



Rescuing the **BARMAH FOREST**

A great variety of birds is attracted to the Murray's wetlands, including those of the Barmah Forest. Nicola Stratford

A powerful collaboration between research, catchment management, indigenous, national parks and government working groups is combining knowledge to restore a precious native river habitat.

Around 225 km north of Melbourne, on the Murray River flood plain between Echuca and Tocumwal, lies one of Australia's ecological jewels – Barmah Forest, part of the world's largest river red gum forest.¹

It is home to more than 200 different birds, and is significant internationally as a wetland breeding ground for water species. There are also abundant mammals, reptiles and frogs. The oldest stands of red gums date back over 400 years, and their rotten limbs and hollows provide important habitat.

It is a special place to be and people visit for many reasons – its historical sites, local Aboriginal culture, bush walking, canoeing and fishing. But there is a downside to this interest and activity.

While the indigenous people lived

lightly on the land, the arrival of Europeans and their new endeavours unleashed changes in this complex ecosystem. First, logging to fuel paddle steamers and make railway sleepers greatly altered the forest structure. Later, taking water for irrigation caused big changes in the regularity of winter flooding, and this subsequently altered the natural cycle of regeneration.

Mr Keith Ward, Wetland Manager with the Goulburn Broken Catchment Management Authority, has worked in Barmah Forest for the past 17 years. 'To see the forest in flood is to truly appreciate the life and beauty the water brings,' he says. 'If more people saw this and realised the importance of the wetlands in the web of life, I believe there would be greater community support for environmental flows and better care of the environment.'

The constant removal of resources and changes in water flows threaten the long-term survival of this wonderful river red gum forest. It has also been used as a rubbish dump and in places is deeply rutted by off-track four wheel drive vehicles.

Grazing by cattle and wild horses has also damaged both vegetation and the soil.

But all is not lost. There are now many groups committed to the restoration and protection of Australia's unique river red gum forests. The Yorta Yorta Nation, who have lived in the area for thousands of years, have long had an interest in the conservation and environmental management of Barmah Forest, as has the Victorian Government.

Now the Murray–Darling Waterways Restoration Project has been set up to provide science-based management options to help repair the damaged landscape. It is a unique partnership between the Goulburn Broken Catchment Management Authority, the Yorta Yorta Nation Aboriginal Corporation, Parks Victoria, the Victorian Department of Sustainability and Environment and CSIRO, through the Water for a Healthy Country Flagship. The aim is to restore the native vegetation and ecological functions of the flood plains of the upper mid-Murray Valley.

¹ Australian river red gums (*Eucalyptus camaldulensis*) are now grown in many countries including Egypt, South Africa, Spain, Israel and Portugal.



Barmah Forest has the world's largest and oldest stands of river red gums. CSIRO Land and Water



A Moira grass plain from the air showing extent of giant rush invasion. An area of the experimental burn for giant rush control is visible as grey ash beds. Keith Ward, GBCMA

To do this, participants need information on the changes in the environment, what caused them and what practical pathways will restore the flood plain forests. While the current focus of research is the Barmah Forest, the project is

also operating at other Living Murray Icon Sites² and Ramsar Convention Wetlands, including Lindsay-Wallpolla, Hattah-Kulkyne and Gunbower.

Restoration ecologists from CSIRO working on the project specialise in natural ecosystems that have been significantly altered by human activities. The information they are gathering will help land managers and agencies develop management strategies that ensure the future health of the area.

'At Barmah Forest, we are concentrating on the major changes in native vegetation in recent years, and the implications of these changes for the functioning of the river red gum forest,' says Dr Matt Colloff from CSIRO. 'In particular, there is a focus on the invasion of giant rush (*Juncus ingens*) and river red gum saplings (yes, they too can turn into pests) onto the Moira grass plains found within the forest, as well as the spread of other invasive plants such as arrowhead (*Sagittaria graminea*), and lippia (*Phyla canescens*) which we recently found at Barmah for the first time.'



Burning giant rush at Steamer plain.

Kim Pullen, CSIRO Entomology

These grasslands appear to be an essential part of the forest and a significant reduction in their extent potentially poses a threat to the biodiversity and functional integrity of the forest. During floods, the decomposition and nutrient turnover of this massive amount of grass drives aquatic food webs. The grasslands are also

2 The Living Murray Icon Sites were chosen for their high ecological and cultural value under the Living Murray program: www.thelivingmurray.mdbc.gov.au

Progress



Feral horses and cattle are one of many recent pressures on the wetland plains.

