

**HIGH PRIORITY**  
Investigate and support development opportunities from new environmental technologies and renewables

## Priority Activities

- Continue to identify markets and opportunities
  - Provide institutional and business support for the development of NRM based economic activities
  - Simplify systems for permits, monitoring and accreditation
  - Strengthen ongoing support arrangements for groups/individuals involved in NRM based economic activities
- 
- Develop and incorporate business skills into NRM activities
  - Develop linkages between local groups and business opportunities
  - Provide training and business support and mentoring to help establish and manage land and sea management contract businesses
  - Support Aboriginal enterprises and land managers to tender for potential contract and fee for service opportunities
  - Government enables policies and utilises the mining environmental levy to encourage Indigenous enterprises to tender for mine rehabilitation activities
  - Support successful Indigenous enterprises to share their stories and to provide mentoring for new enterprises
- 
- Continued communication of information on carbon market developments to NRM community
  - Clarify ownership and governance arrangements around carbon stocks
  - Support the involvement of land sector carbon projects including blue carbon opportunities
  - Support greater involvement in savanna burning for carbon abatement and sequestration in the Top End region
- 
- Support the research and development of horticultural projects that enable commercial opportunities on Aboriginal and pastoral land
  - Support projects that increase participation of Aboriginal land owners in remote horticultural and tourism projects
  - Support emerging and innovative sustainable primary industry activities on pastoral land allowed by the pastoral diversification legislation
- 
- Create new links between industry and corporate bodies and NRM stakeholders particularly looking to deliver new and innovative approaches to NRM
  - Facilitate opportunities between government and industry and link to the delivery of priorities in this NRM plan.
- 
- Continue trialling “biochar” and other emerging technologies promoting waste management, soil rehabilitation and carbon opportunities
  - Support the development of new or existing technology for renewable energy, carbon abatement and other initiatives that support sustainable industry in the Top End region

Milestones	Objectives	Assets Improved
<ul style="list-style-type: none"> <li>By 2018, products are identified and pursued and markets are developed</li> <li>The development of business plans, governance arrangements and product marketing to kick-start priority ventures</li> </ul>	<p>By 2020, new employment and business opportunities are created based on sustainable harvest of native species</p>	 
<ul style="list-style-type: none"> <li>Fee for service contracts are increasingly utilised by local NRM groups in the Top End region by 2018</li> <li>Each year, business mentoring and other support is ongoing to develop emerging Aboriginal land management enterprises</li> </ul>	<p>By 2020, ranger groups and other local NRM enterprises are strong and economically viable, supported by a diversity of funding sources and locally based commercial opportunities</p>	  
<ul style="list-style-type: none"> <li>By 2018 progress opportunities for land managers to gain financial benefit from the developing carbon economy</li> <li>Continued support for land managers to access opportunities to voluntary markets, offsets and other carbon markets in the Top End.</li> </ul>	<p>By 2020, NRM stakeholders have increased their participation in carbon market programs</p>	
<ul style="list-style-type: none"> <li>By 2018, the horticultural industry is extended across the region on Aboriginal land and land under pastoral lease, implementing sustainable practices and increasing local employment</li> <li>By 2018, there is an increase in other primary industry opportunities on pastoral land in the Top End</li> </ul>	<p>By 2020, new employment opportunities developed through diverse primary industries and on different tenures in the NT</p>	 
<ul style="list-style-type: none"> <li>By 2018, there are new partnerships and funding opportunities for NRM stakeholders in the Top End region</li> </ul>	<p>By 2020, new opportunities and new partnerships between private sector and NRM stakeholders have been developed</p>	 
<ul style="list-style-type: none"> <li>By 2018, new and emerging environmental technologies are increasingly utilised across a variety of sectors</li> </ul>	<p>By 2020, the renewables and environment sector is contributing more to the Top End economy than in 2015</p>	 

### Key Measures of Achievement

- Number of Indigenous enterprises wild-harvesting species for commercial use
- Amount of fee for service contracts carried out by local ranger groups
- Number of new enterprises on Indigenous land and pastoral land in primary industries
- Financial benefit gained from carbon market opportunities
- Number of new industry/corporate partnerships in the NRM sector
- Contribution of environment industry sector to the NT economy

### Key Collaborators

Researchers, Northern Land Council, pastoralists, NTG (DME), NTG (DLRM), Aboriginal ranger groups, Aust. Govt.(Environment - Emissions Reduction Fund), Aust. Govt. (PMC – Indigenous Programs), private enterprise, NTG (DPIF).

