State of the catchments 2010

Marine waters and ecosystems

Hunter–Central Rivers region

State Plan target

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

Background

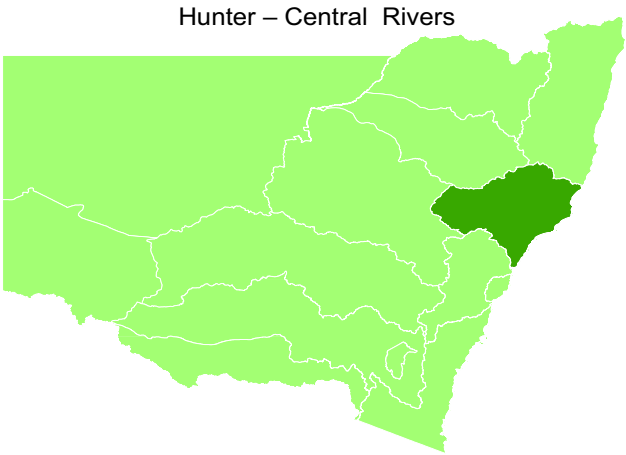
The Hunter–Central Rivers region accounts for 20 per cent of the state's coastline, a distance of 362 km. The region covers approximately 1721 km^2 of ocean, of which 42.3 per cent is within marine protected areas comprising:

- 6.0% marine park sanctuary zone
- 20.5% marine park habitat protection zone
- 15.7% marine park general use zone.

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 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. Marine parks made a positive contribution to marine condition in the region with Port Stephens–Great Lakes Marine Park, declared in 2005 and implemented in 2007.

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 of which are 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 of chlorophyll data is near or below the ANZECC trigger value (1 µg/L) for Hunter–Central Rivers marine waters. 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.

Purple sea urchin abundances, based on published data, show considerable spatial and temporal variability, but overall the trend in abundances in the region has been relatively constant since 1985.

Abundances of abalone decreased significantly in the 1990s due to disease and overfishing. There has been no commercial harvesting since 2001. Numbers are still low, resulting in a very poor ranking, although they now appear to have stabilised.

Averaged across 24 species of reef fish, catch rates in demersal traps have remained relatively stable over the past 10 years. Catches of some species have increased while others have declined. Fishery-independent estimates of lobster abundance 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 and 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. Declines in compliance with health guidelines can occur with high rainfall. 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 17 Beachwatch sites in the Hunter–Central Rivers region.

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 Hunter–Central Rivers region or NSW generally.

Table 1 Indicator ratings and trends in resource condition for marine waters in the Hunter–Central Rivers region

Indicator	HCR	Trend	Data confidence	NSW	Trend	Data confidence
Marine protected areas		↑	H		↑	H
Algal blooms		?	L		?	L
Rocky reef biota		↔	M		↔	L
• Macroalgae		↔	M		↔	M
• Eastern rock lobster		↔	H		↔	H
• Commercial reef fish		↔	H		↔	H
• Purple sea urchin		↔	M		↔	M
• Abalone		↔	M		↔	M
Beachwatch		↔	H		↔	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.

