



Draft for public consultation



Australian Government  
Great Barrier Reef  
Marine Park Authority

## GREAT BARRIER REEF

# BIODIVERSITY CONSERVATION STRATEGY 2012





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STRATEGY 2012**

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*Working together today for a healthier Reef tomorrow*

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# Vision



*'Biodiversity in the Great Barrier Reef is healthy and resilient to threats, supporting sustainable use and the environmental, economic, social and cultural values of present and future generations, while considering the effects of a changing climate.'*

# Summary

Biodiversity is the variety of life on Earth at all its levels. It includes all living things and the way they interact with each other and their environment. Conserving biodiversity is an essential part of safe-guarding the Earth's biological resources. The Great Barrier Reef World Heritage Area is an outstanding natural icon. Virtually all groups of marine plants and animals are abundantly represented, with thousands of different species recorded.

The Great Barrier Reef Outlook Report 2009 highlighted that the Great Barrier Reef is one of the most diverse and remarkable ecosystems in the world and remains one of the most healthy coral reef ecosystems. The Outlook Report also highlighted that climate change, continued declining water quality from catchment runoff, loss of coastal habitats from coastal development and remaining impacts from lawful fishing and illegal fishing and poaching are the key ecosystem-level pressures reducing the resilience of the Great Barrier Reef. Importantly, it identified that while many biodiversity protection measures are making a difference, there is no overarching framework to guide and coordinate management actions.

Many of the pressures on the Great Barrier Reef date back to early catchment clearing, and unsustainable levels of fishing and commercial hunting of vulnerable species, such as humpback whales, beche-der-mer (e.g black teatfish), dugong and green turtles, that occurred over the past 150 years. The challenge for management is not only to ensure that any new activity in and adjacent to the Great Barrier Reef World Heritage Area is ecologically sustainable, but perhaps even more challenging, is to address the legacy of past decisions and reverse the long-term declines in biodiversity.

Considerable effort has gone into protecting the biodiversity of the Great Barrier Reef. Over the past three decades or so substantial progress has been made to address the impacts of fishing, protection of vulnerable species and declines in water quality. Actions taken to address the declining humpback whale populations have been a clear success, with the population now increasing

at approximately 10 per cent per year. The previously declining population of loggerhead turtles has also shown signs of recovery. The population of dugong in the north of the Great Barrier Reef Marine Park remains healthy, and a greater than ninety per cent decline in dugongs in waters south of Cooktown since the 1960s, appears to have stabilised although recovery will be dependent on the health of seagrasses along the developed coast.

The Great Barrier Reef Water Quality Protection Plan (Reef Plan) has been a very significant initiative, and is making measurable progress towards the goal of halting and reversing the decline in water quality entering the Great Barrier Reef. The progress towards this goal reflects the level of commitment by both the Australian and Queensland Governments, who are investing in excess of \$375 million over five years on Reef Plan activities. This includes \$200 million for the Australian Government's Caring for our Country Reef Rescue initiative and \$175 million for Reef Plan activities through the Queensland Government, including \$50 million to implement the Reef Protection Package. As importantly, the progress to date reflects the very strong commitment and collaboration by key stakeholders, including the Australian Government, the Queensland agencies, the Great Barrier Reef Marine Park Authority, Natural Resource Management groups and industry.

As a result of these actions, very substantial progress has been made towards halting and reversing the decline of Great Barrier Reef water quality. It is important that this work continue through to achieving the goal of *ensuring that by 2020 the quality of water entering the reef from adjacent catchments has no detrimental impact on the health and resilience of the Great Barrier Reef.*

Despite the considerable management effort, some elements of biodiversity continue to show declines. Within the Great Barrier Reef there has been an approximate 40 per cent decline in coral cover, particularly affecting reefs in the central part of the Great Barrier Reef that have been subjected to increasingly frequent crown-of-thorns starfish outbreaks; a decline in the abundance of seagrass meadows along parts of the developed coast due to

*Local government, Traditional Owners, community groups and marine industries will play an important role in implementing on-ground conservation activities . . .*

declining water quality; and significant range contractions and population declines for freshwater and green sawfish due to fishing, coastal clearing and declining wetlands. It is also possible that the spartooth shark has become extinct from waterways on the East Coast of Australia, as the last verified specimen was recorded in Princess Charlotte Bay in 1983. These declines clearly identify the need for all levels of government and the community to take a coordinated and focussed approach to conserve biodiversity.

Climate change adds another pressure on biodiversity, and, as a result, management objectives need to be reorientated from preserving all species in their natural habitat and current locations to ensuring space and opportunities are available for ecosystems to adapt and reorganise. This will increase the chances that they can maintain the provision of ecosystem services through a diversity of well-functioning ecosystems.

This draft *Great Barrier Reef Biodiversity Conservation Strategy 2012* has been developed to respond to the pressures identified in the Outlook Report and biodiversity declines. This Strategy provides a context on the Great Barrier Reef, its biodiversity and the threats acting upon it. Most importantly, it provides a framework for biodiversity protection, conservation and management within the Great Barrier Reef.

This Strategy has established a process for determining and documenting the habitats, species and groups of species that are 'at-risk'. Vulnerability assessments are being completed to identify actions to reduce the risks from threats and pressures. The habitats considered 'at-risk' are islands, mangroves, seagrass meadows, coral reefs, the lagoon floor and open waters. The species or species groups considered to be 'at-risk' are holothurians (beche-der-mer; including black teatfish), king and blue threadfin salmon, grey mackerel, snapper, sharks and rays (including sawfish), marine turtles, sea snakes, seabirds, humpback whales, dwarf minke whales, inshore dolphins and the dugong. The process has also identified overwhelming evidence that inshore habitats along the developed coast south of Cooktown and the species that use these habitats are continuing to be affected by a range of threats. Management of inshore areas is complex and current research and monitoring that focuses on inshore biodiversity and the impact of pressures acting on these elements of biodiversity is limited spatially and temporally and lacks integration. The implementation of an integrated inshore biodiversity program will be a key outcome of this Strategy.

In seeking to address these ecosystem-level threats to the Great Barrier Reef World Heritage Area, the draft *Great Barrier Reef Biodiversity Conservation Strategy 2012* builds on a solid foundation of 35 years of management by the Commonwealth and Queensland Governments. By balancing ecologically sustainable use, commercial realities and an overarching objective to protect and conserve biodiversity, the Great Barrier Reef Marine Park

Authority works in partnership with the Queensland and Commonwealth Governments to ensure the long-term sustainability of this multiple-use Marine Park. A range of management tools are employed both inside the Great Barrier Reef World Heritage Area and beyond its boundaries to address issues and manage activities impacting on the Great Barrier Reef. Many of the management measures employed in the Great Barrier Reef and beyond are improving its resilience.

A number of other existing programs implemented by multiple government agencies, Traditional Owners, Natural Resource Management groups, marine and land-based industries and the community focus on reducing the risks from ecosystem-level threats and pressures. These programs take a multi-disciplinary approach to addressing the priority issues and reducing ecosystem-level pressures impacting biodiversity through a mixture of legislative and policy reforms, management arrangements and on-ground actions.

This draft *Great Barrier Reef Biodiversity Conservation Strategy 2012* seeks to recognise and build on these existing programs. This is addressed through a 'Framework for Action' based on three strategic objectives that form the basis of the Strategy and are aimed at restoring or maintaining ecosystem resilience and protecting biodiversity. They are:

- Engage communities and foster stewardship
- Building ecosystem resilience in a changing climate
- Improved knowledge

Each of the strategic objectives is supported by long-term objectives, outcomes and key actions. The success of this Strategy will be tracked through specific targets representing key areas of focus for biodiversity conservation.

To ensure a complementary approach to biodiversity conservation and management, this Strategy has been developed within the context of the Australian Government's *Australia's Biodiversity Conservation Strategy 2010-2030*, the Queensland Government's *Building Nature's Resilience: A biodiversity strategy for Queensland and the draft Australian Government Biodiversity Policy*. By 'nesting' this draft *Great Barrier Reef Biodiversity Conservation Strategy 2012* within these national and state policies a more coordinated approach will be taken to minimise threats to the biodiversity of the Great Barrier Reef.

The Great Barrier Reef Marine Park Authority will work in partnership with the Queensland and Australian Governments to implement many of the Biodiversity Conservation Strategy's actions, particularly those that address threats originating from catchments adjacent to the Great Barrier Reef. Local government, Traditional Owners, community groups and marine industries will play an important role in implementing on-ground conservation activities to reduce threats and enhance the resilience of the Great Barrier Reef.



## Framework for Action - Snapshot

The *Great Barrier Reef Biodiversity Conservation Strategy 2012* Framework for Action is based on three key objectives, each supported by long-term objectives, program level outcomes and key actions.

### Key objective 1 Engage communities and foster stewardship

#### Long-term objective

Promote stewardship and develop best practice approaches to ensure the long-term protection and management of the Great Barrier Reef Region.

#### Program level outcomes

- Improved awareness of the Great Barrier Reef, the pressures facing it and the actions needed to address those pressures.
- Expanded Sea Country Partnerships Program with Traditional Owners.
- Through Reef Guardian and industry stewardship programs, communities, individuals and businesses work together to build a healthier and more resilient Great Barrier Reef.
- Community contributing to biodiversity conservation at local and regional scales.

### Key objective 2 Building ecosystem resilience in a changing climate

#### Long-term objective

Reduce the threats to at-risk habitats, species and groups of species, especially those found in inshore areas.

#### Program level outcomes

- Decline in water quality reversed.
- Coastal ecosystems managed for biodiversity values.
- Vulnerability assessments completed and key actions implemented for all at-risk habitats, species and groups of species.
- Threats to inshore biodiversity systematically addressed.
- Maintain a high-standard and effective compliance program.

### Key objective 3 Improved knowledge

#### Long term objective

Improved protection and sustainable use of biodiversity supported by improved knowledge about habitats, species and groups of species.

#### Program level outcomes

- Increased science focus on:
  - At-risk habitats, species and groups of species
  - Conservation of inshore biodiversity.
- Knowledge of biodiversity enhanced through engagement with Traditional Owners, industry and the community.
- Raise awareness of the vulnerability of Great Barrier Reef biodiversity to climate change:
  - Identify and support strategies for adaptation
  - Enhanced adaptability of Reef-based industries to a changing climate.



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# 1 Introduction

Biodiversity includes all living things and the way they interact with each other and their environment.<sup>1</sup> Three levels of biodiversity are usually recognised:

- Genetic diversity – the variety of genetic information contained in individual micro-organisms, plants and animals
- Species diversity – the variety, size and age classes of species present in an area
- Ecosystem diversity – the variety of habitats, ecological communities and ecological processes.

Around the world biodiversity is under threat, mainly from human-related pressures such as deforestation, coastal development, direct and indirect use of natural resources, population growth and an increasing reliance on fossil fuels.<sup>2</sup> A further stress on ecosystems is a rapidly changing climate.<sup>3,4,5</sup> This can act to exacerbate the effects of the other threats.<sup>6,7</sup> In aquatic and marine ecosystems, this has led to declines in species populations (especially corals, fish, marine mammals and seabirds<sup>2</sup>), declines in water quality, increasing amounts of marine debris in the ocean and degradation of key marine habitats such as coral reefs.<sup>8</sup>

Biodiversity provides the basis for the majority of our food and resources, as well as many of our economic activities. It provides goods and services that sustain our wellbeing and our economy. Maintaining healthy and diverse marine ecosystems is important so they are better able to withstand, recover from or adapt to impacts and stressors; to provide for a productive and healthy environment and to provide essential biological resources, such as fish and prawns, which many human populations rely on.<sup>9</sup>

Conserving biodiversity is an essential part of safeguarding the Earth's biological resources.<sup>9</sup> It underpins our quality of life, our economy and much of our national identity. All living creatures depend on biodiversity and natural ecosystems to provide the goods and services that sustain our wellbeing and our economy, usually referred to as ecosystem services.<sup>10,2</sup> Maintenance of biodiversity is critical for the provision of ecosystem services.

## 1.1 About the *Great Barrier Reef Biodiversity Conservation Strategy 2012*

The *Great Barrier Reef Marine Park Act 1975* was amended in 2007 requiring the Great Barrier Reef Marine Park Authority (GBRMPA) to prepare an Outlook Report for the Great Barrier Reef Region every five years. In addition, the Objects of the Act were amended to read: *'The main object of this Act is to provide for the long term protection and conservation of the environment, **biodiversity** and heritage values of the Great Barrier Reef Region.'* This amendment clearly emphasises the importance that the Great Barrier Reef Marine Park Authority places on the protection and conservation of biodiversity.

