

“Watering Wetlands on Private Properties” project Murray Valley, New South Wales, Australia

SUMMARY

Recent decades have seen the decline of water quality and biodiversity in Australia’s inland rivers managed for irrigation – the largest of which is the Murray-Darling system. In parts of the Murray-Darling system isolated from flooding, wetlands have been overtaken by terrestrial vegetation and trees hundreds of years old have been declining. As a result, governments and communities in Australia have become increasingly aware of the need for setting aside water for the environment.

In 2001, the NSW Murray Wetlands Working Group Inc (MWWG) initiated a project of delivering water that has been allocated to the environment - termed Adaptive Environmental Water (AEW) - to isolated wetlands in the Central Murray region. The aim was to address the decline in wetland condition and biodiversity in the region.

The Watering Wetlands on Private Properties Project has seen 74,152 ML of environmental water delivered to 215 wetlands covering over 67,238 hectares. Since the project began, the number of land managers involved has increased from 10 to 150 overall.

As a result of this, vegetation, particularly the dominant riparian and floodplain tree, River Red Gum which had been showing signs of decline, has generally responded positively to environmental watering. Monitoring has demonstrated a vast improvement in vegetation health and subsequently the fauna that utilise these wetlands. The aquatic vegetation at various wetland sites has provided dynamic habitats for water birds and amphibians.

Project area and ecosystems

This project focuses on wetlands in the Murray and Lower Murray-Darling River Catchments – the major agricultural catchments in the state of New South Wales, Australia (Figure 1). The Murray catchment covers an area of 3.5 million hectares, and the Lower Murray-Darling catchment spans 6.3 million hectares. The main rivers associated with these wetlands are the Murray, Wakool, Edward and Neimur rivers. There are approximately 7,600 wetlands, covering 132,000 hectares, with an average size of 15 hectares. The wetlands of the two catchments include River Red Gum (*Eucalyptus camaldulensis* Dehnh.) or Black Box (*Eucalyptus largiflorens* F.Muell.) overstorey, and often with an understorey of Lignum (*Muehlenbeckia florulenta* Meissner).

Stakeholders

The project involves the collaboration of many individual private landholders, irrigation companies in the Murray and Lower Murray-Darling catchments (Murray Irrigation Ltd, Moira Private Irrigation District, West Corurgan Irrigation Trust), government agencies (Department of Environment and Climate Change, Department of Water and Energy, Catchment Management Authorities, Forests NSW, River Murray Water/Murray Darling Basin Commission, NSW State Water). Where pumping is used, rather than irrigation infrastructure, a pumping contractor is engaged to run the pumps.



Figure 1 Murray and Lower Murray-Darling River Catchments (inset shows catchment areas, main figure shows area that AEW is used).

Why is restoration needed?

The natural flooding regime for wetlands in this region would have been winter/spring inundation once every 5 to 10 years (Close 1990). Since the draining of floodplains and construction of dams and levees to serve agriculture and rural towns, however, these wetlands have been isolated from the river and have had their flooding frequency greatly reduced. Where this has occurred over long timeframes, this has placed them potentially beyond their threshold of natural recovery even if re-flooded, due to destruction of soil seedbanks. The resultant effect is that many wetlands no longer experience flooding, and exist in long-term drought. Temporary wetlands are important in the landscape, and can retain high biodiversity values even when they are dry for long periods. Consequently as these wetlands are becoming degraded, the biodiversity of the area is in decline. It is likely that wetlands in this region will have longer periods of dry as the impacts of climate change become realised. Predictions of a reduction in rainfall by 20% over the next 50 years will result in prolonged periods of dry and increasing pressure on wetlands where existing regulated water supply has already been over-allocated.

Other impacts include over-grazing (which results in less native vegetation), increased weeds and soil pugging from animal access.

Restoration goals

There is little recorded information on reference ecosystems as nearby sites unaffected by isolation from flooding are rare. Given this, and the fact that anecdotal and field observation of other similar wetlands within the Murray Valley show high variation in the array of species, restoration goals are initially be aimed at increasing (through assisted natural regeneration) the cover of locally occurring native aquatic and riparian vegetation to provide habitat for wetland dependant species.

While the main aim of the project is to reinstate healthy function to wetlands, information gathering is also an essential component, particularly given the lack of specific knowledge about restoration potential of these sites. A secondary aim is therefore to build up a database of information about wetlands to inform reinstatement of more natural wetting and drying regimes for the wetlands. This database would be used to determine which wetlands require water in which years, with the occasional new wetland being added to the database.

