



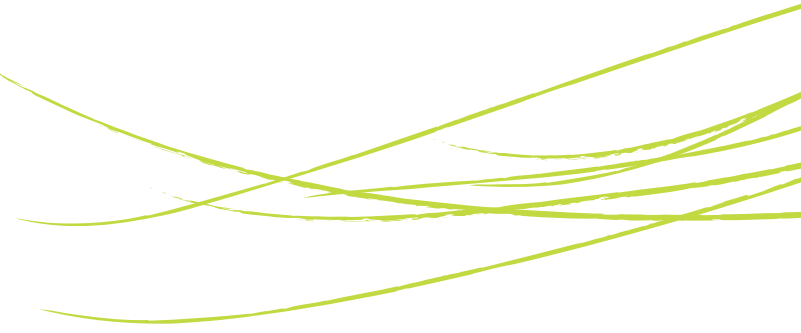
Australian Government

**Department of Sustainability, Environment,
Water, Population and Communities**



Wetlands Australia

NATIONAL WETLANDS UPDATE FEBRUARY 2013—Issue No 22



© Commonwealth of Australia 2013

This work is copyright. You may download, display, print and reproduce this material in unaltered form only (retaining this notice) for your personal, non-commercial use or use within your organisation. Apart from any use as permitted under the Copyright Act 1968, all other rights are reserved. Requests and enquiries concerning reproduction and rights should be addressed to Department of Sustainability, Environment, Water, Populations and Communities, Public Affairs, GPO Box 787 Canberra ACT 2601 or email public.affairs@environment.gov.au

The views and opinions expressed in this publication are those of the authors and do not necessarily reflect those of the Australian Government or the Minister for Sustainability, Environment, Water, Population and Communities.

Front cover photos: (Left to right) Twin Falls Kakadu National Park (Director of National Parks), Recently refurbished Yarran Creek regulator, Gunbower Forest (North Central Catchment Management Authority), Coastal wattle forced upslope at White sands, Long Swamp Victoria (Mark Bachmann), Sunset over Ubirr Rock (Sarah Stuart Smith), Lotus Flower (Kate Clark), Lake Argyle (Jim Mollison)

Rear cover photos: (Left to right) Moulting Lagoon (Michelle McAulay), Nymphaea Lily Lake, Royal Botanic Gardens Melbourne (Janusz Molinski), Twin Falls Kakadu National Park (Director of National Parks), Brolga on Shark Creek (Georgia Beyer), Black-tailed native hen (Roger Williams), Starfish, Ashmore Reef National Nature Reserve (Australian Heritage Council)



CONTENTS

Introduction

Managing environmental water for wetlands

Ten years of The Living Murray program — restoring the health of the Murray River

Regulator upgrades in Gunbower Forest to help manage environmental flows

Tracking flooding from space for Macquarie Marshes environmental water management

New structures open natural flow paths to long stranded wetlands

Concrete structures achieve environmental benefits

Water management and wetlands

Victoria moves to a fully integrated program for rivers, wetlands and estuaries

Working Wetlands – bringing the lakes back to life

Water quality action for Corner Inlet

Managing water in the landscape – wetlands surviving the dry

Mapping groundwater dependent ecosystems in Queensland

Water requirements for wetland species

Water for plants — capturing knowledge for wetland managers

The Australasian bittern and its water requirements

Wetlands, water and Indigenous Engagement

Ancient Science — an Indigenous perspective on wetland care

Indigenous cultural and spiritual values in water quality planning

Engaging Indigenous Australians in environmental research

4 Wetland Conservation and Restoration 33

Unravelling the story of change at Long Swamp, south-west Victoria 33

5 Wetlands at risk of weeds 35

Authority to boost self-defence for eight priority public wetlands 36

Delivering biodiversity dividends in the Barratta Creek Catchment 38

9 Wetland Management 39

WetlandCare Australia National Art and Photography Competition 39

Development of the Wetland Tender metric 41

'Walking the landscape' — a whole-of-system framework for understanding and mapping environmental processes and values 43

Pictures worth a thousand words — A guide to pictorial conceptual modelling for wetland managers and scientists 45

17 Government Updates 47

Australian Government Update 47

New South Wales Government Update 49

Victorian Government Update 50

Queensland Government Update 51

Tasmanian Government Update 52

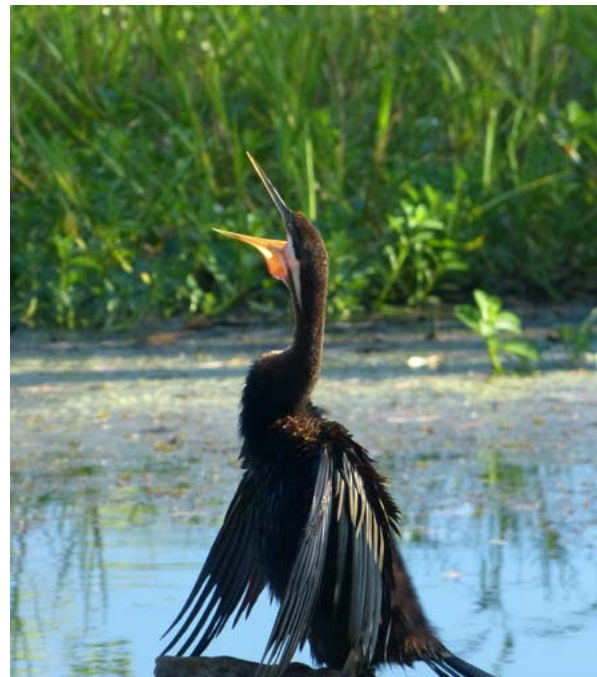
2013 Calendar of Events 53

INTRODUCTION

The international theme of World Wetlands Day 2013 is “Wetlands Take Care of Water”. Wetlands provide important hydrological functions such as groundwater recharge, water quality improvement and flood alleviation. The health of wetlands depends on the quality and quantity of water that reaches them. To secure their conservation and wise use it is essential that they are managed in the wider context of catchment-scale water resource management.

This edition includes several feature articles on wetlands and water management along with many other articles on current wetland projects and programs.

If you would like to contribute to future editions of *Wetlands Australia* contact wetlandsmail@environment.gov.au



Darter (Jim Mollison).



Recently refurbished Yarran Creek regulator, Gunbower Forest (North Central Catchment Management Authority).





MANAGING ENVIRONMENTAL WATER FOR WETLANDS

Ten years of The Living Murray program — restoring the health of the Murray River

Murray Darling Basin Authority

In 2003, the Murray-Darling Basin Ministerial Council announced The Living Murray First Step Decision to restore the health of the Murray River system by recovering 500 gigalitres of water and constructing major water management structures at iconic sites. To achieve this, the New South Wales, Victorian, South Australian, Australian Capital Territory and Australian governments pledged \$650 million, making The Living Murray one of Australia's largest river restoration programs.