*“We want the resources to be able to take our children on country, to look after them out there through telling them their history, the way their ancestors lived in traditional times, all of the flora and fauna that sustains them, all of the animals that they lived on that are now extinct, so that they understand their history and culture”*

# MINIMISING ECOLOGICAL FOOTPRINTS OF DEVELOPMENT

## Background

The Top End region is home to about 70% of the NT's population and is therefore under the most pressure for urban and industrial development. Urban expansion, with new housing developments in Darwin, Palmerston and the peri-urban areas are placing more demands and pressures on the natural environments. The objective of this program is to minimise the ecological footprints of Territorians by supporting measures to reduce the impact of new and existing residential and industrial developments on natural values and reduce the entry of pollutants to the environment via mechanisms such as: supporting environmental research, planning and management to minimise the impacts of development; and offset schemes to ensure that where development cannot avoid environmental degradation this is offset by investments in priority areas to improve environmental conditions elsewhere.

## Strategies

**MEDIUM PRIORITY**

Minimise the environmental footprint of urban and peri-urban development of the greater Darwin area

**MEDIUM PRIORITY**

Assess current hazardous substance handling and emergency response procedures and improve where necessary

**HIGH PRIORITY**

Strengthen and consolidate environmental offset arrangements to direct offsets where they are likely to be most effective

**MEDIUM PRIORITY**

Minimise the impact of tourism on the environment through the adoption and promotion of sustainable initiatives

## Priority Activities

- Support urban Landcare groups to raise community involvement in urban ecosystem rehabilitation projects and peri-urban stewardship arrangements in the greater Darwin area
- Lobby for and promote development approval processes and policies that adhere to best practice principles for ecologically sustainable development
- Increase coordination of environment groups to provide a more effective alternative voice to development and planning proposals.

- Support continued assessment of the independent report card for Darwin Harbour
- Develop reporting mechanisms for key areas at risk from mine site pollution
- Establish regional waste facilities capable of storing and handling toxic substances
- Promote a culture of disclosure and compliance within industry
- Undertake a review to assess adequacy of current legislative instruments

- Develop a clear direction to offsets and 'voluntary' offset activities that encourages more investment into NRM
- Develop partnerships between the private sector, government and NRM stakeholders to enable the use of offsets to support NRM activities

- Develop and support strategies that minimise environmental and cultural impacts of recreational users and visitors to key areas and sites within the Top End
- Collaborate with key recreational user groups to manage impacts on key areas

## Milestones

- Multi-stakeholder plans are developed to ensure sustainable development of the Darwin area by 2018
- Damage to ecosystems from suburban development is minimised via appropriate policy mechanisms by 2018

- The compliance and enforcement role of the NT EPA is strengthened
- Enhanced communication between mining industry, the NT EPA and the community on pollution issues by 2018.

- Increased alliances between industry and government that promote offsets from development activities to support NRM activities by 2018
- Increased stewardship in NRM and conservation activities from well directed offset funds by 2018

- Amateur fishers sustainably manage fisheries and have minimal impact on ecosystems by 2018
- Management of impacts from tourism on significant environmental and cultural sites by 2018

## Objectives

By 2020, development of urban and regional centres adheres to best practice principles of ecologically sustainable developments

## Assets Improved



By 2020, the entry of toxic chemicals into the environment from commercial activities has been reduced



By 2020, offsets are well directed and transparent and linked to achieving the prioritised NRM strategies of the NT



By 2020, there is increased environmental awareness by recreational users of natural resources and visitors to the Top End and practical solutions are implemented to reduce these impacts



### Key Measures of Achievement

- Assessment of environmental planning in new urban developments
- Trends in per capita water and power consumption
- Amount of funds from offsets invested into NRM activities identified in the NRM plan
- Percentage of energy coming from renewable sources
- Public information programs and their uptake
- Number of accredited green tourism programs
- Response to before and after surveys assessing attitudes of recreational users to NRM issues
- Analysis of waste and pollution management procedures and policies and implementation

### Key Collaborators

NTG (DLRM), NTG (DLPE), Local Government (Shires), Darwin and Palmerston City Council, NT Environment Protection Agency, NT Environment Centre, NTG (DME), TNRM, research institutions, Northern Land Council, environment NGOs.

*“We have to stay viable and ensure the land we leave for future generations is healthy”*

Railway line

# MANAGING AND PROTECTING KEY NATURAL AND CULTURAL ASSETS

## Background

There are a number of sites of international significance in the Top End region including 27 Sites of Conservation Significance, which encompass islands, coastal wetlands and floodplains, river systems and the Western Arnhem Plateau. The Top End region contains a number of large protected areas to protect and manage iconic areas and important ecosystems. The majority of land within the region is under Aboriginal land tenure with pastoral, horticultural, urban residential and peri-urban land use also prominent. The objective of this program seeks to build on partnerships with landholders to maintain key cultural and natural assets. Stewardship programs that support good conservation outcomes on pastoral properties are important, as is the support and resourcing of Aboriginal ranger groups. Supporting Traditional Owners' cultural knowledge systems and resourcing them to monitor and manage cultural sites is also integral to the longevity of maintaining the knowledge of cultural sites across the Top End region. This program recognises the importance of developing evidence based planning approaches to include a mix of dedicated conservation areas and conservation principles across the Top End region. Indigenous Protected Areas, Territory Conservation Agreements on pastoral land, urban Land for Wildlife, national parks and reserves and other land management programs are important in managing and protecting key natural and cultural assets.

