

Marine waters and ecosystems

Northern Rivers region

State Plan target

By 2015 there is no decline in the condition of marine waters and ecosystems.

Background

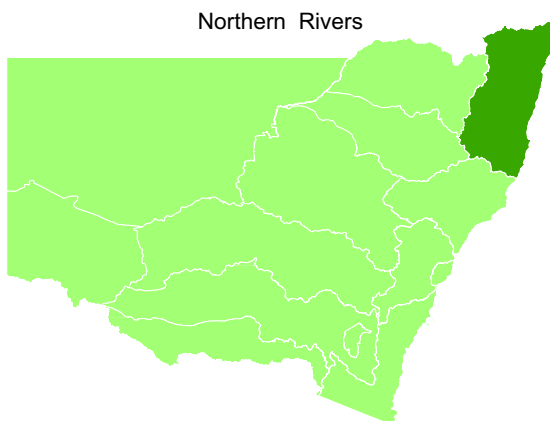
The Northern Rivers region accounts for 33 per cent of the state's coastline, a distance of 604 km (including Lord Howe Island). This region covers 3440 km² of ocean, of which 40.7 per cent is within marine protected areas (excluding estuaries) comprising:

- 8% marine park sanctuary zone
- 22% marine park habitat protection zone
- 10.5% marine park general use zone
- 0.01% marine park special purpose zone
- 0.02% aquatic reserve.

A detailed technical report describes the methods used to derive the information contained in this report. At the time of publication of the *State of the catchments (SOC) 2010* reports, the technical reports were being prepared for public release. When complete, they will be available on the I&I website: www.industry.nsw.gov.au/info/mer.

Note: All data on natural resource condition, pressures and management activity included in this SOC report, as well as the technical report, was collected up to January 2009.

Map of the catchment



Condition

Indicators

Extent of marine protected areas: this indicator is more of a performance measure than a condition indicator. Marine protected areas, which include marine parks and aquatic reserves, aim to remove or reduce a number of pressures on the marine environment, particularly certain fishing activities. The zoning of the Solitary Islands Marine Park is currently under review and this could result in changes to the extent of some zones within that marine park.

Algal blooms: these occur naturally in the marine environment, but some species can be harmful. Nutrients promoting their growth come from upwelling and estuarine outputs, both closely related to El Niño weather cycles. Ocean outfalls may also affect local nutrient supplies. Algal blooms were rated on the basis of the 80th percentile of all data analysed from 1998 to 2003. The 80th percentile value is above the ANZECC trigger value (1 µg/L) for most sections of the Northern Rivers region coast, suggesting a generally poor condition. However, it is not clear whether this is an artefact of the remote sensing method used to detect algal blooms in this region or whether the ANZECC trigger value is not applicable to these coastal waters, which receive significant nutrient inputs from the numerous rivers. Improved techniques to remotely monitor and ground-truth algal blooms in coastal waters are currently being developed.

Rocky reef biota: several key species have been identified as indicators of the condition of rocky reef biota:

- large habitat-forming algae
- abundances of sea urchins, abalone and lobsters
- commercial catches of reef fish in demersal fish traps set in coastal waters.

No data is available for abalone (which are not commercially harvested north of Crowdy Head), and there is no sea urchin data for the Northern Rivers region in the published literature.

Averaged across 24 species of reef fish, catch rates in demersal traps have remained relatively stable over the past 10 years, but catches of some species have increased while others have declined. Fishery-independent estimates of lobster abundances have remained unchanged.

An overall condition assessment for rocky reef biota has not been made as there is no good baseline or referential condition available. Similarly, no separate condition assessment is possible







for the status of some of the key species – macroalgae, sea urchins or reef fish. A new sampling program which started in 2009 is attempting to determine relative condition of intertidal and subtidal habitats based largely on macroalgae.

Beachwatch: this indicator measures the presence of two types of bacteria, *faecal coliforms* and *enterococci*, which indicate ‘recent’ versus ‘aged’ sewage contamination and the possible presence of waterborne pathogens that pose significant risk to human health. The Beachwatch indicator was rated very good because most beaches consistently pass the guidelines, generally have excellent water quality, and are affected by few sources of sewage contamination. Beaches that pass the guidelines more than 90 per cent of the time generally have good water quality, but they can still be affected by intermittent sources of pollution, generally related to rainfall. There are 18 Beachwatch sites in this region, with 10 on ocean beaches and eight in estuaries/harbours. There are large sections of coastline not monitored, including the Lord Howe Island group.