Kim Pullen, CSIRO Entomology

important breeding and feeding sites for native fish and birds, as the Yorta Yorta have long recognised (see Box).

Changes in water availability through irrigation and drought have changed the balance between plants. The shift in the flood regime towards short, shallow summer floods appears to have played a major role in favouring the spread of giant rush and red gum, which cannot tolerate prolonged and deep inundation, at the expense of Moira grass which requires long, deep floods for optimum growth.

'We also conducted an extensive survey of damage caused by feral horses and

cattle, which were removed from the forest around March 2007,' says Dr Colloff. 'In eight Moira grass plains and adjacent forest areas, we measured the amount of plant material (biomass) and the density, depth and age of hoof prints (pug marks).'

There is growing evidence that grazing animals open up niches for weeds through heavy grazing and trampling. As an example, arrowhead, an introduced and very invasive aquatic plant, is now spreading throughout the forest waterways.

Early results indicate that the Moira grass plains in particular can be degraded by grazing. Heavily impacted sites tend to be those that flood first – these may attract more use for grazing because they retain standing surface water for longer and act as important watering points.

'In these areas,' says Dr Colloff, 'there were up to 20 cattle pug marks per square metre of soil and some of them were more than 20 cm deep. The sites also had a relatively low Moira grass biomass.'

Pug damage is not unlike ploughing – it greatly increases the soil surface area, causing the soil to dry more rapidly than normal. Thus it appears that grazing increases the impact of the changes in flood regime to the detriment of Moira grassland health, facilitating the invasion by giant rush.

At several sites giant rush has completely taken over the grass plains and invaded the forest, forming an impenetrable understorey. This causes a serious reduction in habitat quality.

Dr Colloff says his team believes the exclusion of cattle and removal of feral horses from these areas of the Barmah Forest would be a positive step towards the restoration of the area's natural assets.

Meanwhile, the results of the research in Barmah Forest and the development of management plans for it will provide a timely basis for restoration and management of other areas in the broader Murray–Darling Basin.

● Louise Lawrence with Matt Colloff

More information:

CSIRO Water for a Healthy Country
Flagship: www.csiro.au/org/HealthyCountry.html

Murray–Darling Basin Commission, The Living Murray Initiative: <http://theliving-murray.mdbc.gov.au/>

Yorta Yorta Co-operative Management Agreement: www.atns.net.au/agreement.asp?EntityID=2508

Indigenous knowledge is integral to the Barmah partnership

Lee Joachim, Chairperson of the Yorta Yorta Nation Aboriginal Corporation, explains the importance of his community's involvement.

'Indigenous knowledge is gaining recognition globally for its sustainable environmental management systems; however, this awareness needs to take careful account of the people that this knowledge derives from, and to involve indigenous people directly in scientific projects.

'Our involvement in this project is crucial to the inclusion of indigenous knowledge in environmental – and cultural – sustainable management of biodiversity and the landscape.

'We are taking on board some ideas of western science, but are using principles of Yorta Yorta culture for environmental and cultural sustainability to create a fusion of the two. We are actively forming a bridge between western science and indigenous knowledge for more sustainable management, in order to maintain what we term the "cultural biodiversity" of the landscape.

'Over the time of settlement in the area, our Elders have witnessed the abuse of this cultural environmental biodiversity through grazing, logging, 4WDs, introduced pests and other destructive human activity, on top of changes to the cultural water flow, which has had significant effects on our country.

'This includes the disappearance of aquatic life in the form of two key species of fish. These are the Walka and Gilgarja, which inhabited the large grass plains in times of flood. The grasslands are breeding grounds and an important part of the filtration of the floods.

'These fish species are gone, but they helped form the plain as it is now. Since



From right: Keith Ward, Environmental Water Manager, from the Goulburn Broken Catchment Management Authority (GBCMA) with Yorta Yorta representatives Neville Atkinson, Indigenous Co-ordinator (GBCMA), and a member of the Giant Rush Monitoring Group. Kim Pullen, CSIRO Entomology

these fish have never been recorded in any western science journals or books, our involvement forms an important part of the partnership for the cultural environmental biodiversity efforts.

'The Yorta Yorta people hope that their knowledge will be valued as a fundamental part of the quest towards more environmental and cultural sustainable management options in the light of future climate change directions.

'An indigenous understanding of living with environment needs to be heeded and no longer ignored.

'The forced exclusion of us and our cultural environmental management throughout Australia's European history is going to take significant work to overcome. We are now trying to gain back our rightful place and be included and respected through what our knowledge holds, and what we can do in a joint management of nature.'