It is not possible for this project to reverse the main causal factor, which is river regulation and wetland isolation due to irrigation infrastructure. Instead the aim is to ameliorate the cause by targeted delivery of water. However, it is feasible to overcome other contributing causal factors such as grazing by providing for fencing and alternative watering supplies.

Restoration activities

As the main cause of wetland decline in the area is lack of water, the delivery of AEW to wetlands was thought to be a useful tool in restoring ecological function to these wetlands. This water was delivered first through the Watering Wetlands on Private Properties Project in 2001, using irrigation infrastructure, In 2005 the MWWG expanded the project to incorporate wetlands that are isolated from the river due to river regulation within the Lower Murray Darling catchment (refer Figure 1, around Mildura) using portable irrigation pumps (owned by the MWWG).

Causes of degradation other than flooding were addressed through complementary strategies to either remove stock completely or better manage grazing through fencing and providing alternative water supply points. Riparian revegetation works take place on areas adjacent to the wetlands. Landholders also agree to the sites being used for field days or other educational purposes.

Methods of water delivery

Water delivery methods ranging from using irrigation infrastructure (i.e. channels), or using pumps located directly on the banks of the Murray River. At each wetland, a program is designed to deliver water for the wetland under agreement with the landholder, taking into consideration local conditions or potential impacts such as salinity or sulfidic sediments. These agreements with landholders include an understanding of the purpose for the watering (eg. to improve aquatic biodiversity, to restore tree health) and the grazing management permitted. Landholders can access funds held by the MWWG to conduct other on-ground works which compliment the aims of the environmental watering such as fencing or installation of alternative watering points. Revegetation plans are often considered with advice from the relevant Catchment Management Authority. Access to the site for monitoring or education/demonstration purposes is also negotiated on an individual basis.

Co-operation of the irrigation companies and landholders is vital to the planning and implementation of the project. The irrigation companies receive initial expressions of interest for water allocation and assess these against their groundwater maps, removing any that are in the vicinity of high groundwater zones. The irrigation companies also deliver the AEW through their infrastructure, to selected wetlands and monitor water use. The landholder contribution includes exclusion of stock, arranging for fencing, infrastructure upgrades and managing water delivery.



Pump set-up on Murray River for watering wetlands in the Lower Murray-Darling.

Costs

The costs involved for this project range between \$50,000 to \$100,000 per year in cash (not including staff employee time), and substantial in-kind contributions from agencies, landholders and companies. It is difficult to estimate the cost of the water used, as this is unique to each year, depending on market demand/availability.

Training

To ensure high standards of on-ground works, MWWG staff regularly participate in training on management planning, classification and prioritisation, determination of Acid Sulphate Soils, and wetland condition rapid assessment techniques. Internal training from more experienced staff or group members to new staff members is vital especially for vegetation monitoring.

Implementation issues yet to be resolved.

When pumping is involved, the approvals process can be time-consuming (taking up to 6 months), which can be unfavorable for the adaptive management of wetlands when environmental water is required. These restraints are largely a result of the AEW licenses being treated as irrigation licenses under the Water Management Act 2000, and therefore subject to the same terms and conditions. However, the policies and approval processes for watering wetlands using an irrigation license have yet to be fully articulated, and much of the work done by the MWWG has been breaking new ground.

Case Study 1 is an example of a landholder's motivation to be involved in the project.

CASE STUDY – “UNION PLAINS”