## Strategies

**MEDIUM PRIORITY**  
Develop and implement management programs for Sites of Conservation Significance in the Top End

**HIGH PRIORITY**  
Implement the Action Plan for Priority Threatened Species in the NT (2015-2025) linking on-ground action to the latest knowledge

**HIGH PRIORITY**  
Facilitate stewardship of high value conservation areas through schemes such as Territory Conservation Agreements and Indigenous Protected Areas

**MEDIUM PRIORITY**  
Continue and extend marine habitat and key species mapping to inform planning, management and monitoring

## Potential Activities

- Secure resources for planning and management of Sites of Conservation Significance (SoCS)
- Develop and implement management plans and raise awareness of SoCs particularly where they occur outside of protected areas
- Communicate the Action Plan for Priority Threatened Species in the NT (2015-2025) and supports its implementation
- Link threatened species action in the NT to the national Threatened Species Strategy and implement key priorities relevant to the NT
- Support private land owners and pastoral lease holders to develop conservation agreements (stewardship) over key areas particularly in Sites of Conservation Significance
- Support Traditional Owners and Aboriginal ranger groups to develop and implement Indigenous Protected Area Management plans
- Increase awareness and stewardship of important conservation sites and cultural heritage within the region
- Identify key threats to coastal and marine environments
- Communicate marine habitat and key marine species information
- Create a framework for assessing and minimising impact of mining and development on coastal and marine environments

## Milestones

- Management plans are developed and implemented for 50% of the SoCs in the Top End by 2018
- Ongoing adaptive management of SoCs in the Top End is implemented by 2018
- Threatened species action is guided by science, practical action and working in partnership by 2018
- Increase in the resources provided for the management of IPAs within the region by 2018
- Conservation agreements over pastoral leases are developed and implemented by 2018
- The condition of Darwin Harbour is maintained or improved by 2018
- Mapping and monitoring of NT marine habitat and ecosystems is extended beyond Darwin Harbour by 2018

## Objectives

By 2020, the majority of Sites of Conservation Significance have management plans being implemented

By 2020, the approach to threatened species management is more integrated with strong links between research, monitoring and on-ground action showing progress against key indicators in the Action Plan for Priority Threatened Species in the NT (2015-2025)

By 2020, increase the involvement of Aboriginal people with Indigenous Protected Areas and pastoralists in conservation stewardship arrangements

By 2020, marine habitat and key species knowledge has improved and is informing development decisions

## Assets Improved



### Key Measures of Achievement

- Number of active management plans being implemented in Sites of Conservation Significance
- Progress against the Action Plan for Priority Threatened Species in the NT (2015-2025)
- Survey of NRM stakeholders on understanding of likely impacts of climate change
- Number of cultural sites actively being managed on all land tenures
- Number of people and areas under active conservation management
- Number of people involved in collecting biodiversity data
- Number of marine species for which essential habitat has been mapped and described
- Area under active management for salt water intrusion

### Key Collaborators

Research institutions, TNRM, pastoralists, NTG (DLRM), NTG (Parks and Wildlife), Parks Australia, Sacred Sites Authority (AAPA), Traditional Owners, Northern Land Council, landholders, Landcare groups.

### Sites of Conservation Significance

Sites of Conservation Significance were identified as the most important sites for biodiversity conservation in the NT.



Source: <https://nt.gov.au/environment/environment-data-maps/important-biodiversity-conservation-sites/map-sites-conservation-significance>

# MANAGING AND PROTECTING KEY NATURAL AND CULTURAL ASSETS

## Background

## Strategies

## Potential Activities

## Milestones

### HIGH PRIORITY

Develop and implement a strategic plan to address preventable salt water intrusion into coastal SoCs

- Continue research into and monitoring of changes, processes and rates of salt water intrusion focusing on hotspots across the NT coastline (such as Arafura Swamp and other SoCs)
- Work with coastal Aboriginal communities to develop strategies to address high risk areas for salt water intrusion

- Causes of salt water intrusion are better understood leading to clearer strategies for prevention by 2018

8.5

### MEDIUM PRIORITY

Develop adaptation plans for the impacts of climate change for vulnerable ecosystems in the Top End

- Investigate the likely impacts of climate change on threatened habitat/species communities in the Top End
- Develop management strategies and prioritise action on vulnerable assets most likely to be impacted by climate change

