

2023–2033 Natural Resource Management Plan for the Northern Gulf Region

GULF SAVANNAH NRM



The land and waters within the Northern Gulf NRM region includes the country of Western Yalanji, Kokoberra, Yir Yoront, Kokomenjen, Kunjen, Kuku Muluridji, Djungan, Jabalbina, Wokomin, Bar Barrum, Ewamian, Tagalaka, Kukatj, Gkuthaarn and Kurtijar people. Gulf Savannah NRM acknowledges and respects these Traditional Custodians of land and sea.

We recognise the diversity of Traditional culture, and the deep and varied connections Aboriginal and Torres Strait Islander peoples have with the land and sea within Queensland and the Northern Gulf. We recognise caring for Country contributes to connection, participation and overall health of people and Country. We recognise the expertise, knowledge, historical and cultural connection Aboriginal people have with land and sea and are committed to partnering with, and following the lead of, Traditional Custodians to improve outcomes for people, Country and culture.

We pay our respects to Elders past and present, and emerging leaders. We acknowledge and recognise the primacy of Aboriginal people's obligations, rights and responsibilities to use and care for their Traditional lands and waters.

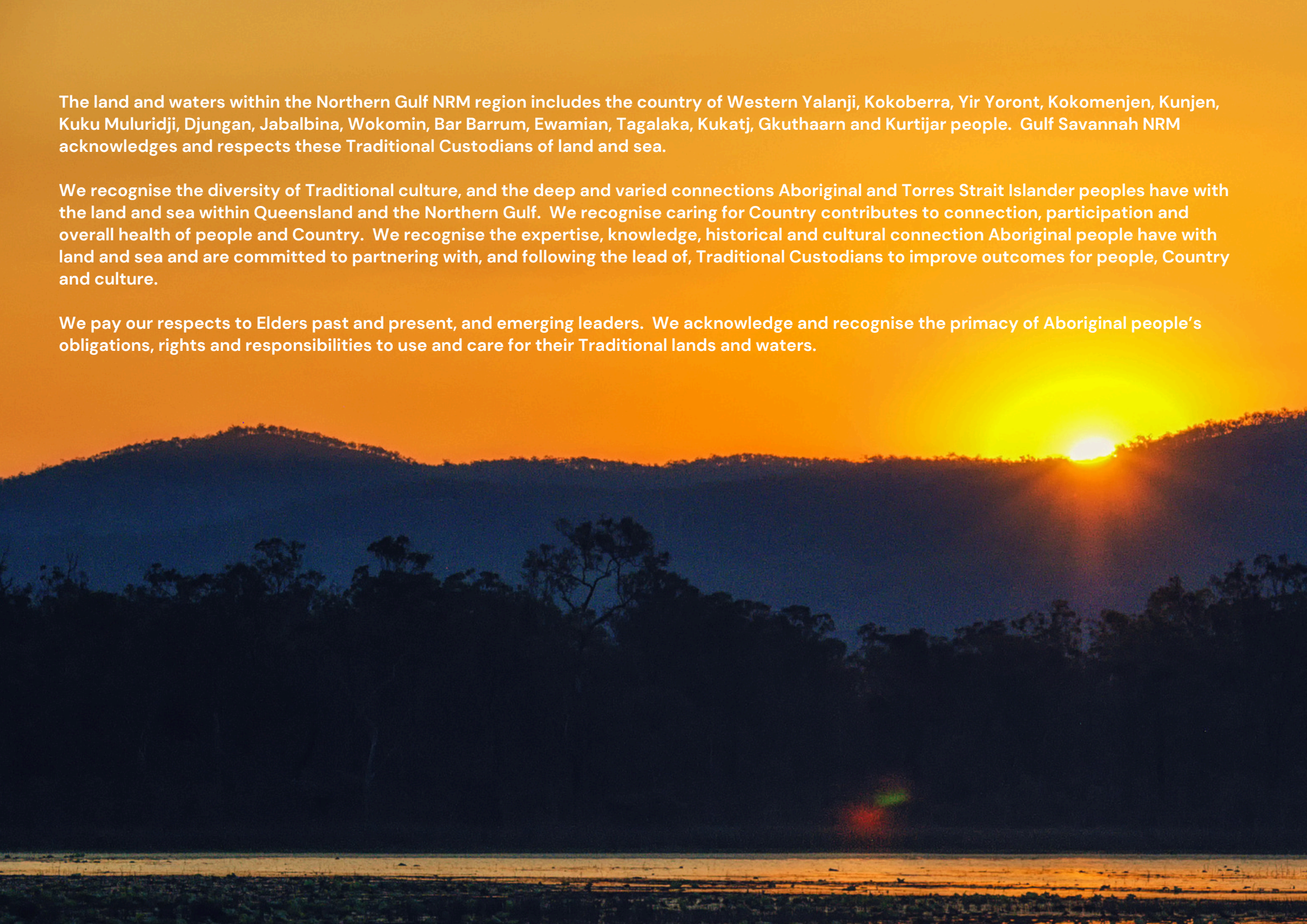




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FOREWORD

On behalf of the Gulf Savannah NRM Board, it is my pleasure to present the *2023–2033 Natural Resource Management Plan for the Northern Gulf Region*, which has been co-developed by the community and stakeholders. Our NRM team have worked hard to integrate the local knowledge, values, aspirations and ideas of our community with contemporary scientific evidence, into a strategic road map for the region.

The natural assets across the Northern Gulf NRM region form the foundation of our regional societies, communities and economies. They generate wealth in many ways: our Gulf coasts and coastal areas are nursery habitats for commercial fisheries species and internationally-significant marine biodiversity; the Gulf plains are home to around 160 grazing properties and enterprises that turn off around 200,000 cattle per year; and across the Northern Tablelands, the Mareeba Dimbulah Irrigation Area supports a range of horticultural industries including around thirty tropical agricultural crops.

The *2023–2033 Natural Resource Management Plan for the Northern Gulf Region* sets out a strong vision and priorities for the Northern Gulf, to protect our natural and community assets into the future.

It recognises and balances the need to sustain the productive values of the region while improving the condition of our land and water resources; protecting our natural, cultural and community assets; and managing pressures and threats from unplanned fires, floods, drought, pests and a changing climate.

It builds upon the legacy of previous NRM plans and the lessons learned from their implementation. It also looks to the future, recognising the newly emerging challenges and opportunities that this decade brings.

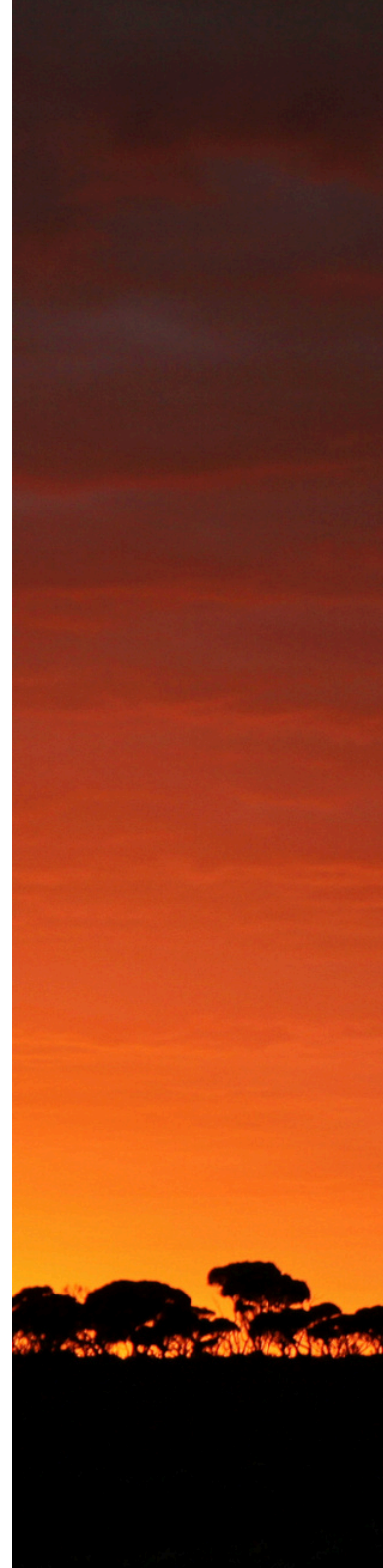
With this new plan, Gulf Savannah NRM aims to strengthen regional leadership, trust, effort, commitment and coordination in plan implementation. We will bring together and facilitate diverse regional stakeholders to adaptively manage implementation and find the approaches that work best for them.

We invite you all—as individuals, industry, Traditional Custodians, community groups and agencies—to contribute to maintaining and improving the Northern Gulf NRM region's environmental and production assets on which our prosperity and way of life depend.

I would like to thank everybody who assisted in the development of the 2023–2033 NRM Plan and invite you to rally together and be part of taking actions to shape our region.

Ellen Weber

Chair, Gulf Savannah NRM



HOW TO USE THIS DOCUMENT

This document is the 2023–2033 Natural Resource Management Plan for the Northern Gulf NRM region (the Plan). It builds on extensive work undertaken in our region across many years.

A Natural Resource Management Plan is a guidance document for the region. It can be used by anyone engaging in the use and management of our natural resources.

Section 3 sets the scene for the Plan and outlines Gulf Savannah NRM's approach to NRM planning in this document using a simplified Asset–Pressure approach.

Section 4 outlines the characteristics of the Northern Gulf NRM region.

Section 5 outlines the region's assets.

Section 6 outlines the pressures our natural resources are under, and our current understanding of the broad resource condition. The goals and strategies for each of these pressures are also outlined. This is the heart of the Plan and sets out the priorities for 2023–2033.

1 INTRODUCTION

The Northern Gulf Natural Resource Management (NRM) region is a special place. Home to more than 9,000 of us, these lands are where we earn our livelihoods, raise our families, and connect with Country.

The Northern Gulf NRM region has some of the most intact savannahs on the globe, supporting amazing plant and animal diversity across unique landscapes—from rainforest up in the clouds, across wide grasslands, to the incredible Gulf of Carpentaria. The Gulf's waters have rich and diverse fisheries, and the lands produce an enormous array of food and fibre for our tables and exports. Vast, remote and still wild, the region is on the bucket list for many tourists.

Everything we do, have, earn, value and enjoy in our region is directly linked to our natural resources.

For these reasons and more, it is vital that we look deeply at what natural resources we have, what's impacting these resources and what we can do to maintain them. This will allow us to have sustainable, profitable and resilient businesses, protect and enhance the unique flora and fauna, and protect Culture and Country—creating a positive legacy to hand on to future generations.

The 2023–2033 Northern Gulf NRM Plan provides a guide for investment to enhance our benefits and tackle our challenges.

Whether you're a Traditional Custodian, grazier, fisher, grower, tourist, community volunteer or school child, everyone has a part to play in our shared natural resource management.

2 GULF SAVANNAH NRM —WHO ARE WE?

Gulf Savannah NRM is a not-for-profit natural resource management company and a registered charity. We work with people to create opportunities for current and future generations. Our work helps strengthen communities and industries, enhancing living landscapes to support local livelihoods whilst protecting the natural resource values in the region. We balance social, economic and cultural interests while maintaining environmental values and healthy ecosystems.

We began in 2003 as Northern Gulf Resource Management Group, rebranding to Gulf Savannah NRM as a trading name in August 2021. Our projects include regenerative farming, healthy soils, food security, Indigenous partnerships, land care, threatened species and biodiversity, new technologies for agriculture, grazing business resilience, activities for kids, youth and community engagement, and advocating for better services and improved livability for the region.

The role of an NRM body is to be a science-based organisation that coordinates, plans, funds and implements natural resource management programs—directly, in partnership or supporting stakeholders to do so. Gulf Savannah NRM fulfils this role by being:

- a conduit for knowledge, pulling this from disparate sources, interpreting into real-world application and providing it to those that manage the natural resources of the region in a targeted, digestible, and useful format
- an advocate for the region, seeking common themes, issues, and concerns to collate and then communicate a policy position to those that have capacity to set direction, in a local, state and national context
- a central point for collecting, collating, and interpreting regional data which informs resource assessment trends, demonstrates the need for action or reflects the impact of interventions
- a source for, and advocate of, upskilling and capacity-building across our region's enterprises and communities.

We recognise that we have no statutory powers, own no land, and manage no businesses within the Northern Gulf NRM region. We support those that manage the natural resources of the area, encourage best-practice management, and reflect a holistic view of the community expectations of the region. We work with a long-term perspective and for the equitable and collective benefit of all.



3 OUR APPROACH TO NRM PLANNING

Natural resources include everything that is not made, grown or bred by people—including soils, water, air, minerals, nutrients, animals, plants, biodiversity and landscapes. Our resource base is the foundation on which our regional societies, communities and economies are built.

An NRM Plan is a big picture look at our whole region. It seeks to identify issues for natural resource management (positive and negative) right across the region and identify what we need to do to maximise the benefits for our communities. An NRM Plan looks to address a simple set of questions:

- What natural resources do we have in our region?
- What is impacting these resources?
- What do we need to do about that, with what priority?

This NRM Plan has no statutory basis. It is a guidance document which builds on the trust of our communities, our understanding of their experiences, and knowledge developed through our previous NRM planning processes.

3.1 CONSULTATION PROCESS & OUTCOMES

Through 2014–2016, Gulf Savannah NRM (then Northern Gulf Resource Management Group) undertook a large body of work in preparing the *2017–2022 Northern Gulf NRM Region NRM Plan* (2017 NRM Plan). This work included a very significant body of consultation. It involved more than 120 community surveys, discussions with 54 Traditional Custodians and seven Aboriginal organisations, dedicated workshops in Karumba, Georgetown and Dimbulah, and visits to all regional centres across the region. In total, over 900 people were involved in the development of the 2017 NRM Plan—approximately 10% of the total Northern Gulf NRM region population.

The premise of the 2023 NRM Plan development was that the 2017 NRM Plan work—and associated data collations, scientific literature reviews, reports and analysis—provided an effective foundation. A broad review of the characteristics of the Northern Gulf NRM region (including population, demographics, economy, activities and relevant science) indicated that the fundamentals were largely unchanged.

As such, the consultation phase of the 2023 NRM Plan sought not to re-do the work completed for the 2017 NRM Plan, but to confirm the currency of the information through discussions with a subset of a broad range of stakeholders across the sectoral, geographic, demographic and spatial spread of the region. This body of work refined the information in the current context, verified and refined the currency of the base data, and integrated new and emerging science and trends.

