

Restoring ecosystems and habitats

Wise use of Macquarie Marshes wetlands pays bird diversity and water quality dividends

Commonwealth Environmental Water Office

In October 2015, staff from the Commonwealth Environmental Water Office (CEWO) joined staff from the NSW Office of Environment and Heritage (OEH) to undertake bird surveys across the Macquarie Marshes. Since August, 52 gigalitres of much needed environmental water had flowed across the drying system.



Grey teal and some black duck foraging on the Hall's flooded back paddock (© Copyright, Commonwealth Environmental Water Office)

Over three days, wetland ecologists, environmental water managers and local Rangers from NSW National Parks and Wildlife Service spotted 130 woodland and wetland bird species at several sites, including several threatened species of birds, such as ducks and herons. Australasian bitterns were heard 'whooping' in the south

marsh reed beds, with clamorous reed warblers and wrens. Magpie geese were nesting in the reeds, whiskered terns swooped on the bounteous insect population and white-necked herons and ducks dabbled for food in the muddy swamp margins.

On Mole Marsh, one of two private parcels in the Macquarie Marshes Ramsar site, at least eight of the cryptic Australian painted snipe were observed visiting the flooded homestead paddocks during the survey. Several frog species, including the ground dwelling salmon-striped frog, were also heard calling from the reeds.

Mole Marsh is owned by Garry and Leanne Hall, successful cattle and horse breeders, whose family has been actively discussing water allocation issues for over 45 years. Garry is also a member of the Macquarie-Cudgegong Environmental Flows Reference Group, which provides advice on managing discretionary environmental water in the catchment.

‘Our grazing system is all about sustainability, including the use of grazing to promote the spread of water couch and reed,’ says Leanne Hall. Leanne told CEWO that including their property in the survey inspires them, including the children, to get out and about and see it for themselves.

Over in the Hall’s ‘U-block’ the glossy ibis, a listed migratory species, had settled in with grazing cattle and kangaroos. The morning sun revealed a variety of herons happily perched in the big old Coolabah tree — one that has been around, like the Halls, for generations. If wetlands such as these can be used wisely then ecosystem, economic and social/cultural benefits should be available for more generations to come.

Sustainably managing nationally and regionally important wetlands in modified catchments, such as the Macquarie, pays significant ecological and water quality dividends. This is especially important during drier times, as healthy wetland communities provide valuable refuge for a range of important species from the harsher realities of a drying landscape.



Herons and ibis perched in a coolabah tree (© Copyright, Garry Hall)

Restoring a Ramsar Wetland: Piccaninnie Ponds Conservation Park

Steve Clarke, Wetland Conservation Ecologist, SA Department of Environment, Water and Natural Resources

Piccaninnie Ponds Conservation Park achieved Ramsar status in 2012 for a multitude of reasons. This karst rising spring is home to 65 national and state listed species and is the flagship of the severely threatened karst rising spring communities.



Flow path after planting (© Copyright, Steve Clarke)

These crystal clear springs occur in the karst landscapes near the coast in the southeast of South Australia. They well from deep within the limestone aquifer and create the perfect habitat for many plant and fish species including the nationally listed spiny cray and the variegated and yarra pygmy perch. All but one of these springs now drain to the sea and only the Piccaninnie waters spread into large wetlands within the park.

While drainage, clearing and grazing ceased in Piccaninnie in the mid 1970s, little conservation work was undertaken until 2005 when Pick Swamp, a grazing property to the west, was purchased and restored and re-joined to Piccaninnie. At this time a regulator was constructed south of the main Piccaninnie ponds to restore water levels. These two projects greatly increased the conservation value of the park and now over 150 species of bird have been recorded in the restored Pick Swamp.