- Awareness of climate change impact amongst NRM stakeholders is increased by 2018
- An adaptation plan is developed with vulnerable species, areas and communities identified in the Top End

8.6

### HIGH PRIORITY

Support best practice management of Aboriginal culturally significant sites and landscapes

- Support the mapping, documentation and management of culturally significant sites by Traditional Owners
- Negotiate access to cultural sites on non-Aboriginal land tenure
- Increase the awareness of industry and government agencies about Aboriginal Sacred Sites and the processes and mechanisms for their protection in development activities
- Encourage the development of enterprises for Aboriginal ranger groups to carry out cultural heritage contract work

- Culturally significant sites are increasingly mapped and recorded by the appropriate Traditional Owners by 2018
- Cultural sites are prioritised for fire, weed and feral animal management activities in IPA plans by 2018
- Increased adoption and awareness of the process for the protection of Sacred Sites in proposed developments by 2018

8.7



## Objectives

By 2020, salt water intrusion threats to Sites of Conservation Significance have been identified, along with prioritised strategies for addressing them

By 2020, our understanding of the impacts of climate change on ecosystem function informs management.

By 2020, increased involvement of Aboriginal land managers and Traditional Owners in managing culturally significant sites and landscapes.

## Assets Improved



“A projected sea level rise of 30cm could potentially cause the loss of 80 per cent of the area of freshwater wetlands in Kakadu”

Top End wetland

# PROGRAM 9 KNOWLEDGE, CAPACITY AND ENGAGEMENT

## Background

Natural resource management will not be effective without a strong, capable and knowledgeable workforce. The objective of this program is to support knowledge across the broad range of stakeholders in the Top End region through both formal and informal training programs and to encourage strong networks between these stakeholders. It aims to foster a funding and policy framework that supports a viable NRM community in the Top End where Traditional Owners, Aboriginal ranger groups, community groups and other land managers are increasingly supported to carry out NRM work utilising the latest scientific knowledge and Traditional Ecological Knowledge.

## Strategies

### HIGH PRIORITY

Strengthen networks and partnerships between NRM stakeholders including supporting the development of new partnerships with industry and philanthropic organisations and promoting community and industry responsibility of NRM issues

### MEDIUM PRIORITY

Support land managers to record, utilise and share scientific research, traditional ecological knowledge (TEK) and pastoral knowledge in NRM planning and management activities

### MEDIUM PRIORITY

Support accredited and informal training in land management and sustainable industry practices

### HIGH PRIORITY

Ongoing review of NRM outcomes facilitating adaptive management

## Priority Activities

- Consolidate and extend landscape level and cross border partnerships through supporting workshops that bring together stakeholders and share knowledge
- Support the development of fee for service opportunities and a diversified funding base to ensure the long-term growth and development of Landcare groups, Aboriginal rangers and other NRM groups
- Seek alternative sources of funding for NRM activities through new partnerships with philanthropic organisations and offset arrangements
- Develop and build the capacity of Landcare Coordinators, volunteers and Aboriginal ranger groups
- Support collaboration between key technical agencies to encourage their support for actions of Landcare groups
- Promote good 'stories' from NRM to increase the profile of NRM in the community.
- Conduct forums to facilitate knowledge sharing between NRM stakeholders and researchers
- Identify knowledge gaps and research priorities in collaboration with key stakeholders
- Establish knowledge capture, storage and sharing projects by Traditional Owners and Aboriginal rangers
- Develop programs that facilitate community monitoring of key environmental assets (adding to the NT species database) ensuring data collection is relevant, efficient and utilised
- Share knowledge through websites, newsletters, fact sheets and other publications.
- Assess training needs (non-accredited and accredited) for NRM stakeholders and support the delivery of appropriate training where needed particularly supporting skills linked to employment in NRM
- Assess the efficiency of training and improve where necessary
- Introduce stronger mentoring programs in the NRM sector
- Deliver training and support for sustainable grazing practices
- Support governance and leadership training of locally based NRM groups and establish clearer career pathways in NRM
- Promote strong links between Aboriginal ranger groups and schools through Learning on Country programs
- Facilitate multi-stakeholder annual reviews of progress against the NRM plan
- Support a multi-stakeholder approach to adaptive management to help prioritise funding, resources and effort in areas of highest need

## Milestones

- Increased collaboration with NRM stakeholders within the Top End and across borders to collectively lobby and work on large landscape issues by 2018
- Ongoing and diversified resources are secured for multi tenure and long-term approaches to NRM issues in the region by 2018
- Strategic planning initiatives of Landcare groups around the Top End is supported by 2018
- Aboriginal ranger groups are increasingly funded and supported with capacity building training by 2018
- Land managers are included in NRM research projects and monitoring by 2018
- Knowledge systems (Science, TEK, NRM) are increasingly utilised in NRM activities and planning in the Top End by 2018
- Analysis of biodiversity data better informs status of ecosystem functions and directs management decisions by 2018
- Increased training and capacity building of NRM stakeholders in the Top End by 2018
- Capacity building and training activities are evaluated to further improve and target future training and capacity building programs by 2018
- An annual NRM "report card" document is published by TNRM based on review
- Increased numbers of partners join and support the NRM community and access key strategies identified in the NRM plan

