

State of the catchments 2010

Wetlands

Hawkesbury–Nepean region

State Plan target

By 2015 there is an improvement in the condition of important wetlands and the extent of those wetlands is maintained.

Background

The Hawkesbury–Nepean region covers approximately 21,400 km² of temperate New South Wales. The region contains a number of wetland types such as upland lakes and wetlands, coastal floodplains and coastal swamps.

Overall, wetlands in the Hawkesbury–Nepean region are in very poor condition. The greatest pressure on wetlands in the region is from habitat disturbance caused by grazing, feral animals and roads crossing or adjoining wetlands.

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 DECCW website: www.environment.nsw.gov.au/publications/reporting.htm.

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



Assessment

Specific sites have been mapped for this report as NSW wetlands are neither comprehensively nor consistently mapped. The state target specifies that only 'important' wetlands be assessed; the sites reported on in this document are therefore internationally, nationally and regionally important but may not be representative of all wetlands in the region.

The state target reports only on freshwater wetlands in NSW and does not include riverine, estuarine or tidal wetlands.

Condition

Wetland 'extent' refers to the condition of the inundated area and the vegetation that depends on it. A state-wide methodology is currently being developed by DECCW to determine the minimum and maximum extent of each wetland. Until this method has been developed and consistent mapping is carried out for all regions, the extent of NSW wetlands cannot be compared or comprehensively reported on.

Indicators of condition

In general, there is a lack of available data on the condition of NSW wetlands and very few procedures or standards for collecting and analysing such data.

For the purposes of this report, 'indicators of condition' have been combined for each wetland (without weighting) to produce an overall 'condition rating' (see Table 1). This provides an overview of the wetlands within the region and may prove useful when devising a formal methodology to assess wetlands in NSW. The value of this condition rating depends to a very large extent on the data on individual indicators; in many cases the 'indicator of condition' is based on very limited data, in some cases on pest species alone, so the overall indicator should be regarded with some caution.





Measured in the fringing zone and/or wetland, the indicators of condition assessed for the nine most significant wetlands in the Hawkesbury–Nepean region were:

- **biological condition** – the response of the wetland flora (eg aquatic and fringing vegetation) and fauna (eg birds, fish and invertebrates) to pressures on the ecosystem. It can be a measurement of the abundance or health of these plants and animals or a combination of both; there is currently not much data available for many of these indicators and additional data will need to be collected in future
- **pest species** – the ratio of native to introduced species of flora and fauna
- **water quality** – the condition of the water in the wetland. Water quality takes into account pH, salinity and turbidity; data can be very difficult to analyse as results can be highly variable. Analysis of a wetland's water quality is important as the water supports biota and ecological processes within the ecosystem
- **soil condition** – the physical attributes of the wetland including pH, salinity, soil moisture, erosion and modifications such as channelling works. Wetland soils contain nutrients that form the base of the food chain and store seeds and eggs of wetland flora and fauna. Soils vary according to wetland type.



Table 1 Indicators of condition and condition rating for wetlands in the Hawkesbury–Nepean region

Wetlands	Condition	Trend	Data confidence	Indicators				Extent (hectares)	Trend
				Biological condition	Pest species	Water quality	Soil condition		
Overall Hawkesbury–Nepean wetlands		?	L						
Overall NSW wetlands									
Blue Mountains Swamps Upland swamp		?	L					37.88	?
Boyd Plateau Bogs Upland bog and fen								141.95	?
Lake Bathurst Upland freshwater lake		?	L					1319.79	?
The Morass Upland freshwater lake								589.88	?
Longneck Lagoon Coastal freshwater lake		?	L					15.8	?
Pitt Town Lagoon Coastal floodplain swamp		?	L					50.68	?
Thirlmere Lakes Coastal freshwater lakes		?	L					23.67	?
Wingecarribee Swamp Upland bog and fen		?	L					924.62	?
Paddys River Swamps Coastal floodplain swamp		?	L					196.9	?

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

Indicators of condition vary between wetland types; some indicators of condition do not apply to certain wetland types or may be scored differently between types. Various data is not available due to reasons such as a lack of raw data, lack of information on how to score certain indicators and no long-term datasets to appropriately score the indicator.