Steve Clarke at the restored flow path (© Copyright, Steve Clarke)

On-ground work for the next stage of restoration commenced in early 2013. The aim was to raise the overall wetland water level by 20 centimetres and open up 30 hectares of eastern wetland that had been isolated for 60 years. This would influence 180 hectares of wetland and recreate part of an old, long lost flow path. The infrastructure work was both extensive and sensitive to ensure those undertaking the restoration work adhered to Ramsar guidelines, which specify that no ecological degradation occurs as a result of the work. Main works included breaching the Piccaninnie road to allow flows to the eastern wetland and construction of a levee, weir and larger fish passageway. The old flow path presented a problem to restore as it was covered with 80 centimetres of drifted sand from the coastal dunes. Over 300 metres of this sand was pulled back to expose the flow path and reconstruct a low dune.

The results of the work have been amazing. Over 7 million litres a day now flow into the eastern wetland and two fish species, jolly tails and eels, long absent, have been recorded. There have also been unexpected benefits such as the unforeseen creation of shallow water areas that have become habitat for the dwarf galaxias, a small fish listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

Many partners have contributed to the works and volunteer groups have been actively involved since 2005. Restoration work within the Piccaninnie Conservation Park has been funded by the South Australian and Australian Governments. For more information, contact steve.clarke@sa.gov.au

Frogs and the health of their wetlands: the ACT Bio-Indicator Project

Nick Bakker University of Tasmania, and Anke Maria Hoefer, ACT & Region Frogwatch.

Recent news in biodiversity worldwide has highlighted the dramatic decline of frog species numbers and the important role frogs play in the food web of wetlands and rivers. If frogs disappear from an area, the whole ecosystem can suffer.



The project team conducting wetland health assessment at a grassland pond on the outskirts of Canberra

(© Copyright, Anke Maria Hoefer)

From the mid 1990s Waterwatch and more recently Frogwatch ACT have been stalwarts in capturing and recording frog species data in the ACT and Southern NSW region. Using the wealth of information obtained from many hours of volunteering in the field, Frogwatch ACT, led by coordinator Anke Maria Hoefer, undertook a bio-indicator project in October 2015 to help assess the health and viability of various wetlands identified as frog habitats in several areas around the ACT.

The project, funded by the ACT Government, Environment and Planning Directorate, was set up with the vision of using the data to assist in recognising the distribution and abundance of frogs when related to riparian structure and condition at certain sites. Following on from the project, the information obtained could be used to supplement the Catchment Health Indicator Project (CHIP) to be released by the ACT Government.

Besides Anke Maria, the project team consisted of Upper Murrumbidgee Waterwatch scientific officer, Danswell Starrs, and two students completing environmental studies at the University of Tasmania and Canberra Institute of Technology. The team conducted wetland health assessment at over 30 dams and ponds around the ACT in a variety of urban, semi-urban and bushland environments.

The team worked tirelessly to complete the field work, which included night time frog monitoring, through the month of October to coincide with the local frog breeding season and time of highest activity. Also being recorded was the presence of threatening exotic fish species: eastern gambusia (*Gambusia holbrooki*), a small aggressive species that preys on amphibian eggs and oriental weather loach (*Misgurnus anguillicaudatus*), a pest species that feeds on fresh water insect larvae and algae, vital for frog health.

For more information regarding Upper Murrumbidgee Waterwatch or ACT Frogwatch contact the Ginninderra Catchment Group on (02) 62783309.



Upper Murrumbidgee Waterwatch scientific officer, Danswell Starrs, checking illegally placed fish traps

(© Copyright, Anke Maria Hoefel)

Restoring Australia's Great Southern Seascapes

Chris Gillies, Marine Manager, The Nature Conservancy

All along the southern coast of Australia lie hundreds of bays and estuaries with important marine habitats including rocky reefs, seagrass meadows, mangrove forests and saltmarshes. Yet there is one marine habitat you probably haven't heard of, *shellfish reefs*.

Shellfish reefs were once an important and common marine habitat all across southern and eastern Australia but were rapidly fished to near extinction during the mid to late 1800s, due to their usefulness as a source of food, and as a source of lime used in the early construction of roads and buildings. Shellfish reefs were not only a biodiverse and structurally complex habitat that supported a rich array of terrestrial and marine species but they also played an important role in estuary health through water filtration, fish production and coastal protection.