## Objectives

By 2020, increased resources and long-term approaches to NRM issues for people managing land

## Assets Improved



### Key Measures of Achievement

- Number of accredited and non-accredited training sessions delivered
- Number of graduates of NRM courses
- Number of active Aboriginal ranger and pastoral Landcare Groups
- Amount of funding provided for NRM in the region
- Number and quality of landscape scale multi-stakeholder workshops in region
- Number and quality of NRM plan review and adaptive management processes

### Key Collaborators

Landcare groups, TNRM, philanthropic sector, Charles Darwin University, Batchelor Institute, private training providers, research Institutions, Northern Land Council, industry representative groups, pastoralists, NTG, Aust. Govt.

*“To get a better understanding of how to use the land is using two toolbox. We call it two toolbox, and our two toolbox is knowledge that we use - Bininj knowledge, which is our knowledge and western knowledge from Balanda knowledge, and bring that knowledge together to manage this land”*

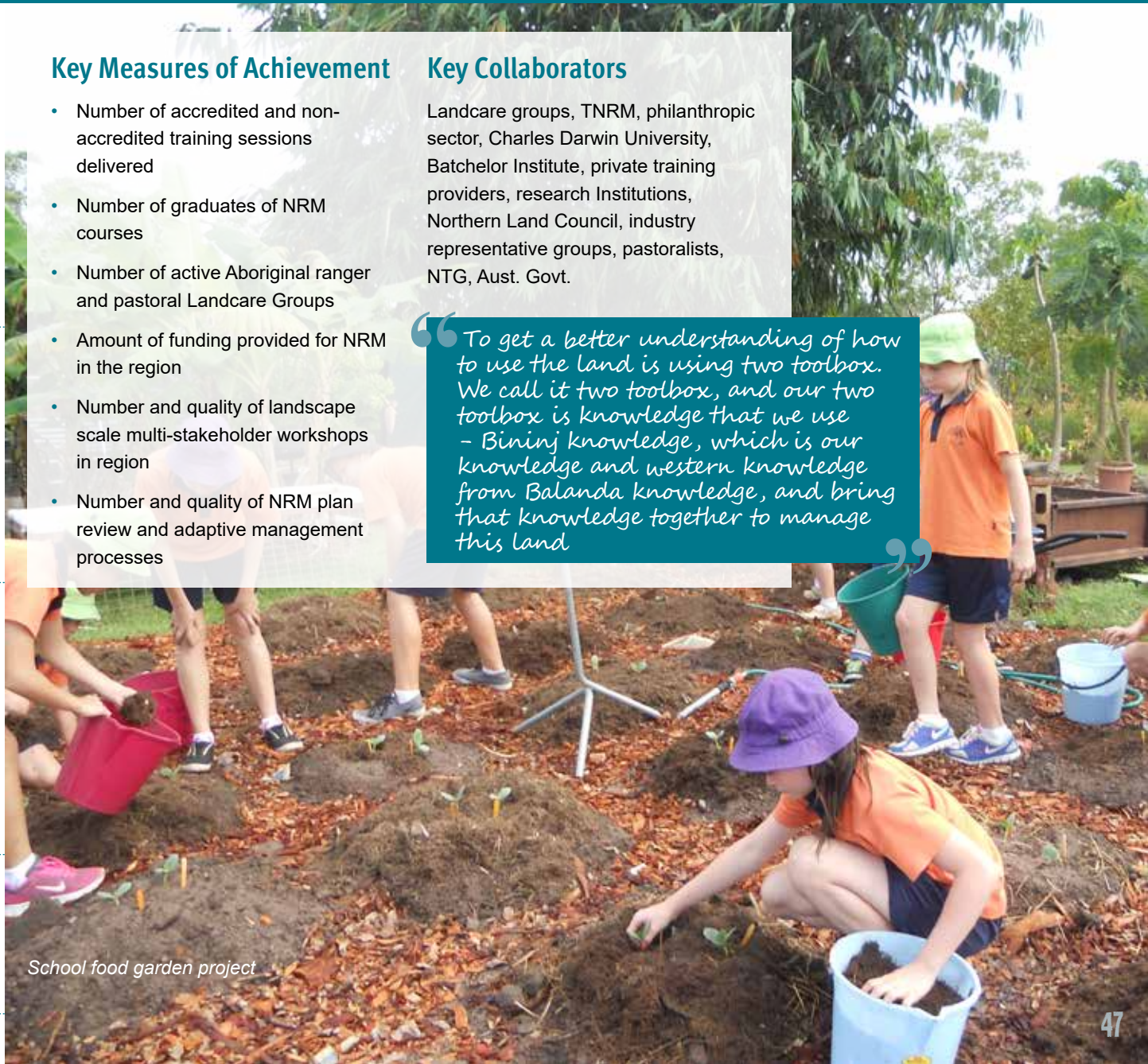
By 2020, Territory Natural Resource Managers are incorporating the best available knowledge, information and data into their management including TEK and community knowledge



