

State of the catchments 2010

Marine waters and ecosystems

Sydney Metropolitan and Hawkesbury–Nepean regions

State Plan target

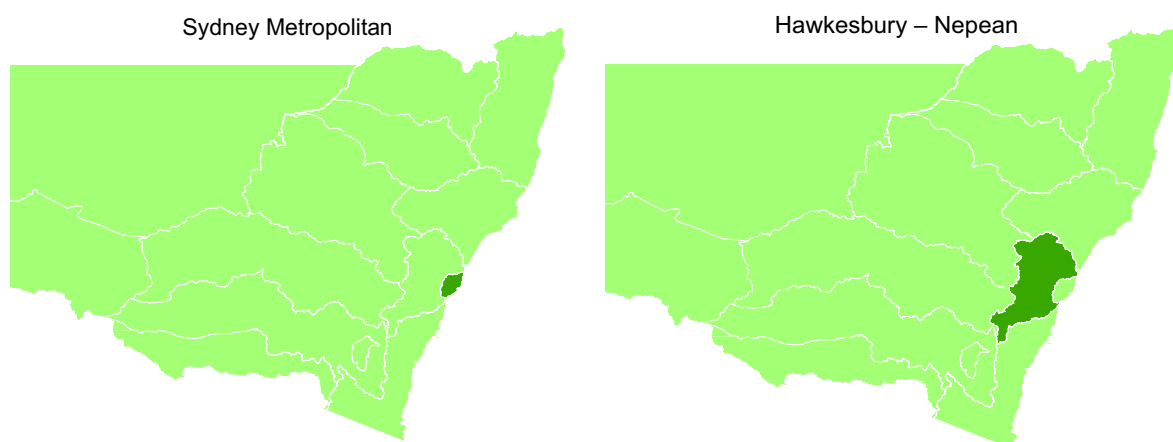
By 2015 there is no decline in the condition of marine waters and ecosystems.

Background

The Sydney Metropolitan and Hawkesbury–Nepean regions account for seven per cent of the state's coastline – a distance of 125 km. Of this, the Hawkesbury–Nepean region covers a distance of only approximately 15 km from Turimetta Head north to Barrenjoey Headland. The combined Sydney Metropolitan and Hawkesbury–Nepean regions cover 565 km² of ocean, of which 0.43 per cent is within marine protected areas. There are four aquatic reserves in the Sydney Metropolitan region and one in the Hawkesbury–Nepean region.

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.



Maps of the catchments

Condition

Indicators

Extent of marine protected areas: this indicator is more 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. There are no marine parks in these regions, only aquatic reserves.

Algal blooms: 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 coastal marine waters in the Sydney region.

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.

A large brown seaweed (*Phyllospora comosa*) has apparently disappeared from the Sydney region since the mid-1980s, and there is anecdotal evidence that a green seaweed (*Caulerpa filiformis*) has increased considerably over the same period.

Purple sea urchin abundances, based on published data, show considerable spatial and temporal variability, but overall the trend in abundances in the Sydney coastal area 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, but 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. The Beachwatch indicator was rated good because most beaches pass the guidelines 90 per cent of the time and generally have good water quality. However, they can still be affected by intermittent sources of pollution, generally related to rainfall. Due to poorer flushing, harbour sites generally have poorer water quality than ocean beaches, and are more susceptible to outflow from sewage overflows. There are 81 Beachwatch sites within these regions. A total of 35 Beachwatch sites are located on ocean beaches, with 29 sites located in the Sydney Metropolitan region and six sites in the Hawkesbury–Nepean region. The remaining Beachwatch sites are in estuaries, including Sydney Harbour.






Due to the greatly divergent nature of the indicators 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 recent decline in the overall condition of the marine waters and ecosystems in New South Wales. However, there are indications of historical declines in overall condition of the marine waters in the Sydney Metropolitan and Hawkesbury–Nepean regions, perhaps exemplified by the apparent loss of one large algal species.