Ten years later, The Living Murray program has recovered a long-term average of 479 973 megalitres of water, delivered 657 016 megalitres of environmental water, and commenced construction of major water management structures at Gunbower–Koondrook–Perricoota, Hattah Lakes and Chowilla Floodplain and Lindsay–Wallpolla Islands icon sites. The program has also completed 10 of the 14 fishways along the Murray River.

This year major structures will be completed at the Hattah Lakes and Gunbower–Koondrook–Perricoota icon sites. This will enable water managers to provide environmental water to the floodplains with much smaller volumes of water.

The Sea to Hume fishway will also be completed, restoring migratory passage for native fish along 2225 kilometres of the Murray River, extending from the Hume Dam to the Murray Mouth.

Throughout the drought, monitoring showed that the last remaining refuge wetlands for Murray hardyheads and southern pygmy perch were in danger of drying out. Small volumes of environmental water from The Living Murray were pumped to these sites and the fish populations were sustained. Small volumes were also delivered to refuge sites on the Chowilla floodplain improving vegetation condition and supporting the successful breeding of many species including the nationally vulnerable southern bell frog.

Mandy Rossetto
(Department of Environment,
Water and Natural Resources, SA)

Delivering environmental water

The Living Murray delivered its first environmental water to the icon sites during the longest drought in recorded history. Small amounts of environmental water provided refuges for stressed native flora and fauna, and helped prevent local extinctions. Watering at the Lower Lakes maintained water levels in Lake Albert to prevent acidification and the loss of key species such as the endangered Murray hardyhead.

More recently, after record rain, environmental water was used between flood peaks to ensure that water did not recede too quickly and cause waterbirds to abandon their nests. This resulted in one of the best colonial waterbird breeding events in Barmah–Millewa Forest in 60 years.

This water also contributed to flows to the Lower Lakes, Coorong and the Murray Mouth.

The prospect of receiving substantial water allocations for the first time since the program began opened up a whole new range of possibilities for environmental water delivery, including large single watering events and watering multiple sites along the river.

Environmental monitoring has shown that the icon sites have begun to improve in the last two years in response to natural flooding, with areas that were watered during the drought showing faster improvement. Some species which were less resilient may take longer to recover, and some may not recover.

Working together

The success of The Living Murray program is underpinned by the strong collaborative approach that has developed between the Murray–Darling Basin Authority and the partner governments. This also involves working closely with the local communities, including Aboriginal communities, as well as with land managers, catchment management authorities, water authorities and construction companies.

The Living Murray program has now delivered environmental water through the longest drought in recorded history and during two years of close to record rainfall. Over the next few years, with the completion of the water management structures, and the implementation of the Basin Plan, it is likely that The Living Murray will continue to make significant progress in helping to restore the health of the Murray River.

The on-ground works at Wallpolla Island were a key success for me. While the rest of the landscape was basically dying through the longest, biggest drought on record, the little refuges of Horseshoe Lagoon were flourishing with the combination of The Living Murray structures and the local environmental watering program.

Peter Kelly (Mallee CMA, Victoria)

During the decade long drought we were able to deliver Living Murray environmental water to Reedy Lagoon, a wetland that is highly valued for its intact vegetation community and is considered a jewel in the crown of Gunbower Forest. The environmental watering created a drought refuge in the forest for animals and increased the resilience of the wetland vegetation.

**Anna Chatfield
(North Central CMA, Victoria)**

A significant outcome of The Living Murray's Koondrook–Perricoota project has also been the strong relationship that has been built between the community and local Indigenous groups during the construction period.

Jamie Hearn (Murray CMA, NSW)





Victorian Minister for Water, Peter Walsh, officially opened the Yarran Creek regulator on the 31st August 2012 with Aunty Ester Kirby, local Barapa Barapa Elder, Llew Vale, G-MW Chairman and David Clark, North Central CMA Chairman (North Central Catchment Management Authority).

Regulator upgrades in Gunbower Forest to help manage environmental flows

Anna Chatfield, North Central Catchment Management Authority

A major milestone in a multi-million dollar infrastructure project to deliver environmental water to Gunbower Forest has recently been celebrated with the opening of three refurbished regulators.

Gunbower Forest, an internationally important wetland along the Murray River, near Cohuna in north central Victoria, supports a diverse range of aquatic and terrestrial ecosystems.

The future health of the 20 000 hectare forest depends on the ability to deliver environmental water to support the forest's flood-dependent ecosystem. The effects of river regulation and climate change have reduced the frequency and duration of natural flood events in the forest. This has had a significant impact on the health of the forest including deterioration in the condition of river red gums, contraction of wetland areas and less frequent breeding opportunities for waterbirds, frogs and fish.

To arrest the decline in the forest's health, a package of engineering structures that allows for the efficient and effective management of environmental water has been developed as part of the North Central Catchment Management Authority's Flooding Enhancement of Gunbower Forest Project, funded by The Living Murray program.



Great Egret Chicks in the Little Gunbower wetlands complex, Gunbower Forest January 2012 (North Central Catchment Management Authority).

An important stage of the project is complete with a \$1.6 million refurbishment of three existing regulators in the lower forest. The works improve the functionality and structural stability of the regulators and allow fish to move between the forest and Gunbower Creek.

The regulators enable the delivery of environmental water to approximately 2500 hectares of wetlands and river red gum forest to maintain their health during extended 'dry times'. Without active environmental water delivery, the forest's wetlands, flood dependent understorey and river red gum communities will continue to decline.

During times of flood the lower area of the forest provides habitat that supports colonial waterbird breeding, including the threatened great egret. Environmental water can be delivered through the

new regulators to maintain water levels under nests, to reduce the risk of birds abandoning their chicks.

The next works planned for the project involve additional investment of \$13.5 million to construct a weir, regulator and channel to allow large volumes of environmental water to be delivered to a greater area, helping to sustain a vibrant forest. The infrastructure will enable environmental water managers to flood approximately 4700 hectares of the forest - 80 per cent of the forest's wetlands. Works are expected to be complete in late 2013.

The Living Murray is a joint initiative funded by the New South Wales, Victorian, South Australian, Australian Capital Territory and Commonwealth governments, coordinated by the Murray–Darling Basin Authority.