By 2020, there is increased and more targeted training in relevant natural resource management skills



By 2020, multi-stakeholder review processes are strengthened in the NT leading to adaptive management and improved practices and stakeholder cooperation



School food garden project

# THREATENED SPECIES OF THE TOP END

Threatened Species listings are currently under review and likely to change over the life of this plan. Refer to updated threatened species list at <http://www.lrm.nt.gov.au/plants-and-animals/threatened-species/specieslist>.

Birds	Nat / NT Status
Asian Dowitcher	- / VU
Australian Painted Snipe	EN / VU
Bar-tailed Godwit	- / VU
Crested Shrike-tit	VU / -
Curlew Sandpiper	CE / VU
Eastern Curlew	CE / VU
Gouldian Finch	EN / VU
Great Knot	- / VU
Greater Sand Plover	- / VU
Grey Falcon	- / VU
Hooded Robin (Tiwi)	EN / CE
Horsfield's Bushlark (Tiwi Islands)	VU / VU
Lesser Sand Plover	- / VU
Masked Owl (northern mainland)	VU / VU
Masked Owl (Tiwi Islands)	EN / EN
Partridge Pigeon	VU / VU
Red Goshawk	VU / VU
Red Knot	- / VU
White-throated Grasswren	- / VU
Yellow Chat (Alligator River)	EN / EN
Cycads	Nat / NT Status
<i>Cycas armstrongii</i>	- / VU
<i>Cycas armstrongii</i> x <i>conferta</i>	- / VU
<i>Cycas armstrongii</i> x <i>maconochiei</i>	- / VU
Ferns	Nat / NT Status
<i>Angiopteris evecta</i>	- / VU
<i>Bolbitis quoyana</i>	- / VU
<i>Cephalomanes obscurum</i>	- / EN
<i>Sticherus flabellatus</i> var. <i>compactus</i>	- / VU

Flowering Plants	Nat / NT Status
<i>Acacia praetermissa</i>	VU / VU
<i>Acacia</i> sp. Graveside Gorge	CE / CE
<i>Boronia quadrilata</i>	VU / VU
<i>Boronia viridiflora</i>	VU / VU
<i>Burmanna</i> sp. Bathurst Island	EN / EN
<i>Calochilus caeruleus</i>	- / VU
<i>Clausena</i> sp. Tipperary	- / EN
<i>Cleome insolata</i>	- / VU
<i>Crepidium marsupichila</i>	- / VU
<i>Dendromyza reinwardtiana</i>	- / VU
<i>Dienia montana</i>	- / VU
<i>Elaeocarpus miegei</i>	- / CR
<i>Eleocharis retroflexa</i>	VU / -
<i>Endiandra limnophila</i>	- / VU
<i>Erythroxyllum</i> sp. Cholmondely Creek	- / EN
<i>Freycinetia excelsa</i>	- / VU
<i>Freycinetia percostata</i>	- / VU
<i>Garcinia warrenii</i>	- / EN
<i>Goodenia quadrifida</i>	VU / -
<i>Habenaria rumphii</i>	- / EN
<i>Helicteres macrothrix</i>	EN / EN
<i>Hernandia nymphaeifolia</i>	- / VU
<i>Hibbertia brennanii</i>	- / VU
<i>Hibbertia pancerea</i>	- / VU
<i>Hibbertia</i> sp. South Magela	- / VU
<i>Hibbertia tricornis</i>	- / VU
<i>Hibiscus brennanii</i>	VU / VU
<i>Hoya australis</i> subsp. <i>oramicola</i>	VU / VU
<i>Intsia bijuga</i>	- / CE
<i>Jacksonia divisa</i>	- / VU

