

# Climate Change Adaptation Research Grants Program

## - Freshwater Biodiversity Projects

### **Project title:**

Adaptive management of Ramsar wetlands.

**Principal investigators:** Professor Richard Kingsford

**Lead organisation:** University of New South Wales

### **Objectives:**

- To provide scientific and stakeholder information underpinning adaptive management planning for climate change in the case study of a wetland of international importance - the Macquarie Marshes;
- To incorporate climate change adaptation into a hierarchy of objectives for management;
- To develop a process model, scientific management thresholds and targets for rehabilitation for key organisms and ecological processes in adapting to climate change;
- To identify opportunities to integrate different planning processes and incorporate effects of climate change on conservation goals

### **Project design and methods**

There are eight stages for this project (i-viii), covering the four objectives, with six accompanied by separate deliverable reports and a final report.

- (i) A postdoctoral fellow will be appointed.
- (ii) To further review and collate available scientific information (published and data sets), underpinning development of management objectives (see iii) thresholds for the aquatic ecosystem, its biota and responses to drivers, including climate change. There is considerable scientific information relevant to the aquatic biota and ecosystem processes of the Macquarie Marshes but no consolidation or access that can be used for climate adaptation and management. The recent synthesis' broadly identified potential impacts of changing climate and potential adaptation measures available for the Macquarie Marshes but did not investigate availability and accessibility of data or information on all biota in decline, critical for reporting on management effectiveness. This objective would be achieved through building on our recent detailed literature reviews', analysis of the content of all databases to produce a metadata database of available data, including temporal and spatial coverage.
- (iii) To incorporate climate adaptation into the hierarchy of objectives for the management of the Macquarie Marshes Nature Reserve. OEH is currently developing an adaptive management plan with a hierarchy of objectives, following identification of key attributes to be managed (e.g. river red gum, waterbirds and their breeding) and their dependency on factors amenable to management. The synthesis project identified a need to extend this to include adaptation to climate change. This project will produce a framework for scientific information necessary for developing objectives and informing decision-making of management and provide the actual data, where available (see ii).
- (iv) To produce a process model of the ecosystem 17 and identify thresholds of concern and rehabilitation targets for key biota near their climate limits (e.g. aquatic vegetation communities, waterbirds and their breeding, fish populations). This part of the project will produce an agreed model of ecosystem dynamics and identify key transitions that influence resilience. This will be done through a facilitated workshop, involving managers and scientists familiar with the system. The second part of this objective involves estimation of thresholds of adaptation for different biota and processes, based on key attributes identified by managers (e.g. river red gums, breeding of colonial waterbirds). This will be done using

available data, scientific literature, local knowledge, modelling and expert elicitation. The aim is to establish thresholds of concern that will trigger management action, based on data. This will be facilitated through a second workshop of scientists and managers that will identify thresholds of adaptation for different biota, potential targets for rehabilitation and indicators that can inform management. We will also develop a model for inundation linked to flow and rainfall, allowing scenario development for different thresholds, based on analysis already completed

- (v) To identify how climate change affects different policies, goals and international obligations and integrate these into a cohesive adaptive management plan. This part of the project will examine all relevant legislation and planning policies and their conservation goals at the range of different scales (wetland, catchment, basin, jurisdictional, national, and international) to identify alignment, potential conflicts and opportunity for incorporating climate change adaptation policies into the adaptive management framework. Plans include water management plans, operating plans of the Environmental Flows Reference Group, catchment action plans, Murray-Darling Basin Plan, environmental flow delivery plans, management plan for the Nature Reserve and the Ramsar site. Much of the background for the current state of the system was reviewed in an adaptive environmental plan 18 but this provided limited direction for operational management, currently underway within OEH7,
- (vi) To develop an information platform (software tool), allowing access to key scientific information and modelling for climate adaptation and management. A critical constraint on adaptation is access to scientific information for adaptation management. This project will develop a system that assists call up of data on biota, ecological processes and modelling into a spatio-temporal interface. This interface would also include the distribution of flood dependent vegetation communities and their required flooding regimes to determine adaptation opportunities delivered with climate adaptation to altered flow regimes (e.g. environmental flow management) based on our modelling,
- (vii) To review expert local knowledge from different sectors (e.g. agricultural) for development of objectives and thresholds and identify mutually beneficial climate adaptation measures for freshwater biodiversity conservation. Much of the Macquarie Marshes is private land in which landholders rely on regular inundation to increase their capacity to sustain livestock. We will investigate opportunities for synergies in climate adaptation; this can potentially tie into future management of their Marsh holdings. To underpin this information, local knowledge of flooding patterns and understanding of responses of biota from long-term residents needs to be captured to produce an oral history of the Macquarie Marshes and the river.
- (viii) The final stage will be production of the final report, a compilation of the previous reports with a synthesis of the six interim reports.