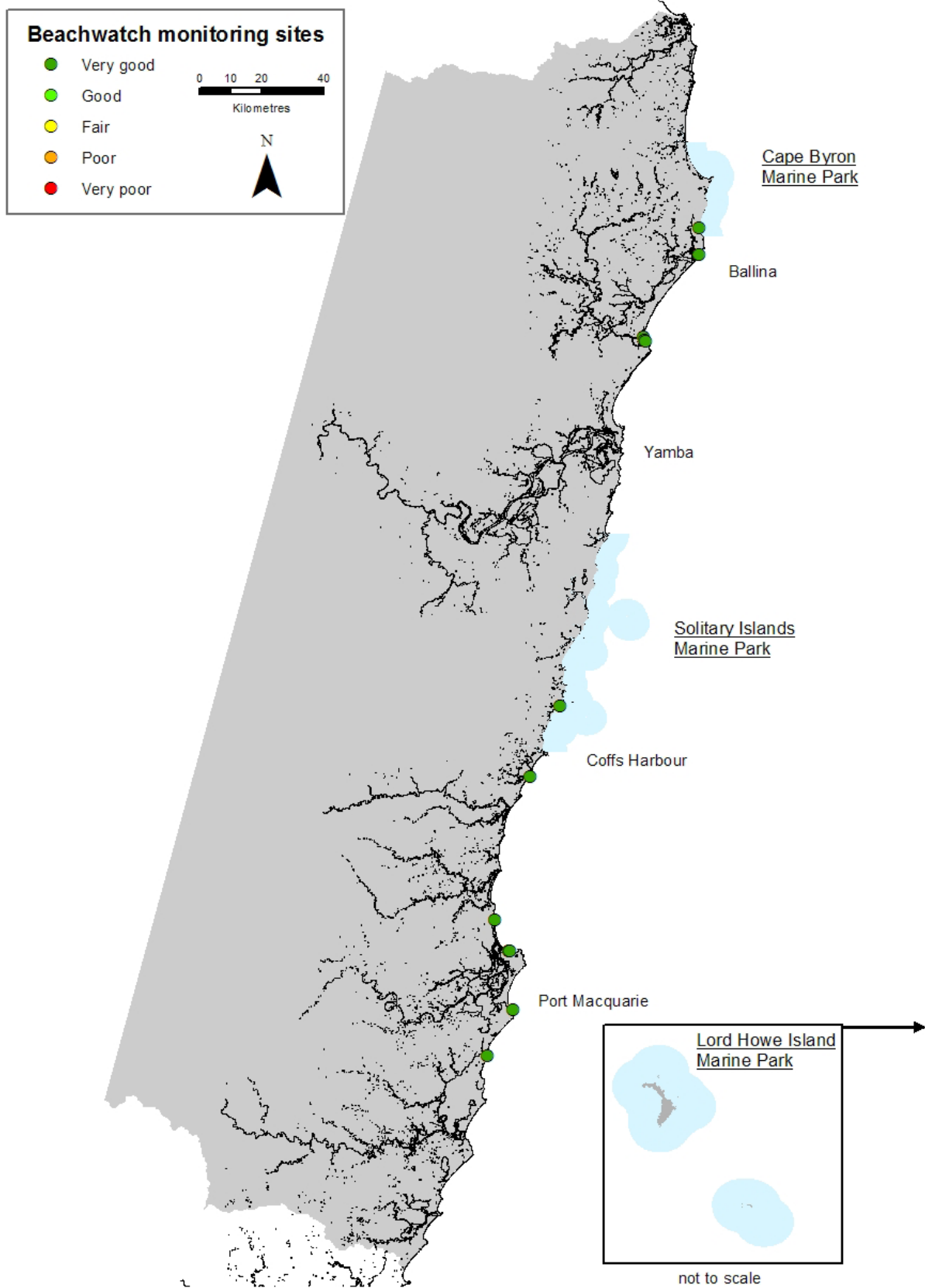
Due to the greatly divergent nature of the indicators currently used to assess the marine environment and the lack of reliable reference datasets for many of these indicators, it has not been possible to quantitatively formulate a single condition index. A qualitative assessment of all available data, however, suggests that there has been no decline in the overall condition of the marine waters and ecosystems in the Northern Rivers region or New South Wales generally.