A Draft 2023 NRM Plan was developed through multiple internal iterations through 2021–2022. It was approved by the Gulf Savannah NRM Board in October 2022.

The Draft 2023 NRM Plan was made publicly available and used as a basis for discussions with all stakeholders, which included the following consultation process:

- A formal consultation period was held from October 2022 to February 2023.
- 11 digital surveys were completed by six individuals.
- Approximately 140 stakeholders were directly contacted, resulting in 90 meetings/discussions with approximately 220 individuals.
- This consultation included representation from a wide cross-section of our communities and stakeholders, including business, Traditional Custodians, grazing, agriculture, fishing, tourism, local and state governments, environmental and conservation groups, consultants and researchers.

Several general themes arose from the consultation process:

- Stakeholders were generally comfortable with the broad approach, the outline of the assets, and the pressures and priorities presented. Stakeholders had some difficulty in separating their direct experience/priorities from whole-of-region priorities.
- Feral animal management was a consistent issue with many stakeholders, and towards the top of their priorities on a local scale. Issues mentioned included coordination of effort, funding support, and knowledge of effective techniques and approaches.
- Weed management was a consistent issue with many stakeholders. Again, the coordination of effort, funding support, knowledge of effective techniques and



approaches was mentioned. Concerns over the lack of progress with controlling weeds, and essentially going backwards, was consistent.

- Pests and weeds were the priority issue for all local governments consulted.
- Most stakeholders identified with the reduced state of land condition, especially graziers directly engaged with the issue. Many stakeholders recognised the issue and could provide examples of land condition decline over long periods (decades). Many identified with core issues such as woody thickening, loss of 3P (palatable, perennial and productive) grasses and erosion within our region.
- The issue of fire management, especially across the grazing industry, was often discussed. Stakeholders often acknowledged effective fire management was limited by a complex interplay between knowledge, risk management, land management, legislation and legal issues. Especially in the north of our region, projects surrounding the Emission Reduction Fund were raised as emerging matters for land use changes.
- Traditional Custodians were especially vested in the issues surrounding fire management, and often illustrated the additional aspects of Culture in relation to fire management.
- Stakeholders acknowledged the emerging opportunities for future changes in land use, especially with cropping projects. This was a consistent theme especially in Etheridge Shire.
- Stakeholders expressed concerns over water extraction developments and the potential impacts to downstream users. Concerns were over potential changes to water quality (increased sediment load, increased nutrients, contamination), altered flow regimes (including spawning cues) and flow rates. These concerns were especially prevalent in stakeholders in the Gulf Coast region.

The outcomes of the consultation were reviewed and included into revision of the Draft NRM Plan, to provide the final 2023–2033 NRM Plan (this document).



3.2 ASSET-PRESSURE APPROACH

This Plan uses a simplified approach to NRM planning by adopting an Asset-Pressure framework. It is born of a simple question:

What are our natural resources, what is impacting these and by how much?

This is applied in stages by determining:

- broad groupings of natural resource assets in our region—Land, Water (fresh, marine and ground water), Biodiversity and Biosecurity (see Section 5).
- broad groupings of pressures on these assets—Fire Management, Land Management, Climate Change, Feral Animals and Pests, Invasive Weeds, Water Management and Pollution (see Section 6).
- the direct impact to an asset using a framework that seeks to provide a relative measure across pressures. This is developed using whatever data is available (often limited), discussions with informed stakeholders and then cross-checked with the community through the consultation process (see Section 7).

This approach provides an indication of the

status of our assets in a robust and repeatable way. Further, it provides (at a broad level) a way to compare the impact of various pressures between assets. These rank the understanding of the impact (current and future) for each pressure on each asset.

The ranking is completed for the current understanding of the asset condition and then an estimation on what that condition would be at the end of the Plan (2033) if the current trend continues. For example, is the pressure of fire management the same for our land asset as it is for biodiversity? What is the impact of that now, and what is it likely to be in 2033 if the current trend continues?

This approach provides broad guidance on the priority for actions across our region over the life of the Plan. This approach is applied in detail in Sections 6 and 7.

For each pressure, the Plan outlines a **goal**. Simply put, this is where we want to be by 2033. There is then a **strategy** (how we want to get to that goal) under five categories—Information, Coordination, Research, Policy and Monitoring.

Each of these strategies then has a series of activities. These provide a summary of some

of the pathways to implement the strategies and ultimately achieve the goals. These activities are based on the current understanding of what is required in our region, what works and what is sustainable. It is likely that other pathways will emerge over the life of the Plan, while the strategy and goals will remain the focus for the region.

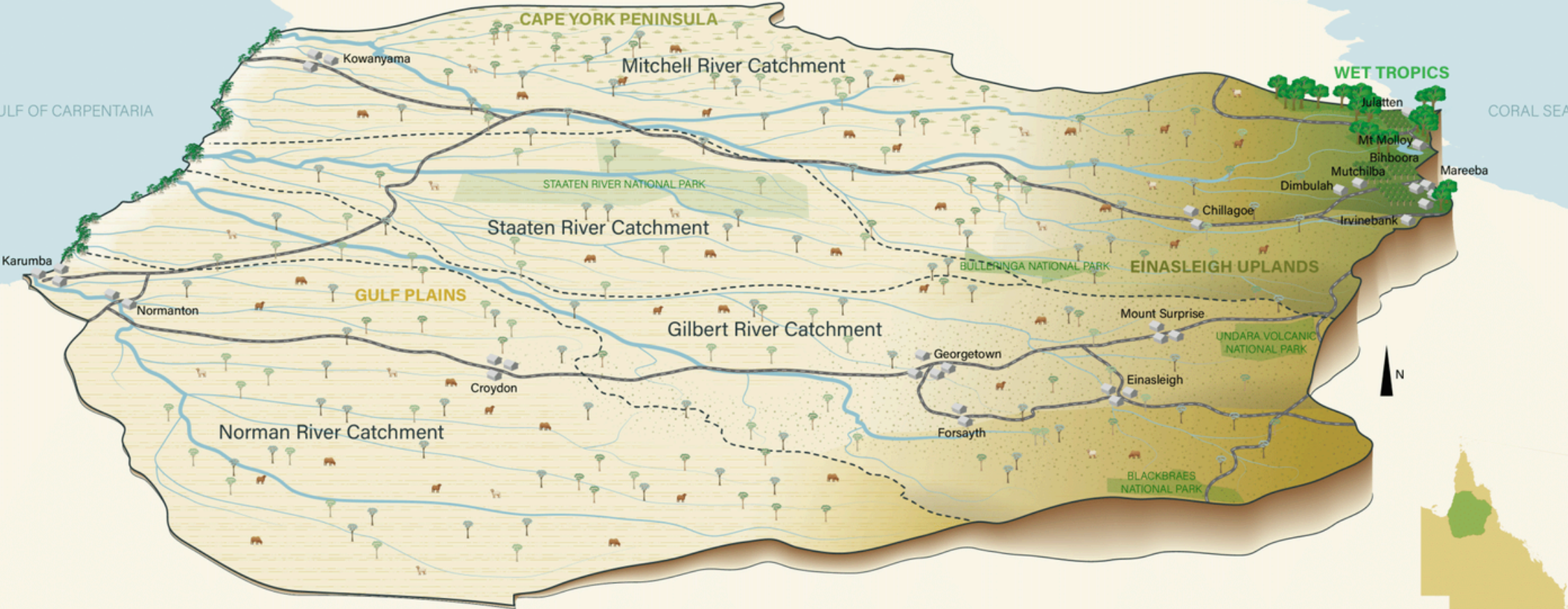
Score	Impact rank
1	Severe
2	Very high
3	High
4	Moderate
5	Minor

Impact rankings of pressures

Gulf Savannah NRM supports the United Nations' Sustainable Development Goals (SDGs). Relevant SDGs are displayed alongside the pressure where proposed actions will address these Goals.







4 OUR REGION

The Northern Gulf NRM region is extensive, covering an area of approximately 196,100km², which is about 90% the size of Victoria. This area is comprised of two management areas, 85% of which is exclusively managed by Gulf Savannah NRM, and the Joint Management Area (15% of total) in the Palmer River Catchment and Kowanyama areas which is jointly managed with Cape York NRM.

Twelve local government authorities have coverage within the Northern Gulf NRM region—Carpentaria, Cook, Croydon, Etheridge, Kowanyama and Mareeba being the principal local government areas (LGAs), with small areas of Charters Towers, Douglas, Flinders, McKinlay, Richmond and Tablelands also included.

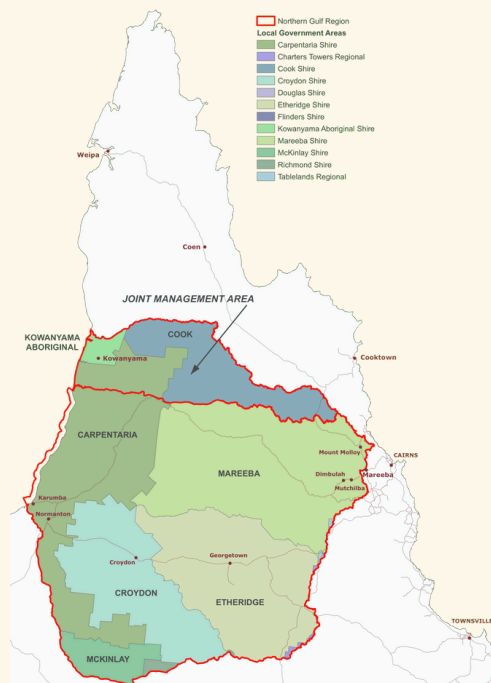
The vast majority of the Northern Gulf NRM region (~84%) is currently used for

extensive beef cattle grazing properties, with ~11% Conservation and Natural Environments (National Parks and Private Nature Refuges).

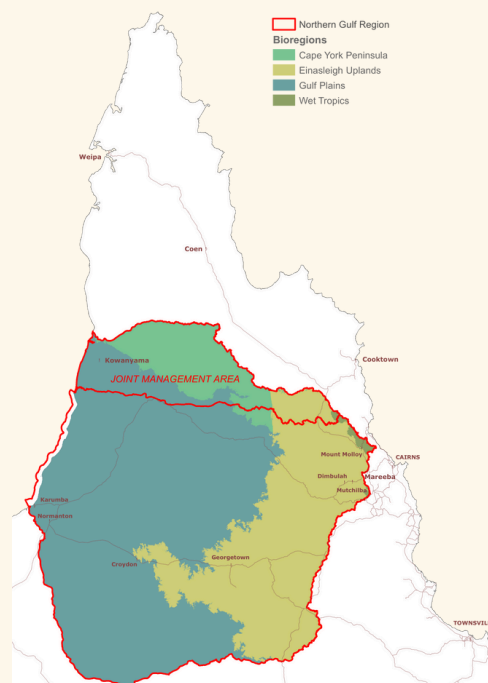
Most of the land tenure across the region is Leasehold (~86%), with a further ~7% Freehold, and an additional ~7% in National Parks. This uniformity of land use and land tenure has important implications for natural resource management in our region.

The majority of the Northern Gulf NRM region has Native Title Determinations, Applications in process or Indigenous Land Use Agreements in place. Traditional Custodians have Native Title interests over the region, whether they reside in it or not.

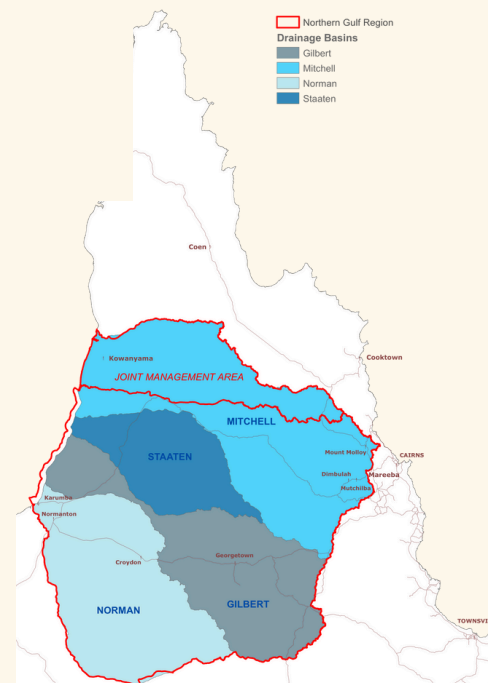
The region is defined as a combination of the Mitchell, Staaten, Norman and Gilbert



Local government areas (LGAs)



Bioregions



Catchments



Subregions

River catchments. It is dominated by tropical savannah rangelands, but also contains a stretch of Gulf of Carpentaria coastline to the west and wet tropical rainforests to the east. The region contains four broad bioregions: Cape York, the Wet Tropics, the Einasleigh Uplands and the Gulf Plains.

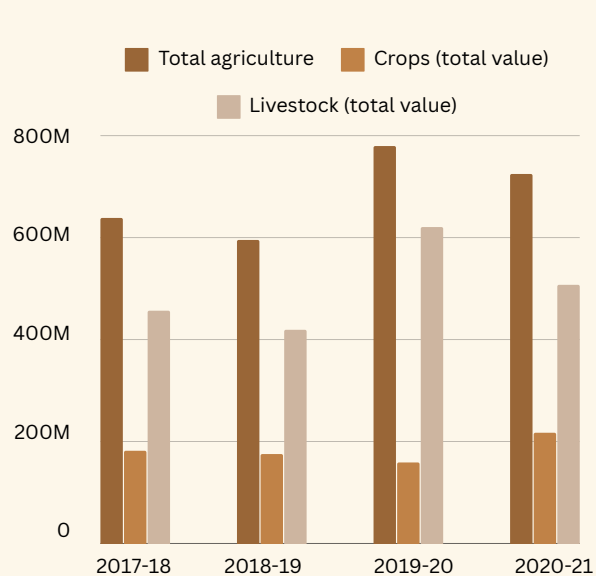
The total population of the Northern Gulf NRM region is approximately 9,392 people, about 0.2% of the Queensland population. The population of the Northern Gulf NRM region has remained relatively stable in the last 20 years (2000–2021), increasing by about 7%. The wider Queensland population has increased by ~50% in the same period.

There are population clusters in the Upper Mitchell catchment and along the Gulf of Carpentaria coastline, with a dispersed network of small, remote townships in the Gulf Plains and the Einasleigh Uplands. About 56% of the region's population lives within Mareeba Shire, with a further 21% in Carpentaria Shire. The shires of Kowanyama (10.8%), Etheridge (8.5%) and Croydon (3.1%) account for approximately 23% combined, while 0.5% reside in Cook Shire.