The first Great Barrier Reef Outlook Report prepared by the Great Barrier Reef Marine Park Authority was published in 2009.<sup>11</sup> The Outlook Report provided information about the condition of the ecosystem of the Great Barrier Reef Region (including the ecosystem outside the Region where it affects the Region). It includes discussion on social and economic factors, management effectiveness and a risk-based assessment of the long-term outlook for the Region.

The Outlook Report underpins decision-making for the long-term protection of the Great Barrier Reef. The best available information was used to prepare the Outlook Report, and it was independently peer reviewed. It is a comprehensive stock-take of the Great Barrier Reef, providing a summary of the past and present condition and presents its possible future.

The Outlook Report identified the need for a framework for biodiversity conservation and management within the Great Barrier Reef Region to more effectively harness the resources available for management and the support of Great Barrier Reef industries and communities.

The *Great Barrier Reef Biodiversity Conservation Strategy 2012* has been developed to provide the overarching framework to guide and coordinate actions for the protection, conservation and management of biodiversity in the Great Barrier Reef.

## 1.2 Preparation of the Biodiversity Conservation Strategy

This draft *Great Barrier Reef Biodiversity Conservation Strategy 2012* has been prepared by the Great Barrier Reef Marine Park Authority and developed within the context of the Australian Government's *Australia's Biodiversity Conservation Strategy 2010-2030*,<sup>12</sup> the Queensland Government's *Building Nature's Resilience: A Biodiversity Strategy for Queensland*<sup>13</sup> and the draft Australian Government Biodiversity Policy released in 2011.<sup>14</sup> Through this complementary, or 'nested', approach, it is intended that it will provide a coordinated framework for biodiversity conservation and management within the Great Barrier Reef Region. It will form the basis for all stakeholders to respond to regional scale and local issues and implement actions to reduce the impact of identified pressures within their sphere of influence.

A number of Australian and Queensland government agencies, researchers, industry representatives and members of the public contributed to its development. The Great Barrier Reef Marine Park Authority's Ecosystem Reef Advisory Committee provided guidance throughout the development of the strategy, with advice from the Indigenous Reef Advisory Committee, Tourism and Recreation Reef Advisory Committee and the Catchment and Coastal Reef Advisory Committee.

No new research was undertaken as part of developing this Biodiversity Conservation Strategy; rather, the evidence used is derived from existing research and information sources. Figure 1 provides an overview of the key considerations in preparing this draft Strategy.

## 1.3 Scope of the Biodiversity Conservation Strategy

The area covered by this Strategy is the Great Barrier Reef Region, which covers the area of ocean from the tip of Cape York Peninsula in the north to past Lady Elliot Island in the south, with mean low water as its western boundary and extending eastwards a distance of between 70 and 250km (see Figure 2).

Protection of biodiversity in this region is challenged by complex factors originating beyond the Great Barrier Reef.<sup>11</sup> Therefore, where it is relevant, this Strategy also looks beyond the boundaries of the Region and includes information about ports, islands, marine areas and catchments adjacent to the Great Barrier Reef.

This Strategy will be reviewed every five years following publication of successive Outlook Reports. Further actions will be developed during the life of this Strategy, and the regular review will be a key part of determining future priorities, particularly in light of emerging pressures to the Great Barrier Reef and social and policy priorities.

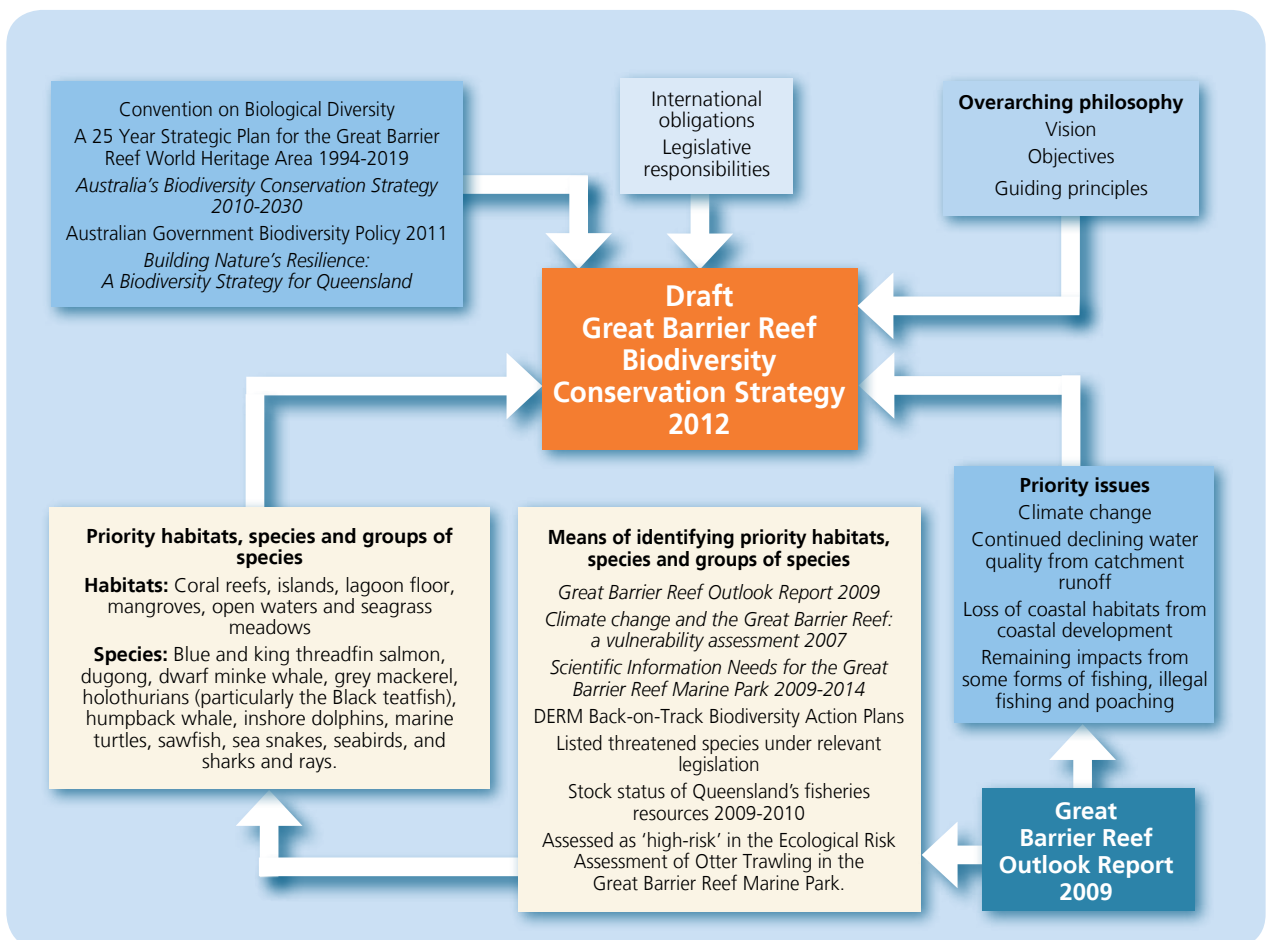


Figure 1 Key considerations in preparing the draft *Great Barrier Reef Biodiversity Conservation Strategy 2012*.



## Australia's commitment to the Convention on Biological Diversity

The Convention on Biological Diversity, ratified by Australia on 18 June 1993, deals with the full range of biological diversity conservation at a global level. It has three objectives – the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. The National Strategy for the Conservation of Australia's Biological Diversity is the Australian Government's key platform to implement the Convention on Biological Diversity and to bridge the gap between current activities and the effective identification, conservation and management of Australia's biological diversity. The Strategy's primary focus is Australia's indigenous biological diversity. Implementation of the Strategy will require actions affecting virtually all of Australia's land and sea, most of which will continue to be subject to a multiplicity of uses, either in parallel or in sequence. Governments, community groups, the private sector and individuals are engaged in numerous activities aimed at the conservation of biological diversity in Australia, but much remains to be done.



Figure 2 The Great Barrier Reef Region

## 2 The Great Barrier Reef

### 2.1 An outstanding natural icon

The Great Barrier Reef, one of Australia's first World Heritage properties, was inscribed on the World Heritage List in 1981 in recognition of its outstanding universal value. Specifically it was recognised as having outstanding examples of the following four natural criteria for World Heritage listing:

- Major stages of Earth's evolutionary history
- Superlative natural phenomena or exceptional natural beauty
- Significant ongoing geological processes, biological evolution and man's interaction with his natural environment
- Habitats where populations of rare or endangered species still survive.

It is one of the world's largest World Heritage properties extending over 2,300km and covering 348,000km<sup>2</sup> on the north-east continental shelf of Australia. Larger than Italy, it is one of the world's best known marine protected areas. The Great Barrier Reef's diversity reflects the maturity of the ecosystem which has evolved over many thousands of years. It is the world's most extensive coral reef system and has some of the richest biological diversity found anywhere.

Today the coral reef ecosystem ranges from inshore fringing reefs to mid-shelf reefs, and exposed outer reefs, including examples of all stages of reef development. The processes of geological and geomorphological evolution are well represented, linking islands, coral cays, reefs and sand barriers. The varied seascapes and landscapes have been moulded by changing climates and sea levels, and the erosive power of water, over long time periods.

The ecological integrity of the Great Barrier Reef World Heritage Area is enhanced by the unparalleled size and current state of the area. It contains nearly all the ecological and physical processes essential for the long-term conservation of the marine and island ecosystems and their associated biodiversity. This includes the fullest possible representation of marine ecological, physical and chemical processes from the coast to the

deep abyssal waters, enabling the key interdependent elements to exist in their natural relationships.

The Great Barrier Reef World Heritage Area is also intact as a complex aggregation of well protected ecosystems, with comprehensive and effective ongoing integrated management, including management influence over more than just the marine areas.

Biologically the unique diversity of the Great Barrier Reef reflects the maturity of an ecosystem that has evolved over millennia; evidence exists for the evolution of hard corals and other fauna. Globally significant marine animal groups include over 3000 species of molluscs; over 1500 species of fish; plus a great diversity of sponges, anemones, marine worms, crustaceans, and many others.<sup>15</sup> The establishment of cay and island vegetation shows the important role of birds, such as the pied imperial pigeon, in processes such as dispersal and colonisation. Similarly, island biogeography is demonstrated by remnant vegetation such as hoop pines.



Vegetated coral cays are one example of the outstanding natural values of the Great Barrier Reef

The long history of human interaction with the natural environment is illustrated by strong ongoing links between Aboriginal and Torres Strait Islander peoples and their sea country, and includes numerous shell middens, fish traps, and the application of story places and marine totems. It is for these and many other reasons why the Great Barrier Reef was listed as a World Heritage Area. The IUCN evaluation at the time of nomination stated ".....if only one coral reef site in the world were to be chosen for the World Heritage List, the Great Barrier Reef is the site to be chosen."

As a signatory to the World Heritage Convention, Australia has an obligation to protect, conserve, present and transmit to future generations the natural heritage and universal value of the Great Barrier Reef World Heritage Area.

## 2.2 Biodiversity of the Great Barrier Reef

Compared to many other ecosystems throughout the world, the biodiversity of the Great Barrier Reef Marine Park is well documented.<sup>11,16,17,18</sup> Nearly all groups of marine plants and animals are abundantly represented in the Great Barrier Reef, with thousands of different species recorded (Table 1). It is recognised that there are many new species yet to be discovered and named.<sup>15</sup> This extraordinary biodiversity and the interconnectedness of species and habitats make the Great Barrier Reef and the surrounding areas one of the most complex natural systems on earth.<sup>11, 19</sup>

As the world's largest coral reef ecosystem, it is a critical global resource. The reefs and surrounding areas are significant for Aboriginal and Torres Strait Islander peoples and have provided the basis for sustenance and been of cultural significance for thousands of years. The Great Barrier Reef and its natural resources are of vital social and economic importance to present and future generations.

Today, much of the economy derived from the Great Barrier Reef is based upon the use of its biological resources.<sup>11</sup> As an example, the commercial fishing industry which operates within the Great Barrier Reef Marine Park is almost totally dependent on natural ecological systems for productivity and sustainable profit. Almost all marine-based tourism and recreation in the Great Barrier Reef is nature-based and also reliant on a healthy and diverse ecosystem to provide a lasting impression for visitors who visit the Reef.<sup>11</sup>

When biodiversity is impacted by threats, whether

they be environmental or man-made, ecosystems can become unstable, affecting all things that rely on those ecosystems.<sup>20</sup> This has the potential to impact on the industries that rely on a healthy ecosystem for making their living and on the social values of that ecosystem.<sup>5, 9</sup>

## 2.3 Ecosystem services

Biodiversity and natural ecosystems provide goods and services that sustain our wellbeing and our economy, usually referred to as 'ecosystem services'. Historically, the value of ecosystem services has rarely been fully considered in decision-making. Healthy wetlands, for example, provide a natural water purification service, as well as flood protection, carbon sequestration, food products and much more. The disappearance of a wetland means that these services would need to be replaced by man-made capital, like a water treatment plant or a flood levee bank. The value of

the ecosystem service provided, and the cost of replacing this service through infrastructure provides an indication of the true value of such ecosystem goods or services ('natural capital') in the environment.