<i>Lithomyrtus linariifolia</i>	- / VU
<i>Luisia corrugata</i>	- / VU
<i>Mapania macrocephala</i>	- / VU
<i>Mitrella tiwiensis</i>	VU / VU
<i>Monochoria hastata</i>	- / VU
<i>Pternandra coerulescens</i>	- / VU
<i>Ptychosperma macarthurii</i>	EN / EN
<i>Santalum acuminatum</i>	- / VU
<i>Schoutenia ovata</i>	- / EN
<i>Stylidium ensatum</i>	- / EN
<i>Tarennoidea wallichii</i>	- / EN
<i>Thrixsperma congestum</i>	- / VU
<i>Toechima</i> sp. East Alligator	EN / EN
<i>Typhonium jonesii</i>	EN / EN
<i>Typhonium mirabile</i>	EN / EN
<i>Typhonium praetermissum</i>	- / VU
<i>Typhonium taylori</i>	EN / EN
<i>Utricularia dunstaniae</i>	- / VU
<i>Utricularia singeriana</i>	- / VU
<i>Xylopia monosperma</i>	EN / EN
<i>Zeuxine oblonga</i>	- / VU

## Amphibians Nat / NT Status

Howard Springs Toadlet	- / VU
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## Mammals Nat / NT Status

Arnhem Leaf-nosed Bat	EN / VU
Arnhem Rock-rat	VU / VU
Bare-rumped Sheath-tailed Bat	CE / -
Black-footed Tree-rat (mainland)	EN / VU
Black-footed Tree-rat (Melville Island)	VU / VU
Blue Whale	EN / -
Brush-tailed Rabbit-rat	VU / EN
Butler's Dunnart	VU / VU

# SITES OF CONSERVATION SIGNIFICANCE IN THE TOP END

Fawn Antechinus	- / EN
Golden Bandicoot	VU / EN
Golden-backed Tree-rat	VU / CE (PE)
Humpback Whale	VU / -
Nabarlek	EN / VU
Northern Brush-tailed Phascogale	VU / EN
Northern Hopping-mouse	VU / VU
Northern Leaf-nosed Bat	- / VU
Northern Quoll	EN / CE
Pale Field-rat	- / VU
Water Mouse	VU / -
<b>Reptiles</b>	<b>Nat / NT Status</b>
Arnhemland Egernia	EN / EN
Flatback Turtle	VU / -
Green Turtle	VU / -
Hawksbill Turtle	VU / VU
Leatherback Turtle	EN / CE
Loggerhead Turtle	EN / VU
Mertens' Water Monitor	- / VU
Mitchell's Water Monitor	- / VU
Oenpelli Python	- / VU
Olive Ridley	EN / VU
Plains Death Adder	VU / VU
VRD Blacksoil Ctenotus	- / VU
Yellow-snouted Gecko	EN / VU
Yellow-spotted Monitor	- / VU
<b>Invertebrates</b>	<b>Nat / NT Status</b>
Atlas Moth	- / VU
Gove Crow Butterfly	EN / -
Dodd's Azure Butterfly	- / EN
<b>Snails</b>	<b>Nat / NT Status</b>
Cognate Land Snail	- / VU
Land Snail	- / VU

Site name	Significance	World heritage area	Ramsar	% Protected
Adelaide River coastal floodplain	International	-	-	24.9
Alligator Rivers coastal floodplains	International	Kakadu National Park	Kakadu	60.5
Anson Bay and associated coastal floodplains	International			-
Arafura Swamp	International			-
Blue Mud Bay and associated coastal floodplains	International			27.4
Boucaut Bay and associated coastal floodplains	International			87.0
Buckingham Bay and associated coastal floodplains	International			-
Castlereagh Bay and associated islands	International			2.2
Chambers Bay	International			37.9
Cobourg Peninsula	International		Cobourg Peninsula	36.6
Croker Island group	International			--
Daly River middle reaches	National			50.3
Darwin Harbour	International			2.9
Elcho Island group	International			-
Finniss River coastal floodplain	International			-
Fog Bay	International			-
Gove Peninsula and north-east Arnhem coast	International			40.3
Groote Eylandt group	International			36.2
Howard sand plains	International			4.2
Hyland Bay and associated coastal floodplains	International			28.6
Maningrida coastal habitats	International			68.6
Mary River coastal floodplain	International			28.9
Shoal Bay	International			36.9
Tiwi Islands	International			-
Wessel and English Company island groups	International			-
Limmen Bight and associated coastal floodplains	International			10.9
Western Arnhem Plateau	International			79.3

# WEEDS OF THE TOP END

Weed lists published are agreed at time of publication but are likely to change over the life of this plan.

## Priority Weeds

Species that require priority management attention within the region were determined using rigorous weed risk assessment processes.

