Temporal change in the vegetation communities of the Macquarie Marshes, a wetland in the drylands of NSW

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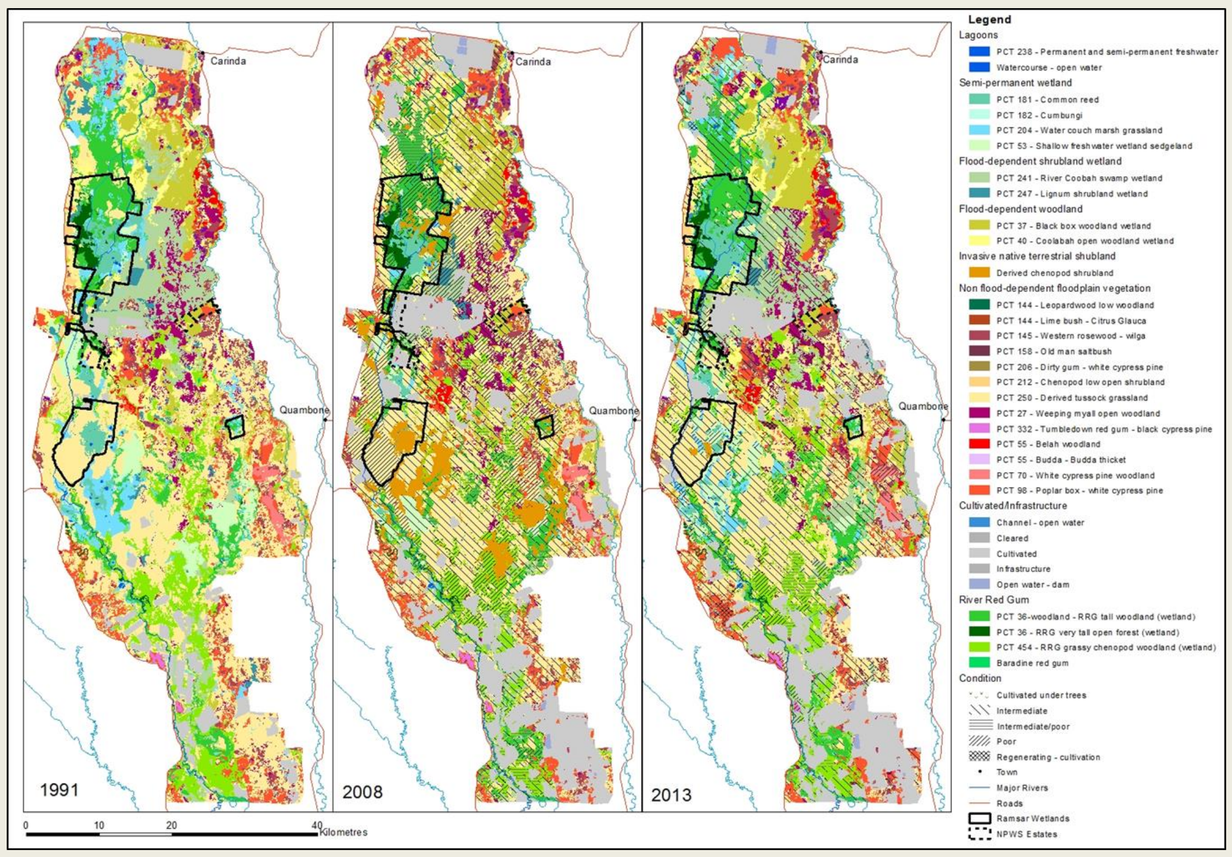
Introduction/Aim