Table 1 Indicator ratings and trends in resource condition for marine waters in the Sydney Metropolitan and Hawkesbury–Nepean regions

Indicator	SM & HN regions	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			
• Abalone		↔	M		↔	M
Beachwatch		↔	H		↔	H

* Trend typically relates to the previous five to 10 years

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

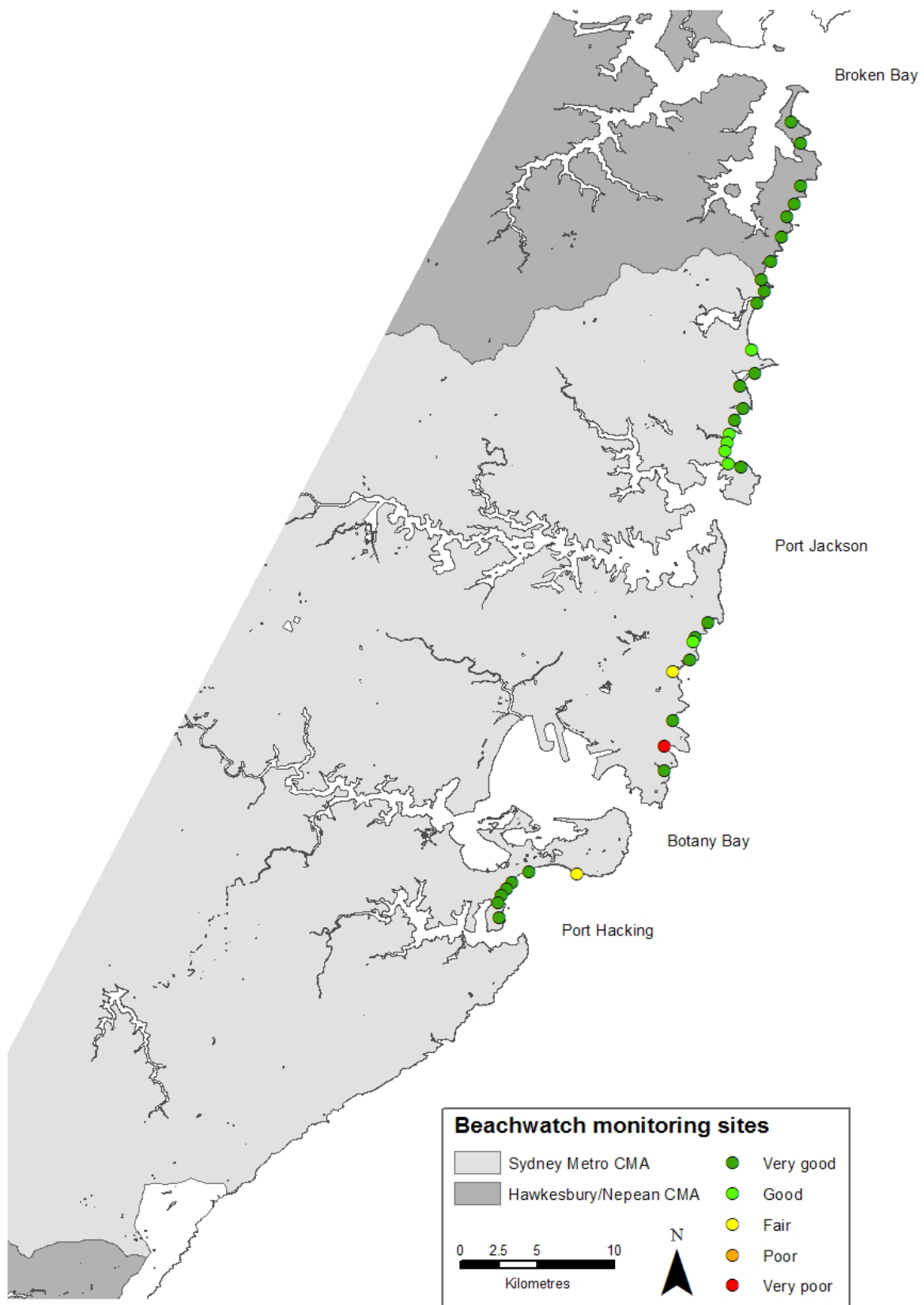


Figure 1 Beachwatch monitoring sites in the Sydney Metropolitan and Hawkesbury–Nepean regions showing the condition of beaches in the region