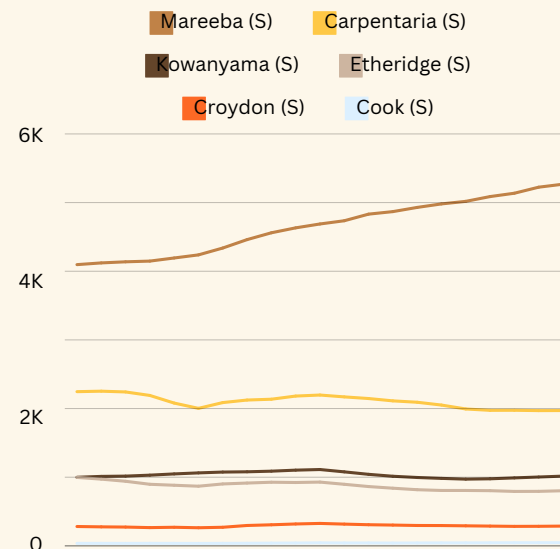
All catchments and sub-regions of the Northern Gulf NRM region have strong and vibrant Indigenous communities. Approximately 18% of residents identify as Aboriginal, Torres Strait Islander or both (the Queensland average is 4%). This varies markedly across the region, with Etheridge recording 5% and Kowanyama recording 87% (2021 Census). It is noted however that Indigenous people are typically underrepresented in census counts and the real proportion of Indigenous people could be higher.

All LGAs within the region fall below the Queensland average for the index of relative socio-economic disadvantage. The shires of Carpentaria, Cook and Croydon are all within the 10% most disadvantaged LGAs in Queensland.

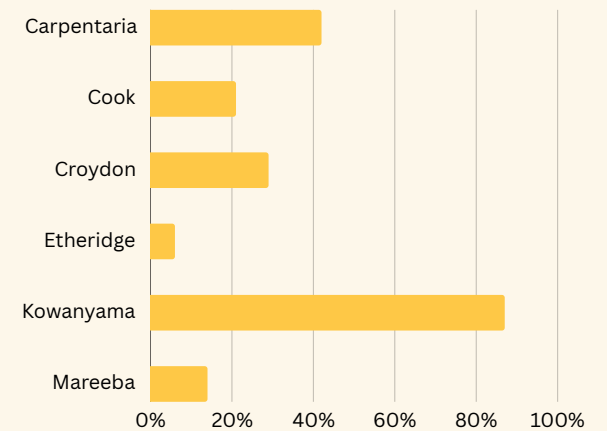
The regional economy can be classed as a rural economy based on four main activities—agriculture (including grazing and horticulture), fishing, mining and tourism. Agriculture, Forestry and Fishing (i.e. primary production) accounts for the majority of employment across the region at about 17%. This has been consistent over the 2006–2016 period. Between 2017–2021, total agricultural production from the Northern Gulf



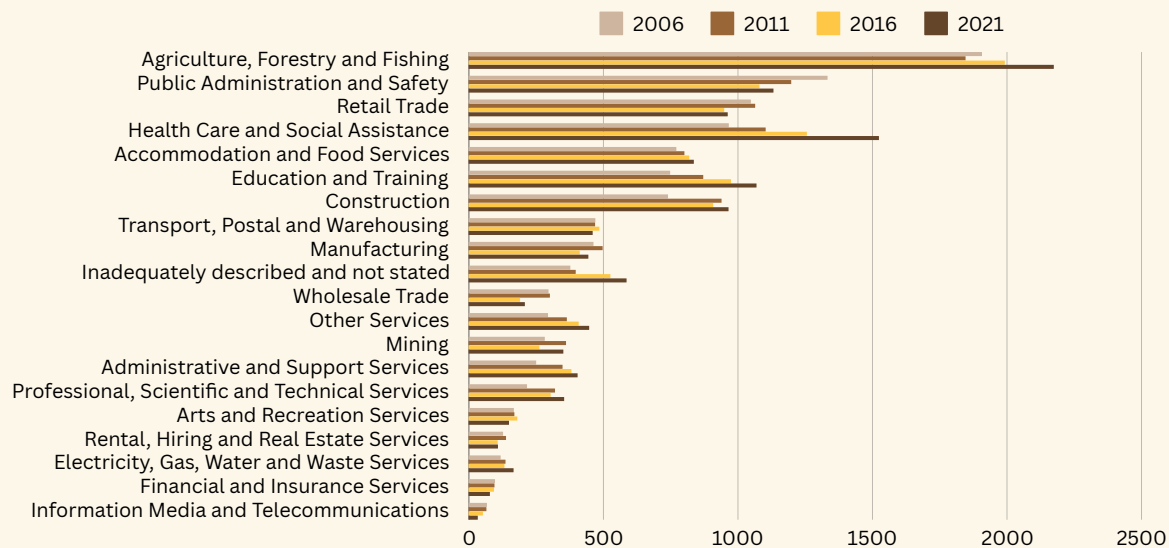
Total value of agricultural production



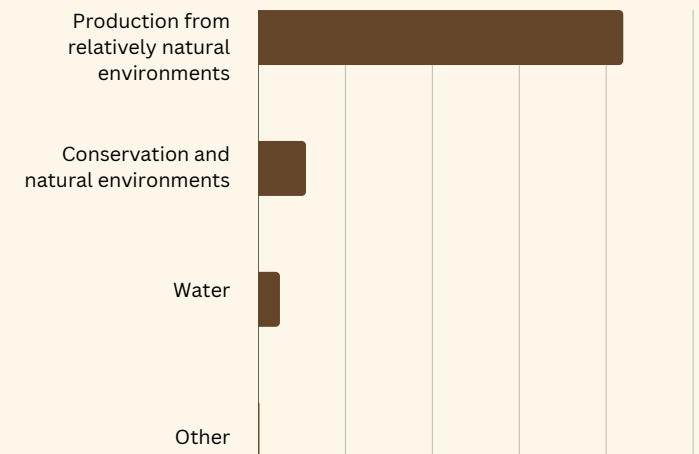
Population growth (2001-2021)



Population identifying as Aboriginal, Torres Strait Islander or both (2021)



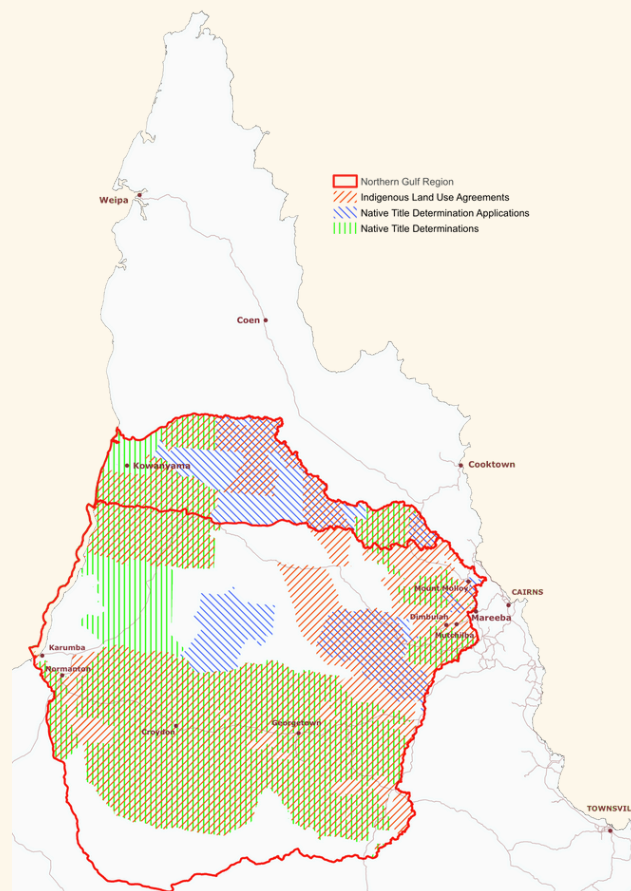
Regional employment by sector



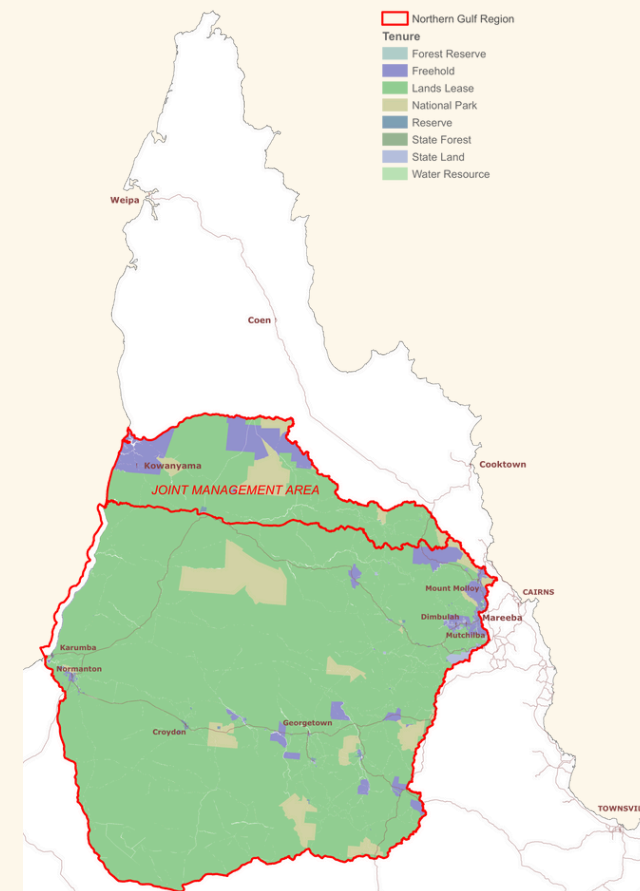
Land use (2019)



Land use



Native Title



Tenure

NRM region has varied from \$600,000,000 to ~\$750,000,000 per year, with total crops at \$150–\$200M and livestock contributing \$400–600M.

The region's population is spread over an area which spans more than 196,100km², or approximately one person for each 20km². With the exception of small peri-urban clusters in the Upper Mitchell catchment, the whole region is classed as “very remote —very little accessibility to goods, services and opportunities for social interaction” in the Accessibility and Remoteness Index Assessment (ARIA).

For the purpose of the Plan and to remain consistent with previous plans, the region is

divided into three nominal areas: Gulf Coasts, Grazing Lands and Northern Tablelands. These subregions are generally based on their common economies, landscapes and stakeholder networks, and provide a basis to group similar assets, pressures, and management responses. The divisions are nominal as all areas are intrinsically linked through economics, communities, and environments. This is especially true in reference to water where all Northern Gulf NRM region catchments drain to the Gulf of Carpentaria; any effects in headwater areas impact (positively or negatively) downstream areas.



Gulf Coasts This includes the coastal strip and Gulf Plains, 15m above the sea level contour from the Carpentaria coastline, as well as the towns of Kowanyama, Karumba and Normanton, and the south-east Gulf of Carpentaria marine environment. The Gulf of Carpentaria is a shallow-water tropical sea containing varied and dynamic marine and estuarine habitats, such as mangrove communities and patches of coral reef and seagrass beds which are nursery habitats for commercial fisheries species and internationally-significant marine biodiversity. The adjoining coastal area contains high conservation value coastal wetlands which support abundant birdlife, and extensive salt pans that are now being recognised for their unique ecological significance. The Gulf Coast has a very high Indigenous population. There are two well-established and highly respected Land and Sea Ranger groups, which are the primary delivery mechanism for on-ground NRM along the coast. The town of Karumba is the focal point of a thriving tourist economy based on recreational fishing and the port.



Grazing Lands This includes the vast expanse of remote dry tropical savannah, stretching from the Palmer River catchment in the north-east to the Claraville Plains in the south-west, and is dominated by broad hectare pastoral leases. Over 90% of our region's land area is covered by grazing lands, the vast majority of which is leased rather than owned freehold. These extend over the Gulf Plains, up into the Einasleigh Uplands, along the Gulf Coast and up into the Palmer River catchment at the base of Cape York. There are approximately 160 grazing properties, covering an area of roughly 17M ha. These enterprises rely principally on native pastures to turn off about 200,000 cattle per year. Grazing lands are mostly open woodland dominated by Eucalyptus and Corymbia species with a grassy understory, but paperbark woodlands, lancewood open woodlands and bluegrass communities can also be found on open grasslands. This reflects the region's diversity of landforms, geology, soil types, climatic variation, and fire history. The grazing lands generally support native vegetation from pre-European times; however, these have been altered by weeds and feral animals, modified fire regimes and grazing pressure. Consequently, the understory and grass layer cannot support the wildlife it once did, with small mammals and birds which rely on grass seeds being the most affected.



Northern Tablelands This is the more densely populated part of the region, straddling the western shed of the Great Dividing Range, and includes the towns of Dimbulah, Mutchilba, Julatten, Mt Molloy, Irvinebank and Watsonville. It is a mixed-use rural area with many small acreage and lifestyle blocks, but also includes the Mareeba Dimbulah Irrigation Area (MDIA) which supports a range of horticultural industries including around 30 tropical agricultural crops such as bananas, sugar cane, mangoes, avocados and citrus. The region also includes a large population of "peri-urban" residents on small acreage lots in the Cairns Hinterland, particularly in the Julatten/Mt Molloy area and the bush communities in Irvinebank and Watsonville. The Northern Tablelands supports a great diversity of regional ecosystems and biodiversity, as it straddles the three bioregions of the Wet Tropics, the Einasleigh Uplands and Cape York and contains important landscape-scale linkages for biodiversity—spanning a mosaic of wet tropical rainforests, open eucalypt woodlands and dry savannah country, with a network of important riparian corridors and waterways.

5 OUR NATURAL ASSETS

The natural assets across the Northern Gulf NRM region are the foundation on which our regional societies, communities and economies are built. The area is extensive, and the natural assets complex and varied at a small scale. However, by looking at the bigger picture and considering the region as a whole, these natural assets can be grouped into broad categories such as Land, Water (fresh, marine, ground water), Biodiversity and Biosecurity.