The interconnected nature of ecosystems within an area as diverse as the Great Barrier Reef means that management actions simultaneously affect a range of ecosystem services and ultimately affect multiple-user groups who rely on the natural resources of the area.<sup>10</sup>

Protection of biodiversity is critical to maintaining ecosystem functions, for example oxygen production, soil formation and retention, water and nutrient cycling. Well functioning ecosystems form the basis of ecological resilience<sup>6, 21</sup> and maintaining and

establishing ecosystem functions must be part of a whole-of-ecosystem approach to biodiversity conservation. A whole-of-ecosystem approach expands on and complements species-specific management actions, which remain fundamental for biodiversity conservation.

*Conserving biodiversity is not just desirable - it is essential. By protecting biodiversity, we are ensuring the essential ecosystem services for current and future generations.*





**Table 1** Overview of the biodiversity of the Great Barrier Reef

Habitats / communities	Percentage of the Great Barrier Reef Marine Park
Seagrass, shoals and sandy or muddy seabed (up to 200m deep)	~61%
Mangroves	~0.6%
Fringing reefs, mid-shelf reefs and outer reefs	7%
Continental shelf/slope	~15%
Deep water habitats	16%
Islands	~1%
Taxonomic group	Species diversity and level of knowledge in the Great Barrier Reef
Macroalgae	At least 630 species; level of knowledge for a limited number of species good; overall level of knowledge poor
Seagrasses	15 species; level of knowledge fairly good
Mangroves	39 species; level of knowledge fairly good
Sponges	At least 2500 species for all Queensland waters; overall level of knowledge poor
Jellyfish	>100 species; overall level of knowledge poor
Bryozoans	~950 species; overall level of knowledge poor
Soft corals and sea pens	At least 150 species; overall level of knowledge poor
Sea anemones	~40 species; overall level of knowledge poor
Hard corals	>450 species; knowledge for many reef-building species good; level of knowledge for remainder poor
Molluscs	>3000 species; overall level of knowledge medium; good for commercially important species
Worms	At least 500 species; level of knowledge poor but better for polychaetes than other groups
Crustaceans	~1300 species; overall level of knowledge poor; good for some commercially important species
Marine insects	Number of species unknown, probably >20, level of knowledge very poor
Marine arachnids	Number of species unknown, probably >5, level of knowledge very poor
Plankton	Species diversity very high; overall level of knowledge poor
Echinoderms	~630 species; some species well studied, i.e. crown-of-thorns starfish, but majority poorly known
Ascidians/Tunicates	~720 species for all Australian waters; overall level of knowledge poor
Bony fishes	~1625 species; level of knowledge good for some coral reef and commercially important species; poor for remainder
Sharks and rays	~133 species; level of knowledge generally poor but improving
Crocodiles	One species estuarine crocodile; level of knowledge good
Marine turtles	Six species; level of knowledge generally good
Sea snakes	14 breeding species; level of knowledge good for several species; but remainder poor
Seabirds	22 nesting species; level of knowledge good for some species; poor for remainder
Marine mammals	>30 species of whales and dolphins and 1 species of dugong; overall knowledge for dugong and humpback whale good; for remainder poor to very poor



# 3 Threats and pressures

## 3.1 The Great Barrier Reef is at a crossroad

The *Great Barrier Reef Outlook Report 2009* identified that the Great Barrier Reef ecosystem is at a crossroad, and it is decisions made in the next few years that are likely to determine its long-term future. The Outlook Report identified that the Great Barrier Reef Region is threatened by a suite of impacts including climate change, declining water quality from catchment run-off, habitat loss from coastal development, illegal fishing and poaching, and some remaining impacts of lawful fishing.

The Outlook Report assessed habitats that support species, populations of species and groups of species and the ecological processes that contribute to ecosystem health as well as a high level assessment of the effectiveness of biodiversity protection. These assessments indicated that the majority of habitats and populations of species and groups of species are intact, but that some inshore habitats and some populations such as dugongs, as well as some species of sharks, seabirds and marine turtles, are known to have seriously declined, due mainly to human activities and the resultant decline in environmental conditions. There were also concerns that populations of some species may have declined but there was insufficient data to confirm this. The summary for ecosystem health indicated that many of the key processes of the Great Barrier Reef ecosystem are changing and this is negatively affecting the health of the ecosystem.

## 3.2 Climate change as a primary driver of ecosystem change

Unavoidably, future predictions of climate change dominate most aspects of the Great Barrier Reef's outlook over the next few decades. The extent and persistence of the damage to the ecosystem will depend to a large degree on the amount of change in the world's climate and on the resilience of the Great Barrier Reef ecosystem in the immediate future.<sup>11</sup> Impacts from climate change have already been



Bleached branching corals as a result of high water temperatures witnessed and all parts of the ecosystem are vulnerable to its increasing effects, with coral reef habitats the most vulnerable. Marine turtles<sup>22</sup> and seabirds<sup>23,24</sup> are also likely to be highly vulnerable. Changes to the ecosystem because of climate change are likely to have serious implications for dependent industries and communities.

The average annual sea surface temperature on the Great Barrier Reef is likely to continue to rise over the coming century and could be as much as 1 °C to 3 °C warmer than the present average temperatures by 2100. In the last 15 years there have been two severe mass coral bleaching events (1998 and 2002) resulting from prolonged elevated sea temperatures. In addition, Great Barrier Reef waters are predicted to become more acidic. Even relatively small increases in ocean acidity will decrease the capacity of corals to build skeletons and therefore create habitat for reef biodiversity in general. Sea level on the Great Barrier Reef has already risen by approximately 3mm per year since 1991. Changes in the climate also mean that weather events are likely to become more severe. Almost all Great Barrier Reef species and habitats will be affected by climate change, some seriously.

### 3.2.1 Climate change driving adaptive management

The conservation and management of biodiversity in a changing climate requires a re-evaluation of what outcomes we are trying to achieve. Future management objectives aimed at maintaining all species in their present locations and ecosystems in their present condition will no longer be achievable.<sup>6</sup>

Current climate change projections indicate that the rate of change within natural ecosystems will be very swift compared to those recorded in the past and the magnitude of change is expected to be large in many instances. In addition, further climate-related impacts are inevitable even under the most optimistic mitigation scenarios due to the lag effect of current levels of greenhouse gases continuing to influence the Earth's climate.

The conservation and management of biodiversity in a changing climate requires a re-evaluation of what outcomes we are trying to achieve. Future management objectives aimed at maintaining all species in their present locations and ecosystems in their present composition will no longer be achievable.

*Steffen et al., 2009*<sup>6</sup>

While the complexities of the Earth's ecosystems prevent precise predictions of future conditions, there is now strong scientific consensus and high confidence in fundamental aspects of climate change. These include future warming, rising sea levels and acidification of the oceans. Impacts are already being observed consistent with climate projections, such as increasing frequency of coral bleaching events, sea level rise and reduced growth rates in calcifying organisms like corals. It is clear that further delays in action on climate change will result in more severe impacts, fewer available options for action and increased costs of damage and intervention.<sup>25</sup> As a result, management objectives need to be reoriented from preserving all species in their natural habitat and current locations to ensuring space and opportunities are available for ecosystems to adapt and reorganise. This will increase the chances that they can maintain the provision of ecosystem services through a diversity of well-functioning ecosystems.<sup>6</sup>

### 3.3 Climate change and the Great Barrier Reef: A vulnerability assessment

A comprehensive assessment of the vulnerability of the biodiversity of the Great Barrier Reef was prepared in 2007.<sup>16</sup> This assessment was commissioned to



White capped noddies nesting in *Pisonia* trees



Marine turtles are one group of animals that are sensitive to the impacts of climate change

comprehensively assess current knowledge about climate change vulnerability and to identify strategies for building resilience. These insights provided the foundations for the *Great Barrier Reef Climate Change Action Plan 2007-2012*,<sup>7</sup> and are a fundamental reference for the development of this draft Strategy and future Climate Change action plans.

The proactive adaptive management strategies undertaken to protect and manage the Great Barrier Reef in relation to climate change were independently evaluated as a component of preparing the Outlook Report.<sup>26</sup> The report found that the management agencies responsible for the Great Barrier Reef are contributing significantly to the development of international best practice for managing climate change issues as they relate to coral reef ecosystems. The Outlook Report also found that the comprehensive vulnerability assessment of the Great Barrier Reef provides good contextual information for management of climate change impacts.

The evaluation concluded that the 'key threats such as increasing sea temperatures, ocean acidification, sea level rise and increased severity of storm events are recognised. Significant resources are being allocated by all levels of government and industry to assess threats and develop adaptation plans, and measures are in place for many aspects relating to the Great Barrier Reef. For example, the implementation of the \$8.9 million Great Barrier Reef Climate Change Action Plan is aimed at understanding the vulnerability of the Great Barrier Reef and helping to build resilience to climate change in the ecosystem and the communities and industries that depend on it.'

However, the Outlook Report recognises that for all these plans and measures, the challenge remains to translate them into specific policies and measurable on-ground actions. The Outlook Report acknowledges that ultimately, if changes to the world's climate become too severe, no management actions will be able to climate-proof the Great Barrier Reef ecosystem.



Climate change poses an enormous danger and a new challenge for the protection of our natural heritage. What can marine managers do about changes that are worldwide in scope? We must start with understanding what the impacts on tropical marine ecosystems could be. Identifying the most sensitive species and habitats is an important outcome of this book. Identifying impacts that the ecosystem cannot tolerate is another. Efforts can then be targeted towards protecting these areas.

As we experience climate change, we are starting to see real action to reduce greenhouse gas emissions. Governments and industries from around the world are accepting the reality of climate change and are building strategies to reduce their carbon footprint. These efforts must continue. We are committed to some change and we must prepare for it. But efforts to reduce greenhouse gas emissions and the extent of climate change are in our hands.

Based on solid facts, we must work together to find solutions. For without solutions, the Great Barrier Reef and all life is in peril.



Jean-Michel Cousteau,  
Founder and President, Ocean Futures Society

Foreword: *Climate Change and the Great Barrier Reef: A Vulnerability Assessment*<sup>16</sup>

### 3.4 Cumulative impacts and threats from extreme weather events

There have been large-scale cumulative impacts on coral reefs in the Great Barrier Reef from crown-of-thorns starfish outbreaks in the late 1900s<sup>27</sup> combined with repeated mass coral bleaching events in 1998 and 2002 and physical damage caused by extreme weather events in the last six years (category 4 tropical cyclones Ingrid [2005] and Ului [2010]; category 5 tropical cyclones Larry [2006], Hamish [2009] and Yasi [2011]; Figure 3). This means coral reef habitats in the area between Cooktown and Rockhampton have not had an opportunity to recover from these major disturbances. The regional scale of these cumulative impacts is unprecedented in the history of scientific monitoring of the Great Barrier Reef; together these disturbance events have caused damage to reefs spanning a distance of over 1000km.

In the past few years severe tropical cyclones Hamish and Yasi, both category five storms, have also had a significant impact on the Coral Reef Fin Fish Fishery, which relies primarily on catches of live coral trout (*Plectropomus leopardus*) to supply the overseas market. Following cyclone Hamish, commercial fishers observed significant physical damage to many reefs and they also suffered a serious reduction in catch rates of coral trout and other species.<sup>28</sup> This led to some fishers shifting their fishing effort from the southern Great Barrier Reef area to reefs offshore of Bowen and further north.<sup>28</sup> In February 2011 tropical cyclone Yasi damaged reefs in the central Great Barrier Reef and the reduced commercial catch rates of coral trout has continued in some areas.

Major flooding events in the 2009/2010 and 2010/2011 wet seasons has meant that inshore areas have received significant amounts of sediments, nutrients and pollutants. This has resulted in coral mortality at some nearshore coral reefs and a significant decline in seagrasses between Cairns

and the southern limits of the Great Barrier Reef Marine Park and into Hervey Bay. There has also been significant physical damage to seagrass meadows as a result of cyclone Larry and cyclone Yasi.