Condition indicators, such as invertebrates and vegetation, would be appropriate if data and standards were available. These will continue to be developed for future reporting cycles.

Condition variables

Many variables were taken into account when calculating condition scores. Where relevant, the following variables were considered during analysis of the Hawkesbury–Nepean region wetlands:

- **biological condition** – tree health
- **pest species** – ratio of native to introduced plants, ratio of native to introduced animals
- **water quality** – total nitrogen load (kg/ha/yr), total phosphorus load (kg/ha/yr), total nitrogen (µg/L), total phosphorus (µg/L), number of algal blooms, turbidity (NTU), ambient pH, salinity (EC)
- **soil condition** – ambient pH.

For detailed information on which variables were used to calculate the condition scores and how they were scored, aggregated and weighted, please see the supporting technical report.

Pressures

There are a variety of ‘pressures’ or disturbances that adversely impact on wetlands and ultimately affect the overall condition rating. As was the case with condition assessment, a methodology has not yet been formulated to determine the pressures on individual wetlands across all NSW.

Indicators of pressure

For the purposes of this report, the following ‘indicators of pressure’ have been combined (without weighting) to produce an overall ‘pressure rating’ (see Table 2).

Measured in the fringing zone, wetland, and/or hydrological catchment, the indicators of pressure assessed for the nine most significant wetlands were:

- **catchment disturbance** – modifications or changes to the catchment structure or processes that affect the wetland. Significant catchment disturbances affecting NSW wetlands include urbanisation, agriculture, vegetation clearing, infrastructure and fire

- **hydrological disturbance** – the levels of nutrients entering a wetland, water and soil chemistry, vegetation patterns, the biota present and the wetland's productivity. Drainage, damming, extraction and river regulation have greatly altered the hydrologic dynamics of many NSW wetlands
- **habitat disturbance** – both the direct removal of wetland habitat and activities that modify, damage or disturb wetland habitat areas. Disturbance to a habitat may include construction work, urban development, clearing for agriculture, recreational uses and water regulation.

Table 2 Indicators of pressure and overall pressure rating for the Hawkesbury–Nepean region

Wetlands	Pressure	Trend	Data confidence	Indicators		
				Catchment disturbance	Hydrological disturbance	Habitat disturbance
Overall Hawkesbury–Nepean wetlands		?	L			
Overall NSW wetlands						
Blue Mountains Swamps Upland swamp		?	L			
Boyd Plateau Bogs Upland bog and fen		?	L			
Lake Bathurst Upland freshwater lake		?	L			
The Morass Upland freshwater lake		?	L			
Longneck Lagoon Coastal freshwater lake		?	L			
Pitt Town Lagoon Coastal floodplain swamp		?	L			
Thirlmere Lakes Coastal freshwater lakes		?	L			
Wingecarribee Swamp Upland bog and fen		?	L			
Paddys River Swamps Coastal floodplain swamp		?	L			

Pressure					Trend		Confidence	
1	2	3	4	5	↑	Increasing	H	High
very high	high	moderate	low	very low	↔	No change	M	Medium
					↓	Decreasing	L	Low
					?	Unknown		
<div></div> No data								

As was the case with indicators of condition, some indicators of pressure do not apply to certain wetland types or may be scored differently between types. Likewise, various data is not available due to reasons such as a lack of raw data, lack of information on how to score certain indicators and no long-term datasets to appropriately score the indicator.

Pressure variables

Many variables were taken into account when calculating pressure scores. Where relevant, the following variables were considered during analysis of the nine most significant wetlands in the Hawkesbury–Nepean region:

- **catchment disturbance** – catchment cleared (%), wetland adjoining urban areas (%), infrastructure, presence of point sources
- **hydrological disturbance** – number and type of impoundments, river regulation, farm dam density, number of groundwater bores, density of irrigation channels
- **habitat disturbance** – recreational use (eg camping, boat ramps, parks), lakebed cropping, grazing, pugging, travelling stock routes, roads crossing and/or adjoining the wetland, wetland in a protected area (%), barriers without fish passage, presence of feral animals.