ASSET	DETAILS	CONDITION
Biodiversity	<p>The Gulf of Carpentaria is one of the major tropical savannahs of Northern Australia with large areas of relatively undisturbed habitat. The tidal wetlands have extensive mangroves and saltmarsh habitats that do not occur anywhere else in Queensland. There are many rare, vulnerable, and endangered species of flora and fauna. The region also contains springs and spring-fed wetland systems providing significant waterbird breeding and feeding areas. However, the Northern Gulf NRM region remains one of the least studied areas for biodiversity in Australia.</p> <p>The Gulf of Carpentaria contains significant areas of biodiversity, with a diversity of largely intact habitats. These support very significant fisheries and ecosystems. There are some 125 threatened species recorded within the Northern Gulf NRM region, and five threatened ecological communities. Less than 10% of the total area is within protected areas. The major drivers of biodiversity decline in the region are most likely altered fire regimes, grazing pressure and introduced pests like feral cats and pigs.</p>	<p>Baseline terrestrial vertebrate surveys have been completed across several sites; however, knowledge of the distribution and abundance of species is lacking for biodiversity in this region. Long-term monitoring data has not been collected. Baseline data shows that critical weight range mammals are at low abundance in much of the region (particularly the Gulf Plains bioregion). Small pockets of mammals exist in relatively high abundance in the higher elevation upland savannahs in the Einasleigh Uplands. Information from limited surveys indicate a significant decline in native mammals, which is also noted as occurring across Northern Australia.</p>
Biosecurity	<p>The Biosecurity status of the region (the presence or absence of pests/weeds/disease) directly influences the ability of the environment to function and support flora/fauna, enterprises and hence communities. There are more than 300 introduced plant species in the region including 56 weeds of importance, of which 13 were classed as high priority. Multiple feral animals and pests—such as deer, pigs, cats and dogs—impact on biodiversity and production systems.</p>	<p>There are significant knowledge and data gaps relating to the nature of biosecurity threats in the region. No robust monitoring of current feral animals, pests and weeds.</p>
Land	<p>Total area of some 196,100km². The area is typically low in elevation, ranging from sea level on the coast, to ~1,300m above sea level in the east. Soils are typically low in nutrients (especially in the west) and prone to erosion. The region encompasses four bioregions (Einasleigh Uplands, Cape York Peninsula, Gulf Plains and Wet Tropics (2)). Land use is largely leasehold (~86%) especially in the Grazing Lands subregion.</p>	<p>Current condition of the Grazing Lands area is fair/good, with data suggesting land condition is decreasing. A range of impacting processes, such as inappropriate land management and altered fire regimes, are directly impacting land condition.</p>

ASSET	DETAILS	CONDITION
Land (cont.)	<p>Most of the land use is production from native vegetation (extensive grazing properties). This occupies ~84% of the region. Grazing properties are typically 20,000 ha or more in size, and relatively few properties (~200) comprise some 90% of the total area of the Northern Gulf NRM region. Within the Grazing Lands subregion, there are a variety of irrigated and dry-land cropping operations, with this activity increasing. There is ongoing significant interest in the development of irrigated cropping across the region, such as the Gilbert River catchment. The Northern Tablelands support a range of horticultural production, such as citrus, mangoes and avocados. Other crops are emerging in significance (cotton, grapes). The Land asset also includes soils and minerals (mining).</p>	<p>Within the Mareeba-Dimbulah Irrigation Area, soils are often in fair condition as a result of 50+ years of intensive agriculture. Some soils have limited water efficiency and nutrient-holding capacity and low soil carbon.</p> <p>Significant knowledge and data gaps relating to land condition, and nature of ongoing impacts. Competing demands on resource.</p>
Water – Surface, Ground and Marine	<p>Water resources support habitat for iconic species, agricultural and industrial activities, and provide drinking water, amenity and recreation opportunities.</p> <ul style="list-style-type: none"> • Surface waters: Four river basins—the Mitchell, Staaten, Gilbert and Norman—collectively drain over 190,000km to the Gulf of Carpentaria and include several listed wetlands. This supports a diverse range of freshwater environments which include seasonal lowland rivers, coastal and floodplain wetlands, spring-fed rocky gorges and perennial rainforest mountain streams. • Groundwater: Range of shallow and deeper aquifers, including areas of the Great Artesian Basin. Multiple active spring-dependent ecosystems, such as Talaroo Springs. • Marine: Estuarine portions of the river basins and nearshore coastal waters of the Gulf of Carpentaria support important tidal wetlands/ecosystems and a diverse range of uses. <p>The Northern Gulf NRM region is drained by four major catchments, all flowing into the Gulf of Carpentaria—the Norman (including the Clara, Yappar, Norman and Carron Rivers), Gilbert (including the Smithburne, Etheridge, Einasleigh and Gilbert Rivers), Staaten (including Clark Creek, Vanrook Creek, and the Red and Staaten Rivers) and Mitchell (including the Lynd, Tate, Walsh, Palmer, Alice and Mitchell Rivers).</p> <p>The marine environment of the south-east Gulf of Carpentaria is highly reliant on the monsoonal flows from these rivers, which flush nutrients into the Gulf. Monsoonal flow also enables spawning runs between the Gulf out across floodplains and upstream into fresh water. Riparian corridors are important habitats, and if degraded can be avenues for weed spread through the region.</p> <p>The length of the waterways in the region is enormous; the Mitchell catchment alone contains 15,425km of major stream length, and this catchment only accounts for 36% of the total area of the Northern Gulf NRM region. Monsoonal rainfall events typically occur between December to March, and then become scarcer into the remainder of the year. Most rivers and creeks stop flowing and dwindle to a series of permanent and semi-permanent waterholes.</p>	<p>Generally thought to be in fair/good condition, with competing demands (traditional, ecosystems, agricultural) and limited supply (surface and ground waters). Sediment loads are high (possibly twice the pre-European settlement levels (2)) largely from erosion associated with land management. Marine areas are generally in fair/good condition, noting high sediment loads and significant mangrove dieback in southern and western Gulf of Carpentaria that occurred in 2015–2016 are very slowly recovering.</p> <p>Significant knowledge and data gaps relating to water, and water quality. Competing demands on resource.</p>

ASSET

DETAILS

CONDITION

Water – Surface, Ground and Marine (cont.)

The Great Artesian Basin underlies most of the Northern Gulf NRM region, and several major springs are fed from this source. Wetland habitats provide wintering, feeding, and breeding grounds for biodiversity, especially migratory and wetland birds. Eight of the region's wetland areas have been listed as nationally significant. Most of these listed wetlands are in the extensive coastal floodplain area.





5.1 COMMUNITIES

In addition to these natural assets, strong communities are an important asset within the Northern Gulf NRM region. Whilst community is not a natural asset, it is people that undertake natural resource management activities. Having resilient and viable communities across the Northern Gulf NRM region is a vital component of successful natural resource management. In a complementary relationship, well-managed and viable natural resources provide a basis for strong economies, influencing strong communities.

All LGAs within the region fall below the Queensland average for the index of relative socio-economic disadvantage (Section 3). In addition, there are some common themes to the issues within our communities (3) which are blockers to successful, engaged and ongoing natural resource management. These are outlined here to provide context to the issues regarding NRM participation, although addressing these community issues is beyond the scope of an NRM Plan. Work in some of these areas is further addressed in the *Gulf Savannah NRM Corporate Plan*.

LOCAL ISSUE

IMPACT ON NRM PLANNING AND DELIVERY

Housing

The availability of housing (either for rent or purchase) and its affordability, diversity and quality within our communities is an ongoing issue. This directly relates to the ability for people to permanently reside within the region and thus strengthen the community base, or for organisations to attract and retain quality staff to the region. The limited availability of housing also increases prices; this promotes a higher percentage of household income expended on housing, and reduces resources available for participation in the community. In terms of NRM, this limits the breadth and depth of the talent pool or people available to fill positions and/or engage with NRM issues.

Digital connectivity

Digital connectivity issues (lack of connectivity, upload/download speeds, cost) play out across the community spectrum. This limits opportunities for businesses to effectively be based in regional centres and to maximise benefits of participation. It limits access to digital resources, such as education. A lack of familiarity with digital technologies limits participation where hardware challenges are overcome. Collectively, this impedes relocation of people to the region, information access and/or dissemination or data collection for NRM participation.

Education

Educational opportunities within the region are limited, with most centres offering education services to primary school level and early secondary (to Grade 10) available in Dimbulah, Normanton and via distance education (School of the Air). Students must leave the region to attend higher education schools. Opportunities within regional schools and/or distance education relating to natural resource management are also limited. This is another impediment to families relocating to regional areas, and means students leave the region for higher education opportunities.

Healthcare

Healthcare services, such as access to medical, dental, mental health, aged care and respite care, are limited within regional centres. Care above primary healthcare levels often involves significant travel, disruption and expense. This impacts NRM by reducing the pool of people able to live in regional areas or reduces capacity (money/time) to engage.





LOCAL ISSUE

IMPACT ON NRM PLANNING AND DELIVERY

Economic diversity

The diversity of economic opportunities is limited across the region. This both reduces the ability for people to relocate to, or remain within, regional areas and to maximise the multiplier effect of resources circulating within a community. For NRM, this again reduces the pool of people to engage, the diversity and depth of experience and the capacity to engage.

Workforce availability

The lack of additional capacity in the skilled and non-skilled workforce within our communities limits the potential for development of new businesses or expansion of existing enterprises. This limits the growth and diversification of the community, and the pool of people (both in number and experience) to engage in NRM activities. In communities with generally small populations, the pool of people with additional capacity (time/money/ability) to participate is limited. Volunteers, who are critical to community function, are ageing and/or reducing in number.

Funding

Obtaining sufficient funding to undertake required projects is a constant issue, as is accessing ongoing strategic funding to support long-term objectives over several years, such as weed control for local councils. The gains of short-term funding are often lost without ongoing support.

Ageing workforce

An ageing population has implications for the management of properties. It also places additional stress on the limited health and disability services available in the region.

Cost of living

Costs of living pressures impact in NRM in terms of both money and time. Travelling to participate in NRM activities may involve distances of several hundred kilometers and hours of time. When drawn from a relatively small pool of potential participants and in the context of many competing demands, resource availability becomes a significant blocker to effective and ongoing NRM participation. Cost of living, particularly the cost of fresh food, is generally higher in remote communities.

6 OUR PRESSURES

Pressures are those factors which are directly impacting our assets. These are varied, complex and often interrelated across the Northern Gulf NRM region. However, broad groupings of pressures can assist in taking a big picture view of our region and simplifying the situation.

The broad pressures are Fire Management, Land Management, Extreme Weather influenced by Climate Change, Feral Animals and Pests, Invasive Weeds, Water Management and Pollution. The basis for these groupings and the approach to management is outlined in the following section.

Each pressure has a **goal** (where do we want to be by 2033?). This is then supported by a **strategy** (what do we need to do to get to our Goal?) and **activities** (what individual

things can we do to address the strategy?). To capture where we are headed with each pressure, a **Plan priority** is assigned. This is a direct translation of the impact (ranked from Minor to Severe) of that pressure across our assets.

These impact assessments are very broad in nature. They are established using any data on the asset condition available (often limited) and discussions with informed stakeholders, and were cross-checked with the community through the consultation process. They are indicative, and intended to provide a broad indication of where resources would be best allocated within the Plan to manage most impacts.

These are further detailed and expanded in Section 7.

Plan priority	Action
Very high	These are priority actions for the Northern Gulf NRM region. These pressures are significantly impacting multiple asset categories and ranked as severe for at least one asset category (section 7). Action is required immediately and ongoing.
High	These pressures are impacting multiple assets across the Northern Gulf NRM region. Impacts are such that they are currently or likely to impact the environmental, social, cultural or economic value of the assets, and ranked as very high on at least one asset category (Section 7). Action is required now and ongoing.
Moderate	These pressures are significantly impacting at least one asset category within the Northern Gulf NRM region. Impacts are such that they are likely to impact the environmental, social, cultural or economic value of the assets, and ranked as having high impacts on at least one category (Section 7). Action is required within 1–5 years.



6.1 PRESSURE: FIRE MANAGEMENT

Plan priority
Very high



Australia is one of the most flammable nations on earth (4), and fire is a long-term and consistent theme of Australian ecosystems. Traditional Custodians have used fire to manage the landscape for thousands of years; it is one of their principal connections with Country. Fire also has a major influence on the management and conservation of Australian biodiversity. However, inappropriate contemporary fire regimes (including wildfires) are a key threatening process for many Australian plant and animal species (5). Decline in small native mammals (<2kg) has been linked to extensive and less patchy fires (6).

The informed use of fire, especially in conjunction with grazing management, is one of the most cost-effective tools available for land managers to manage large-scale areas to maintain productivity and biodiversity values (7), manage woody thickening and invasion by a variety of weeds (such as rubber vine) (7), as well as manage infrastructure and community risks. An appropriate fire regime can manipulate pasture composition and modify grazing patterns to the advantage of agricultural production systems.

Conversely an inappropriate fire regime can contribute to woody thickening and

significantly reduce grazing opportunities (8). Unmanaged fires, especially fires with a significant fuel load (wildfires) can impact huge land areas. These can be a significant risk to life and infrastructure, damage cultural sites, decimate pastoral and agricultural productivity, and reduce biodiversity (9) sometimes for many years. Extreme climatic events (high temperatures, low humidity and high winds) produce intense fires. These are likely to become more frequent in the future with a changing climate.

Fire has largely been absent from the Northern Gulf NRM region, especially the Grazing Lands subregion. Heavy grazing reduces fuel loads; when loads fall below ~1,500kg/ha, they are unable to effectively carry fire. Coordination of fire management across large areas of the landscape, either to manage risks (hazard reduction burns), improve biodiversity outcomes (mosaic burns) or manage weed species is currently lacking. Land managers currently make individual decisions about burning and management objectives. Emerging carbon markets in fire management, if sensitively applied, have the potential to improve fire management engagement as well as provide diversified income for land managers.



Goal – By 2033, community and enterprises will be confident in the appropriate use of fire in the landscape. This will protect Culture and promote sustainable productive pastures, carbon storage, and improved biodiversity while reducing the potential for destructive wildfires.

STRATEGY

ACTIVITIES

Information

Increase the accessibility of current and relevant information on fire management in the Northern Gulf NRM region, focusing on the practical advantages and disadvantages of implementing fire management. This includes information enabling access to carbon and biodiversity markets.