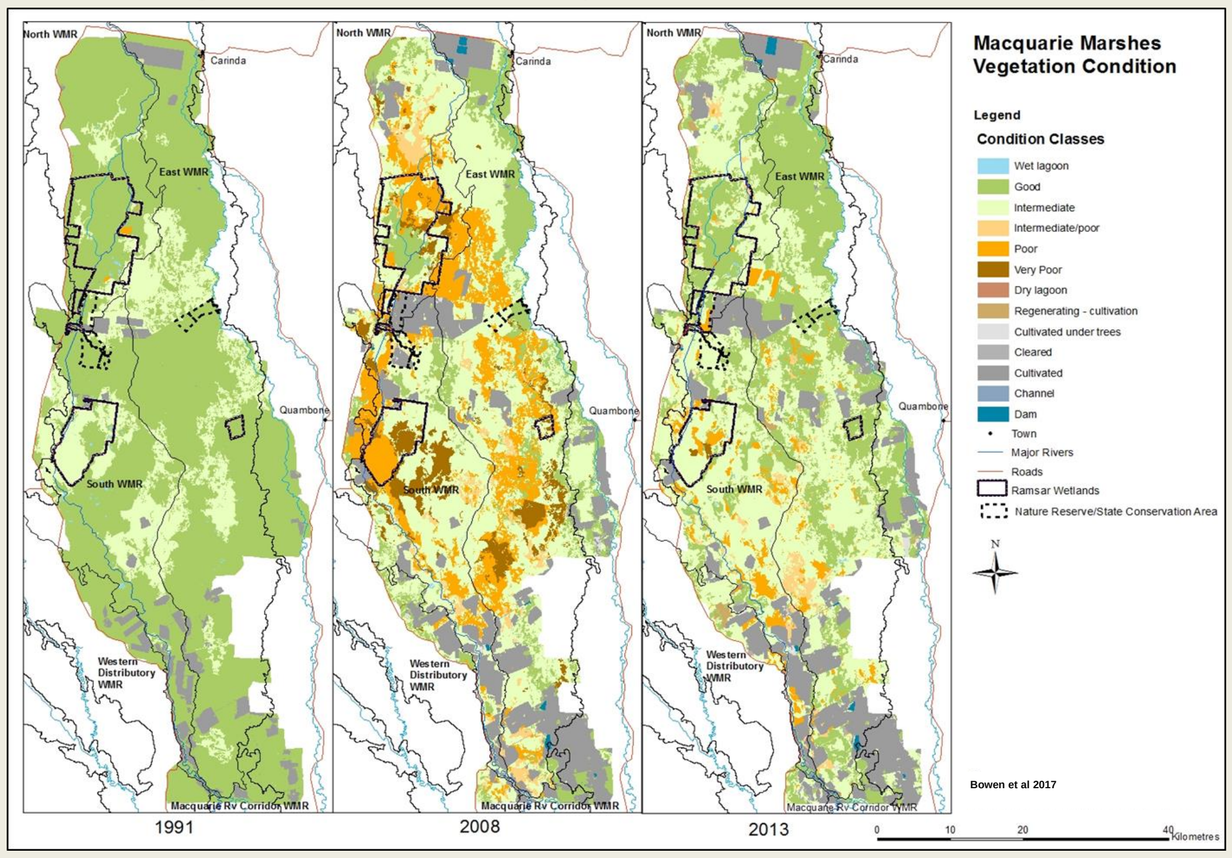
The Macquarie Marshes are a floodplain wetland complex of 250,000 ha, located ~200 km north of Dubbo in Central Western NSW, in the lower floodplain of the Macquarie River Catchment. They include the Macquarie Marshes Nature Reserve and State Conservation Area. Three areas (19,850 ha) are wetlands of international significance listed under the *Ramsar Convention 1971*. The Marshes have been under ecological stress since the building of Burrendong Dam in 1967 changed the natural flooding regime, exacerbated by droughts and changed land management practices. There have been changes in the number of and a reduction in duration of flood events since the 1990s. This study provides information for adaptive monitoring under the NSW OEH Environmental Water Management Program. The study identifies the type and magnitude of changes in the extent and condition of all vegetation communities of the Macquarie Marshes in the period 1991-2013. It will be used to track and model the response of water-dependent vegetation communities to inundation variables to adaptively manage environmental water delivery.