Pressures

Indicators

Urbanisation can increase levels of runoff, pollutant inputs into the marine environment, human modification and use of the shoreline. All of these have a potential impact on the marine environment at a variety of spatial scales. Coastal areas in the Sydney Metropolitan and Hawkesbury–Nepean regions are not expected to face increased urbanisation.

Tourism is a potential source of intermittent pressure for coastal waters. However, compared with the much larger and more permanent impact of urbanisation, the pressure from tourism is expected to be relatively minimal for coastal water in the Sydney Metropolitan and Hawkesbury–Nepean regions.

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. The impacts of sewage from Sydney on the coastal regions have lessened considerably since the installation of the deep ocean outfalls.

Estuarine output relates to the levels of sediment, nutrient, pollutant and fresh water discharges into the ocean. The Sydney Metropolitan and Hawkesbury–Nepean regions have 13 estuaries discharging into marine waters. This discharge currently contributes approximately 95,099 tonnes of sediment, 240 tonnes of phosphorus and 2207 tonnes of nitrogen annually. The greatest contributors are the Hawkesbury and Georges 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 evidence of any increase in fishing pressure in the Sydney Metropolitan or Hawkesbury–Nepean regions.

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

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

Table 2 Qualitative trends in the impact of pressures on resource condition indicators in the Sydney Metropolitan and Hawkesbury–Nepean regions

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 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 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 Sydney Metropolitan and Hawkesbury–Nepean CMAs are undertaking various activities in relation to the marine theme including:

- engaging with primary producers (fishing, aquaculture and agriculture industries) to improve the management and health of estuarine and coastal areas through the Tide to Table project
- implementing integrated coastal estuary and marine programs which in 2007–08 included more than 20 coastal estuary and marine projects with aquatic/estuarine management outcomes
- installing seagrass-friendly moorings to protect seagrass habitat in priority areas.

Organisations working with the CMAs on these projects or on other significant activities in the catchments contributing to better marine waters outcomes include Coastcare, local government, Oceanwatch, Industry & Investment NSW, DECCW, the fishing industry and oyster growers.

Further reading

Extent of marine protected areas indicator

Breen DA, Avery RP & Otway NM 2005, *Broadscale Biodiversity Assessment of Marine Protected Areas in the Hawkesbury Shelf Marine Bioregion*, Final report for the NSW Marine Park Authority.

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.

ANZECC & ARMCANZ 2000, *Australian and New Zealand guidelines for fresh and marine water quality*, Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand, Canberra, available at www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality.

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

Coleman MA, Kelaher BP, Steinberg PD & Millar A 2008, Absence of a large brown macroalga on urbanized rocky reefs around Sydney, Australia, and evidence for historical decline, *Journal of Phycology* 44: 897-901.

Scandol J, Rowling K & Graham K 2008, *Status of Fisheries Resources in NSW 2006–07*, p 334, NSW Department of Primary Industries, Cronulla.

Underwood AJ, Chapman MG, Cole VJ & Palomo MG 2008, Numbers and density of species as measures of biodiversity on rocky shores along the coast of New South Wales, *Journal of Experimental Marine Biology and Ecology* 366: 175-183.

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.

National Health and Medical Research Council 1990, *Australian Guidelines for Recreational Use of Water*, Australian Government Publishing Service, Canberra.

Published by: Department of Environment, Climate Change and Water NSW, 59–61 Goulburn Street, PO Box A290, Sydney South 1232.

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