Similar events in the past<sup>29</sup> have highlighted the need for management agencies to consider appropriate responses to these extreme weather events. The impacts of two major floods and a cyclone in Hervey Bay in early 1992 resulted in the loss of 1000km<sup>2</sup> of seagrass, a dramatic decline in the dugong population in the area and a significant increase in dugong and green turtle mortality.<sup>29</sup> The results of the most recent aerial survey to count dugong in the Hervey Bay area (in 2005) indicated that the population had still not returned to the numbers recorded prior to 1992 but were recovering.<sup>30</sup> Based on the environmental and ecological impacts of the Hervey Bay extreme weather event in 1992, it is predicted that the more recent widespread flooding events and the subsequent loss of seagrass will have a significant impact on the dugong and green turtle populations along the urban coast of Queensland south of Cairns. Unfortunately, the seagrass loss from these extreme weather events will only compound the concerning situation with seagrass meadows along the east coast of Queensland, which had already declined in abundance over the last 3-4 years.<sup>31</sup>

The magnitude of these extreme weather events represents an unprecedented challenge for all users of the Great Barrier Reef. Given the level of impact highlighted above and the ecosystem-level changes already being observed, reducing the impacts of threats to the Great Barrier Reef ecosystem is critical.

In the area impacted by these high-intensity cyclones and widespread flooding, emphasis may need to focus on slowing the rate of decline of habitats and species and more actively implementing adaptation strategies.



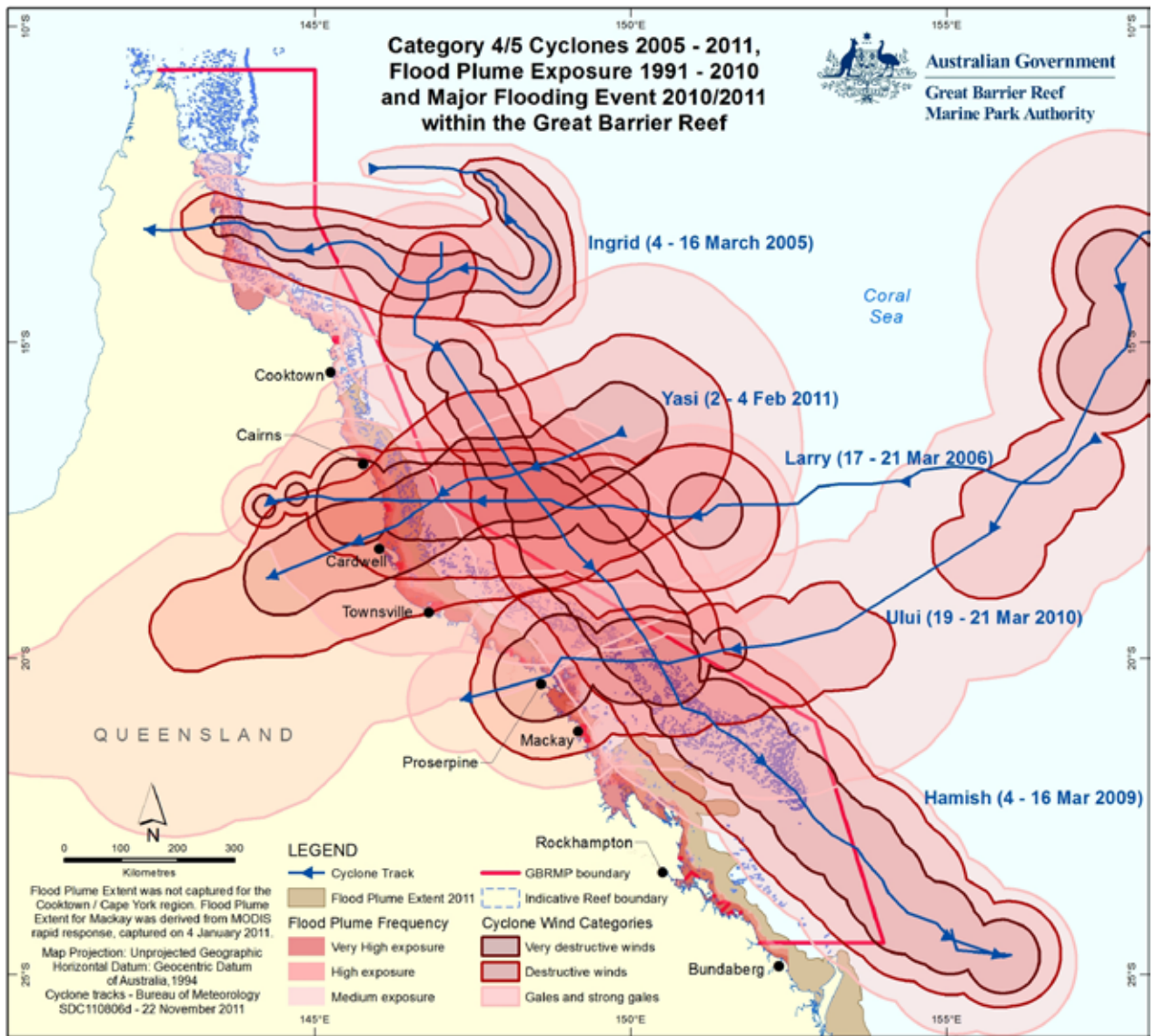


Figure 3 Map showing the dates and extent of the category 4 and 5 cyclones impacting the Great Barrier Reef Region since 2005.



# 4 Identifying what is at risk

Research and monitoring have identified that populations of some species have undergone steep declines in the past century. There is a clear need to implement measures to better understand and address these declines. Relevant examples include a significant decline in the dugong population along the urban coast of Queensland,<sup>32</sup> significant declines in freshwater and green sawfish<sup>33,34</sup> and for some species of seabird that nest on islands and cays within the Great Barrier Reef.<sup>35,36,37</sup>

To identify the at-risk habitats, species and species groups to be assessed as part of this draft Strategy, a hierarchical approach was applied based on existing information. In particular, habitats and species were assessed if they are:

- assigned an assessment grade of 'poor' or 'very poor' in the *Outlook Report*.<sup>11</sup>
- assessed as vulnerable to the impacts of climate change in the *Climate Change and the Great Barrier Reef: A vulnerability assessment*.<sup>16</sup>
- identified as having a high/moderate degree of concern to management and low/moderate adequacy of information in the *Scientific Information Needs for the Management of the Great Barrier Reef Marine Park 2009-2014*.<sup>18</sup>
- identified as a priority species in the Department of Environment and Resource Management's (DERM) *Back-on-Track Biodiversity Action Plans*.<sup>38,39,40,41,42</sup>
- a listed species under the *Environment Protection and Biodiversity Conservation Act 1999*; the *Nature Conservation Act 1992* or a protected

species under the *Great Barrier Reef Marine Park Regulations 1983*.

- identified as having an exploitation status of 'overfished' or 'uncertain' in Fisheries Queensland's *Stock status of Queensland's fisheries resources 2009-2010*.<sup>43</sup>
- assessed as having a 'high-risk' rating in the draft ecological risk assessment of otter trawling in the Great Barrier Reef Marine Park (Trawl ERA).



## 4.1 At-risk habitats, species and groups of species

The following habitats (Table 2), species and groups of species (Table 3) were identified as 'at-risk' following the application of this hierarchical assessment process. They represent those elements of biodiversity that are the focus for this draft Strategy. However, it must be recognised that this list is not definitive and habitats and species will be added should information and assessments indicate they are a priority for management.



Dugong foraging on seagrass



Freshwater sawfish

Photo: Stirling Peveell

**Table 2** At-risk habitats and remaining pressures

Habitats	Remaining pressures acting on these habitats
<b>Coral reefs</b>	Coral reefs are exposed to multiple pressures including climate change, extreme weather events, declining water quality and coastal development (for shallow water fringing reefs). They are also at risk from outbreaks of crown-of-thorns starfish.
<b>Islands</b>	Islands are exposed to multiple pressures including climate change and impacts from extreme weather events, and are recognised as nodes of entry for invasive species. They are a primary nesting site for marine turtles and seabirds and a major tourism destination.
<b>Lagoon floor</b>	Overall this habitat is not well understood but considered to be exposed to multiple pressures including climate change, declining water quality and in some areas physical impacts from the trawl fishery.
<b>Mangroves</b>	Mangroves are exposed to multiple pressures including climate change, declining water quality and coastal development.
<b>Open waters</b>	Overall this habitat is not well understood but considered to be exposed to multiple pressures including climate change, declining water quality, marine debris and fishing, especially inshore.
<b>Seagrass meadows</b>	Seagrass meadows are exposed to multiple pressures including climate change, declining water quality and coastal development. They are also very susceptible to damage and degradation from extreme weather events like cyclones and major flooding events. Latest studies show a decline in the overall extent of seagrass meadows within the Great Barrier Reef Region. <sup>31</sup>

**Table 3** At-risk species or groups of species in the Great Barrier Reef Region and remaining pressures

Species or groups of species	Remaining pressures acting on this species or species group
<b>Bony fish – king and blue threadfin salmon</b>	Stock status for king threadfin salmon assessed as ‘uncertain’ in the East Coast Inshore Fin Fish Fishery (ECIFFF) and there are concerns about significant population declines along the east coast and harvesting of fish before they can change sex from male to female. Both species of threadfin are exposed to multiple pressures including climate change, declining water quality from catchment run-off, loss of habitat from coastal development and commercial and recreational fishing.
<b>Bony fish – grey mackerel</b>	Stock status for grey mackerel assessed as ‘uncertain’ in the ECIFFF. This species is exposed to multiple pressures including climate change, declining water quality from catchment run-off, loss of habitat from coastal development and commercial and recreational fishing.
<b>Bony fish – snapper</b>	Stock status of snapper assessed as ‘overfished’ in the Rocky Reef Fin Fish Fishery, which has led to concerns about a significant population decline in the southern Great Barrier Reef.
<b>Dugong</b>	Dugong are exposed to multiple pressures including climate change, declining water quality from catchment run-off, habitat loss from coastal development, incidental capture in mesh nets, boat strike, disease and unsustainable traditional hunting and illegal hunting. There has been a significant population decline along the urban coast of Queensland. The dugong has been identified as a priority species under DERM’s Back-on-Track Biodiversity Action Plans. The dugong is listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> ; the <i>Nature Conservation Act 1992</i> and is a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> .
<b>Dwarf minke whale</b>	The Great Barrier Reef Marine Park Authority permits one of the only swim-with-whale activities in the world. This is a high-profile activity and requires good information and targeted research to ensure it is ecologically sustainable with minimal risks for the people and the dwarf minke whales. The dwarf minke whale is listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> and is a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> .
<b>Holothurians (sea cucumbers)</b>	There are concerns regarding the risk of local depletion for sea cucumbers, particularly the black teatfish; the black teatfish fishery is the only commercial fishery to be closed in the Marine Park; many species of holothurians are data-deficient and understanding of their ecological role is lacking.