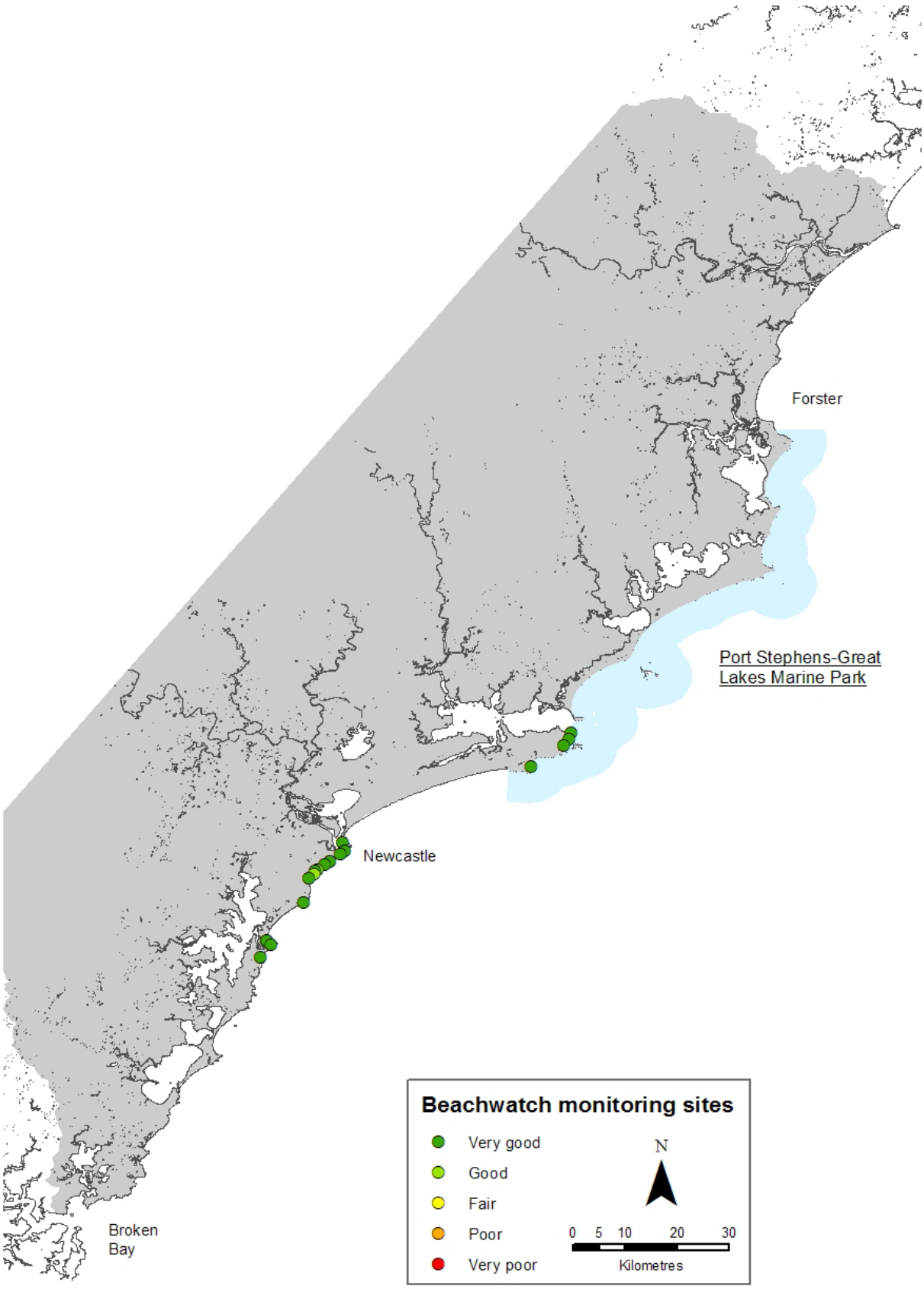


Figure 1 Beachwatch monitoring sites in the Hunter–Central Rivers region showing the condition of beaches in the region

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 Hunter–Central Rivers region are experiencing increased urbanisation.

Tourism is a potential source of intermittent pressure for coastal towns in the Hunter–Central 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. The Hunter–Central Rivers region has 20 estuaries discharging into marine waters. This discharge currently contributes approximately 145,700 tonnes of sediment, 593 tonnes of phosphorus and 5348 tonnes of nitrogen annually. The greatest contributors since pre-European times are the Hunter and Manning 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. It is likely that fishing pressure on rocky reefs in the Hunter–Central Rivers region has decreased since 2007 as a result of the establishment of the Port Stephens–Great Lakes Marine Park.

Disease refers to any disease or parasite which may reduce the numbers of key marine organisms. The *Perkinsus* parasite has been one contributor to the decline of abalone stocks in the Hunter–Central Rivers region.

Wave impact will be affected by climate change, with an 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 Hunter–Central Rivers region.

Sea temperature is predicted to increase slowly due to climate change and this might cause distributional boundaries of marine species to shift southward over time. There is no data available to assess whether any such impacts currently affect coastal species in the Hunter–Central Rivers region.

Rainfall can significantly affect levels of *faecal coliforms* entering the marine environment from sewerage systems, and can also influence algal blooms. There is no evidence of any such impact currently affecting the coastline in the Hunter–Central Rivers region.

Table 2 Qualitative trends in the impact of pressures on resource condition indicators in the Hunter–Central 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	-	-	-	-	↔	-	-	-	-
• Purple sea urchin	?	?	?	?	?	?	?	?	?
• Abalone	-	-	-	-	↑	↓	-	-	-
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 indicates 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 activities

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 Hunter–Central Rivers CMA is undertaking the following activities in relation to the marine theme:

- development of marine habitat mapping products, and marine habitat assessment, to focus future investment in priority areas
- protection of key rocky platform habitats through community education and awareness campaigns
- education and community-capacity building activities at numerous sites across the region, to increase community awareness of the marine environment and educate people about implementing actions that will help conserve the marine environment.

Local level

A number of other groups in the region are undertaking significant work that is contributing to better outcomes for marine waters and ecosystems, including Newcastle City Council's implementation of the Coastline Management Plan, and the Aware on the Rocks project.

Further reading

Extent of marine protected areas indicator

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

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

Algal blooms indicator

Ajani P, Hallegraeff G & Pritchard T 2001, Historic overview of algal blooms in marine and estuarine waters of New South Wales, Australia, *Proceedings of the Linnean Society of New South Wales* 123: 1-22.

Hallegraeff G & Reid D 1986, Phytoplankton species successions and their hydrological environment at a coastal station off Sydney, *Australian Journal of Marine and Freshwater Research* 37: 361-377.

Pritchard T, Lee R, Ajani P, Rendell P, Black K & Koop K 2003, Phytoplankton responses to nutrient sources in coastal waters off southeastern Australia, *Aquatic Ecosystem Health and Management* 6(2): 105-117.

Rocky reef biota indicator

Gladstone W, Loisier A & Herbert C 2007, *Central Coast Rocky Shore Biodiversity Assessment*, Final Report (Project CAE 06017) for Hunter–Central Rivers CMA.

Scandol J, Rowling K & Graham K 2008, *Status of Fisheries Resources in NSW 2006–07*, NSW Department of Primary Industries, Cronulla.

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

Department of Environment and Climate Change 2008, *Beachwatch and Harbourwatch Program State of the Beaches 2007–2008*, Sydney.

Department of Environment and Climate Change 2008, *Beachwatch Partnership Program State of the Beaches 2007–2008*, Sydney.

Department of Environment and Conservation NSW 2004, *Monitoring and Reporting Coastal Recreational Water Quality*, Information Package and Field Manual, Sydney.

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