Tracking flooding from space for Macquarie Marshes environmental water management

Rachael Thomas and Debbie Love,
NSW Office of Environment and Heritage

Recent flooding has seen the iconic Macquarie Marshes, a Ramsar wetland, burst into life with an abundance of waterbirds, fish and frogs supported by a lush mosaic of interconnected wetland habitats in the semi-arid region of the Murray-Darling Basin. Wetland plants and animals depend on floods which vary greatly in size over short and long time periods. Therefore, imagery captured from the Landsat space satellite is being used to track flooding at the Macquarie Marshes.

Environmental water is a volume of water used for the specific purpose of maintaining ecological integrity in the Macquarie Marshes and other significant sites. It is essential during times of drought and complementary to large flood events. Using water purchased through the Australian and New South Wales governments' water buyback and irrigation efficiency programs, the NSW Office of Environment and Heritage (OEH) manages environmental water delivery to sustain wetland health, improve ecosystem resilience and recover degraded wetlands.

Fundamental to the management of environmental water is knowing where and when different parts of the Macquarie Marshes are flooded as a result of environmental water delivery or natural flood events. At OEH scientists use imagery captured from the Landsat space satellite to identify water and accurately map flooding over large areas. A unique satellite, Landsat has been capturing images from the same locations on Earth's surface for 40 years providing insight into flooding patterns over months, years and decades.

Like many other wetlands in the Murray-Darling Basin, the Macquarie Marshes, a wetland of international importance, experienced an extended drought during the 2000-2010 decade. Small environmental water volumes were used in this period and flooded a fraction (less than 15 000 hectares) of the 50 000 hectare core wetland but importantly nourished refuge habitat of semi-permanent wetland and river red gums.



Flooding in the Macquarie Marshes, December 2010 (R. Thomas).

In contrast, a period of drought-breaking catchment rainfall began in mid-2010, increasing river flows to flood 74 000 hectares of the Macquarie Marshes. This was followed by extensive flooding (200 000 hectares) in December 2010. Environmental water delivered almost 37 000 hectares of flooding during the spring months of 2011 and after March 2012 dam spills, expanded flooding to 80 000 hectares.

The variable nature of flooding in inland wetlands highlights the importance of satellite imagery and robust techniques to track flood distribution as a key tool for environmental water managers. With a better understanding of flooding patterns OEH managers and scientists can together assess the ecological outcomes of flooding from river flows for improved wetland conservation.



New regulator at Paika Lake (James Maguire, OEH)

New structures open natural flow paths to long stranded wetlands

NSW Office of Environment and Heritage

In the spring of 2012, newly installed regulators, pipes and culverts enabled the delivery of environmental water flows to long-stranded Lower Murrumbidgee wetlands located on private property in south western New South Wales.

“The Lower Murrumbidgee wetlands support diverse native vegetation and provide important habitat for waterbirds, frogs and other wildlife. However, Cherax Swamp, Hobbler Lake and Penarie Creek, north of Balranald, were in poor condition after decades without substantial water flows,” said Justen Simpson, Environmental Water Delivery Manager for the New South Wales Office of Environment and Heritage (OEH).

To help improve the health of the wetlands system, landholders fenced off the areas from stock and planted wetland plants native to the local area including common reed, lignum and tall spike rush. New structures were installed to enable the delivery of environmental water to the wetlands.

The water infrastructure works, funded by the OEH and Australian Government Biodiversity Fund, include the installation of three water control structures in Yarrowol and Paika Creeks, enlargement of box culverts in the bed of Paika Creek at the Ivanhoe Road crossing and installation of a number of control pipes.

Importantly, carp screens were also fitted at key locations to prevent the movement of adult carp into the wetland areas, to the benefit of native fish populations.





Great crested grebes have been observed at Cherax Swamp (Roger Williams).

Mr Simpson said Cherax Swamp, Hobbler Lake and Penarie Creek are located north west of Paika Lake where thousands of waterbirds (including threatened species) foraged and bred after the lake was filled last year for the first time in 100 years.

As the environmental water flows began to reach the far end of the wetland system and Cherax Swamp filled in October 2012, large numbers of waterbirds were observed. Even early in the water delivery approximately 20 000 black-tailed native hens and thousands of ducks and coots were observed as well as glossy ibis and great crested grebes.

The OEHL worked in partnership with the Commonwealth Environmental Water Office and with local landholders to plan the environmental water delivery to the wetlands.

Peter Morton, owner of the property Dundomallee, said the water flows during spring will greatly benefit the growth of newly planted vegetation. "Carp feed on aquatic vegetation and negatively impact on habitat for native fish populations. We have successfully trialled carp screens on a smaller scale and seen the results with abundant aquatic plant growth. These new carp screens along with the environmental water delivery should have a big positive impact on the wetland systems."

A total of 8000 megalitres of environmental water was made available for the event, from Commonwealth and NSW environmental water accounts. The environmental water flow was identified as an action in the Annual Environmental Watering Plan for the Murrumbidgee Valley, developed in consultation with the Murrumbidgee Environmental Water Advisory Group.

For further information on environmental watering in the Murrumbidgee Valley visit the Office of Environment and Heritage website at <http://www.environment.nsw.gov.au/environmentalwater/envwatermurrumbidgee.htm>.



Carp screen at Cherax Swamp (James Maguire, OEHL).

Concrete structures achieve environmental benefits

Jamie Hearn,
Murray Catchment Management Authority

The planned completion of the Koondrook-Perricoota Forest Flood Enhancement Project (KPFEP) in February 2013, will help highlight the role of water delivery structures in the efficient use of water in Australia.

The project will enable the environmental watering of up to 17 000 hectares of the Koondrook-Perricoota Forest. The water delivery structures will allow the operators of the scheme to target wetlands and other areas within the forest and achieve specific ecological outcomes identified within the Murray Darling Basin Authority's The Living Murray program.

Without these structures, a River Murray flow in excess of 30 000 megalitres per day through the Torrumbarry Weir is required to achieve a significant level of natural flooding. The same level of inundation can now be achieved by diverting flows of only 4500 megalitres per day through a newly constructed inlet channel and regulator. This inlet structure, coupled with the associated downstream regulators and levee, enables the timing, volume, depth and duration of watering events to be carefully managed.



Inlet channel with habitat trees in place (Jamie Hearn).



Inlet regulator (Jamie Hearn).

The ability to maintain the health of the creeks and wetlands within the forest during times of drought and low flow is a major benefit of the project. These ecological systems are affected by the altered natural flooding regimes brought about by the construction of weirs and dams built to meet the demands of a growing economy and population, and the long term impacts of changing rainfall patterns.

The inlet regulator and channel have been designed with the needs of wetlands animals and fish in mind. The regulator includes fishways and a turtle ramp to reduce the risk of stranding in the forest. Even the radial aluminium regulator gates are designed to minimise fish damage. Additionally, the inlet channel has been lined with trees for fish habitat and refuge.