- Collate and synthesise existing available information on fire management from diverse sources, including land managers, published material and research. Provide this to land managers in a local and seasonal context, such as grazing land managers and intensive agriculture holdings. Include information of how locally effective fire management can improve productivity outcomes. Make available in a digestible format such as via extension activities or resources. This includes supporting land managers' awareness of and capacity to use existing platforms such as NAFI, and existing resources such as the *Gulf Savannah Fire Management Guidelines* (10).
- Collate existing and emerging information on the impacts of proactive fire management to enhance biodiversity in a local context. Encourage fire regimes designed to promote recruitment of native flora and maintain essential habitat for native fauna.
- Establish demonstration sites for effective fire management across a range of land types and uses. Disseminate good and bad practice outcomes to land managers through forums such as field days, circulars and journal articles.
- Work with Traditional Custodians to integrate traditional knowledge of fire management into landscape-scale practices. This includes supporting the development of Ranger programs to deliver fire management services across the region.
- Collaborate with Indigenous organisations to support Land and Sea Ranger groups to deliver education/interpretation modules and facilitate greater dissemination of cultural/environmental awareness of fire management.
- Support the participation and access of land managers in environmental services markets (carbon, biodiversity) by disseminating information on opportunities and providing assistance. This will include providing information on practices in the context of the principal land use and biodiversity impacts.
- Support community education about the role of appropriate fire as an effective and necessary land management tool. This includes the education of tourists regarding appropriate fire use.

Coordination

Facilitate coordination of fire management across the Northern Gulf NRM region.

- Engage with land managers, including owners/occupiers on small acreages (5–100 ha), to increase the use of appropriate fire as a land management tool.
- Support multi-stakeholder fire management working groups to plan and undertake cross-tenure strategic fire management, either at a local (e.g. neighbouring properties) or regional (e.g. Local Government Authority Area Fire Management Group) scale.
- Support community coordination of fire programs, provide education to fire stakeholders (such as local fire brigades and community networks) to improve the management of pasture, biodiversity and carbon, while managing the risks of wildfires. This may include support for multi-property fire permits to assist cross-tenure approach.
- Support training of land managers to implement fire management so they feel confident in applying the tool. This could include practical on-ground training and development of property-specific fire management plans with well-established objectives (e.g. hazard reduction, pasture improvement, weed control) which are culturally appropriate.
- Promote and coordinate proactive fire management to protect and enhance biodiversity.
- Assist in the provision of firefighting equipment and encourage the sharing of resources among graziers, rangers and other land managers.
- Support delivery of appropriate fire regime outcomes for habitats such as Wetland Associated Regional Ecosystems in Protected Areas, Local Government Reserves and on selected private lands.
- Provide material and technical support (such as Fire Management Guidelines) for the delivery of sustainable fire management outcomes including sensitive habitats such as coastal wetlands.

STRATEGY

ACTIVITIES

Research

Facilitate targeted research which addresses information needs in applying Fire Management across the Northern Gulf NRM region.

- Identify knowledge gaps in fire management. Collaborate with research organisations to encourage and support targeted research into fire management. This includes accessing and inclusion of traditional ecological knowledge via collaboration with Traditional Custodians and western science.
- Develop simple indicators for efficient and effective fire management across all land types and uses in the Northern Gulf NRM region.
- Collate and review multiple information sources (e.g. NAFL, VegMachine, historical images) to characterise the scale and nature of woody thickening across the Northern Gulf NRM Region.

Policy

Facilitate the improvement of policy influencing the successful management of Fire across the Northern Gulf NRM region.

- Review emerging policy which influences fire management. Seek feedback from land managers on current and emerging key local, state, and federal policy issues in relation to fire management. Collate results, develop consensus position and communicate to areas of influence. This would include an assessment of the Fire Permit system and its on-ground application.
- Seek clarity on application and practice of accessing conservation economy markets (e.g. carbon, biodiversity) for Northern Gulf NRM region land managers.

Monitoring

Develop and support data acquisition which informs improved Fire Management across the Northern Gulf NRM region.

- Using existing resources, such as NAFL, undertake annual reviews (prior to wet season onset) of fires at a property, local and regional level. Contextualise with Regional Ecosystem burn frequency guides and fire history to provide fire planning information.
- Support monitoring of biodiversity trends and conditions, and responses to change in management interventions.

6.2 PRESSURE: LAND MANAGEMENT

Plan priority
Very high



Land, and its ongoing productivity, is the fundamental resource on which all activities, including biodiversity, within the Northern Gulf NRM region are based. This relates to the stability, soil health and functionality of the land, all of which can be impacted (negatively or positively) by management activities.

Grazing properties are typically large and rely almost exclusively on native grasses and vegetation for productivity and long-term viability. Much of the land in the Northern Gulf Grazing Lands and Coastal region has soils characterised by poor fertility, low phosphorus and highly erodible. Stocking rates in line with land unit carrying capacity are required to maintain good land condition.

Land condition has declined over a large part of the region as a result of over-utilisation of pastures through poor management of grazing, fire and vegetation (10). The ABCD land condition assessments measure the grazing productivity of the land unit by assessment of the pasture, soil, and woodland condition. “A” condition land retains 100% of its potential grazing productivity, with each successive category approximately 25% less retained capacity.

Land condition has decreased significantly across the region. The proportion of original carrying capacity retained has reduced from 72% to 66% between 2002 and 2016. If this trend continues at the current rate, the Northern Gulf NRM region will have lost 50% of the total original grazing capacity by 2046 (11). Lands that have degraded to B category can be restored to A category with management intervention within realistic timelines and is generally economically viable. The ability and economic viability of recovery of lands once they deteriorate to C and D category is very challenging.

Grazing trials at Wambiana have shown that managing stock rates and wet season paddock spelling to maintain good groundcover can generate more profit in the longer term than heavy stocking rates that also lead to land degradation (12), as well as improving biodiversity. Generally, it is more profitable to manage stocking rates in line with the long-term carrying capacity of the grazing land type.

Productivity within the agricultural sector is less clear, with limited condition assessment and/or productivity data available. Soils within the Northern Tablelands area are generally poor (sandy loams with low organic carbon) and have been farmed for an extended period (50+ years), including with crops which are known to be hard on soil health, such as tobacco. The limited capacity of these soils to hold nutrients and moisture leads to high input costs and potential losses to adjacent waterways without careful management.

Land management is holistic and relates to appropriate use of the land unit given its inherent qualities and issues. Inappropriate land management impacts productivity and sustainability of agricultural and pastoral activities, but also has flow-on impacts to biodiversity, and water quality (sediment, nutrients, erosion) to downstream areas.

There is generally a lack of systematic and regular monitoring of land condition across the Northern Gulf NRM region. Whilst there is good remote sensing data coverage, on-ground assessments are required to determine critical finer scale detail beyond vegetation coverage alone.



Goal – By 2033, communities and enterprises across the Northern Gulf NRM region will be implementing best-practice land management decisions. This will see resilient, profitable and sustainable activities.

STRATEGY

Information

Increase the accessibility of current and relevant information on land management in the Northern Gulf NRM region, focusing on the practical advantages and disadvantages of implementing specific management.

ACTIVITIES

- Collate and synthesise information on Land Management practices. This includes working with land holders to integrate their knowledge of current best practice into land management. Make information available in a digestible format, including supporting land managers' awareness and capacity.
- Support land managers in obtaining, understanding and using information, such as GIS mapping tools, to improve land management.
- Support land managers in understanding and calculating safe stocking rates at a property or paddock level. This may include mapping of land types at a property level to demonstrate the difference between effective stocking rate and absolute stocking rate.
- Support land managers in obtaining, understanding and using business analysis to improve their productivity, profitability and sustainability. This would include understanding of the triple bottom line measures of success of a business.
- Support land managers to understand, manage, conserve, and improve soils. This may include activities such as identifying erosion issues (e.g. gully erosion), improving soil carbon, managing acid sulphate soils and salinity, retaining effective soil cover and applying effective management techniques. This support includes education on potential impacts to downstream land uses of poor soil management, such as increased sedimentation or impacts to roads, fences and other assets.
- Support the development of a Soil Management Manual for the Northern Gulf NRM region which outlines the nature of soils present, their characteristics, capacity, potential issues, and management recommendations.
- Develop erosion management guideline for the Northern Gulf NRM region, providing locally relevant examples and management technique options suitable for effective early intervention.
- Support producers to understand the implications of the *Vegetation Management Act 2018* in a land management context. This may include issues such as the management of woody thickening.
- Work with Traditional Custodians to integrate traditional knowledge of land management into landscape-scale practices.
- Establish demonstration sites for effective grazing land management across a range of Land Management types and issues, such as woody thickening, pasture species, soil health and weeds. Disseminate good and bad outcomes to land managers through field days, circulars, journal articles.
- Provide information and assistance to position land managers to take advantage of emerging economies, such as carbon markets, biodiversity markets and the conservation economy. This would include assessment of the impact of these economies on the principal land use.
- Provide targeted extension (group and one-on-one) and tailored communications, to inform and encourage producers about the use of management practices which build resilience to drought and climate variability.
- Support the application of best practice grazing management, and build skills and knowledge in sustainable agriculture to achieve more sustainable and viable businesses which are resilience to climate extremes and improve biodiversity outcomes. This would include understanding animal nutrition and supplementation in context of land management.
- Engage property owners/occupiers on small acreages (5–100 ha) to understand the requirements of land management and sustainable practices. This may include developing educational resources and events which inform owners of land management practices and sustainable alternatives suited to small holdings.

STRATEGY

ACTIVITIES

Information (continued)

- Promote ecological literacy and a stewardship ethos through multiple avenues such as developing classroom resources, curriculum material, and hosting excursions and events which relate to the unique environments of the Northern Gulf NRM region.
- Develop opportunities for citizen science, via volunteers, tourists, local residents, students and amateur field naturalists across the Northern Gulf NRM region to participate in the collection of field data across the region.
- Improve the knowledge of coastal pastoral land managers about the location, importance and management of DIWA wetlands to in the Gulf coastal zone.
- Recognise and support the tourism sector as a source of volunteers, NRM educators and disseminators of knowledge. Collaborate with them to develop and support environmental projects, interpretation and realise new eco-tourism ventures.
- Identify key habitat characteristics and/or impact processes for threatened species. Identify land management practices which improve threatened species management and/or recovery. Communicate this to land managers and encourage implementation.
- Communicate key elements of the action plans for threatened species to land managers and support their implementation.

Coordination

Facilitate and improve the coordination of land management across the region.

- Support the development of peer-to-peer networks for sharing effective land management approaches through cluster identification, establishment and resources.
- Support the effective and strategic land use planning through mechanisms, such as local government Land Use Planning systems, to assist regional consideration of high value areas (ecological, primary production) and reduce adjacent inconsistent land uses.
- Strengthen linkages between NRM managers, researchers, government stakeholders and industry bodies influencing Land Management across the Northern Gulf NRM region.
- Facilitate the participation of land managers and Traditional Custodians in the carbon trading market and other ecosystem services markets by disseminating information to industry on carbon market opportunities.
- Promote, support and assist with the declaration of Protected Areas (Nature Refuges), including support and advice on site identification and on-going management, to maximise benefits to biodiversity and stakeholders.
- Support Traditional Custodians to effectively manage their land and sea country.
- Support existing Indigenous ranger programs and encourage/support new and emerging Indigenous ranger groups to undertake on ground works towards improving environmental understanding and health in collaboration with land managers of pastoral and mining leases, and government agencies.
- Further develop material and financial incentives to encourage the establishment of conservation agreements and other protected area arrangements for high value biodiversity assets on privately and publicly managed land.
- Support tree plantings and habitat restoration works on selected strategic sites to restore landscape scale connectivity.

Research

Facilitate targeted research which addresses information needs in applying land management across the Northern Gulf NRM region.

- Support and seek partnerships in the development of improved and more accurate soils and land system mapping, including Regional Ecosystem mapping.
- Identify knowledge gaps in management. Collaborate with research organisations to encourage and support targeted research into Land Management. This includes accessing and inclusion of traditional ecological knowledge via collaboration with Traditional Custodians and western science.
- Support the development of indicators for efficient and effective ongoing management of Land across all land types and uses in the Northern Gulf NRM region. This would include physical (e.g. presence of gullies) and biological (e.g. stem density indicating woody thickening or absence of key groups) measures suitable for land manager assessment on-site.
- Support the improvement of remote sensing as an efficient and effective tool in land condition assessment.

STRATEGY

ACTIVITIES

Policy

Facilitate the improvement of policy influencing the successful land management across the Northern Gulf NRM region.

- Support coordinated feedback from stakeholders on the application and practical implications of the *Vegetation Management Act 1999* on Land Management. This includes the assessment of the Net Zero policy on a regional basis.
- Integrate monitoring and evaluation outcomes to support the improvement in policy; and the development of reports to support policy changes.
- Proactively engage with developing industries and relevant departments across the region to ensure sustainable outcomes and broad NRM objectives are considered.
- Seek opportunities to influence leaseholder management, such as via Lands Act, to encourage improvement in land management.
- Support actions to include coastal wetlands of the southeast Gulf coast on the Wetlands of International significance register, thus elevating their conservation status.

Monitoring

Develop and support data acquisition which informs improved land management across the Northern Gulf NRM region.

- Review existing data sources to identify priority management areas for land management interventions across the Northern Gulf NRM region.
- Support monitoring of biodiversity trends and conditions, and responses to management interventions. This could include additional monitoring for key fauna groups (such as birds) and review of existing longer-term data to examine impacts of changes in land condition.
- Support the development of systematic and efficient land condition monitoring across the Northern Gulf NRM region.
- Support and encourage land managers to conduct their own monitoring to inform land management practices. This may include developing standardised efficient and practical techniques communicated through sector-specific guides.
- Support a national review of land condition across the rangelands, including collaboration on consistent monitoring techniques.
- Support the establishment of effective and efficient soil health monitoring, including indicators, across the Northern Gulf NRM region.

6.3 PRESSURE: EXTREME WEATHER EVENTS AND CLIMATE CHANGE

Plan priority

High



Recent decades have shown a clear warming trend, with the last seven years being globally the warmest on record (13). Australia's 2021 national mean temperature was 0.56°C warmer than the 1961–1990 average, with warmer summers despite successive El Niño years (14), continuing the warming trend evident since the 1970s. Mean global sea levels have risen at approximately 4.5mm/year (13), with the rise per decade rate increasing.