Table 3 ....continued

Species or groups of species	Remaining pressures acting on this species or species group
<b>Humpback whale</b>	The humpback whale population that migrates along the eastern Australian seaboard is increasing at ~10 per cent/year which will lead to an increase in interactions with users of the Marine Park. The humpback whale is listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> ; the <i>Nature Conservation Act 1992</i> and are a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> .
<b>Inshore dolphins</b>	The three species of inshore dolphin, the Australia snubfin, the Indo-Pacific humpback and the inshore bottlenose dolphin are exposed to multiple pressures including climate change, declining water quality from catchment run-off, habitat loss from coastal development and incidental capture in set mesh nets set by commercial fishers or under the Queensland Shark Control Program. The Australia snubfin and Indo-Pacific humpback dolphins maintain small populations with limited home ranges, making them particularly sensitive to local disturbances. Both the Australian snubfin and Indo-Pacific humpback dolphins are listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> ; the <i>Nature Conservation Act 1992</i> and are a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> . Inshore dolphins are also identified as priority species under DERM's Back-on-Track Biodiversity Action Plans.
<b>Marine turtles</b>	Marine turtles are exposed to multiple pressures including climate change, declining water quality from catchment run-off, habitat loss from coastal development; some direct and indirect impacts from commercial and recreational fishing; unsustainable traditional hunting (green turtles) and illegal hunting, which have resulted in significant population declines for some species. All marine turtle species in the Great Barrier Reef are listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> ; the <i>Nature Conservation Act 1992</i> and are a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> . All species listed as priority species in DERM's Back-on-Track Biodiversity Action Plans.
<b>Sawfish</b>	Sawfish are exposed to multiple pressures including climate change, water quality, coastal development and commercial and recreational fishing. All sawfish species are protected species in the Great Barrier Reef Marine Park and listed as 'no-take' species under Queensland fisheries regulations because of concerns about population declines. The dwarf, freshwater and green sawfish are listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> and are a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> . The green, freshwater and dwarf sawfish have been identified as priority species under DERM's Back-on-Track Biodiversity Action Plans.
<b>Sea snakes</b>	Sea snakes are exposed to multiple pressures including climate change, water quality, coastal development and commercial fishing. Two species, <i>Hydrophis elegans</i> and <i>H. ornatus</i> have been identified as 'high-risk' species in the Trawl Ecological Risk Assessment. All sea snakes are listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> and are a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> .
<b>Seabirds</b>	Seabirds are exposed to multiple pressures including climate change, water quality, coastal development and commercial fishing possibly linked to availability of prey because of a decline in predatory fish. Many species of seabirds are listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> ; the <i>Nature Conservation Act 1992</i> and are a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> .
<b>Sharks and rays</b>	Sharks and rays are exposed to multiple pressures including climate change, declining water quality from catchment run-off, loss of habitat from coastal development and commercial and recreational fishing. Many species are data-deficient. The grey nurse shark, whale shark, white shark, speartooth shark and mako (both short-finned and long-finned) are listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> ; the <i>Nature Conservation Act 1992</i> (except the mako) and are a protected species under the <i>Great Barrier Reef Marine Park Regulations 1983</i> . The estuary stingray, white shark, speartooth shark (Bizant River shark) and grey nurse shark have been identified as priority species under DERM's Back-on-Track Biodiversity Action Plans. Eleven species of ray ( <i>Aptychotrema rostrate</i> , <i>Hypnos monopterygius</i> , <i>Himantura astra</i> , <i>Neotrygon kuhlii</i> , <i>Neotrygon picta</i> , <i>Trygonoptera testacea</i> , <i>Urolophus flavomosaiacus</i> , <i>Dipturus apricus</i> , <i>Dipturus polyomata</i> , <i>Dipturus endeavouri</i> and <i>Gymnura australis</i> ) are identified as 'high-risk' species in the Trawl Ecological Risk Assessment.

## 4.2 Vulnerability assessments

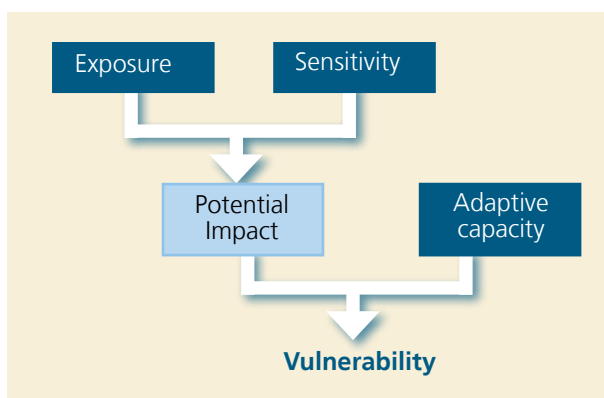
To aid and inform the *Great Barrier Reef Biodiversity Conservation Strategy 2012*, vulnerability assessments are being completed on those habitats, species and groups of species identified in the previous section.

These vulnerability assessments:

- identify key sources of vulnerability for each at-risk habitat, species and groups of species
- identify appropriate and practical management actions that could be taken to mitigate risks and enhance ecosystem resilience
- identify gaps in management effectiveness, including deficiencies in legislation and policy, and those areas where additional research is required for making informed decisions.

The vulnerability assessments guide the implementation of priorities for action in this Biodiversity Conservation Strategy.

The vulnerability assessments are being prepared by the Great Barrier Reef Marine Park Authority using a standard approach to assess exposure and sensitivity, and adaptive capacity to potential impacts (Figure 4) based on the best-available information on that particular habitat, species or group of species. They are then peer-reviewed by natural resource managers and researchers who were considered to be authorities on that particular element of biodiversity.



**Figure 4** The key components of vulnerability assessments (adapted from Wachenfeld *et al.*, 2007).<sup>44</sup>

The purpose of this vulnerability assessment process is to provide a mechanism to highlight concerns and make assessments of the vulnerabilities for habitats, species or group of species to known sources of pressure within the Great Barrier Reef. These assessments are not designed to be a comprehensive ecological risk assessment, but to identify and document the pressures using a standardised and transparent process.

The vulnerability assessments are also a key resource for consultation and engaging with other groups and agencies that either have a management responsibility for the habitats, species or group of species or have influence over the pressures that are impacting the habitat or species. The development of the vulnerability assessments provides an opportunity

... there is an urgent need for a systematic approach to addressing the cumulative impacts on inshore biodiversity.

to gain a shared understanding of their concerns and resource limitations and then develop complementary actions to maximise outcomes.

Measures to reduce the pressures acting on biodiversity must be practical, pragmatic and included within relevant work programs or the effectiveness of such measures will be compromised. The information from the vulnerability assessments will be used to inform the implementation of the Framework for Action outlined in Section 6.

Vulnerability assessments available for each of the habitats, species or species

groups listed in the previous section can be seen at [www.gbrmpa.gov.au](http://www.gbrmpa.gov.au).



*Australian snubfin dolphin*

*Photo: Guido Parra*

## 4.3 Risks to inshore biodiversity

A significant majority of the identified at-risk habitats and species in this draft Strategy occur in inshore areas<sup>a</sup>. The vulnerability assessments have identified overwhelming evidence indicating that inshore habitats and species are being impacted by a range of threats including declining water quality due to catchment run-off, loss of habitat due to coastal and port development, some remaining impacts of fishing and climate change. While there have been large-scale projects to better understand biodiversity and habitats of the Great Barrier Reef and significant programs addressing aspects of water quality and specific inshore species, there is an urgent need for a systematic approach to addressing the cumulative impacts on inshore biodiversity.

<sup>a</sup> For the purposes of this Strategy, inshore areas include (but are not limited to) those areas extending up to 20km offshore from the coast and which correspond to Enclosed Coastal and Open Coastal water bodies as described in the Water Quality Guidelines for the Great Barrier Reef Marine Park (2010)<sup>45</sup>.



## The time to focus on the threats acting on inshore biodiversity is now.

Unprecedented losses of dugong and green turtles in 2011 have highlighted the fragility of the inshore ecosystems along the developed parts of the Great Barrier Reef coast. Signs that inshore ecosystems are under stress have been apparent for many decades, and while the rate of loss of dugong in 2011 was unprecedented in recent times, historically the dugong population along this coast had been reduced by more than ninety percent with signs of the decline occurring as early as the 1960s.<sup>32</sup> The recent dugong and turtle deaths have predominantly been caused by the loss of the seagrass meadows, the primary food for these species, following flooding and cyclones in late 2010 and early 2011. However, a steady decline in the abundance of seagrass meadows along parts of the coast of Queensland has become evident, at least since regular monitoring commenced in the last 3-4 years.<sup>31</sup> Recently scientists have also used cores taken from inshore reef flats to assess changes in coral communities over more than 800 years. This research found that the predominant coral species at Pelorus Reef (in the Palm Group located just north of Townsville) had remained stable for more than 800 years, until the 1930s when substantial changes in the inshore coral reef communities occurred, following land clearing in the adjacent catchments.<sup>46</sup>

Significant range contractions and population declines have occurred for the freshwater and green sawfish<sup>34</sup>, listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and most concerning of all is the possibility that the spartooth shark, listed as critically endangered under the EPBC Act, has now become extinct on the east coast of Australia.<sup>34</sup> Not a single specimen was found when recent surveys were undertaken to search for the spartooth shark along the east coast, which means that the last verified specimen was recorded from the Bizant River, which flows into Princess Charlotte Bay, in 1983.<sup>34</sup>

One of the main reasons that inshore species are particularly vulnerable is that they often have life history traits and behaviours that predispose them to exposure to human-related threats. Many are relatively long-lived and maintain small home ranges (the areas where they spend most of their time). This reliance on a small home range is exhibited by the Australian snubfin dolphin<sup>47</sup>, arguably the Reef's most threatened marine mammal. Recent evidence suggests that commonly fished species such as king threadfin salmon<sup>48</sup> and grey mackerel<sup>49</sup> also maintain discrete local populations at spatial scales of less than 100km. These localised populations are particularly susceptible to cumulative impacts associated with declining water quality, coastal development and intensive localised fishing pressure.

Despite being right on our doorstep, little is known about many inshore species. Compared with the relatively safe and clear waters associated with the mid-shelf and outer reefs, inshore waters are often turbid, which makes the conduct of scientific surveys challenging. In this day and age it seems inconceivable that a large marine mammal like the Australian snubfin dolphin is so poorly known that its conservation status cannot even be assessed under the EPBC Act, but this is the case for this species. What we do know is that this inshore specialist feeds on fish and squid in shallow waters (<5m deep)<sup>50</sup>, and is typically found in bays with large river systems draining into them.<sup>46</sup> Research has shown that these dolphins live in small groups (~100 animals per embayment)<sup>51</sup>, and like the king threadfin salmon maintain very small home ranges (<200km<sup>2</sup>) with no interchange of animals from nearby bays.<sup>51</sup> This maintenance of small home ranges with no intermixing means that this species is particularly susceptible to localised extinction, especially from human-related threats. This situation is even more concerning because within the Great Barrier Reef World Heritage Area, current information indicates that large groups of Australian snubfin dolphin have only been recorded from three areas: Princess Charlotte Bay and Bathurst Bay on Cape York Peninsula<sup>47</sup>, Cleveland Bay near Townsville<sup>47</sup> and Keppel Bay at the mouth of the Fitzroy River.<sup>52</sup> Of these three sites, one is a major port with an extensive expansion program (Townsville), and the other two sites are currently being assessed for new port developments.

The resources boom in Queensland has outstripped the capacity of current port facilities to handle the export of coal and other commodities. The scale and scope of the expansion programs for existing ports and proposals for new ports to meet these export demands is unprecedented and will necessitate the

development of large-scale coastal infrastructure and commensurate increases dredging activities, shipping movements and the number of ships moored in the Great Barrier Reef Marine Park awaiting loading. Many of the at-risk habitats, species and groups of species identified in this draft Strategy can be found in these areas.

The rapid urban expansion, mining and development or expansion of ports and related infrastructure currently occurring along the Great Barrier Reef is adding further pressures to inshore biodiversity and must be considered in the context of the decline of water quality from catchment run-off, habitat loss from other coastal development, some remaining impacts of fishing, illegal fishing and poaching, climate change and recent cyclones and the extreme weather events of 2010/2011.

The Great Barrier Reef Water Quality Protection Plan (Reef Plan) has been a significant initiative, and is making measurable progress towards the goal of halting and reversing the decline in water quality entering the Great Barrier Reef. The progress towards this goal reflects the level of commitment by both the Australian and Queensland Governments, who are investing in excess of \$375 million over five years on Reef Plan activities.

*... very substantial progress has been made towards halting and reversing the decline of Great Barrier Reef water quality.*

This includes \$200 million for the Australian Government's Caring for our Country Reef Rescue initiative and \$175 million for Reef Plan activities through the Queensland Government, including \$50 million to implement the Reef Protection Package. As importantly, the progress to date reflects the very strong commitment and collaboration by key stakeholders, including the Australian Government, the Queensland agencies, the Great Barrier Reef Marine Park Authority, Natural Resource Management groups and industry.

As a result of these actions, substantial progress has been made towards halting and reversing the decline of Great Barrier Reef water quality. It is important that this work continue through to achieving the goal of *ensuring that by 2020 the quality of water entering the reef from adjacent catchments has no detrimental impact on the health and resilience of the Great Barrier Reef.*

In the course of developing this draft Strategy there have been some significant changes in the way that a number of proactive major resource sector companies are planning and evaluating their proposed port developments; particularly with regard to the understanding, minimisation and management of potential impacts on biodiversity and heritage values of the Great Barrier Reef. For example, in an industry-led voluntary approach, BHP Billiton, GVK Hancock Coal and Adani, along with North Queensland Bulk Ports, as the port authority, are working together to prepare a cumulative environmental impact assessment for their proposed projects at the Port of Abbott Point (located to the north of Bowen). This initiative is over and above what is required under relevant Commonwealth legislation and policy and demonstrates a commitment to understand the cumulative nature of their separate projects.

This voluntary assessment is scientifically based, comprising over 15 individual technical studies culminating in an overarching report involving leading scientific research organisations including James Cook, Southern Cross and Curtin Universities and the Defence Science and Technology Organisation. In addition, eminent waterbird, marine and heritage experts have been engaged in a peer review process. This comprehensive cumulative impact assessment will be used to inform individual approval decisions at the Port, while also providing a framework to better locate and design resource and port-related infrastructure to avoid and minimise potential impacts on the Great Barrier Reef and adjacent coastal habitats.