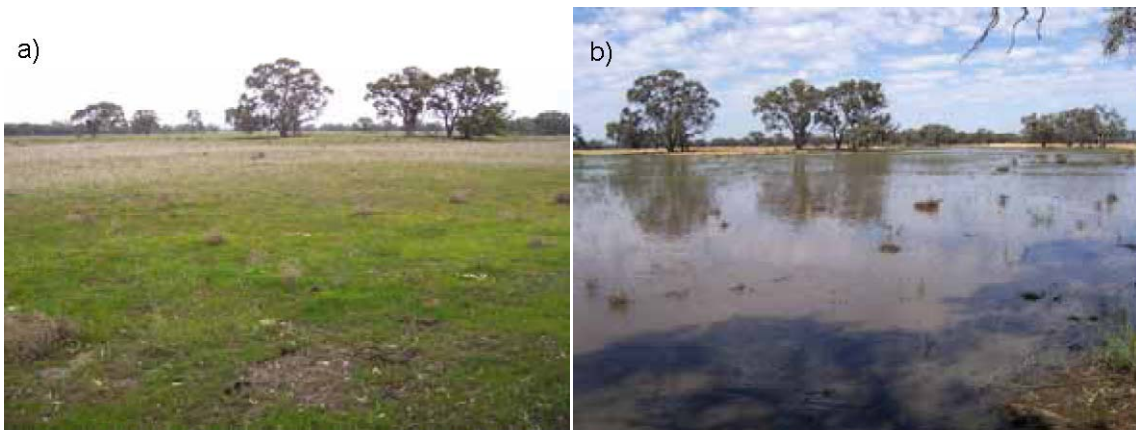
Neil and Susan Bull own the property “Union Plains” situated within the Riverina Plains country approximately 20 kilometres north-west of Deniliquin, New South Wales, Australia. The wetland on the property is 16 hectares and an example of Black Box (*Eucalyptus largiflorens*) floodplain. Typically these areas would receive flooding every 5 to 10 years, however with river regulation and other development, flooding has been reduced to every 15 to 20 years, and in some cases has ceased all together. As a result, these areas are becoming seriously degraded.

Neil and Susan have been actively enhancing the native vegetation on their property for many years, planting understorey species to try to re-instate some of the likely pre-existing diversity in their grazed remnant vegetation areas as well as fencing off these areas. In 2001, they realised that the health of the vegetation in their wetland area was extremely poor due to the lack of flooding and ongoing drought conditions in Australia. When they heard of the MWWG’s “Watering Wetlands on Private Property” project, they thought it would be an ideal way to try and save as many dying Black Box trees in their wetland as possible. The Bull’s were eager to be involved in the project, despite wider community concerns as to whether water should be used ‘for environmental purposes when water allocations for irrigators were extremely low. One of the main challenges faced by the Bull’s was the uncertainty as to where the water would run once it was delivered to the wetland. When asked if there was anything they would do differently if involved in the project again, Neil replied “Yes! I would take measurements of some of the levels of the wetland to ensure that the water supply system delivers the water in the most efficient way”.

When asked what benefits they thought the project provided, Neil and Susan explained “This project has delivered numerous significant benefits like triggering regeneration of indigenous tree and shrub species, replenishing the seed stock for future germination, and the restoration of remnant vegetation health including the full recovery of the majority of the dying black box trees. By flooding this wetland, habitat was provided for wetland species during a period of time when nearby wetlands were dry”. To add to this, the wetland was re-flooded in 2004, three years after the initial inundation, thereby further improving the health of the Black Box trees and continuing the regeneration process. Four years after this second watering Neil reports that “the vegetation is still flourishing”.

The wetland watering project at “Union Plains” highlighted some of the greatest difficulties with this sort of work, both in terms of community acceptance and the practical constraints regarding water delivery. However, it also clearly demonstrated the benefits. At a time when the allocation of irrigation water is under increasing scrutiny, gaining community acceptance of the need to provide water for wetlands is always going to be controversial. In Neil and Susan’s words “As the initial response to the flooding occurred within days and increased exponentially over the period of inundation, the level of excitement and feeling of warm satisfaction experienced by us was of the highest order. The speed and diversity of these responses make projects of this kind extremely effective as a means of biodiversity education”.

a) b)



c) d) Photo-

Monitoring and research links

All monitoring is used to inform adaptive management. The NSW Murray Wetlands Working Group Inc. have many years of experience in wetland ecology and management, as well as engaging organizations such as the Murray-Darling Freshwater Research Centre, Arthur Rylah Institute, CSIRO, Birds Australia to undertake specific research. MWWG uses the best scientific knowledge and technology available to assist with management and implementation of the watering project. Contributions have also been made by Honours and/or PhD students and community environmental/nature groups (Sunraysia Bird Observers, Birds Australia, NSW WaterWatch).

Research areas:

- Murray-Darling Freshwater Research Centre various studies – zooplankton, grazing impacts, seedbank, fish
- Charles Sturt University Institute of Land Water and Society – Optimising frog breeding responses to flooding in managed wetlands
- CSIRO – River Red Gum condition - trialing of a new technique to determine water stress on River Red Gum by looking at sapwood depths.
- Arthur Rylah Institute – in conjunction with the MDFRC, utilizing watered wetlands to look at floodplain inundation and impacts on fish communities and recruitment (National Water Commission funded project).

point monitoring of vegetation change at a Central Murray wetland on private property a) prior to wetting, b) 6 weeks post-wetting, c) 12 weeks post-wetting, d) 15 weeks post-wetting.