Our climate is already highly variable, but climate change is leading to shifts beyond this natural variability. The Northern Gulf NRM region's environment, economy and communities are already experiencing the impacts from a changing climate; average temperatures across the state are currently 1°C higher than they were 100 years ago (15). Current modelling of the climate future for the Northern Gulf NRM region indicates the region can expect:

- Higher temperatures, including extreme heat events, which may be lethal for some plants and animals
- Hotter and more frequent hot days
- More intense rainfall events
- Less frequent but more intense tropical cyclone
- Rising sea levels
- Warmer and more acidic seas
- More frequent sea-level extremes
- Increased evapotranspiration rates and water stress
- Longer and more intense periods of extreme dry and water stress

These changes to our climate will impact important natural resource management factors, such as fire behaviour. Changes to fire frequency across our region will depend on the spatial variability of future rainfall. However, when and where fire does occur, its behaviour is likely to be more extreme. Sea-level rise will pose a particular challenge for the coastlines and communities in low-lying areas of the Gulf of Carpentaria, as will extreme sea level events (storm surge). Climatic changes could alter the distribution and incidence of weeds, pests and diseases. Long dry spells, followed by heavier precipitation events could lead to increased flood duration on the gulf plains, with consequent erosion and ecosystem impacts. This may result in stock and wildlife loss, widespread pasture death and weed invasion. More extremes of temperature and changes in rainfall variability could decrease crop production, forage production, surface cover, livestock carrying capacity and animal production (16), and cause major changes in plant and animal species composition. Livestock will be exposed to a greater risk of heat stress. Animals are unlikely to travel as far to water, which concentrates grazing pressure and increases the risk of adverse pasture composition changes and soil degradation.

A concerted shift towards best-practice natural resource management and planning will assist in our adaption to this changing climate. It will increase the economic sustainability of agricultural and ancillary industries and make our natural resources more sustainable and resilient (17). Planning to include future climate trends will be required for sustainable businesses.



Goal – By 2033, community and enterprises will be armed with the best available information on their exposure to climate variability, risk, and assisted in implementing strategies to mitigate impacts and adapt to current and future challenges.

STRATEGY

ACTIVITIES

Information

Increase the accessibility of current and relevant information on climate adaptation and mitigation in the Northern Gulf NRM region, focusing on the practical advantages and disadvantages of implementing specific management for climate adaptation and resilience.

- Support projects focused on improving the knowledge and skills of producers across the region to proactively manage climate variability impacts.
- Provide targeted extension (group and one-on-one) and tailored communications, to encourage and inform producers about the use of management practices that build the resilience of the grazing industry to drought and climate variability.
- Establish, expand and protect areas of 'native refugia' that are identified as being resilient to predicted climate change impacts.
- Promote awareness of climate variability and practical resilience strategies for the variety of sectors across the Northern Gulf NRM region.
- Support investigation, dissemination and use of regionally specific information to guide emission reduction opportunities, methods and tools to support decision making.

Coordination

Facilitate and improve coordination of climate adaptation and mitigation across the Northern Gulf NRM region.

- Support the engagement of enterprises in conservation economy projects to improve resilience to climate variability. This may include actions to reduce carbon emissions, protect biodiversity, improve land condition and water quality in addition to improving enterprise resilience via income diversification.
- Continue to develop and implement conservation strategies on Nature Refuges, protected areas and targeted areas identified as "key refugia". This will include corridors for biota movement to adapt to changed climates.
- Collaborate on regional partnerships to design and bid for large-scale conservation economy projects, such as biodiversity offset or carbon credit projects. This will include ensuring objectives of the projects do not compromise existing land uses or environmental values.
- Encourage activities to improve water efficiency and reduce water stress across the region (e.g. reduced stocking rates) and evaporative losses (e.g. reduce shallow surface water storage, canals, and flood irrigation).
- Support the further development of high-quality weather and climate information. This will include the identification of existing data deficiencies and addressing these on a priority basis.

Research

Facilitate targeted research which addresses climate adaptation and mitigation pathways across the Northern Gulf NRM region.

- Support research that aims to improve agricultural productivity and resilience, such as non-chemical and carbon building treatments to assist agricultural productivity and viability long term.
- Seek and continue with collaborative partnerships with research institutions focused on climate change impacts on resources and management practices.
- Support research into the likely impacts of climate change on threatened habitat, species and communities, reviewing and updating existing profiles and information with current information. This would include aquatic habitat and communities and impacts such as reduction in drought refugia waterholes via evaporation, sedimentation or reduced connectivity.



STRATEGY

ACTIVITIES

Policy

Facilitate the improvement of policy influencing the successful adoption of climate adaptation and mitigation pathways across the Northern Gulf NRM region.

- Integrate monitoring and evaluation outcomes to support improved policy, and develop reports to support policy changes.
- Support coordinated feedback from stakeholders on the application of climate adaption policies to sectors across the Northern Gulf NRM region.

Monitoring

Develop and support data acquisition which informs improved climate adaptation and mitigation across the Northern Gulf NRM region.

- Support monitoring of trends, condition, and responses to changes in climate and management interventions.
- Support monitoring of biodiversity trends, condition, and responses to change in climate variables, especially in threatened species and ecosystems.

6.4 PRESSURE: FERAL ANIMALS AND PESTS

Plan priority
High



Feral animals and pests significantly impact the Northern Gulf NRM region’s biodiversity values and biosecurity. Feral animals not only compete for food with native animals but can also predate on them, spread weeds and diseases, cause erosion and general habitat degradation (18). Cane toads, foxes, rabbits, goats, cats, wild dogs, and pigs are declared pests under the *Biosecurity Act 2014*. The Act also places a General Biosecurity Obligation on people and corporations to ensure they do not spread a pest, disease or a contaminant.

Where natural populations of native species become unbalanced (such as by improved access to water, food or reduced predators) they can also become a significant issue for pastoral and agricultural production as well as biodiversity and habitat protection, for example Agile Wallabies.

Pest species also impact agricultural production by direct damage to crops, increased production costs and resource loss. Significant existing pest species within the region include Fruit Spotting Bug (*Amblypelta lutescens*) and phytophthora.

The potential for additional pest species to be introduced to the region is a significant risk, as demonstrated recently by the Fall Army Worm (*Spodoptera frugiperda*) and the increased production costs this has caused, especially to maize and sorghum crops. The risk of diseases such as Lumpy Skin or Foot and Mouth disease is also significant for the region as these both occur immediately to Australia’s north.

Mozambique and Spotted Tilapia occur in many areas across north eastern Australia (present in 26 of 67 catchments (19)), having been illegally released in the 1970s. However, catchments of the Northern Gulf NRM region (which flow west into the Gulf of Carpentaria) have been largely free of this pest. Previous minor incursions (2008, Eureka Creek) appeared to have been eradicated. Populations of these fish, including breeding-sized individuals have now been recorded in the Walsh River, within the Mitchell River catchment (20). Unmanaged, these have the potential over time to move into the lower Mitchell and then to other Gulf Coast catchments during flood events.



Goal – By 2033, stakeholders will be informed of the nature and impact of feral animals across the Northern Gulf NRM region, and appropriate coordinated and prioritised management will be implemented to see a net threat reduction. Rapid identification and response to emerging feral animals and pests will be implemented.

STRATEGY

ACTIVITIES

Information

Increase the accessibility of current and relevant information on feral animal and pest management in the Northern Gulf NRM region, focusing on the practical control measures and emerging Pest issues.

- Raise awareness of feral animal and pest issues including:
 - Preventing new, emerging species and existing range expansion
 - Identification and reporting of any new and/or suspicious feral animal and pests
 - Increasing community understanding of feral animal issues
 - Individual landholder responsibilities
 - Increasing landholder participation in feral animal and pest management
 - Promoting successful management examples and outcomes
 - Increasing awareness and adoption of best practice methods and emerging technologies in controlling feral animals
 - The General Biosecurity Obligations of land managers under the *Biosecurity Act 2014*
- Support Land and Sea Ranger programs to develop ranger-delivered pest management information and on-ground management.
- Provide material and technical support to pastoral landholders for targeted feral animal and pest management (particularly to mitigate the impacts of feral cats and pigs on high-risk areas).
- Provide educational resources to tourists and residents regarding the implications of spreading feral animals or pests across the Northern Gulf NRM region, and avenues to report sightings.
- Engage with new and existing Working Groups to support the listing of emerging Feral Animal and Pest species.
- Develop a simple risk-assessment tool, useful at a property level, which provides land managers with some guidance on the best-spend of limited budgets in addressing Feral Animals and Pests.

Coordination

Facilitate and improve coordination of feral animal and pest management across the Northern Gulf NRM region.

- Collaborate with local and state governments to deliver coordinated feral animal control across properties and land tenures in prioritised and strategically targeted sites to:
 - Have a strategic view of key emerging feral animal issues
 - Provide resources and extension services to liaise with land holders and agencies to help land holders implement and refine pest management practices
 - Help attract and distribute funding to on-ground pest managers, based on the most significant priority pests and projects determined by the various local agencies
 - Support local government in the achievement of strategies and priorities as identified in Biosecurity Plans
- Support the coordination of effort and information sharing regarding approaches to feral animal and pest management, such as across Local government boundaries, with Biosecurity Queensland, Traditional Custodians and Land and Sea Ranger Groups. This may include facilitated regular meetings, information sharing portals and/or shared databases to maximise effectiveness of controls across administrative boundaries and overlapping jurisdictions.
- Promote and assist implementation of the *Queensland Invasive Plants and Animals Strategy 2019–2024* (21).
- Support the Western Cape Turtle Threat Abatement Alliance and expand this programme's reach to adjacent areas of need.
- Support efforts to understand the impact of feral animals, especially feral pigs, on native fauna populations, such as freshwater turtles. Follow-up with supporting coordinated management across stakeholders to reduce impacts.

STRATEGY

ACTIVITIES

Research

Facilitate targeted research which addresses information needs in the successful management of feral animals and pests across the Northern Gulf NRM region.

- Support research on feral animals and pests in the region, their impacts and effective control practices.
- Support applied research projects to test, trial and demonstrate the efficacy of different feral animal and pest control techniques.
- Continue collaborative partnerships with research institutions focused on feral animals and pest impacts on resources and management practices.
- Support the development of simplified land condition assessments to characterise the abundance and/or impacts of feral animals and pests. This would be a more cost-effective alternative to monitoring actual pest abundance.

Policy

Facilitate the improvement of policy influencing the successful management of feral animals and pests across the Northern Gulf NRM region.

- Collaborate with local government, Biosecurity Queensland and neighbouring NRM bodies to identify emerging issues and present informed and coordinated policy positions.
- With broad-based community support, facilitate the declaration of emerging Feral Animal and Pest species across the region.

Monitoring

Develop and support data acquisition which informs improved management of feral animals and pests across the Northern Gulf NRM region.

- Support the systematic collection and analysis of data on feral animal and pest abundance, impacts and controls to inform improved management.
- Encourage and support seasonally stratified fish surveys and baseline aquatic biota surveys in areas vulnerable to new Tilapia infestations.
- Support the identification and reporting of emerging feral animal and pest species including with new technology to assist proactive management.



6.5 PRESSURE: INVASIVE WEEDS

Plan priority
High



Invasive weeds have the potential to significantly impact the natural resources of the Northern Gulf region in a variety of ways. Weed species can impact the viability of agricultural and pastoral enterprises by increasing costs or reducing productivity. Introduced grasses, such as Gamba and Grader grass, can alter fire regimes by substantially increasing fuel loads, which in turn can impact biodiversity values. Invasive species such as Rubber Vine can alter habitat in critical riparian areas. Introduced aquatic weeds, such as Water Hyacinth and Amazon Frogbit, have the potential to dramatically impact biodiversity of aquatic systems and access to water resources. The annual cost of invasive plants in Queensland is estimated to be \$600M (23).

Priority weed species are identified in the biosecurity management plans for the regional bodies, e.g. FNQROC (Far North Queensland Regional Organisation of Councils) and local governments. These plans outline the species for management priority across the region and are based on an assessment and prioritisation framework.



Goal – By 2033, stakeholders will be informed of the nature and impact of invasive plants/weeds across the Northern Gulf NRM region, appropriate coordinated and prioritised management will be implemented to see a net threat reduction. Rapid identification and response to potential new invasive plants/weeds will be implemented.

STRATEGY

ACTIVITIES

Information

Increase the accessibility of current and relevant information on weed management in the Northern Gulf NRM region, focusing on practical control measures and emerging weed issues.

- Develop and distribute information to raise awareness of weed issues including:
 - Preventing new, emerging species and the potential expansion of existing ranges
 - Increasing community understanding of weed issues
 - Individual landholder responsibilities
 - Increasing landholder participation in weed containment
 - Promoting successful management examples and outcomes
 - Increasing awareness and adoption of best practice methods and emerging technologies in controlling weeds
- Develop a simple field guide for current and emerging weeds of the Northern Gulf NRM Region, including outline of the risk factors and effective controls.
- Promote early detection and management of emerging weeds by educating the general public, land holders and key stakeholders about key weed species.
- Support Land and Sea Ranger programs, local governments and landholders in managing invasive plants and weeds species outlined in the regional and/or Local Government Area Biosecurity Management Plan.
- Support Land and Sea Ranger programs to develop ranger-delivered pest management information and on-ground management.
- Develop a simple risk-assessment tool, useful at a property level, which provides land managers with some guidance on the best-spend of limited budgets in addressing invasive plants and weeds.
- Provide invasive plant and weed distribution survey information, such as the DAF Agricultural Pest Distribution Survey, at a local or property level to land managers, noting changes in distributions. This information will allow land managers to be more vigilant of species in region, and/or provide information back on accuracy of data for regional management (e.g. new range extensions).
- Provide educational resources to tourists and residents regarding the implications of spreading invasive plants and weeds across the Northern Gulf NRM region, and avenues to report sightings.

Coordination

Facilitate and improve coordination of weed management across the Northern Gulf NRM region.

- Support the coordination of control measures for weeds across the Northern Gulf NRM region encouraging collaboration between multiple stakeholders and ongoing review of management effectiveness. This would include strategic application of controls measures, such as commencing in upstream areas and working downstream to avoid reinfestation.
- Collaborate with Department of Main Roads and local councils to investigate the effectiveness of wash down stations in removing weed reproductive material from vehicles travelling within and into the Northern Gulf NRM region. This would include consideration of movement of new weeds species in harvesting equipment from other regions.
- Promote early detection, reporting and management of emerging weed species by educating the general public, land holders and key stakeholders about key weed species.
- Support local governments in the development and implementation of Biosecurity Management Plans.
- Support the coordination of effort and information sharing regarding approaches to invasive plant and weed management, such as across Local government boundaries, with Biosecurity Queensland, Traditional Custodians and Land and Sea Ranger Groups. This may include facilitated regular meetings, information sharing portals and/or shared databases to maximise effectiveness of controls across administrative boundaries and overlapping jurisdictions.