Strategic and effective management of development, targeted research and on-ground actions are essential if we are going to address the habitat and species declines in the inshore areas of the Great Barrier Reef World Heritage Area. The success of the Reef Water Quality Protection Plan and the coordinated development assessment for Abbott Point Port provide solid models for effective and integrated management of our coastal resources. Together they demonstrate that through strategic approaches to development planning, in combination with regional coordinated natural resource management programs, we can more effectively manage for sustainable development and take actions that will halt and reverse the decline of our coastal ecosystems.

# 5 Addressing ecosystem-level threats

## 5.1 Building on a solid foundation

For more than 35 years the Commonwealth and Queensland governments have managed this multiple-use natural resource to ensure its long-term sustainability. They do this by balancing ecologically sustainable use, commercial realities and an overarching conservation objective. The Great Barrier Reef Marine Park is considered by many to be a leading example of world's best practice management. The Great Barrier Reef Marine Park Authority works in partnership with stakeholders, Traditional Owners, marine industries and interest groups, communities and all levels of government to achieve its goal of the long-term protection, ecologically sustainable use, understanding and enjoyment of the Great Barrier Reef for all Australians and the international community, through the care and development of the Marine Park.

## 5.2 A multifaceted approach to management

The Great Barrier Reef Region is managed under a comprehensive statutory framework (legislation, policies and management arrangements) administered by the Australian and Queensland governments (Figure 5).

A range of management tools (Table 4) are employed both inside the Great Barrier Reef Region and beyond its boundaries to address issues and manage activities which have an impact on the Great Barrier Reef Region. The management of some of the main activities is principally confined to actions within the Great Barrier Reef Region (such as commercial fishing and marine tourism, defence and scientific research); while some of the major pressures require actions outside and sometimes well beyond the Great Barrier Reef (such as climate change, coastal development and water quality). This also extends to meeting a range of obligations under various international agreements and conventions.

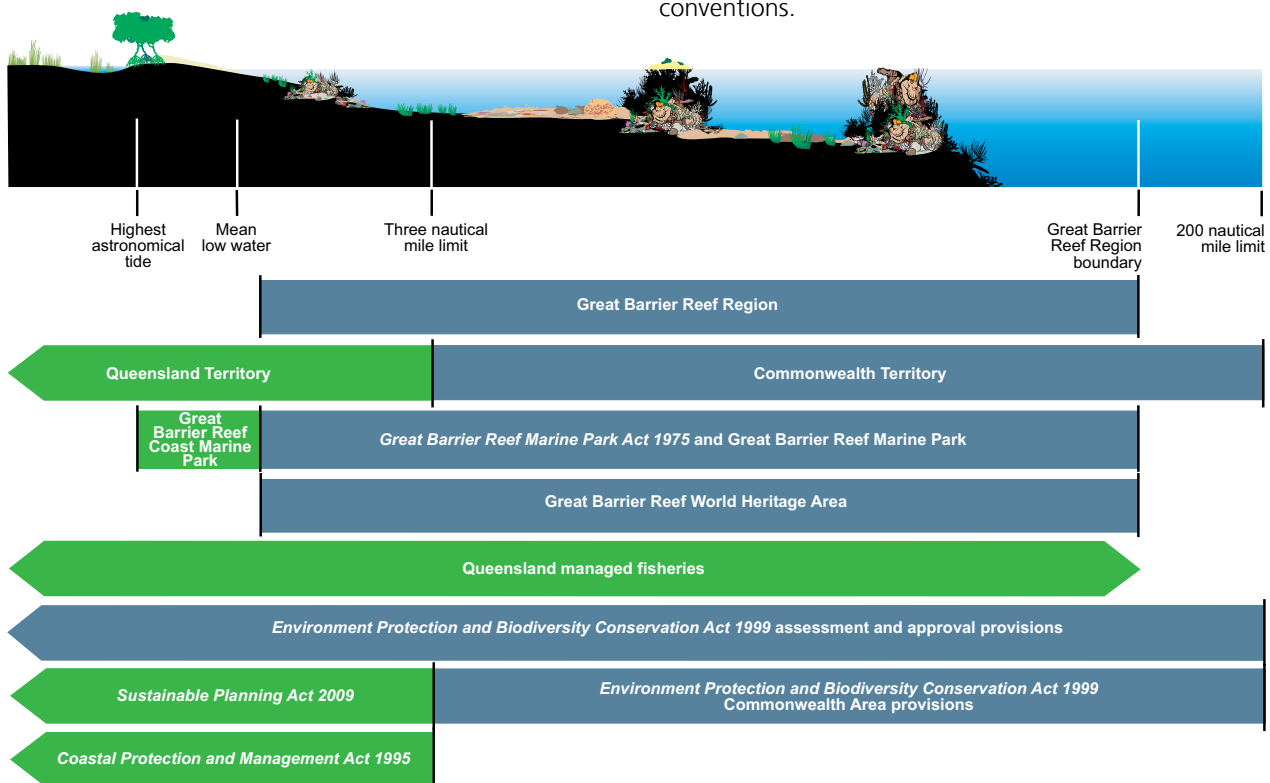


Figure 5 Jurisdictional boundaries for the Great Barrier Reef Region (Source, *Great Barrier Reef Outlook Report 2009*).<sup>11</sup>

**Table 4** Summary of the management tools used in addressing the broad management topics of the Great Barrier Reef (Source: *Great Barrier Reef Outlook Report 2009*).<sup>11</sup>

Management tools	Management topics											
	Biodiversity protection	Climate change	Coastal development	Commercial marine tourism	Defence	Fishing	Heritage	Ports and shipping	Recreation (not including fishing)	Scientific research	Traditional use of marine resources	Water quality
Legislation	•		•	•	•	•	•	•	•	•	•	•
Zoning plans	•			•	•	•	•	•	•	•	•	
Permits and licences	•		•	•		•	•	•		•	•	•
Management plans – legally binding	•		•	•		•	•		•	•	•	
Management plans - policy	•	•	•	•	•	•	•	•	•	•	•	•
Site management	•		•	•	•		•	•	•	•		•
Policy	•	•	•	•	•	•	•	•		•	•	•
Research	•	•		•		•	•	•	•	•	•	•
Partnerships and best practices	•	•	•	•	•	•	•	•	•	•	•	•
Education and community awareness	•	•	•	•	•	•	•	•	•	•	•	•
Compliance	•		•	•		•	•	•	•	•	•	•

### 5.3 Zoning – a comprehensive network of protection

The *Great Barrier Reef Marine Park Zoning Plan 2003* is one of the primary management tools for the protection of the Great Barrier Reef ecosystem. It provides the underlying basis for these other programs and protects biodiversity by regulating activities within the Marine Park and by providing for a network of no-take zones that protect at least 20 per cent (often more) of all the 70 reefal and non-reefal bioregions that extend both along and across the Region. In combination this network of no-take zones, other zone types and associated regulations provide protection for habitats and species while providing opportunities for



Coral trout are one species that has shown a dramatic increase in numbers in no-take areas since the Marine Park was rezoned in 2003

sustainable use of the Marine Park and its resources. The zoning of the Great Barrier Reef Marine Park is complemented by similar zoning by the Queensland Government over adjacent State waters.

### 5.4 Existing ecosystem level programs

There are a number of other existing programs that are focussed on reducing the risks from ecosystem-level threats and pressures. These programs are implemented by multiple government agencies, Traditional Owners, Natural Resource Management groups, industries and the community. These programs take a multi-disciplinary approach to addressing the priority issues and reducing ecosystem-level pressures impacting biodiversity. A mixture of legislative and policy reforms, management arrangements and on-ground actions are used.

The Australian and Queensland governments are collaborating on a strategic assessment to manage coastal development along the Great Barrier Reef coast. This will enhance the programs detailed here, and complement the actions and targets in this draft Strategy. Combined they will make a substantial contribution to addressing the remaining impacts of coastal development.



## Climate change

### **Great Barrier Reef Climate Change Action Plan 2007-2012**

The Climate Change Action Plan outlines a five year program of actions that Great Barrier Reef managers can take, in collaboration with stakeholders and other partners, which will increase the resilience of the Great Barrier Reef to climate change. The action plan is organised around four objectives:

1. Targeted science
2. A resilient Great Barrier Reef ecosystem
3. Adaptation of industries and regional communities
4. Reduced climate footprints.

## Addressing declining water quality from catchment run-off

### **Reef Water Quality Protection Plan 2009**

The *Reef Water Quality Protection Plan 2009* (Reef Plan) is on target to halt and reverse the decline in water quality. A joint Australian and Queensland government initiative focussed on improving Reef water quality so that the Reef has the resilience to cope with the stresses of a changing climate. It incorporates a regulatory safety net to accelerate uptake of better management practice. It also establishes an integrated monitoring and evaluation strategy.

### **Reef Rescue**

The Australian Government has invested \$200 million over five years in Reef Rescue – a vital component of the Caring for our Country initiative. The program is aimed at restoring the health of the nation's environment and improving land management practices. Reef Rescue's objective is to improve the water quality of the Great Barrier Reef lagoon by increasing the adoption of land management practices that reduce the run-off of nutrients, pesticides and sediments from agricultural land. Queensland farmers, tourism, fishing and aquaculture industries, Indigenous communities, conservation groups and research organisers are taking action that will help protect one of the world's great natural wonders.

### **Great Barrier Reef Protection Amendment Act 2009 (Queensland)**

The *Great Barrier Reef Protection Amendment Act 2009* introduced regulations to improve the quality of water entering the Great Barrier Reef. It applies to sugarcane growing and cattle grazing properties in the Burdekin Dry Tropics, Wet Tropics and Mackay Whitsunday catchments. Regulation is necessary to ensure the reduction of the levels of farm chemicals, fertiliser nutrients and sediment entering the Reef. The new legislation is part of the Queensland and Australian governments' Reef Plan and Reef Rescue initiatives. It has been developed in partnership with industry to deliver practical regulation.

## Loss of coastal habitats from coastal development

### **Queensland Wetlands Program**

The Australian and Queensland governments established the Queensland Wetlands Program in 2003, to protect wetlands in the Great Barrier Reef catchment and throughout Queensland. The program delivers projects that include a range of new mapping, information and decision-making tools. These enable government agencies, landowners, conservationists and regional land care bodies to protect and manage wetlands for future generations.

### **Queensland Coastal Plan**

The Queensland Coastal Plan addresses management of the coast and planning for future urban development in the coastal zone. It incorporates the State Policy for Coastal Management and State Planning Policy for Coastal Protection. The Queensland Coastal Plan reduces overlap and consolidates planning and natural resource management policies with best practice guidelines.

## Remaining impacts of fishing and hunting

### **Zoning and ecologically sustainable fishing in the Great Barrier Reef Marine Park**

The Great Barrier Reef Marine Park Authority (GBRMPA) recognises that fishing on the Great Barrier Reef is an important pastime and a source of income for Queensland coastal communities and the Queensland seafood industry. The *Great Barrier Reef Marine Park Zoning Plan 2003* established at least 20 per cent of each bioregion in highly protected, no-take zones in order to better protect the range of biodiversity in the Great Barrier Reef. The GBRMPA also works collaboratively with others including Fisheries Queensland, the Department of Sustainability, Environment, Water, Population and Communities (DSEWPac), and commercial and recreational fishers to continuously improve fishing gear, methods and compliance. While fisheries management continues to improve, some risks remain which are being progressively addressed.

### **Queensland Fisheries Strategy 2009-2014**

The *Queensland Fisheries Strategy 2009-2014* was implemented to set new directions for the management of fish habitats, the tools and processes used to manage fisheries harvest, and the ways in which the value of fishing and related industries could be enhanced. The strategy emphasised the three key investment areas of habitat, harvest and value, and brought a tighter focus to the Queensland Primary Industries and Fisheries (now Fisheries Queensland) drive to maximise the economic potential of Queensland's primary industries on a sustainable basis.

### **Various Queensland Government fisheries management plans and management arrangements**

Recreational and commercial fishing in the Marine Park is regulated by the Queensland Government's *Fisheries Act 1994* and *Fisheries Regulation 2008*. Management of recreational fishing includes seasonal closures, restrictions on the size and number of fish taken, limits on the number of lines and hooks used and restrictions on the types of gear allowed. Commercial fishing is managed through a variety of means including limits on the amount of fish taken, limits on the number of fishing licences, spatial and seasonal closures, restrictions on fishing vessel size and on the length, mesh size and number of nets and hooks used, restrictions on the take of some fish species and on the minimum and maximum size of fish retained.