Table 1 Indicator ratings and trends in resource condition for marine waters in the Northern Rivers region

Indicator	NR	Trend	Data confidence	NSW	Trend	Data confidence
Marine Protected Areas	Very good	↔	H	Very good	↑	H
Algal blooms	Good	?	L	Good	?	L
Rocky reef biota	No data	↔	M	No data	↔	L
• Macroalgae	No data	↔	L	No data	↔	M
• Eastern rock lobster	Good	↔	H	Good	↔	H
• Commercial reef fish	No data	↔	H	No data	↔	H
Beachwatch	Very good	↔	H	Good	↔	H

Condition		Trend		Data confidence	
	Very good	↑	Improving	H	High
	Good	↔	No change	M	Medium
	Fair	↓	Declining	L	Low
	Poor	?	Unknown		
	Very poor				
	No data				





* Trend relates to the previous five to 10 years

Figure 1 Beachwatch monitoring sites in the Northern Rivers region showing the condition of beaches in the region

Pressures

Indicators

Urbanisation can increase levels of runoff, pollutant inputs into the marine environment, and human modification and use of the shoreline. All of these have a potential impact on the marine environment at a variety of spatial scales. Many coastal areas in the Northern Rivers region are experiencing increased urbanisation.

Tourism is a potential source of intermittent pressure for coastal towns in the Northern Rivers region that generally have small populations but which can swell considerably during peak holiday periods.

Sewage can have localised impacts on intertidal and subtidal reef species. Levels of sewage discharge are directly related to human population and determine the outcomes of Beachwatch monitoring. As urbanisation and/or tourism increase, growth in sewage load can be expected.

Estuarine output relates to the levels of sediment, nutrient, pollutant and fresh water discharges into the ocean from rivers, creeks and coastal lagoons. The Northern Rivers region has 46 estuaries discharging into marine waters. This discharge currently contributes approximately 533,483 tonnes of sediment, 1300 tonnes of phosphorus and 12,880 tonnes of nitrogen annually. The greatest contributors are the Richmond and Clarence rivers; these rivers have also contributed most to changes in loads since European settlement.

Fishing has a direct impact on lobsters and finfish, and there is evidence of indirect effects such as an increase in sea urchin abundance and associated loss of macroalgae. Both commercial and recreational fishing have been considered. There is no quantitative evidence of any widespread increase in fishing pressure, although the targeting of sharks in the Northern Rivers region is currently under investigation.

Disease refers to any disease or parasite that may reduce the numbers of key marine organisms. There are no such disease issues currently in the Northern Rivers region.

Wave impact will be affected by climate change, with a predicted increase in wave energy likely to have direct impacts on intertidal and shallow subtidal reef habitats. There is no evidence of any such impact currently affecting the coastline in the Northern Rivers region.

Sea temperature is predicted to increase slowly due to climate change and this might cause species boundaries to shift southward over time. Some short-term data has been collected in the Northern Rivers region, particularly within the Solitary Islands Marine Park, but the dataset is too short to allow trend analysis or to assess impacts on coastal species in the region.

Rainfall can significantly affect levels of *faecal coliforms* entering the marine environment from sewerage systems and also influence algal blooms. There is no evidence of any such impact currently affecting the coastline in the Northern Rivers region. Rainfall may also increase in the Northern Rivers region because of climate change, resulting in larger or more frequent sediment plumes in the marine environment.