The economic benefits of early shellfish harvest must have been substantial. Not only did the shellfish fishery directly support the livelihoods of thousands of commercial fishers but it also supported jobs in the curing and transportation of shellfish as a major food item transported to interior settlements, sold to passing ships and exported to overseas markets. Carpenters and boat builders were also employed to build and maintain the fishing fleets that numbered as many as 100 in a single estuary.



Native flat oyster reefs (Ostrea angasi) in Georges Bay, Tasmania (© Copyright, Chris Gillies)

The near extinction of a precious wetland habitat that sustained early Australian colonialization and expansion for nearly 100 years, and which has gone largely unnoticed by the general public and researchers alike, makes for an intriguing story that is not only important to the ecological history of Australia but to its cultural and economic identity as well.

Efforts are underway to repair and restore shellfish reefs across Australia (natureaustralia.org.au/our-impact/water/port-phillip-bay) and to bring attention to the ecological, economic and social value of repairing marine wetland habitats and their

ecosystem services. The Nature Conservancy along with others such as NOAA in the United States (habitat.noaa.gov/restoration) have demonstrated that when the restoration of marine habitats occurs across large scales, ecosystem services and biodiversity can be restored and the works associated with restoration can contribute to both short and long-term economic benefits for coastal communities.

To find out more about coastal restoration and the Nature Conservancy's new marine program *Great Southern Seascapes* visit natureaustralia.org.au/our-work/great-southern-seascapes or contact chris.gillies@tnc.org



Native flat oyster reefs (Ostrea angasi) in Georges Bay, Tasmania (© Copyright, Chris Gillies)

Benefiting wetlands with existing infrastructure

Kieran Squire, Community Partnerships Project Officer, River Murray Operations and Major Projects, South Australian Department of Environment, Water and Natural Resources

Reinstating variability in flows along some sections of the River Murray, through the use of existing weirs, is providing benefits to river ecology.

In South Australia, River Murray flows were naturally highly variable, increasing through late winter, peaking in spring and reducing over summer. Flows above 150 000 megalitres per day and below 2000 megalitres per day were common, and river levels could vary by as much as five metres. As a result the river's ecology is based on highly variable water levels.

While these variations in water levels were good for the environment, they were not good for irrigation, navigation and meeting critical human needs. To create more stable water levels, a series of weirs along the River Murray was built between 1913 and 1937. Now, the river in South Australia is operated as a series of stable pools, which experience very little water level variation. As a result, 70 per cent of wetlands once seasonally inundated are now permanently connected to the river, and this has been detrimental to the environment.

However, weirs can be used to raise and lower water levels to mimic more natural water variability. While fully restoring pre-regulation ecology via water level manipulation is not a realistic goal, achieving improvements to aspects of the ecology is possible, especially in localised areas along the River Murray.

In 2014, the South Australian Department of Environment, Water and Natural Resources (DEWNR) raised the water levels between Lock One and Lock Three (weir pools 1 and 2). Water levels were raised 50 centimetres above the usual level and the resulting inundation brought some positive ecological results and supportive community feedback.

As a result of raising the weir pool levels DEWNR has seen some increased crown growth in river red gums, an increase in both the abundance and diversity of submerged and fringing vegetation, and some change in biofilm composition. Monitoring is now being adjusted to better detect responses as repeat water level fluctuations help to slowly reinstate the ecology and produce greater responses.

The community has been supportive with survey results showing:

- 84 per cent of the community members living alongside weir pools 1 and 2 were supportive of changing the water levels in the weir pools
- 82 per cent experienced little to no impact on their lifestyle
- 40 per cent observed the presence of more birds, yabbies, frogs or fish
- 47 per cent observed increased vegetation growth and health.

The water levels in weir pools 2 and 5 are being raised in 2015 and results will be available sometime in mid-2016. It is expected that this year's raising will inundate an additional 214 hectares of wetlands and water approximately 920 hectares of vegetation.

Weir Pool Manipulation is part of the Riverine Recovery Project (RRP) which is funded by the South Australian Government's *Murray Futures* program and the Australian Government. RRP is a \$91 million initiative to improve the health of the River Murray and its wetlands and floodplains from the South Australian border to Wellington.