STRATEGY

ACTIVITIES

Research

Facilitate targeted research which addresses information needs in applying weed management across the Northern Gulf NRM region.

- Support research on weed species across the Northern Gulf NRM region, their impacts and effective control practices.
- Develop demonstration sites for effective control techniques of invasive plants and weeds.
- Continue collaborative partnerships with research institutions focused on weed species on resources and management practices.

Policy

Facilitate the improvement of policy influencing the successful management of weeds across the Northern Gulf NRM region.

- Collaborate with local government, Biosecurity Queensland and neighbouring NRM bodies to identify emerging issues and present informed and coordinated policy positions.
- With broad-based community support, facilitate the declaration of emerging weed species across the region.

Monitoring

Develop and support data acquisition which informs improved weed management across the Northern Gulf NRM region.

- Support the systematic collection and analysis of data on weed species abundance, impacts and effectiveness of controls. This will inform improved management.
- Support landholder surveys of priority weeds, collate, analyse and share resultant data. This may include developing a standardised survey approach and data collation platform (e.g. 1 square kilometre grids) for land manager use.
- Support monitoring of emerging weed species on a regional and local basis to assist proactive management.
- Support annual monitoring of beds, banks and floodplains of major river systems for new and emerging weed species washed downstream.

6.6 PRESSURE: WATER MANAGEMENT

Plan priority
High



Water is fundamental to life and public health. It is a critical resource within the Northern Gulf NRM region. It provides habitat for a wide range of species, drinking water, recreation opportunities as well the key component in supporting agriculture. Its availability drives and facilitates economic development and provides social opportunities. Water has a special cultural and spiritual value for Aboriginal people. Due to the variety of habitat types and the remoteness of the region, the systems including their riparian areas are probably some of the most diverse but poorly understood in Australia (22).

Multiple industries within the region are currently reliant on the region’s water supply, mostly rainfall and drawing from surface waters. This demand is likely to increase into the future with the potential expansion of agricultural activities, such as in the Gilbert and Mitchell catchments. Downstream systems, such as estuarine ecosystems (including sectors such as the northern prawn, barramundi and mud crab fisheries)

are extremely dependent on freshwater flows. Large flows are critical for ecosystem health, as are the low-flows that trickle in at the start and tail end of the wet season, often a cue for spawning activity.

Water Management Plans have been developed for the Northern Gulf NRM region in the Water Resource (Gulf) Plan 2007 and Water Plan (Mitchell) 2007 which provide a framework for sustainably managing water.

Water management also includes:

- Water quality: Nutrients, sediments, pesticides have the potential to impact downstream ecosystems, especially in waterways, floodplains and seasonally inundated wetlands.
- The management of the coastal and estuarine resources for the Gulf Coasts region.



Goal – By 2033, communities and enterprises across the Northern Gulf region will be implementing best-practice water management decisions. This will see resilient, profitable and sustainable activities, with this resource shared equitably to meet the needs of communities, environment and enterprises.

STRATEGY

ACTIVITIES

Information

Increase the accessibility of current and relevant information on water management in the Northern Gulf NRM region.

- Promote the respective portions of the Water Plans for the Northern Gulf NRM region which outline the basis for water allocation determinations.
- Promote water-use efficiency and support land managers to establish and maintain sustainable water supply solutions across all sectors in the Northern Gulf NRM region.
- Provide communication channels, available to all stakeholders, to deliberate and ensure long-term sustainability concerns are represented in future water resource development planning, including catchment scale and downstream impacts.
- Support the development of locally applicable guides to assist land managers in understanding water licencing and the associated application process.
- Collaborate with local coastal communities and visiting anglers to provide accessible information in the form of boat ramp signage, brochures and tailored communications concerning fishing regulations, appropriate angler behaviour and the vulnerabilities of certain species.
- Develop an education campaign featuring the Freshwater Sawfish (*Pristis pristis*) as an ambassadorial species for aquatic habitat conservation, to target local communities and visiting anglers. This could include the promotion of existing platforms (such as the SARA app) to engage stakeholders and record sightings.
- Provide material and technical support to reduce erosion, weed and pest impacts and protect ecological values of freshwater habitat, including encouraging landowners to exclude stock from riparian areas during environmentally sensitive times, such as after floods or fire.

Coordination

Facilitate and improve coordination of water management across the Northern Gulf NRM region.

- Support the holistic consideration of developments impacting water resources across the region – including in-depth consideration of downstream ecosystems, users and/or cultural impacts of changes to water use and extraction, such as impoundments.
- Assist in maintaining the natural passage of fish in waterways across the Northern Gulf NRM region by identifying fish passage barriers, undertaking assessments and working to address issues identified.
- Support measures to limit the spread of invasive fish and weed species in aquatic habitat. This would include measures to control or eradicate existing infestations, limit further infestations or ensure risk is considered in regional water management, such as inter-catchment transfers.
- Support conservation of groundwater-dependant ecosystems through identification, management prioritisation and collaboration with land managers including Traditional Custodians.
- Provide material and technical support to agricultural producers, including the upper Mitchell/Walsh catchment, aimed at improving water quality of farm runoff. This may include the establishment of learning/demonstration sites such as riparian corridor management, on-farm capture and recycling and vegetation of drainage systems.
- Address rising salinity groundwater profiles in the Arriga Plain. This may include management of inflows and systems losses, upstream extraction and strategic native tree plantings.
- Review the potential for Indigenous Land and Sea Ranger programs to support, assist and/or deliver fisheries enforcement activities, increasing the reach of these activities in often remote areas.
- Develop a community-based review of fisheries in the southeast Gulf of Carpentaria to examine recreational and traditional fisheries sectors and place in context of commercial effort (23), especially on target species (such as Barramundi, Javelin Grunter and Mud Crabs). This process would identify the types of management initiatives the community and competing sectors wish to see emerge in the Gulf to ensure equitable and sustainable fisheries.
- Support participation of key stakeholders in Gulf fisheries management, such as the Gulf Fishery Taskforce Advisory Committee.
- Support assessment of potential for an intervention strategy, should monitoring indicate a severe and sustained decrease in the seagrass beds adjacent Karumba. This may include measures such as regional parent/seed stock sources or developing an on-land seed source.
- Investigate the potential for development of an artificial reef network adjacent to Karumba.

STRATEGY

ACTIVITIES

Research

Facilitate targeted research which addresses information needs in applying water management across the Northern Gulf NRM region.

- Support research to model, monitor and determine characteristics of the Northern Gulf NRM region's water resources. Such information will be required to manage potential changes to water management and allocation.
- Support the collection of baseline data, including water quality, ecosystem health and aquatic communities. This will include effective maps of important marine resources within the Coastal zone, including seagrass and mangroves.
- Support the assessment of changes in waterway morphology, such as the filling of waterholes with sediments which reduces drought refugia and habitat.

Policy

Facilitate the improvement of water management across the Northern Gulf NRM region.

- Support coordinated feedback from stakeholders on the application and practices of the legislative instruments on effective water management across the Northern Gulf NRM region.
- Ensure fisheries, sustainability and cultural concerns are represented in water resource development planning, including catchment scale and downstream impacts.
- Support the review of management of protected species, such as estuarine and freshwater crocodiles, especially in areas where they did not naturally occur prior to water infrastructure development.

Monitoring

Develop and support data acquisition which informs improved water management across the Northern Gulf NRM region.

- Monitor and document trends and condition of surface and ground water, through establishing a long-term water quality monitoring program at key sites across the Northern Gulf NRM region.
- Support monitoring of freshwater ecosystem health, including the presence of introduced fish and aquatic weed species.
- Support the establishment of effective and efficient water quality monitoring, including indicators, across the Northern Gulf NRM region. This would include dedicated monitoring where land use changes (e.g. cropping) have the potential to influence downstream water quality (e.g nutrients, sediment load, contaminants), or system dynamics (eg ground water increases and rising salinity).
- Support monitoring of coastal resources, such as seagrass and mangroves including the continuation of the long-term Karumba Seagrass monitoring program. Expand programs into adjacent areas to understand the dynamics of these systems and early-warning of impacting processes.
- Support monitoring of biodiversity trends and conditions, and responses to change in management practices, especially in relation to threatened aquatic/marine species and ecosystems.
- Support the establishment of a water quality monitoring and mine rehabilitation program in areas affected by historical mining legacies, such as Irvinebank, Palmer River, Croydon and Chillagoe. In collaboration with stakeholders including Traditional Custodians and land managers, provide training for water quality monitoring techniques.



6.7 PRESSURE: POLLUTION

Plan priority
Moderate



Pollution is a broad term to capture multiple pressures on the assets of our region. For our Northern Gulf NRM region, this includes the runoff containing sediments, excess nutrients, and gross pollutants to our waterways. Sources of these pollutants can be broad-scale catchment disturbances, agricultural practices, or changes to land management, such as fire regimes, removing groundcover and exacerbating erosion.

Once the sediment, nutrients or gross pollutants enter the waterways they can have a wide range of impacts. From direct smothering of fauna and aquatic vegetation, changing flow characteristics of waterways or promoting algal blooms (eutrophication).

Pollution can also result from legacy issues from mining operations. This can result in increased sedimentation of waterways, changes to hydrology and contamination issues.

In the marine environment of the Gulf Coasts Region, pollution includes ghost nets and the unnecessary toll that lost or abandoned fishing gear takes on a wide variety of marine fauna. An estimated 90% of the ghost nets in Northern Australia originate from outside Australia’s borders. These are estimated to kill between 5,000 and 14,000 (24) marine turtles per year. The waters of the Gulf of Carpentaria contain six of the seven marine turtle species, all of which are listed as threatened. Marine debris, including ghost nets, is an important and ongoing transboundary threat to biodiversity in the region (24). Pollution by plastics, including microplastics, is a very significant issue across the region, with impacts into many ecosystems and food webs.

Whist anecdotal information on impacts abounds, such as potential impact in downstream catchments of historical mining operations, broad monitoring data on pollution issues is currently lacking across the Northern Gulf NRM region.



Goal – By 2033, legacies of poor management practices will be identified and under active management to reduce impacts to Culture, productivity and the environment.

STRATEGY

ACTIVITIES

Information

Increase the accessibility of current and relevant information on pollution issues in the Northern Gulf NRM region, focusing on the practical management of existing issues and awareness emerging Pollution issues.

- Support development of environmental and cultural education/interpretation modules for tourists and residents to facilitate greater cultural and environmental awareness of pollution issues. Packages could be delivered by groups such as Land and Sea Ranger programs.
- Provide material and technical support for marine debris initiatives and continued collection of marine debris, including by Indigenous Land and Sea Rangers.
- Provide material support for organisations to develop interpretive signage and communications on pollution issues with opportunity to include messages on cultural and ecological values.

Coordination

Facilitate and improve coordination of pollution management across the Northern Gulf NRM region.

- Support the Irvinebank communities and Traditional Custodians to restore watershed functions by containing the impacts of abandoned mines in the Irvinebank and Watsonville area, focusing on the stretch of McDonald Creek through the Irvinebank town centre.
- Support the continuation and expansion of the Indigenous Land and Sea Ranger marine debris collection and monitoring program on shorelines and beaches, strategically targeting areas of higher modelled risk such as Karumba north.

Research

Facilitate targeted research which improves the management of existing and emerging pollution issues across the Northern Gulf NRM region.

- Support research to model, monitor and determine impacts and improved management of pollution on the Northern Gulf NRM region's resources.
- Support investigation into interactions with marine fauna and abandoned/lost fishing gear, recreational and commercial. This would include assessment of crab traps and potential design changes to limit harm.

Policy

Facilitate the improvement of policy influencing the successful identification and management of pollution issues across the Northern Gulf NRM region.

- Support national and International efforts to address Illegal, Unreported and Unregulated (IUU) Fishing, a key sector which leads to ghost nets (25).
- Continue to work with the Queensland Government on the management of historical and abandoned mines across the Northern Gulf NRM region.

Monitoring

Develop and support data acquisition which informs improved identification and management of pollution issues across the Northern Gulf NRM region.

- Develop a targeted and robust water quality monitoring program to identify spatial and temporal trends in water quality. Especially for the Northern Tablelands region and the Walsh River, include nutrient analysis to examine potential issues with losses from agriculture.
- Support and encourage more detailed studies of sediment and water quality downstream of mine sites that are considered greatest risk to water users to assess the wider spatial distribution and year to year fluctuations of heavy metals, and in response to high rainfall events.
- Support monitoring of marine debris location, type, likely origin and impacts to inform possible management actions.
- Support targeted monitoring, informed by research, of potential pollution impacts to guide future management.

7 OUR PRIORITIES

There are a range of current and emerging issues impacting the assets across the Northern Gulf NRM region. A semi-quantitative framework has been developed to assist in assessing how critical the pressure is, which has then been directly translated as Plan priority (i.e. where management effort would best be applied).

As outlined in Section 5, four broad asset groups have been defined – Land, Water (fresh, marine and ground), biodiversity and biosecurity. Seven broad pressures have been defined (Section 6) – Fire Management, Land Management, Climate Change/Severe Weather Events, Feral Animals and Pests, Invasive Weeds, Water Management and Pollution.

To understand the severity of these pressures on the assets, a consequence table (overleaf) was developed. This provides very broad indicators of severity of impact. Impacts are ranked from minor to severe.

These measures are designed to be a guide only. They look to allow direct comparison of impacts across asset groups. It should be noted that the consideration of impacts is their direct responses to the pressures. While impacts are rarely direct and independent (e.g. reduced fire frequency can lead to woody thickening which alters grazing pressure), this simplification is necessary to gain benefit from this tool.

The classification of impacts was developed using the available data, noting this is often limited, discussions with informed stakeholders and then cross-checked with the community through the consultation process on the draft NRM Plan (October 2022–February 2023). The classification, based on best-available information and community input, aims at providing a relative assessment of each pressure on each asset.

The assessment was completed in two stages. The first was an assessment of the current nature of our assets in response to known pressures. This provided a current

status matrix. This also includes an assessment of the condition trend for the asset, based on best available information (science reviews), discussions with informed stakeholders and community perceptions.

The next level of assessment looked to examine the impact should pressures not be managed effectively, and current declines in asset classes reduced, or preferably reversed. This matrix provides a uniform basis to forecast the direct impact of pressures. It was largely based on interpretation by informed stakeholders and community consultation.

The current condition for an asset class is then taken as the highest score across all the pressures. For example, the Land asset category was ranked between three and five across the seven pressure categories, with a current condition score of three (see Current Position table below). The same was completed as a guide to the future (end-of-Plan, 2033) condition of the asset class should the current understanding of the trend continue (see Future Position table below).