The finished project will ensure the long term health of the wetlands and creek systems within the Koondrook-Perricoota Forest, helping safeguard vulnerable aquatic flora and fauna for future generations. For further information visit <http://www.kpforest.com.au/>



Inlet channel with habitat trees in place (Jamie Hearn).



WATER MANAGEMENT AND WETLANDS

Victoria moves to a fully integrated program for rivers, wetlands and estuaries

Janet Holmes, Victorian Department of Sustainability and Environment

The Draft Victorian Waterway Strategy, released in October 2012 for public comment, signalled an important step in the integration of management for rivers, wetlands and estuaries in Victoria. Rivers, wetlands and estuaries are now managed under a single program which follows an eight-year adaptive management cycle.

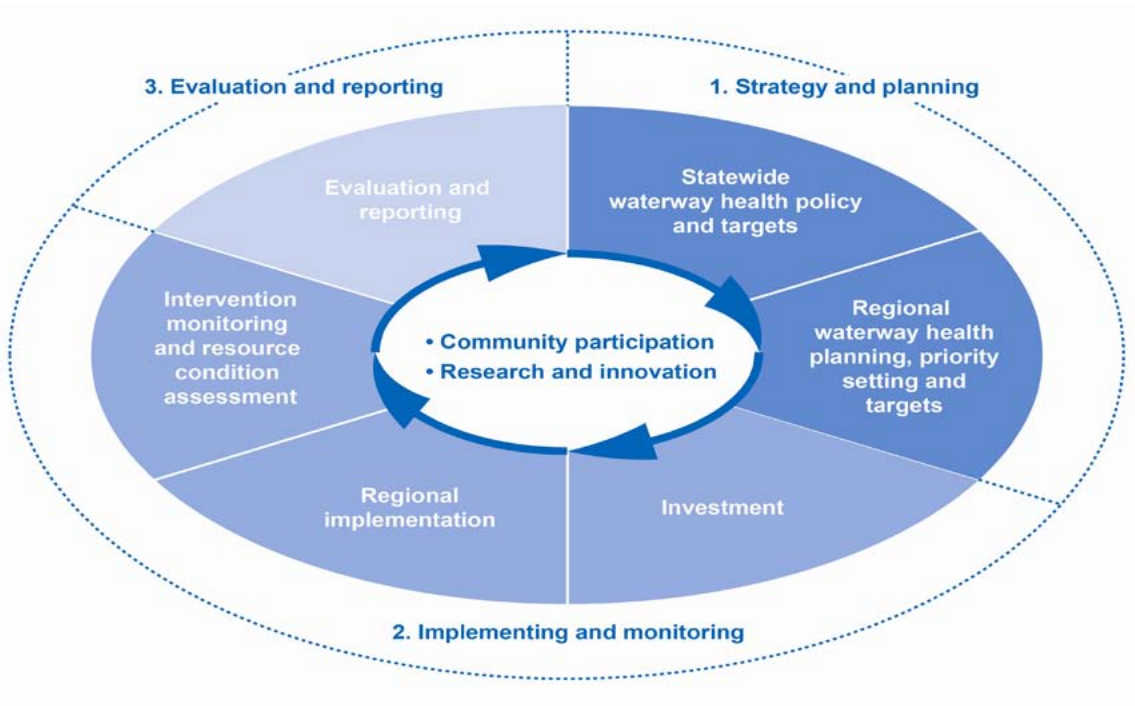
The Victorian Waterway Management Strategy, when finalised in early to mid 2013, will set out the State policy and planning framework for rivers, wetlands and estuaries. This will be complemented by the development of Regional Waterway Strategies (RWSs) by Victoria's catchment management authorities and Melbourne Water.

RWSs will outline eight-year programs of priority actions and provide the basis for annual investment in on-ground works and environmental water management by the Victorian Government. The Strategy will also provide direction to other funding sources. A key feature of the program will be improved integration between the management of environmental water and other on-ground works to protect or improve key community values in priority waterways.

In delivering the Victorian Waterway Management Program, steps are undertaken to ensure that investment is effective. Monitoring of interventions is undertaken to improve knowledge about the relationships between management actions and waterway health outcomes to develop and improve work standards.

Additionally, long term monitoring of resource condition detects broader patterns and trends in the condition of Victoria's waterways. The Victorian Waterway Management Program reporting, evaluation and improvement framework includes independent reviews of both the Victorian Waterway Strategy and regional waterway strategies at the end of the eight year adaptive cycle.

The main source of funding for waterway management in Victoria comes from core Victorian Government funds and the Environmental Contribution. The Environmental Contribution is a levy on Victorian water businesses that funds initiatives that promote the sustainable management of water or address adverse environmental impacts of water consumption and extraction. Other funding comes from a waterways charge which applies in the Port Phillip and Westernport region, Australian Government programs and financial and in-kind contributions from the community.



The eight-year adaptive management cycle for waterways in Victoria (Victorian Department of Sustainability and Environment).

Further details on Victoria's adaptive management program for rivers, wetlands and estuaries can be found in the Draft Victorian Waterway Management Strategy on the DSE website (<http://www.dse.vic.gov.au/>). The draft strategy also sets out the policies and actions proposed to address specific waterway management issues.



Working Wetlands – bringing the lakes back to life

Royal Botanic Gardens Melbourne

A four-year, \$6.5 million project to improve water quality and provide a sustainable water supply for the Royal Botanic Gardens Melbourne was commissioned in August 2012.

The Working Wetlands project includes infrastructure for stormwater collection, treatment, storage and reuse for irrigation at the Gardens' 38 hectare inner-city site – of which a key component was the construction of two bio-remediation wetlands at either end of the Gardens' lake system, on Nymphaea Lily Lake and Ornamental Lake.

The neighbourhood surrounding the Gardens provides an area of about 20 hectares from which stormwater is harvested and diverted into the Gardens' newly-constructed wetlands through underground pipes and gross pollutant traps. The water is then filtered through the constructed wetlands and into the lakes system. In addition to the two permanent wetlands, floating island wetlands were installed on Ornamental Lake and Guilfoyle's Volcano, a historic water storage reservoir at the Gardens.

Water is circulated through the system improving the quality of both the incoming stormwater and the water already in the lakes, keeping temperatures low, increasing oxygen levels and reducing the risk of algal blooms in the lakes in warmer months.