Contact Kieran Squire at the Department for Environment, Water and Natural Resources by phone on (08) 8463 6505 or visit naturalresources.sa.gov.au/weirpools



As the weir pool rises, local wetlands and floodplains receive the water they need between high flow events

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Golden perch spawn in record numbers in response to managed environmental flows

Commonwealth Environmental Water Office, Victorian Environmental Water Holder and the Goulburn Broken Catchment Management Authority

Collaborative efforts of federal, state and local water resource managers demonstrate the effectiveness of environmental flows to promote the successful breeding of native fish species.

An environmental watering priority in the Goulburn River for 2014–15 was the provision of environmental flows to support native fish populations. In Spring 2014, Commonwealth environmental water was delivered to the lower Goulburn River over 3 weeks from mid-November to early December as a (fresh) flow pulse with the aim of triggering movement and spawning of golden perch (*Macquaria ambigua*), which is listed as near threatened under the Victorian Government's Advisory List of Threatened Vertebrate Fauna in Victoria, 2013.

Golden perch exhibited a strong spawning response to increased flows provided by the delivery of environmental water. In fact, the planned Spring 2014 flow pulse induced golden perch spawning in numbers not previously seen, other than following the 2010 floods, and so can be regarded as an outstanding example of managed flows achieving their aim. Critically endangered silver perch (*Bidyanus bidyanus*) also spawned in association with increased flows.

It is important to note, however, that although golden perch and silver perch spawned in the Goulburn River in 2014, no young-of-year fish were collected in the 2015 fish monitoring surveys. Therefore, whilst increased flows can promote spawning of these species in the Goulburn River, it appears that this may not

necessarily lead to immediate in situ recruitment of juvenile fish. Given that golden perch and silver perch lay semi-buoyant eggs that drift downstream on river currents, potentially over large distances, it is possible that eggs drift downstream into the River Murray, and that any recruitment into the Goulburn River occurs at a later stage by older fish and also potentially by fish from other river systems. The origin and migratory history of golden perch and silver perch is a knowledge gap and represents an important area for future research. Ongoing work by the South Australian Research and Development Institute is trying to address this knowledge gap in the southern Murray-Darling Basin (Zampatti et al., 2014).

As part of the Commonwealth Environmental Water Office's Long Term Intervention Monitoring Project, a detailed Monitoring and Evaluation Plan from 2015 to 2019 has been developed for the lower Goulburn River, and includes annual fish surveys to further investigate recruitment of native fish. The Monitoring and Evaluation Plan has been developed, and is being implemented, by a consortium monitoring team led by the University of Melbourne in partnership with the Goulburn-Broken Catchment Management Authority, Monash University, SKM Pty Ltd, Streamology Pty Ltd, Victorian Environmental Water Holder and Arthur Rylah Institute for Environmental Research.

Environmental water deliveries in the Goulburn River are managed in collaboration between the Commonwealth Environmental Water Office, Victorian Environmental Water Holder, Goulburn-Broken Catchment Management Authority, Goulburn-Murray Water and the Murray-Darling Basin Authority.

If you would like to know more about environmental watering in the Victorian Goulburn-Broken system, please contact the Goulburn CMA on 03 5822 7700 or visit gbcma.vic.gov.au

Reference

Zampatti, B.P., Wilson, P.J., Baumgartner, L., Koster, W., Livore, J.P. McCasker, N., Thiem, J., Tonkin, Z., Ye, Q. (2014) *Reproduction and recruitment of golden perch (Macquaria ambigua) in the southern Murray-Darling Basin in 2013–14: an exploration of river-scale response, connectivity and population dynamics*. South Australian Research and Development Institute. SARDI Publication No. F2014/000756-1. SARDI Research Series No. 820. 61pp.



Golden perch eggs collected during monitoring in the Goulburn River in November 2014

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Adult golden perch (© Copyright, Jarod Lyon, Arthur Rylah Institute for Environmental Research)