Table 2 Qualitative trends in the impact of pressures on resource condition indicators in the Northern Rivers region

Indicator	Urbanisation	Tourism	Sewage	Estuarine output	Fishing	Disease	Wave impact	Sea temperature	Rainfall
Algal blooms	↔	-	?	?	-	-	-	?	↓
Rocky reef biota	↓	?	?	?	-	-	?	↓	-
• Macroalgae	↓	?	?	?	-	-	?	↓	-
• Eastern rock lobster	-	-	-	-	↔	-	-	-	-
• Commercial reef fish	-	-	-	-	↔	-	-	-	-
Beachwatch	↓	↓	↓	↓	-	-	-	-	↓

Trend

↑	Improve
↔	No change
↓	Decline
?	Unknown
-	Not related

It has not been possible to formulate scores for the pressures on marine waters and ecosystems. Rather, the above table shows which condition indicators are likely to be affected by which pressures and, where possible, the likely directional nature of that impact. Spatial and temporal scales of trend estimation vary relative to the different indicators.

Management activity

State level

The marine waters target is being addressed at the state level by:

- reviewing the extent of aquatic reserves and marine protected areas
- working with the Australian Government on management agreements for the complementary management of State and Australian waters
- providing information to the coastal councils and catchment management authorities (CMAs) who are working on minimising discharge from sewage treatment plants and diffuse sources to reduce nutrient inputs from coastal catchments reaching the ocean via estuaries
- providing regular assessments of the status of harvested fish species in NSW waters and revising

fisheries management strategies in response to those species assessed as being overfished

- working with the commercial and recreational fishing sectors to design fishing gear that reduces by-catch and minimises environmental impacts
- using swath acoustics to progressively map the extent of reef habitats in NSW coastal waters
- collating all available information on marine sediments, oceanographic features and selected groups of marine biodiversity to inform the management of NSW coastal waters
- monitoring the movement patterns of endangered grey nurse sharks and other key fish species using a coast-wide array of acoustic listening stations
- the introduction of the NSW Marine Water Quality Objectives (WQOs) to complete the suite of WQOs for all NSW surface waters.

Regional level

At the regional level the Northern Rivers CMA is undertaking the following activities in relation to the marine theme:

- overcoming the basic lack of knowledge of the marine environment, including its condition and trend, through projects targeting commercial fisheries research, rocky reef mapping (a biodiversity surrogate), and long-term monitoring
- promoting development and implementation of best practice guidelines for marine resource user groups, including provision of by-catch reduction devices to commercial fishers operating in several fisheries within the region
- improving resource user and wider community awareness and understanding of the marine environment and their impact on it, through various projects including those supporting voluntary underwater research groups within the region
- indirectly implementing a range of on-ground works projects across all coastal river catchments through its Soil/Land Resource, Water, Biodiversity and Land-use Planning Catchment Action Plan Programs that collectively contribute to improved land-use management and water quality entering estuaries and the marine environment. Acid sulfate soil amelioration, soil erosion control, dairy effluent management and riverine corridor enhancement projects also contribute to this target.

Local level

A number of other groups in the region are undertaking significant work that is contributing to better outcomes for the marine environment:

- the National Marine Science Centre, Coffs Harbour, has an active research program that makes a significant contribution to improved understanding and management of the marine environment. This program researches areas such as the biodiversity of marine and estuarine habitats, patterns and biological processes in marine communities, human-induced impacts on marine systems, fisheries and marine park management, pollution and marine resource economics and management
- the most significant impacts of local governments on the health of marine waters and

ecosystems are through land-use planning, pollution control, and stormwater management responsibilities. They make varying but significant contributions across the region towards this target

- three underwater research groups operate within the region and undertake various projects to educate the wider community, as well as record and monitor the marine environment off the Byron Bay, Coffs Harbour and Port Macquarie coastlines
- Landcare groups make an indirect contribution to the health of marine waters and ecosystems, through their activities on land that help to reduce diffuse source water pollution of coastal catchments.

Further reading

Extent of marine protected areas indicator

Marine Parks Authority 2003, *Background Resource Working Paper for the Cape Byron Marine Park*, Marine Parks Authority, Byron Bay.

Marine Parks Authority 2008, *Natural Values of the Solitary Islands Marine Park*, Department of Environment and Climate Change NSW.

Algal blooms indicator

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Rocky reef biota indicator

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Underwood AJ, Kingsford MJ & Andrew NL 1991, Patterns of abundance in shallow subtidal marine assemblages along the coast of New South Wales, *Australian Journal of Ecology* 16: 231-249.

Beachwatch indicator

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