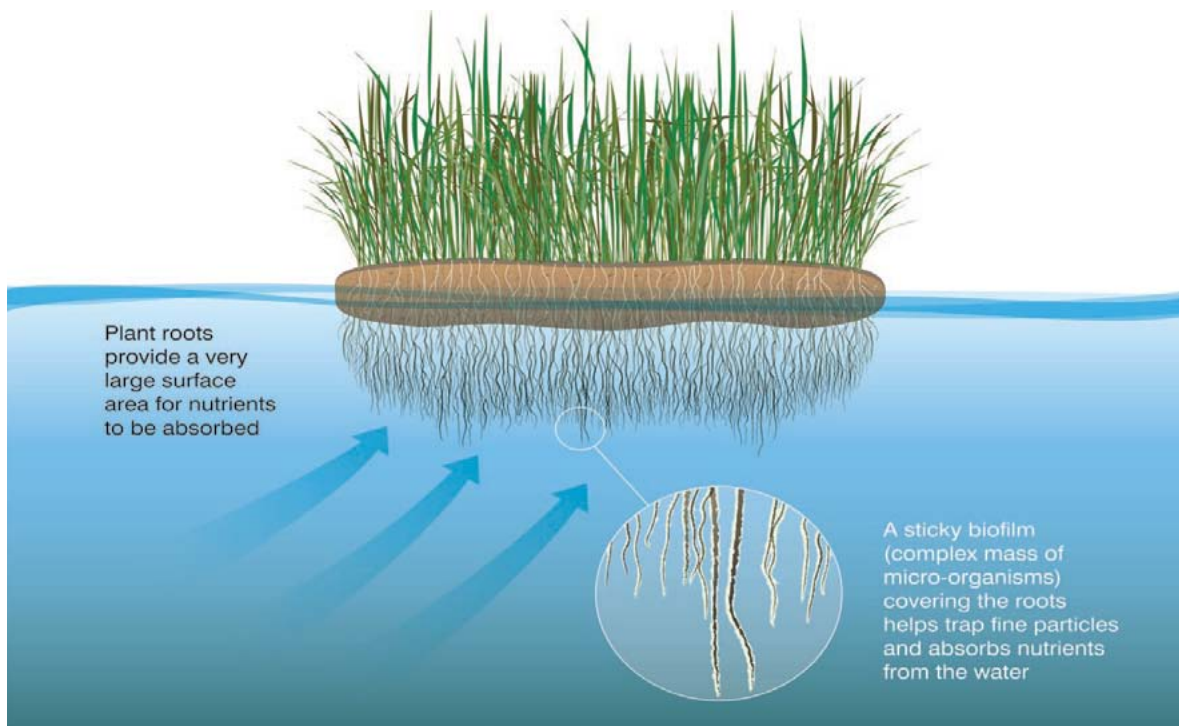
The wetlands serve to 'clean up' the harvested stormwater using a bio-remediation process. The wetlands have been planted with indigenous species, and aquatic and semi-aquatic plants take up excess nutrients such as nitrogen and



The new bio-remediation wetland area on Nymphaea Lily Lake (Janusz Molinski).



Floating island wetlands on Guilfoyle's Volcano (Janusz Molinski).



Floating wetlands have been installed on Ornamental Lake and Guilfoyle's Volcano, a historic water storage reservoir at the Gardens (Royal Botanic Gardens Melbourne).

phosphorus and convert them into foliage. The constructed floating wetlands allow the mass of plant roots to be suspended in the water aiding this process.

The final component of the Working Wetlands project has seen the installation of a separate pumping system, which transports water from Ornamental Lake to a water treatment shed. Here the water undergoes a three-stage treatment process, bringing it up to 'A' class quality. The water is filtered for sediments, pH tested and adjusted, and treated with UV light to kill off any pathogens. The water is held in the four storage tanks, which have a capacity to store a total of 500 kiloliters of treated water for irrigation.

The primary aim of the Working Wetlands Project was to revitalise the Gardens' lake system and reduce the Gardens' reliance on potable water

for irrigation by up to 40 per cent. However, for the many species of waterbirds, frogs and other aquatic fauna at the Gardens, the constructed wetlands have provided valuable new habitat at this inner-city site.

The Working Wetlands project is supported by the Victorian Government, Australian Government, The Myer Foundation and Sidney Myer Fund 2009 Commemorative Grants Program, Melbourne Water, South East Water Corporation, Friends of the Royal Botanic Gardens, Melbourne Inc., Royal Botanic Gardens Foundation Victoria, The Calvert-Jones Foundation, Ken and Jill Harrison, P. J. Jopling QC and many generous individual donors.

Further information on Working Wetlands is available at www.rbg.vic.gov.au





The fenced and revegetated Franklin River winds its way to Corner Inlet through productive beef and dairy farmland and the commercial fishing village of Port Franklin. (Michael Malone, West Gippsland CMA)

Water quality action for Corner Inlet

West Gippsland Catchment Management Authority, Victoria

A Water Quality Improvement Plan (WQIP) for Corner Inlet is being developed by the West Gippsland Catchment Management Authority, with funding provided by the Australian Government, to help protect the ecological character of this significant wetland.

Mudflats, mangroves and migratory birds

Corner Inlet, Victoria's southern-most embayment, is home to the marine and coastal parks of Corner Inlet and Nooramunga and borders the northern coast of Wilsons Promontory National Park.

Corner Inlet is an impressive 67 000 hectare Ramsar-listed wetland and is significant for its unique intertidal mudflats and barrier islands situated west of the Ninety Mile Beach.





Corner Inlet's ecologically valuable seagrass meadows benefit from improved water quality that, in turn, supports marine organisms such as the pot-bellied seahorse (Dr Mark Norman, Museum Victoria).

The wetland provides vital habitat for resident wader birds and each year tens of thousands of migratory birds use its coastal and wetland vegetation as important feeding, breeding, nesting and resting habitat.

Corner Inlet is recognised as home to the most southern stand of White Mangrove in the world and supports seagrass meadows, including the rare broad leaf seagrass, critical to fish feeding and breeding cycles.

Corner Inlet also supports an array of marine life such as the pot-bellied seahorse, King George whiting, brightly coloured sea stars and sponges, and communities of sea squirts and anemones.