Species Name	Common Name	Declared	WONS/KTP
<i>Andropogon gayanus</i>	Gamba Grass	A/B	WONS, KTP
<i>Cenchrus polystachios</i>	Mission grass - perennial	B	KTP
<i>Hymenachne amplexicaulis</i>	Olive hymenachne	B	WONS, KTP
<i>Jatropha gossypifolia</i>	Bellyache Bush	A/B	WONS
<i>Mimosa pigra</i>	Mimosa	A/B	WONS
<i>Parkinsonia aculeata</i>	Parkinsonia	B	WONS
<i>Salvinia molesta</i>	Salvinia	B	WONS
<i>Themeda quadrivalvis</i>	Grader grass	B	-
<i>Vachellia nilotica</i>	Prickly acacia	A	WONS
<i>Ziziphus mauritiana</i>	Chinee apple	A	-
<i>Themeda quadrivalvis</i>	Grader grass	B	-
<i>Vachellia nilotica</i>	Prickly acacia	A	WONS
<i>Ziziphus mauritiana</i>	Chinee apple	A	-

## 'Alert Weeds'

Species not yet fully naturalised in the region, that have the potential to have a high level of impact should it become established, and the likelihood of the species naturalising and spreading is perceived to be high.

Species Name	Common Name	Declared	WONS/KTP
<i>Annona glabra</i>	Pond apple	A	WONS
<i>Cabomba caroliniana</i>	Cabomba	A	WONS
<i>Cryptostegia grandiflora</i>	Rubber Vine	A	WONS
<i>Cryptostegia madagascariensis</i>	Rubber Vine - Ornamental	A	-
<i>Eichhornia crassipes</i>	Water hyacinth	A	WONS
<i>Neptunia plena</i>	Water mimosa - plena	A	-
<i>Neptunia oleracea</i>	Water mimosa	A	-
<i>Hyparrhenia rufa</i>	Thatch grass	A	-
<i>Jatropha curcas</i>	Physic nut	A	-
<i>Senegalia catechu</i>	Cutch tree	A	-

## Other Weeds

Species Name	Common Name	Declared	WONS/KTP
<i>Acanthospermum hispidum</i>	Burr - Star	B	-
<i>Alternanthera pungens</i>	Khaki weed	B	-
<i>Azadirachta indica</i>	Neem	B	-
<i>Barleria prionitis</i>	Barleria	A	-
<i>Calotropis procera</i>	Rubber Bush	B/-	-
<i>Cenchrus echinatus</i>	Mossman river grass	B	-
<i>Cenchrus pedicellatus</i>	Mission grass - annual	No	KTP
<i>Cenchrus setaceus</i>	Fountain grass	B	-
<i>Dalbergia sissoo</i>	Indian rosewood	A	-
<i>Datura ferox</i>	Thornapple - Longspine	A	-
<i>Hyptis capitata</i>	Hyptis - Knob weed	B	-
<i>Hyptis suaveolens</i>	Hyptis	B	-
<i>Lantana camara</i>	Lantana - common	B	WONS
<i>Leonotis nepetifolia</i>	Lions tail	No	-
<i>Martynia annua</i>	Devils claw	A	-
<i>Mimosa pudica</i>	Giant sensitive plant - Common	B	-
<i>Opuntia spp</i>	Prickly pears spp	B/-	WONS
<i>Pistia stratiotes</i>	Water lettuce	B	-
<i>Prosopis pallida</i>	Mesquite	A	WONS
<i>Senna alata</i>	Senna - Candle bush	B	-
<i>Senna obtusifolia</i>	Senna - Sicklepod	B	-
<i>Senna occidentalis</i>	Senna - Coffee	B	-
<i>Sida acuta</i>	Spinyhead sida	B	-
<i>Sida cordifolia</i>	Flannel weed	B	-
<i>Sida rhombifolia</i>	Padd's lucerne	B	-
<i>Sporobolus sp</i>	Rats tail grass sp	No	-
<i>Stachytarpheta sp</i>	Snake weed sp	B	-
<i>Tribulus spp</i>	Caltrop spp	B	-
<i>Urochloa mutica</i>	Urochloa - Para grass	No	KTP
<i>Xanthium strumarium</i>	Burr - Noogoora	B	-

WONS - Weed of National Significance

KTP - Key Threatening Process

Declared weeds - schedule of classees:

A - To be eradicated

B - Growth and spread to be controlled

C - Not to be introduced to the Territory

All Class A and Class B weeds are also considered to be Class C weeds.

# FERAL ANIMALS OF THE TOP END

## Feral animal name

Birds	Barbary Dove	
	Common Starling	
	Eurasian Tree Sparrow	
	House Sparrow	
	Rock Dove	
Amphibians	Cane Toad	
Mammals	Black Rat	
	Banteng	
	Cat	
	Cattle	
	Donkey	
	Horse	
	House Mouse	
	Pig	
	Rabbit	
	Sambar	
	Swamp Buffalo	
	Reptiles	Asian House Gecko
		Flower-pot Blind Snake
	Invertebrates	Big-Headed Ant
Common Honeybee		
Ghost Ant		
Ginger Ant		
Singapore Ant		
Tropical Fire Ant		
Yellow Crazy Ant		