### **Reef Rescue's Indigenous Land and Sea Country Partnerships Program**

In December 2008, the Australian Government committed \$10 million over five years towards the Reef Rescue Indigenous Land and Sea Country Partnerships Program. The program is engaging Indigenous communities in collaborative sea country management that conserves biodiversity and protects cultural and heritage values of the Great Barrier Reef. The program is designed to:

- Expand the Traditional Use of Marine Resource Agreement program across the Reef catchment
- Develop sea country plans
- Strengthen communication between local communities, managers and Reef stakeholders and build better understanding of Traditional Owner issues about the management of the Great Barrier Reef Marine Park.

Progress towards the actions and targets identified in this draft Strategy will require coordinated and targeted efforts, including the continued support for the existing ecosystem level programs identified above.

## **5.5 Stewardship**

A range of stewardship-based programs within the Great Barrier Reef Marine Park and catchment are proving that a hands-on community based approach to caring for the Great Barrier Reef is essential in preserving its immense, social, economic and environmental value.

### **5.5.1 Traditional Owner partnerships in sea country management**

Aboriginal and Torres Strait Islander people are the Traditional Owners of the Great Barrier Reef Region. Today there are approximately 70 Traditional Owner groups whose sea country includes the Great Barrier Reef Marine Park.

Great Barrier Reef Traditional Owner groups have developed a suite of sea country management arrangements including Traditional Use of Marine Resources Agreements (TUMRAs). Partnerships are also fostered through Traditional Owner representation on the Great Barrier Reef Marine Park Authority Board and the advice provided by the Indigenous Reef



Advisory Committee. The Reef Rescue Land and Sea Country Indigenous Partnerships Program provides an opportunity to enhance the existing arrangements for sustainable traditional use of marine resources, sea country research and education, cultural heritage initiatives, sea country planning and support for Marine Park compliance matters.

### **5.5.2 The commercial fishing industry**

Commercial fishing is a key activity conducted within the Great Barrier Reef World Heritage Area. Commercial fishers and the Queensland Seafood Industry Association (QSIA; the peak body representing

## Human use and occupation of the coastal zone of the Great Barrier Reef

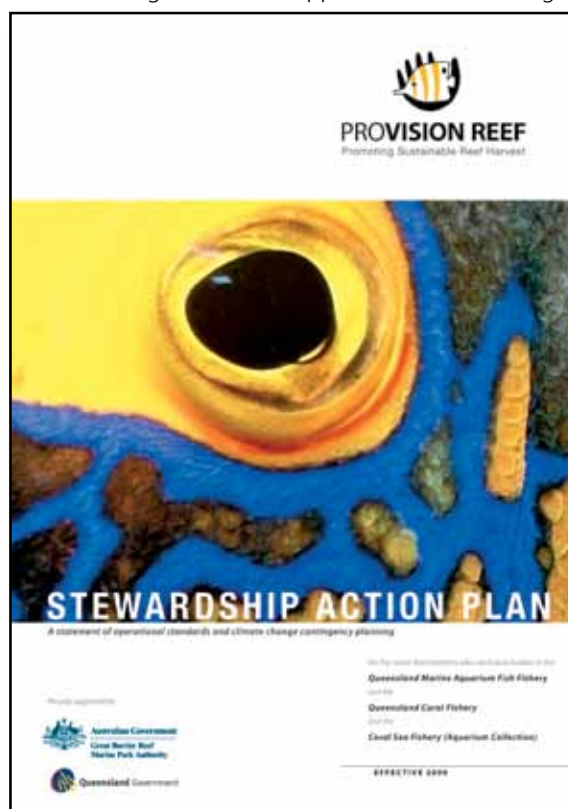
“Aboriginal occupation of northern Australia predates the last substantial rise in sea level that ended approximately 6000 years ago. The Torres Strait islands have been occupied for at least the last 1000 years, although the land bridge between Australia and Papua New Guinea would have been occupied before incursion of the sea. At the time, the inshore seabed between the present mainland and the Barrier Reef would have been coastal plains, containing numerous swamps and rivers. Aboriginal people lived and hunted and used the resources of the plains before the sea level rose. Currently, about half the Aboriginal and Torres Strait Islander population of the tropical north of Australia live within 20 kilometres of the coast. Aboriginal and Torres Strait Islander people have used the resources of the coastal environment, reefs and islands of the Great Barrier Reef extensively for many generations. Archaeological research has dated substantial middens at Princess Charlotte Bay, containing the remains of extensive use of shellfish and dugong bones, up to 5000 years old.

The relationship between Aboriginal and Islander people and their maritime estates is a strong and continuing one. Fundamental to that relationship is the general principle that particular areas of coastline, and the adjacent sea, reefs, islands and cays are held under customary ownership-or more accurately stewardship-by identifiable local descent groups. The traditional estates of Aboriginal and Islander people do not finish at the shoreline.” Source: Lawrence, Kenchington and Woodley 2002<sup>53</sup>.

the Queensland seafood industry) play a crucial role in ensuring that their industry is ecologically sustainable by promoting stewardship and developing best practice approaches. These approaches aim to maximise economic returns while minimising the impacts of commercial fishing on the environment. They are also developing new strategies to help the fishing industry adapt to the pressures from climate change.

For example, following the mass bleaching of coral reefs in the Great Barrier Reef in 1998 and 2002 resulting from elevated sea temperatures, ProVision Reef (a group representing the aquarium supply fisheries) developed a Stewardship Action Plan in collaboration with the Great Barrier Reef Marine Park Authority and the Queensland Government. The Plan, released in 2009, was developed to ensure that licensed participants in the Queensland-based fisheries that supply the marine aquarium industry adhere to a uniform operational standard. Operators now had clear contingency plans in place to respond to major environmental perturbations linked to global climate change. The Stewardship Action Plan has been complemented by the Coral Stress Response Plan (CSRP) developed by the Department of Employment, Economic Development and Innovation (DEEDI), commercial fishers, and the Great Barrier Reef Marine Park Authority. The Response Plan outlines how fishers operating in the aquarium supply fishery can help improve the resilience of reef ecosystems, enabling them to recover from stress events, while allowing collecting to operate in some capacity (where possible). In early 2011, following the extensive flooding from the Fitzroy River, there were concerns that corals in the Keppel Island group would be adversely affected by

freshwater bleaching and increased turbidity and that coral collecting may not be sustainable in some areas for a period of time. Based on these concerns, the Response Plan was initiated and commercial aquarium supply collectors operating in the Keppel Island region near Rockhampton agreed to impose a voluntary moratorium on coral collection in certain areas considered to be ‘at-risk’. This voluntary moratorium will be lifted when environmental conditions and underwater surveys indicate that the coral reef habitats are recovering and could support limited collecting.





Another example of marine stewardship is recent regulatory changes under the *Great Barrier Reef Marine Park Regulations 1983* to commercial set mesh netting in a specific area of the Bowling Green Bay Dugong Protection Area, south of Townsville. These changes exclude commercial set mesh netting in an area considered to be critical habitat for dugong and restricts the type of net that can be used in another area to further reduce risks to this species. What is commendable is that these changes to netting practices and apparatus were suggested by local commercial netters and then supported by the community, other commercial netters in the area, the QSIA and government. It is such initiatives, including those highlighted in the Reef Guardian section below, which clearly demonstrate the growing commitment of the commercial fishing industry to develop and implement stewardship approaches and work with government, researchers, conservation groups and the community to ensure that their industry is ecologically sustainable.

### 5.5.3 High standard tourism operators

The marine tourism industry is also a key partner in the protection and management of the Great Barrier Reef. Tourism operators help enhance visitor experiences of the Reef and play an important role in protecting the amazing biodiversity that supports their industry. Many tourism operators ensure their activities are best practice by following the Responsible Reef Practices for tourism operators. High Standard Tourism Operators operate to a higher standard than required by legislation as part of their commitment to ecologically sustainable use. These operators are independently eco certified as meeting best practice standards for the key areas of protection, presentation and partnership.



High standard tourism operators are key partners in improving the resilience of the Great Barrier Reef

### 5.5.4 Reef Guardians

The Reef Guardian Stewardship program is playing a critical role in ensuring the values of the Great Barrier Reef are appreciated and community actions support management of the Marine Park so it is well placed to meet the challenges ahead.

The program is empowering communities to help

build the resilience of the Reef to withstand the impacts of a changing climate. The community-based initiative showcases the environmental actions being undertaken within coastal communities and industries both in the Great Barrier Reef catchment and in the Marine Park.

The Reef Guardian program was launched in schools in 2003 as a vehicle for behaviour change to encourage the community to take action for a healthier Reef. Today there are more than 260 schools and over 110,000 students in the Great Barrier Reef catchment involved in the Reef Guardian Schools initiative. Due to the success and uptake of the Reef Guardian Schools program, the initiative was expanded in 2007 to involve local councils. There are currently 13 councils along the Great Barrier Reef coastline officially signed up to the program. They represent more than 890,000 residents in an area over 317,000 km<sup>2</sup>, from Bundaberg to Cooktown.



By adopting voluntary best environmental practices, Reef Guardian fishers are reducing their carbon footprint and improving the economic and ecological sustainability of their fisheries

In 2010, the Australian Government announced funding for the GBRMPA to improve the outlook of the Reef. This funding has enabled the GBRMPA to expand the Reef Guardian initiative to include pilot programs for farmers and fishers. The Reef Guardian Farmers and Fishers pilot programs were launched in 2011 and recognise the voluntary environmental practices from primary producers and fishers that go above and beyond mandatory standards and have significant benefits for the Reef. The Reef Guardian program is playing an important role in encouraging communities, individuals and businesses to help build a healthy and resilient Marine Park.



# 6 The way forward - A framework for action

## 6.1 Guiding principles

The actions in this draft Strategy are guided by five well regarded principles<sup>b</sup> which have been applied across all components to ensure a proactive approach is taken to reduce threats to biodiversity. The precautionary principle underpins all of these guiding principles. If there are threats of serious or irreversible risks to biodiversity, a lack of scientific certainty will not be used as a reason for postponing the implementation of measures to prevent environmental degradation. The five guiding principles are:

1. Take practical action now
2. Where possible reduce or eliminate threats to the resilience of the Great Barrier Reef ecosystem
3. Facilitate adaptation through flexible policy and management approaches
4. Integrate action across partners and sectors
5. Build knowledge and plan strategically.



Furthermore, the uncertainty that characterises our knowledge and understanding of marine ecosystems and their components, as well as the difficulties in predicting how human interactions will affect marine ecosystems, all need to be considered in decision-making that guides the management of biodiversity in the Great Barrier Reef Region in the face of climate change.



## 6.2 A framework for action

The purpose of this draft Strategy is to provide a framework for biodiversity conservation and management within the Great Barrier Reef Region. It seeks to recognise and build on a solid foundation of existing programs and work already underway; engage communities and foster stewardship; promote and maximise adaptation opportunities through improved knowledge and understanding.

Three strategic objectives form the basis of the *Great Barrier Reef Biodiversity Conservation Strategy 2012* aimed at building or maintaining ecosystem resilience and protecting biodiversity.

- **Engage communities and foster stewardship**
- **Building ecosystem resilience in a changing climate**
- **Improved knowledge**

These three strategic objectives drive the key actions to be taken resulting in the high level and program level outcomes required. Targets for measuring success are applied and will determine modifications to the draft Strategy as required.