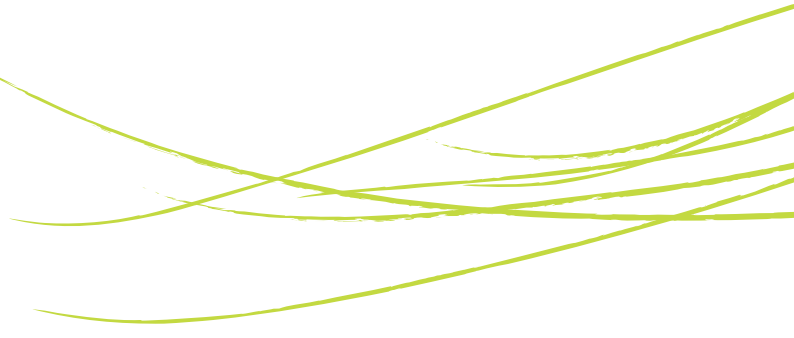
People, production and partnerships

With a surrounding catchment area of 2300 square kilometres, Corner Inlet is fed by a system of creeks and rivers. The catchment supports natural landscapes and vibrant primary industries and is a major draw card for tourists and recreational fishing.

Many individuals, landholders and community groups have formed partnerships with government agencies to bring about on-farm gains that contribute to improved catchment and inlet health.

Water of high quality is central to the health of Corner Inlet. The inlet's animal and plant life rely on good water quality and appropriate water quantities flowing into the system from streams, rivers and groundwater.





Projects undertaken to address water quality issues include:

- protection of highly sensitive saltmarsh vegetation on private land through fencing
- weed control, fencing and revegetation of rivers, creeks and drains
- whole farm planning workshops and mapping of work in priority areas
- control programs for gully, hill slope and drainage erosion issues
- improvements to effluent and fertiliser management on farms
- monitoring activities including habitat mapping, water bird counts and water quality monitoring.

The Corner Inlet WQIP will consolidate the most up-to-date knowledge and research to identify habitats at risk from poor water quality, the sources of the poor water quality, and, the most appropriate actions to address water quality issues.

The WQIP will build on work already underway within the local community to address water quality and sustainability issues. Due for completion in mid 2013, the WQIP is being developed in partnership with the Corner Inlet Connections Program. The partnership will work with the Victorian and Australian Governments to secure investment in priority actions to protect the unique values of the Ramsar site.

Once the plan is completed, monitoring will be undertaken to ensure identified actions are implemented and to provide the capacity to check on catchment and inlet condition to determine the actions that are making a difference.

For further information regarding the Corner Inlet Water Quality Improvement Plan or the Corner Inlet Connections Program, please contact the West Gippsland CMA on 1300 094 262 or visit www.wgcma.vic.gov.au



Managing water in the landscape – wetlands surviving the dry

Kirralee Donovan, WetlandCare Australia

WetlandCare Australia is working with floodplain farmers on the mid north coast of New South Wales to implement best practice wetland management. In dry weather floodplain wetlands are at risk of degradation. Prolonged dry weather brings a different set of wetland management challenges including the impacts of acid sulfate soil – a priority management issue for WetlandCare Australia.

Exposure of acid sulfate soils is a threat as water levels drop in low lying wetlands and floodplain drainage systems. As water levels contract, acid sulfate layers are exposed to oxygen and acid forms. This process leads to scalding of agricultural land and significant consequences for water quality and aquatic life with the next onset of rain.

WetlandCare Australia, a national wetland conservation organisation, has been working with floodplain farmers to implement best practice wetland management. Strategies to retain appropriate water levels and maintain healthy wetland habitat and water quality is the aim of this work. Best practice drainage and wise use of floodplain wetlands is a focus, removing excess flood water from the land in wet times but holding back sufficient water in the dry times. During dry times holding back and maintaining set water levels in drainage channels and wetlands is critical for both wetland health and agricultural productivity.



In many cases wetland management is about finding a balance between environmental health and agricultural productivity. Mid north coast of New South Wales, 2012 (WetlandCare Australia).

WetlandCare Australia is actively promoting best practice options to better manage acid sulfate soils and maintain controlled water levels. A current project on the Bellinger floodplain has seen the installation of a temporary weir structure to retain water in significant backswamp wetlands on the property. This work in conjunction with other natural resource management activities including drain revegetation and upgrading stock laneways has contributed towards improved wetland health and enhanced water quality both onsite as well as downstream.

For further information on wetland issues and management options contact WetlandCare Australia mid north coast, coffsharbour@wetlandcare.com.au or visit www.wetlandcare.com.au.



Mapping groundwater dependent ecosystems in Queensland

Queensland Government and the National Water Commission

Groundwater is not only an important water source to meet human consumptive needs, it also plays a critical role in supporting many ecosystems. A new mapping project is providing information for decision makers to help manage environmental assets that are interrelated to or dependent on groundwater.

Groundwater dependent ecosystems (GDEs) are a sub-set of all natural ecosystems, specifically GDEs are those ecosystems that require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements to maintain their communities of plants and animals, ecological processes and ecosystem services. GDEs may include springs, lakes, palustrine wetlands, rivers, aquifers, caves and terrestrial vegetation.

Demand for Queensland's water resources is increasing due to the combined pressures of development, a variable climate and a growing population. The availability of surface water to meet consumptive needs has declined and the pressure on groundwater resources is growing.

Extraction of groundwater and changes in land use pose risks to GDEs. The ability to protect GDEs is reliant on their accurate identification which, to date, has been constrained by the lack of comprehensive mapping and data. To address this knowledge gap, the Queensland Government and the National Water Commission funded the Queensland GDE Mapping Project as part of a project to further develop the National Atlas of GDEs.



This artesian spring in central Queensland provides critical habitat for the red-finned blue-eye (*Scaturiginichthys vermeilipinnis*), a fish species only known to exist in five small freshwater springs. Major threats to this nationally and state listed endangered fish include declining aquifer pressure resulting in declining spring flows and introduced mosquitofish (*Gambusia holbrooki*) (Queensland Department of Environment and Heritage Protection).

The National Atlas of GDEs was compiled to ensure a complete coverage of GDE mapping for Australia by combining nation-wide layers of satellite remote sensing data with previous fieldwork, literature and mapping.

The Queensland GDE Mapping Project used a bottom-up approach to engage a broad range of experts in aquatic ecology, biodiversity, botany, geology, geographic information systems, groundwater, hydrogeology, hydrology, remote sensing, resource assessment, soil science, water planning and wetlands. Expert knowledge on the interrelationships between groundwater and ecosystems at a fine scale was captured in intensive two-day multidisciplinary workshops and combined with regional ecosystem and wetland datasets to map the extent of GDEs.



Intensive multidisciplinary GDE mapping workshop in Mackay, Queensland (Queensland Department of Environment and Heritage Protection).

To date, workshops have been held in Brisbane, Toowoomba, Bundaberg and Mackay. GDE mapping is complete in three catchments in the eastern Murray-Darling Basin region and seven catchments in the Wide Bay-Burnett region. GDE mapping has begun for a further five catchments in the Mackay-Whitsundays region.