- Adelaide Museum have collected DNA samples from several Southern Bell Frog (*Litoria raniformis*) individuals to differentiate between other populations in South Australia, Victoria and New South Wales



Photo-point monitoring of vegetation change at a Lower Murray-Darling wetland on private property a) prior to wetting, b) 6 weeks post-wetting, c) 24 weeks post-wetting.

Progress to date

Vegetation

Vegetation, has generally responded positively to environmental watering. Monitoring has demonstrated a vast improvement in vegetation health and subsequently the fauna that utilise these wetlands. In particular, the mature River Red Gums have benefitted from AEW, and have shown an increase in cover and extent of crown foliage. In addition, in the majority of a subset of 21 wetlands that received water allocations between 2001 and 2004 (many of which had not been flooded for up to 30 years), re-watering resulted in a decrease in the number of terrestrial plants present and a significant increase in cover of herbaceous wetland plants. No increase in the number of wetland species occurred, but whether this was due to natural floristic variation or species loss is as yet unknown (Alexander et al 2008).

Faunal habitat

The aquatic vegetation at various wetland sites has provided dynamic habitats for water birds and amphibians (seven different frogs were recorded at one wetland by conducting aural and spotlight surveys). At one wetland, breeding habitat for several frog species has been provided with evidence of frog recruitment such as egg masses and tadpoles observed, in which eight species have been identified. The Lower Murray-Darling wetlands have provided critical refuge habitat for the endangered Southern Bell Frog (*Litoria raniformis*) during the prolonged drought. Both male and female adults have been observed in reasonable numbers at one of the wetlands. Numerous aquatic and semi aquatic plants, aquatic macroinvertebrates (18 taxa) and frogs (five species) have been observed at one of the wetlands that hasn't received water since 1995.

Lessons learned

- It is possible to deliver environmental water using irrigation infrastructure and pumps.
- Wetlands that have been isolated from their natural water sources for up to 30 years are able to respond with positive ecological outcomes.
- Responses vary, possibly related to previous management, as well as current climatic conditions
- Consecutive watering events in particular wetlands can greatly improve tree condition and help establish a diverse and abundant understorey community. For example, River Red Gum communities show greater benefit when watered at least 2-3 times in short succession. Similar results have been observed in South Australia and Victoria as part of their Living Murray watering programmes on the Chowilla Floodplain and Lindsay-Walpolla sites (respectively).
- Costs, required permits and time involved increase complexity of watering wetlands
- Landholders and irrigation company support is crucial for success
- Landholder management of wetlands improves through direct action and participation in the project
- Follow up and continuing monitoring is essential
- The project has helped to highlight areas within current NSW policy and/or legislation which require amendments to enable State wetland and environmental water targets to be met.
- Data are suggesting that, to maintain these Black Box wetlands, periods of dry should not exceed 10 years.

Influence of project on other areas

Initially the project began in the Murray Irrigation Ltd (MIL) area of operation (Central Riverina district of NSW). Within three years of the project commencing, the MWWG were approached by other irrigation companies in the Murray region requesting to be involved in the project. The MWWG have also expanded the project to cover wetlands in the Lower Murray-Darling region, where pumps are required to deliver water to wetlands, rather than irrigation infrastructure. With the use of environmental water becoming more prevalent in the Murray-Darling Basin, the model of the MWWG's private property wetlands watering project is becoming more widespread. Many organizations are contacting the MWWG for advice on how to implement wetlands watering projects of their own.

Use of portable irrigation pumps to deliver environmental water to isolated wetland areas is rapidly becoming a common practice. This method of water delivery is already incorporated in large-scale environmental water projects such as The Living Murray. It is likely that other State initiatives eg: NSW RiverBank will incorporate similar methods for water delivery throughout NSW.



Photo-point monitoring of vegetation change at a Central Murray wetland on private property a) prior to wetting, b) 6 weeks post-wetting, c) 12 weeks post-wetting, d) 15 weeks post-wetting.

Future directions

The project is planning a ‘bank’ of wetlands which we water on a rotational basis, rather than only watering once. The frequency of watering of each wetland will be informed by ongoing monitoring. This strategy focuses on the landscape view of wetlands, whereby wetlands are integral to the landscape and contribute to regional biodiversity.

Further reading

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