For detailed information on which variables have been considered when calculating the above pressure scores and how they are scored, aggregated and weighted, please see the supporting technical report.

Management activity

Addressing the wetlands target in the Hawkesbury–Nepean region involves implementing a number of policies and programs at both a state and regional level, which will result in the improved condition of Hawkesbury–Nepean and other NSW wetlands.

State level

The wetlands target is being addressed at the state level in numerous ways:

Policy

- The draft NSW Wetlands Policy provides clear and consistent principles of management for the improvement and protection of the state's wetlands. It also aims to increase the capacity for a coordinated, cross-government approach to wetland conservation.



Protection and rehabilitation

- The NSW Wetland Recovery Program (WRP), NSW Rivers Environmental Restoration Program (RERP) and NSW Riverbank Project aim to deliver long-term and permanent benefits for ecologically significant wetlands. These programs achieve such benefits through water efficiency projects, water buy-back and projects to improve wetland management. The WRP and RERP Programs are joint initiatives with the Australian Government
- There is continuous protection and conservation of wetlands under conservation agreements and on public reserves, in wildlife refuges and on various other private and public lands
- The 2008–2018 NSW National Park Establishment Plan lists wetlands as a priority
- A saltwater wetland rehabilitation manual has been finalised by DECCW.

Monitoring, evaluation and reporting

- The NSW Integrated Monitoring of Environmental Flows measures changes in environmental flows and ecosystem responses and provides information to improve wetland conditions.

Regional level

At the regional level, the Hawkesbury–Nepean Catchment Management Authority (CMA) is undertaking various activities to achieve the state target. Specific examples include the following:

- the Hawkesbury–Nepean CMA Wetland Management Program
- implementing management plans for nationally important wetlands at Lake Bathurst and Paddys River
- providing incentives to landholders to protect and restore priority wetlands across the catchment. In 2007–2008, landholder projects resulted in 15 km of fencing on 58 hectares of wetlands
- supporting council programs that protect upland hanging swamps (including the endangered temperate highland peat swamps) and lower floodplain wetlands
- assessing the condition of wetlands in the catchment to set priorities for investment; this is completed in conjunction with DECCW
- supporting strategic actions to improve the condition of nationally important wetlands on public lands; this includes weir modification for improved natural flows at Longneck Lagoon and improved bird habitat at Pitt Town Lagoon.

Further reading

- Baldwin DS, Nielsen DL, Bowen PM & Williams J 2005, *Recommended Methods for Monitoring Floodplains and Wetlands*, MDBC Publication No 72/04.
- Clarkson BR, Sorrell BK, Reeves PN, Champion PD, Partridge TR & Clarkson BD 2004, *Handbook for monitoring wetland condition. Coordinated monitoring of New Zealand wetlands*, A Ministry for the Environment Sustainable Management Fund Project (5105).
- Fairweather PG & Napier GM 1998, *Environmental indicators for national state of the environment reporting – inland waters, Australia: State of the environment (Environmental Indicator Reports)*, Department of the Environment, Canberra.
- Lloyd P & Alexander P 2003, *Wetlands Watch: A field guide for monitoring wetlands in the southern section of the Murray-Darling Basin* 2nd edition, NSW Murray Wetlands Working Group Inc., Albury.
- NLWRA 2004, *Assessment of data requirements and availability to address natural resource condition and trend indicators, Part A: Project Report*, National Land and Water Resources Audit, Canberra.
- Scheltinga D & Moss A 2008, *A framework for assessing the health of, and risk to, Queensland's lacustrine (lake) and palustrine (swamp) wetlands*, Queensland Environmental Protection Agency.
- Spencer C, Robertson AI & Curtis A 1998, 'Development and testing of a rapid appraisal wetland condition index in south-eastern Australia', *Journal of Environmental Management*, 54:143-159.
- Stein JL, Stein JA & Nix HA 2002, 'Spatial analysis of anthropogenic river disturbance at regional and continental scales: identifying the wild rivers of Australia', *Landscape and Urban Planning*, 60:1-25.
- Walker J & Reuter DJ 1996, *Indicators of catchment health: A technical perspective*, CSIRO Publishing, Collingwood.



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