Queensland GDE mapping and supporting information will enable all decision makers responsible for the protection of GDEs, including state and regional agencies, to access relevant knowledge. Furthermore, GDE mapping will be available to all stakeholders to assist in managing water resources with consideration of the ecological requirements of key environmental assets.

All information, maps and conceptual models developed through the Queensland GDE Mapping Project will soon be hosted on *WetlandInfo* (wetlandinfo.ehp.qld.gov.au)—the Queensland Wetlands Program’s first-stop-shop for wetlands resources and tools.



WATER REQUIREMENTS FOR WETLAND SPECIES

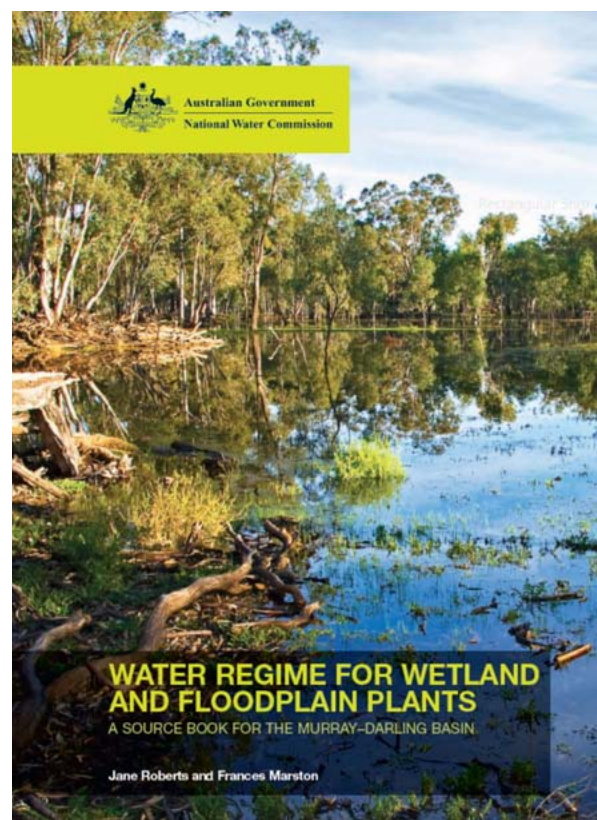
Water for plants — capturing knowledge for wetland managers

National Water Commission


The National Water Commission funded the book *Water regime for wetland and floodplain plants: A source book for the Murray-Darling Basin* by Jane Roberts and Frances Marston to update and extend the authors' original publication launched in 2000. This volume captures the wealth of research knowledge generated over the past decade about effective vegetation management as part of the ecology of our inland wetland and floodplain systems.

The new publication is a valuable resource for everyone involved in wetland and floodplain management in the Murray-Darling Basin. Planners and practitioners can now access the most up-to-date, evidence-based knowledge and practice methods for managing ecologically important wetland plants.

Understanding and better managing wetland plants is vital to boosting the health of the catchments in which they are located. Wetland plants oxygenate and purify water and can directly improve other ecosystems.



Water regime for wetland and floodplain plants: A source book for the Murray-Darling Basin captures the wealth of research knowledge generated over the past decade about effective vegetation management as part of the ecology of our inland wetland and floodplain systems (National Water Commission).



This work addresses the requirement under the National Water Initiative for best available science that allows for informed judgement on the trade-offs between competing outcomes for water systems, and the need for knowledge that demonstrates ecological outcomes from environmental flow management.

The updated edition covers 19 species and information is provided at several levels to meet the requirements of a range of stakeholders. A synthesis of what is known about each species is organised under simple headings such as 'Life cycle' and 'Water regime'.

Each section provides details on the water regime for the subject species, presenting what is known about its ecological dependency on water regimes and the effect on growth, survival and capacity to reproduce. This focus on the flow — ecology relationship will enable managers to use the technical life-cycle details to inform their practical options for regulating and controlling water regimes in wetland and floodplain systems. This detail is followed by a one-page summary of the flow and water regime the species requires for vigorous health. Further scientific and management references are provided for those who need more detail.

The featured species were selected for their ecological importance and relevance to flows and flow management of Basin wetlands, floodplains and rivers. Some are invasive, including introduced plants such as willow and lippia, and native species such as giant rush. These are included for their functional impact on wetland and floodplain systems and the need for managers to develop specific strategies for their control.

The authors' species selection was based on their own experience and knowledge of the vegetation with which most wetland and floodplain managers deal from day to day. To obtain an electronic copy of the publication visit the National Water Commission website (<http://archive.nwc.gov.au/library/topic/environment/water-regime-for-wetland-and-floodplain-plants>) or email the bookshop on bookshop@nwc.gov.au.



The Australasian bittern and its water requirements

Robyn Pickering, BirdLife Australia

New knowledge about the water and plant life requirements of the Australasian bittern will help guide management of their wetland habitats.

The Australasian bittern (*Botaurus poiciloptilus*) is a large (66–67centimetre), stocky, thick-necked heron with mottled buff and brown plumage. It generally occurs singly or in pairs, usually in beds or reeds, rushes or sedges in freshwater wetlands. In south-east Australia it also occurs in irrigated areas and rice fields. It is found in south-west and south-east Australia and New Zealand.

The Australasian bittern is dependent on vegetated freshwater wetlands and the decline of such wetlands throughout Australia over the last century has resulted in a significant decline in the species. The vegetated wetlands it inhabits are usually shallow wetlands which are more likely to be significantly degraded by changes or developments than deeper wetlands.

There has been a variety of reasons that wetlands suitable for Australasian bittern have declined.

These include:

- wetland salinisation
- wetland acidification
- reduced inflow due to changes in drainage and climate, drought, diversion for irrigation or water extraction, and
- wetland infill for urban or industrial development.



Australasian bittern flying above a different type of foraging habitat in Kulnilup Nature Reserve, October 2008 (Robyn Pickering).

In recognition of these declines, and the estimated current population in Australia of only 250 to 800 adult bittern, the species was listed by the Australian Government as endangered in March 2011. It is also listed as endangered internationally in the IUCN Red List.

Since 2007 BirdLife Australia (formally Birds Australia and Bird Observation and Conservation Australia) and other organisations have been working hard to learn more about the Australasian bittern in order to improve its conservation status through the Bittern Project (<http://www.birdlife.org.au/projects/bittern-project>).

Data collected to date and scientific literature indicate that bitterns need shallow water less than 30 centimetres deep with medium to low density reeds, grasses or shrubs for foraging. However, the bittern needs deeper water with medium to high density reeds, rushes or sedges for nesting. These quite different water and habitat requirements further limit the availability of suitable wetlands for this endangered species. Wetlands providing habitat for Australasian bittern need to be given a high level of protection and provided with best practice management in order to conserve the species and other wetland fauna.