<sup>b</sup> Adapted from Smithers *et al.*, 2008.<sup>21</sup>

## Objective 1 Engage communities and foster stewardship

<b>Objective</b>	<b>Promote stewardship and develop best practice approaches to ensure the long-term protection and management of the Great Barrier Reef Region</b>
<b>High level outcome</b>	Activities conducted in and adjacent to the Great Barrier Reef Marine Park are ecologically sustainable and Traditional Owners, reef-based industries and the community have the knowledge, capacity and support tools to adapt to a changing climate.
<b>Program level outcome</b>	<b>A high level of awareness among the Australian public of the values of the Great Barrier Reef, the pressures facing it and the actions needed to address those pressures</b>
<b>Key actions</b>	Develop and implement an overarching communications strategy that includes use of web site, media, social media. Maintain the national education facility for the Great Barrier Reef (Reef HQ).
<b>Program level outcome</b>	<b>An expanded Sea Country Partnerships Program with Traditional Owners to protect their cultural and heritage values and ensure sustainable traditional use of marine resources</b>
<b>Key actions</b>	Develop Traditional Use of Marine Resource Agreements in the Great Barrier Reef Region. Develop partnerships for sea country management with Traditional Owner groups of the Great Barrier Reef Marine Park.
<b>Program level</b>	<b>Communities, individuals and businesses work together to build a healthier and more resilient Great Barrier Reef</b>
<b>Key actions</b>	Maintain regional and sectoral consultation mechanisms such as the Regional Engagement program, Local Marine Advisory Committees, Reef Advisory Committees. Imbed biodiversity linkages into Reef Guardian and stewardship programs in schools, local government, farmers, graziers, fishers and tourism operators. Maintain and expand the adoption of high standard practices by the Great Barrier Reef tourism industry for protection, presentation and partnership for biodiversity conservation. A Recreation Management Strategy for the Great Barrier Reef Marine Park developed and implemented to provide a risk-based approach to minimise the impacts to biodiversity from recreational activities that occur within the Great Barrier Reef. Develop and disseminate education materials that raise awareness of inshore biodiversity. Pilot a regional management program in the Burdekin and expand to four other 'hotspots' in the Great Barrier Reef.
<b>Program level outcome</b>	<b>Raise awareness of the vulnerability of Great Barrier Reef biodiversity to climate change:</b> <ul style="list-style-type: none"> <li>• <b>Identify and support strategies for adaptation</b></li> <li>• <b>Enhanced adaptability of Reef-based industries to a changing climate</b></li> </ul>
<b>Key actions</b>	Undertake education and extension activities to raise public awareness of the continuing impacts of climate change on the Great Barrier Reef ecosystem. Document the lessons learned from the implementation of the <i>Climate Change Action Plan 2007-2012</i> as a means of informing future adaptive management approaches. Develop the second Climate Change Action Plan for the Great Barrier Reef. Complete a review of the impacts of extreme weather events that appropriately considers the impacts on biodiversity. Develop stewardship and certification plans which include climate change adaptation strategies with Reef-based industries, reef users, other government agencies and the community.

## Targets for measuring success

<b>By September 2012</b>	implement an overarching communications strategy that includes use of web site, media, social media.
<b>By July 2013</b>	have ten Traditional Use of Marine Resource Agreements in accredited for the Great Barrier Reef Region.
<b>By July 2013</b>	Working on sea country management initiatives with at least 50 per cent of the Traditional Owner groups of the Great Barrier Reef Marine Park.
<b>By December 2012</b>	biodiversity linkages are imbedded into Reef Guardian and stewardship programs in schools, local government, farmers, fishers and tourism operators.
<b>By July 2013</b>	the economic value of biodiversity and ecosystem services is integrated into industry and stakeholder-based decision making within the Reef Guardian network.
<b>By September 2015</b>	develop and implement stewardship and certification plans which include climate change adaptation strategies with Reef-based industries, reef users, other government agencies and the community.
<b>By September 2012</b>	the Recreation Management Strategy for the Great Barrier Reef Marine Park is implemented.
<b>By July 2013</b>	develop and disseminate education materials that raise awareness of inshore biodiversity with Reef-based industries, reef users, other government agencies and the community.
<b>By July 2013</b>	a pilot regional management program successfully underway in the Burdekin.
<b>By July 2015</b>	regional management programs extended to an additional four 'hotspots' within the Great Barrier Reef Marine Park.
<b>By December 2012</b>	public awareness of the continuing impacts of climate change on the Great Barrier Reef ecosystem has been raised within the community.
<b>By September 2012</b>	document the lessons learned from the implementation of the <i>Climate Change Action Plan 2007-2012</i> as a means of informing future adaptive management approaches.
<b>By September 2012</b>	develop the second Climate Change Action Plan for the Great Barrier Reef.
<b>By September 2012</b>	complete a review of the impacts of extreme weather events that appropriately considers the impacts on biodiversity.

## Objective 2 Building ecosystem resilience in a changing climate

<b>Objective</b>	<b>Reduce the threats to protected and at-risk habitats, species and groups of species, especially those found in inshore areas</b>
<b>High level outcome</b>	<b>Demonstrable reduction in the threats to at-risk habitats, species and groups of species through the development and implementation of targeted, specific management actions</b>
<b>Program level outcome</b>	<b>The decline in water quality entering the reef from nutrients, pesticides, herbicides and sediment is reversed</b>
<b>Key actions</b>	<p>The Reef Water Quality Protection Plan 2009 on target to ensure that by 2020 the quality of water entering the Reef from adjacent catchments has no detrimental impact on the health and resilience of the Great Barrier Reef.</p> <p>Great Barrier Reef Water Quality Guidelines reviewed as necessary to incorporate the most up-to-date information.</p> <p>GBRMMPA to contribute to the Paddock to Reef monitoring and reporting program through the delivery of a Marine Monitoring Program.</p>
<b>Program level outcome</b>	<b>The threats to inshore biodiversity are systematically addressed</b>
<b>Key actions</b>	Develop and implement with key collaborators an integrated inshore biodiversity program, complete with targets, to better understand the impacts of cumulative pressures including climate change and ensure long-term outcomes for inshore biodiversity in the Great Barrier Reef World Heritage Area.
<b>Program level outcome</b>	<b>Coastal ecosystems, wetland and riparian zones are managed for biodiversity values</b>
<b>Key actions</b>	<p>GBRMMPA to undertake and publish an assessment identifying the coastal ecosystems that are most critical to the Great Barrier Reef ecosystem to provide a basis for focussing future coastal management actions.</p> <p>Undertake a comprehensive strategic assessment identifying planned and potential developments that:</p> <ul style="list-style-type: none"> <li>• Plans for and systematically addresses the impacts of coastal development</li> <li>• Effectively provides for the conservation of inshore biodiversity</li> </ul> <p>Comprehensively assess development approvals to avoid, mitigate and where necessary offset environmental impacts.</p> <p>Where impacts of coastal developments are unavoidable, implement offsets to systematically improve and restore ecosystem function.</p>
<b>Program level outcome</b>	<b>Remaining threats to habitats, species and groups of species are being addressed</b>
<b>Key actions</b>	Key actions from Vulnerability Assessments are prioritised and those of highest priority are implemented; and programs reviewed by the publication of the next Outlook Report in 2014.
<b>Program level outcome</b>	<b>The biodiversity of the Great Barrier Reef Marine Park is well protected through an effective system of zoning and permitting</b>
<b>Key actions</b>	<p>Apply risk assessment methodology to ensure that compliance patrol programs target activities that pose the highest risks to biodiversity.</p> <p>Continue to explore the application of technology for more effective surveillance including position-fixing methods for tracking vessels.</p> <p>Education and awareness programs target activities that pose the highest risks to biodiversity.</p> <p>Increase the number of Indigenous rangers that have completed 'Eyes and Ears' training.</p> <p>Comprehensively assess permit applications to avoid, mitigate and where necessary minimise impacts on biodiversity.</p>



## Targets for measuring success

<b>By December 2013</b>	results from the Reef Rescue Marine Monitoring Program have contributed to the development of the Reef Plan Paddock to Reef Report.
<b>By September 2013</b>	developed and implemented an integrated inshore biodiversity program for the Great Barrier Reef World Heritage Area with key collaborators.
<b>By September 2012</b>	finalised and published an assessment that identifies the coastal ecosystems that are most critical to the Great Barrier Reef ecosystem, to assist with future coastal management.
<b>By December 2013</b>	completed a strategic assessment for the Great Barrier Reef World Heritage Area.
<b>By December 2012</b>	completed vulnerability assessments on identified at-risk habitats, species and groups of species.
<b>By December 2014</b>	implemented and reviewed priority key actions to reduce threats to at-risk habitats, species and groups of species.
<b>By September 2012</b>	established a multi-agency group to identify best practice fishing techniques to minimise risks to high-risk species targeted or captured incidentally in commercial fisheries.
<b>By July 2014</b>	increased by 100 per cent the number of Indigenous rangers that have completed 'Eyes and Ears' training.

### Objective 3 Improved knowledge

<b>Objective</b>	<b>Maximise the opportunities for habitats and species to adapt through improving our knowledge about habitats, species and groups of species and then use this to improve management outcomes</b>
<b>High level outcome</b>	<b>Improved knowledge about at-risk habitats, species and groups of species used to make better informed decisions and to ensure best outcomes for biodiversity</b>
<b>Program level outcome</b>	<b>Increased science focus on:</b> <ul style="list-style-type: none"> <li>• <b>at-risk habitats, species and groups of species</b></li> <li>• <b>Conservation of inshore biodiversity</b></li> </ul>
<b>Key actions</b>	<p>Update the Great Barrier Reef Scientific Information Needs based on priorities identified through completion of vulnerability assessments for each at-risk habitat, species and group of species.</p> <p>Undertake targeted research that improves our knowledge and informs the management of at-risk habitats, species and groups of species identified in this Strategy.</p> <p>Collaborations with scientific institutions to establish an integrated inshore biodiversity program to better understand the impacts of cumulative pressures including climate change and ensure long-term outcomes for inshore biodiversity.</p> <p>Ensure targeted research and monitoring programs are undertaken that improves our understanding of the relationship between declining water quality and health status and diseases in inshore species.</p> <p>Maintain and improve monitoring programs to understand long-term trends in habitats, populations of species and ecosystem pressures.</p>
<b>Program level outcome</b>	<b>Knowledge of biodiversity enhanced through engagement with Traditional Owners, industry and the community</b>
<b>Key actions</b>	<p>Continue to develop and expand the 'Integrated Eye on the Reef' community-based monitoring program.</p> <p>Expand partnership programs with Traditional Owners, industry and the community to build knowledge to support biodiversity conservation at local and regional scales.</p> <p>Continue to implement a range of approaches for disseminating contemporary information to Traditional Owners on biodiversity and threats to the Reef to assist them during the TUMRA-development and implementation process.</p> <p>Ensure targeted research projects are in place to inform regional management in the Burdekin and other hotspots as they are identified.</p> <p>Disseminate contemporary information to reef-based industries on ways to assist with managing and conserving biodiversity and reducing the threats to the Great Barrier Reef.</p> <p>Develop and implement processes for better integrating Traditional Ecological Knowledge into management and conservation of biodiversity.</p> <p>Develop and implement processes for better integrating stakeholder knowledge into management and conservation of biodiversity.</p>

## Targets for measuring success

<b>By December 2014</b>	<i>Scientific Information Needs for the Great Barrier Reef</i> document is updated based on priorities identified through completion of vulnerability assessments for each at-risk habitat, species and group of species.
<b>By September 2012</b>	partnerships with researchers and other groups to support projects that improve our knowledge and understanding of the relationship between declining water quality and health status and diseases in inshore species.
<b>By July 2014</b>	targeted research underway that improves our knowledge and informs the management of at-risk habitats, species and species groups identified in this Strategy.
<b>By December 2012</b>	scientific institutions engaged and collaborations formed to assist with the development and implementation of an integrated inshore biodiversity program in the Great Barrier Reef World Heritage Area.
<b>By July 2013</b>	the 'Integrated Eye on the Reef' community-based monitoring program has been implemented for reef-based industries, Traditional Owners and the community.
<b>By July 2013</b>	targeted research projects are in place to inform the Burdekin regional management program.
<b>By July 2013</b>	processes for better integrating Traditional Ecological Knowledge into management and conservation of biodiversity are identified and implemented.
<b>By July 2013</b>	processes for better integrating stakeholder knowledge into management and conservation of biodiversity are developed and implemented.

## 7 Implementing and reviewing the *Great Barrier Reef Biodiversity Conservation Strategy 2012*

The *Great Barrier Reef Biodiversity Conservation Strategy 2012* will be implemented as a key response to the *Great Barrier Reef Outlook Report 2009* and outcomes from the Strategy will inform the development of the next Outlook Report in 2014.

In accordance with the requirements of Section 54 of the *Great Barrier Reef Marine Park Act 1975*, the effectiveness of management measures to protect and manage the Great Barrier Reef ecosystem (including those in relation to conserving and managing biodiversity) will be assessed in a five-yearly cycle as part of the development of the next Outlook Report. Amongst other things, that assessment will examine

the extent to which the Strategy's objectives have been achieved.

The *Scientific Information Needs for the Management of the Great Barrier Reef Marine Park 2009-2014* has been developed to identify the most urgent research questions and to guide investment in research and long-term monitoring programs. The priority research needs will be reviewed and updated every five years following completion of each successive Outlook Report.

Vulnerability assessments provide the roadmap for action in addressing priority biodiversity concerns for each at-risk habitat, species and group of species. The vulnerability assessments will continue to be developed and updated to address the conservation strategies for each of the at-risk habitats, species and groups of species identified in this strategy. The vulnerability assessments will describe actions required to address the pressures acting on each of these elements of biodiversity and report on how those actions are being addressed. The vulnerability assessments are being developed in consultation with key government agencies, scientific experts, Traditional Owners, marine industries and other stakeholders, and will be available for review by the community. They will be updated as new information becomes available and will be reviewed to inform each five-yearly Outlook Report.



Reef Guardian farmers play a critical role in improving the quality of water entering the Great Barrier Reef



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