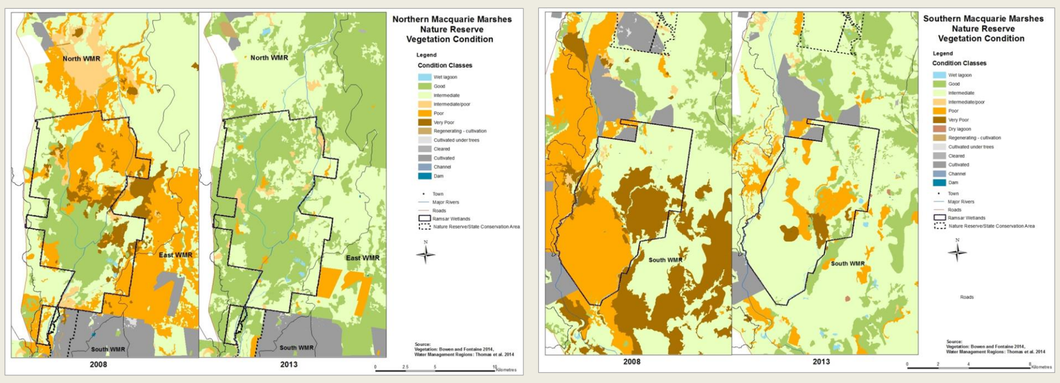
Methods

The vegetation communities were mapped digitally by manual Aerial Photo Interpretation (API) of high-resolution colour aerial photography captured in 2008 and 2013. The 1991 map was produced using digital versions of black and white 1991 aerial photography, at a resolution of 1:1000. Ground survey data from each year was analysed for NSW OEH Plant Community Type (PCT), and condition class was determined from indicator metrics derived from the survey data. These points were used as reference sites to assign PCT and condition class to each polygon of the map in each year. Overlay analysis of the three data layers (1991, 2008 and 2013) was used to measure the spatial change from one time to another in PCTs and condition class.

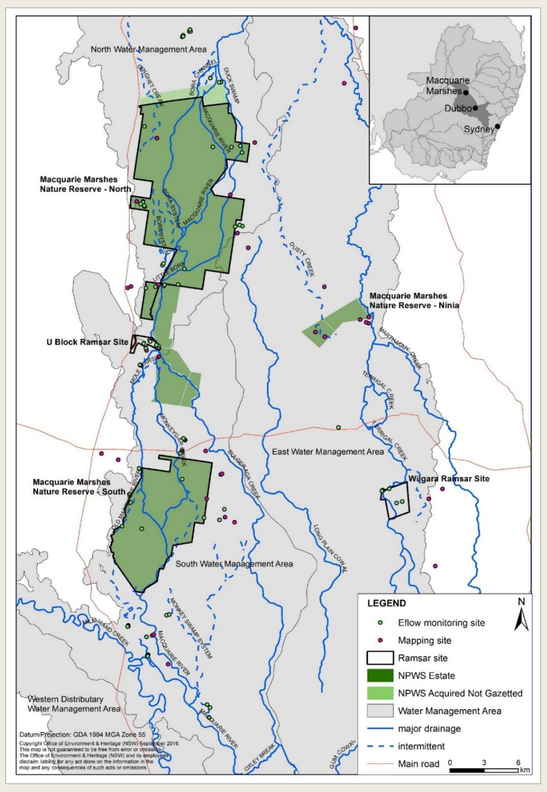


Vegetation communities of the Macquarie Marshes 1991,2008 and 2013

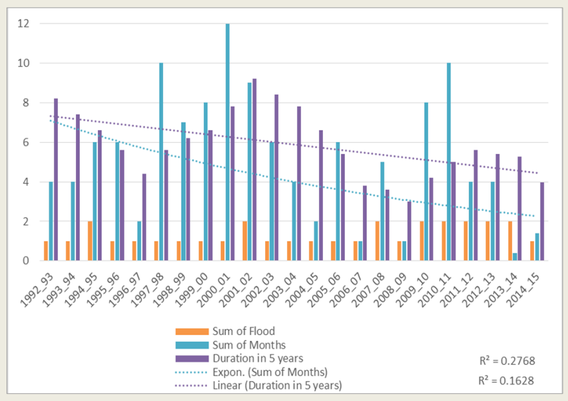




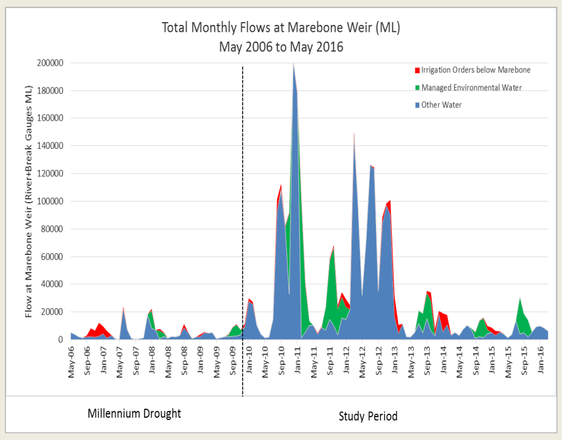
Map of extent of condition classes Macquarie Marshes Nature Reserve 2008, 2013