The assessment was then repeated for each Pressure. This provided a guide as to the impact each pressure was having on the Assets, which then translated directly into the Plan priority.

This approach necessarily involves the simplification of complex and interrelated issues across our vast, diverse and changing area. In the context of the Plan, it is a useful guide. It provides a common framework for all stakeholders to understand and make sense at the whole-of-region, helicopter view level.

It is important to note that whilst this provides an overall guide as to priorities, it doesn't suggest that the priority wouldn't change at a local level, to deal with a specific issue on a particular resource. For example, an issue of feral pigs eating endangered turtle nests preventing any breeding success would be a high priority on a local scale.

Score	Impact rank
1	Severe
2	Very high
3	High
4	Moderate
5	Minor

Our current position

PRESSURES AND ASSETS	Climate change / extreme weather	Fire management	Feral animals and pests	Invasive weeds	Pollution	Land management	Water management	Current condition	Condition trend
Land	3	3	3	3	5	3	4	3	▼
Water – Freshwater	4	4	3	3	4	3	4	3	▼
Water – Marine	4	5	5	5	4	4	5	4	▼
Water – Groundwater	5	5	5	5	5	4	5	4	Stable
Biodiversity	4	4	4	4	4	3	4	3	▼
Biosecurity	5	4	4	4	5	4	4	4	▼

Our future position

PRESSURES AND ASSETS	Climate change / extreme weather	Fire management	Feral animals and pests	Invasive weeds	Pollution	Land management	Water management	Future condition under business as usual
Land	2	1	2	2	4	1	3	1
Water – Freshwater	2	3	2	2	3	3	2	2
Water – Marine	3	4	3	3	3	3	4	3
Water – Groundwater	4	5	5	5	4	5	2	3
Biodiversity	2	2	2	2	3	2	2	2
Biosecurity	3	3	2	2	5	2	3	3
Impact rank	2	1	2	2	3	1	2	
Plan priority	High	Very high	High	High	Moderate	Very high	High	

IMPACT SEVERITY

Asset	Severe (1)	Very high (2)	High (3)	Moderate (4)	Minor (5)	Possible measures
Land	>30% loss of land productivity. Large scale erosion and land system failure. Impacts effectively permanent (D land condition) and impractical or uneconomic to restore.	Large areas (20–30%) of significantly reduced land productivity. Impacts are long-term (>10 years) and require very significant intervention to remediate, mostly impractical or uneconomic to restore (C and D land condition).	Moderate areas (5–20%) of significantly reduced land productivity. Significant areas of erosion. Impacts require significant intervention and timelines to restore function, bordering on permanent.	Minor areas (<5%) of reduced land productivity. Minor and localised areas of erosion. Impacts recoverable within reasonable timeframes (5–10 years) with practical interventions.	Minor and/or limited impacts on land productivity. <5% of total land impacted. Restoration possible with existing technologies and within resources available at property and/or regional level, within short timeframes (less than 2 years).	Productivity Land condition Erosion Scalds/salinity
Water – Freshwater	Major impacts to >30% of freshwater ecosystems. >30% of freshwater systems have poor water quality. >30% of systems have significantly reduced water security. Impacts are long term, broad-scale and impractical or uneconomic to restore.	Large areas (20–30%) demonstrate significant impacts at regional scale (water quality, ecological function). Significant reduction in water security of >20% of systems. Impacts mostly impractical or uneconomic to restore.	Moderate areas (5–20%) of total) of freshwater system demonstrate moderate and/or regional impacts (water quality, ecological function). Moderate reduction in water security of systems. Impacts recoverable but require significant intervention and resources over long timeframes (>10 years).	Minor areas (<5%) of freshwater system demonstrate minor and localised impacts (water quality, ecological function). Minor reduction in water security of systems. Impacts recoverable within reasonable timeframes (5–10 years) with practical interventions.	Minor and/or limited spatial scale impacts freshwater ecosystems. <5% of freshwater systems have reduced water quality. <5% of systems have reduced water security. Impacts are short term (<5 years), limited in spatial extent. Restoration possible with existing technologies and within resources available at property and/or regional level.	Ecological function Connectivity Water quality (such as turbidity) Source security
Water – Marine	Major impacts to >30% of marine ecosystems. >30% of systems have poor water quality. Impacts are long term, broad-scale and impractical or uneconomic to restore.	Large areas (20–30%) demonstrate significant impacts at regional scale (water quality, ecological function). Impacts mostly impractical or uneconomic to restore.	Moderate areas (5–20%) of system demonstrate moderate and/or regional impacts (water quality, ecological function). Impacts recoverable but require significant intervention and resources over long timeframes (>10 years).	Minor areas (<5%) of systems demonstrate minor and localised impacts (water quality, ecological function). Impacts recoverable within reasonable timeframes (5–10 years) with practical interventions.	Minor and/or limited spatial scale impacts of ecosystems. <5% of systems have reduced water quality. Impacts are short term (<5 years), limited in spatial extent. Restoration possible with existing technologies and within resources available at system and/or local level.	Ecological function Fisheries productivity Water quality

IMPACT SEVERITY

Asset	Catastrophic	Very high	High	Moderate	Mild	Possible measures
Water – Groundwater	Major impacts to >30% of groundwater systems ecosystems. >30% of systems have poor water quality. >30% of systems have significantly reduced water security. Impacts are long term, broad-scale and impractical or uneconomic to restore.	Large areas (20–30%) demonstrate significant impacts at regional scale (water quality, ecological function). Significant reduction in water security of 10–30% of systems. Impacts mostly impractical or uneconomic to restore.	Moderate areas (5–20%) of groundwater system demonstrate moderate and/or regional impacts (water quality). Moderate reduction in water security of systems. Impacts recoverable but require significant intervention and resources over long timeframes (>10 years).	Minor areas (<5%) of groundwater systems demonstrate minor and localised impacts (water quality). Minor reduction in water security of systems. Impacts recoverable within reasonable timeframes (5–10 years) with practical interventions.	Minor and/or limited spatial scale impacts on groundwater systems. <5% of systems have reduced water quality. <5% of systems have reduced water security. Impacts are short term (<5 years), limited in spatial extent. Restoration possible with existing technologies and within resources available at property and/or local level.	Source security Water quality (such as salinity)
Biodiversity	Major loss (>30%) of biodiversity at regional scale. Significant number of species considered Threatened or higher risk. Loss of culturally significant or iconic species. Impacts are long term, broad-scale and impractical or uneconomic to restore.	Large impacts (20–30%) to biodiversity. Systems demonstrate significant impacts at regional scale (local abundance and diversity). Multiple additional species listed as Threatened or higher risk. Impacts mostly impractical or uneconomic to restore.	Moderate impacts (5–20%) to biodiversity. Systems demonstrate moderate and/or regional impacts (local abundance and diversity). Increase in species listed as Threatened or higher risk. Impacts recoverable but require significant intervention and resources over long timeframes (>10 years).	Minor impacts (<5%) to biodiversity. Minor and localised impacts (local abundance and diversity). Impacts recoverable within reasonable timeframes (5–10 years) with practical interventions.	Minor and/or limited spatial scale impacts on biodiversity. No increase in species listed as Threatened or higher risk. Impacts are short term (<5 years), limited in spatial extent. Restoration possible with existing technologies and within resources available at property and/or local level.	Net diversity Threatened species Culturally significant, charismatic or iconic species
Biosecurity	Large areas (>30%) significantly impacted (ecological function, productivity) by unrestrained disease, pests and/or weeds. Impacts are long term, broad-scale and impractical or uneconomic to manage.	Significant impacts (ecological function, productivity) detectable in 20–30% of area by disease, pests and/or weeds. Impacts mostly impractical or uneconomic to restore.	Moderate impacts (ecological function, productivity) detectable in 5–20% of area by disease, pests and/or weeds. Impacts recoverable, but require significant intervention and resources over long timeframes (>10 years).	Minor impacts (ecological function, productivity) detectable in 5% of area by disease, pests and/or weeds. Impacts recoverable within reasonable timeframes (5–10 years) with practical interventions.	Spatially limited areas impacted (ecological function, productivity) by disease, pests and/or weeds. Undetectable impacts at regional scale. Impacts are short term (<5 years), limited in spatial extent. Management possible with existing technologies and within resources available at property and/or local level.	Weeds Pest species Diseases

BIBLIOGRAPHY

1. Interim Biogeographic Regionalisation for Australia. *Australia's bioregions (IBRA)*. [Online] Department of Agriculture, Water and Environment, 2022. <https://www.awe.gov.au/agriculture-land/land/nrs/science/ibra/australias-bioregion-framework>.
2. CSIRO. *A catchment sediment and nutrient budget for the Mitchell River, Queensland. A report to the Tropical Rivers and Coastal Knowledge (TRaCK) Research Program*. s.l.: CSIRO Water for a Healthy Country National Research Flagship, 2010.
3. Queensland Reconstruction Authority. *Hinterland to Gulf Regional Resilience Strategy*. Brisbane: State of Queensland, March 2022.
4. *Indigenous impacts on north Australian savanna fire regimes over the Holocene*. Wurster, C.M, et al. s.l.: Nature Scientific Reports, 2021, Vol. 11:23157.
5. Woinarski, J., Burbidge, A., et al. *Fire and biodiversity in Australia*. In A. Stow, N. Maclean, & G. Holwell (Eds.), *Austral Ark: The State of Wildlife in Australia and New Zealand*. Cambridge: Cambridge University Press., 2014. doi:10.1017/CBO9781139519960.027.
6. *Small mammals decline with increasing fire extent in northern Australia: evidence from long-term monitoring in Kakadu National Park*. Lawes, MJ, et al. *International Journal of Wildland Fire*, Vol. 24, pp. 712–22.
7. Queensland Department of National Parks, Recreation, Sport and Racing. *Planned Burn Guidelines – Gulf Plains Bioregion of Queensland*. s.l.: Department of National Parks, Recreation, Sport and Racing, 2013. ISBN 978-1-7423-0933.
8. Roth, G. H., Lawson, G. and Cavanagh, D. *Overview of key natural resource management issues in the Burdekin catchment, with particular reference to water quality and salinity: Burdekin Catchment condition study Phase 1*. Townsville: Queensland Department of Natural Resources and Mines, CSIRO and NQ Dry Tropics, 2002.
9. *Fire-related threats and transformational change in Australian ecosystems*. Keith, David A, et al. s.l.: *Global Ecol Biogeography*, 2022, Vols. 00:1–15. DOI: 10.1111/geb.13500.
10. Catchments, Carpentaria Land Council Aboriginal Corporation and Reef. *Gulf Savannah Fire Management Guidelines*. 2017.
11. *An Economic Assessment Of The Impact Of Grazing Land Condition On Livestock Performance In Tropical Woodlands*. MacLeod, N.D., Ash, A.J. and McIvor, J.G. 1, 2004, *The Rangeland Journal*, Vol. 26, pp. 49–71.
12. Rolf, J.W, et al. *Decline in grazing land condition and productivity in the northern Gulf region of Queensland 1990 – 2016*. s.l.: In Press.
13. O'Reagain, P. and Bushell, J. *Managing for a variable climate: long-term results and management recommendations from the Wambiana grazing trial*. s.l.: Department of Agriculture and Fisheries, 2015.
14. World Meteorological Organization. *State of the Global Climate 2021*. Geneva, Switzerland : World Meteorological Organization, 2022.
15. Bureau of Meteorology. *Annual climate statement 2021*. s.l. : Bureau of Meteorology, 2022.
16. Queensland Department of Environment and Science. *Climate Change in the Gulf Region*. Brisbane : Queensland Government, 2019.
17. *Evaluating the shifts in rainfall and pasture-growth variabilities across the pastoral zone of Australia during 1910–2010*. Cobon, David H, et al. s.l. : CSIRO PUBLISHING, Crop & Pasture Science, 2019, Vols. 70, 634–647. doi.org/10.1071/CP18482.
18. United Nations. *Trade and Environment Review 2013, Wake Up Before It Is Too Late, Make Agriculture truly sustainable now for food security in a changing climate*. Geneva : United Nations Publication, 2013.
19. Australian Pork Limited. *National Feral Pig Action Plan*. Kingston ACT : Australian Pork Limited, 2021.
20. Biosecurity Queensland, Queensland Government. *Restricted invasive fish – Tilapia Oreochromis mossambicus and Tilapia mariae*. s.l. : Queensland Government, 2020.
21. O'Mara, K., Stewart-Koster, B. and Venarsky, M. *Tilapia Incursion – Mitchell River catchment: Reporting the ecology and movement patterns of new tilapia populations in the Mitchell River catchment to identify priority areas and actions to mitigate their Impacts*. Brisbane: Griffith University, 2021.
22. Department of Agriculture and Fisheries. *Queensland invasive plants and animals strategy 2019–2024*. s.l. : y Invasive Plants and Animals in Biosecurity Queensland, Department of Agriculture and Fisheries, 2019.
23. State of Queensland. *Queensland Invasive Plants and Animals Strategy 2019–2024*. Brisbane: Queensland Government. , 2019.

24. Burrows, D. *A review of aquatic management issues and needs for the Northern Gulf NRM planning region*. Townsville: Australian Centre for Tropical Freshwater Research, James Cook University, 2004.

25. Jacobsen, I, B, Zeller and Walton, L. *Level 1 Ecological Risk Assessment. Gulf of Carpentaria Inshore Fin Fish Fishery*. State of Queensland: Fisheries Queensland, Department of Agriculture and Fisheries, 2019.

26. *Understanding the Sources and Effects of Abandoned, Lost, and Discarded Fishing Gear on Marine Turtles in Northern Australia*. Wilcox, Chris, et al. No. 0, , 2014, Conservation Biology, Vols. 00, , pp. 1–9.

27. *Understanding causes of gear loss provides a sound basis for fisheries management*. Richardson, Kelsey, et al. s.l. : Elsevier, 2018, Marine Policy, Vol. 96, pp. 278–284.

28. Gulf Savannah NRM. *Corporate Strategic Plan 2019 – 2024*. 2019.

29. Queensland University of Technology. *A Model for Regional NRM Planning in Queensland*. Brisbane, Queensland, Australia : Regional Groups Collective (NRM Regions Queensland), 2011.





This document has been prepared by Gulf Savannah NRM. As the leading Natural Resource Management (NRM) body for the region, Gulf Savannah NRM is responsible for coordinating the review and maintenance of, and making publicly available the region's NRM Plan.

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