Location: Macquarie Marshes

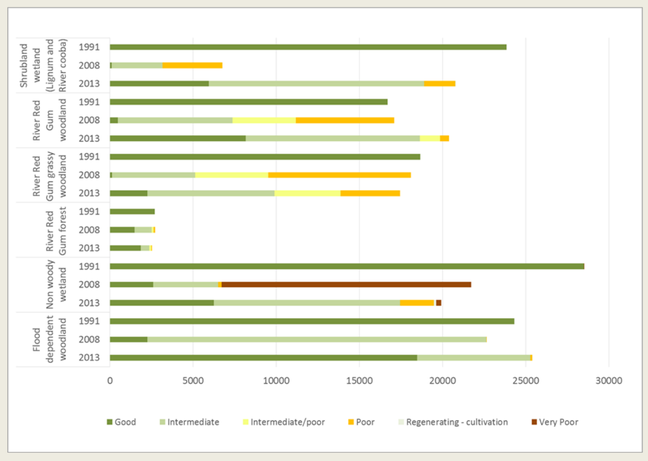


Trends in inundation variables 1992-2014



Macquarie River flows 2006-2016

Extent of vegetation communities 1991, 2008 and 2013

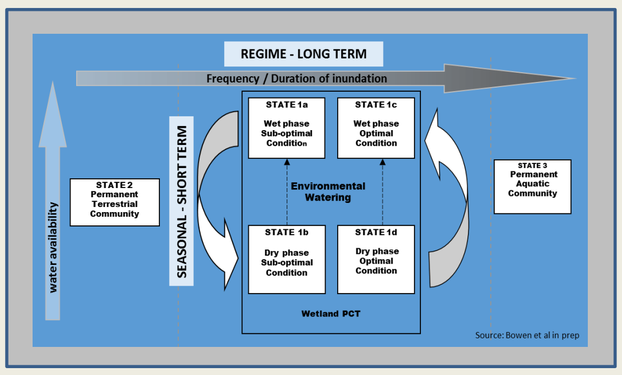


Extent of condition classes 1991, 2008, 2013

Results/Applications

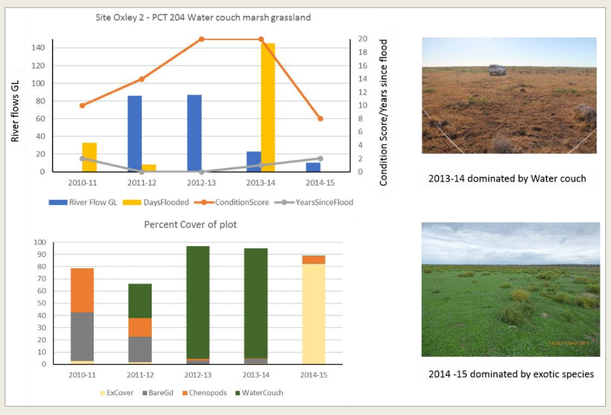
There have been changes in both extent and condition of water-dependent PCTs (e.g.: river red gum (*Eucalyptus camaldulensis*) forests/woodlands, black box (*E. largiflorens*) and coolabah (*E. coolabah*) woodlands, treeless (non-woody) wetlands of water couch (*Paspalum distichum*), common reed (*Phragmites australis*), shrublands of lignum (*Duma florulenta*) and river cooba (*Acacia stenophylla*)) in the sample periods. After a decline in both extent and condition in the period 1991-2008, there has been recovery of the health of many areas of these PCTs in the Marshes post millennium drought and with adaptive management of environmental water in the period 2008-2013. However condition and extent have not returned to the levels of 1991.

Changes in extent and condition of water-dependent PCTs can be linked to changes in inundation variables over the same time. A conceptual process model of the relationships between inundation variables and condition has been developed along with modelled quantitative condition classes. These tools assist Environmental water managers to set targets for watering actions at multiple scales and allow the reporting of the results of watering actions on the condition of target PCTs at the regime scale. These methods are being used to adaptively manage environmental water for water-dependent vegetation communities in multiple NSW valleys under the Murray Darling Basin Plan.



Conceptual process model for water-dependent plant communities

River red gum forest in Good condition – Northern Macquarie Marshes Nature Reserve



Temporal change in site condition and indicator/ species composition

Non-woody wetland in Poor condition – Southern Macquarie Marshes Nature Reserve

Bowen et. al. (in prep) Temporal change in the vegetation communities of the Macquarie Marshes, NSW