Typical bittern habitat at Kulnilup Nature Reserve, March 2012 (Robyn Pickering)





WETLANDS, WATER AND INDIGENOUS ENGAGEMENT

Ancient Science — an Indigenous perspective on wetland care

Herdsman Lake Wildlife Centre, WA

The Western Australian Gould League (WAGL) manages the Herdsman Lake Wildlife Centre (HLWC) within Herdsman Lake Regional Park, Wembley, Perth, Western Australia. WAGL's mission statement is to "Nurture a Passion for Nature" with approximately 10 000 students annually visiting the centre and wetlands on school excursions to participate in a range of hands-on environmental and Indigenous education learning experiences, including *Ancient Science*.

Ancient Science, an Unlocking Australia's Potential initiative, is supported by the Australian Government as part of the Inspiring Australia strategy. Ancient Science is where modern science meets ancient Aboriginal thinking. Primarily designed to unlock the potential of Aboriginal people to engage in science learning activities, *Ancient Science* also assists people working with Aboriginal communities. Participants take part in a unique range of hands-on biological and environmental science learning experiences on the banks of Herdsman Lake. Herdsman Lake is Perth's largest inner metropolitan wetland and serves as an important breeding ground for waterbirds with at least 20 species breeding there.

Input through Dreaming stories and cultural history lessons from local Aboriginal (Nyungar) Elders provide a bridge of common understanding between ancient and modern thinking, breaking down cultural barriers as participants reflect and workshop the modern and ancient ecological footprint. Aboriginal participants are empowered through the learning experience with an understanding that they have much value to contribute to environmental science and the sustainable growth of Western Australia's economy.

Roger Harris, Manager of HLWC, is an accomplished science communicator, having been awarded the Premier's Prize for Excellence in Science Communication, and is the key presenter of the science learning experiences, in collaboration with the local Aboriginal (Nyungar) presenters. Roger shares his thoughts on environmental and sustainable education, which started from his childhood experiences growing up on a farm in the south-west of Western Australia.

"I grew up with a love for nature and many of my school friends were Nyungar, so I had some understanding of their cultural perspectives of the land."



Herdsmen Lake is a major breeding site for waterbirds, especially black swans, in south-western Australia (Brian Furby).

“All humans have a natural love for nature, but its not until you experience it that it gets under your skin, its like osmosis, spend enough time soaking in the experience and you can't help but appreciate the beauty and feel the need to protect it.”

The Australian Curriculum has identified Sustainability and Aboriginal Histories and Cultures as key cross-curricular priorities. Ancient Science addresses both priorities.

“You don't need to grow a tail and paint yourself blue like in the movie Avatar, but if you are going to be working in the area of environmental science, you do need to have an appreciation, affinity and shared understanding of the local Indigenous people to be successful in your field of work. Celebrate Boodga (Country) with them from the Koort (Heart) and watch doors open!”



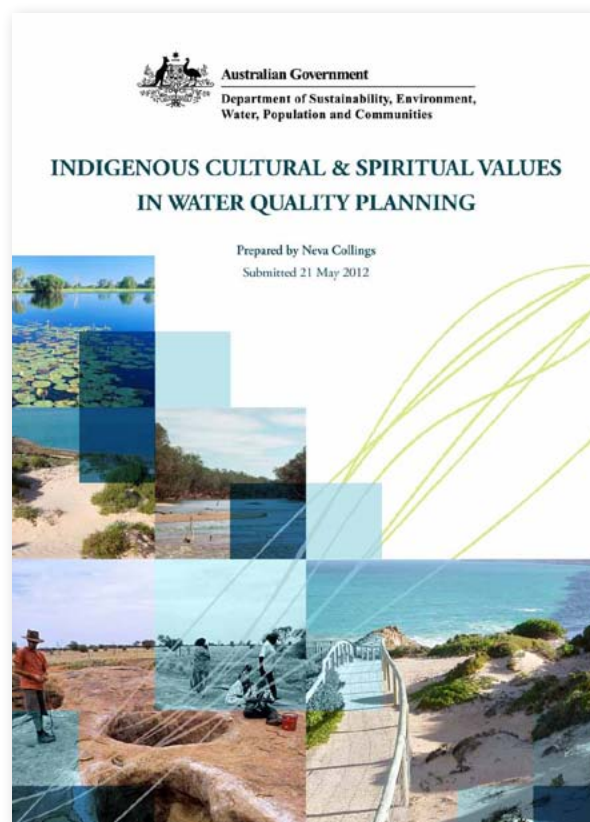
Indigenous cultural and spiritual values in water quality planning

Department of Sustainability, Environment, Water, Population and Communities

Case studies of water quality planning processes that have included Indigenous cultural and spiritual values have been published under the National Water Quality Management Strategy (NWQMS).


A number of 'good practice' themes emerged from the case studies, including that good integration of Indigenous cultural and spiritual values requires:

- due respect for Indigenous law, custom and traditional knowledge;
- early identification and engagement of the most appropriate Indigenous stakeholders and representatives
- information sharing using a range of accessible formats including, for example, illustrated models, booklets and stories
- pro-active efforts to build cultural awareness and positive relationships between stakeholders;
- the integration of science and traditional knowledge, and
- continual collaboration with Indigenous stakeholders.



Case studies of water quality planning processes that have included Indigenous cultural and spiritual values have been published to start addressing the gap in the National Water Quality Management Strategy (Department of Sustainability, Environment, Water, Population and Communities).

One of the case studies focuses on the *Police Lagoons Wetland Conceptual Model, Queensland*. The Police Lagoons are located on the Lower Balonne River floodplain in the Murray-Darling Basin. In this case study, a conceptual model was developed by Queensland's Department of Environment and Heritage Protection (DEHP), in partnership with the Queensland Murray-Darling Committee (QMDC) and local Indigenous Traditional Owner groups to "document the cultural, spiritual and historical significance of Police Lagoons for Indigenous people".



Workshops that brought together the DEHP, QMDC, the Regional Aboriginal Advisory Group, Indigenous persons in the community and the Traditional Owners of Police Lagoons were held to develop wetland conceptual models that integrate cultural, spiritual, hydrological and ecological values of the lagoons and support community goals to maintain and improve the wetland's values. The lagoons were identified as a functioning wetland, meeting place, swimming hole, campsite, bora ring, and burial site. Water extraction and land-use change have led to increased pressure on Police Lagoons, with particular threats including declining water quality, pests, erosion, loss of habitat and changes in the water regime of the wetlands.

The development of conceptual models provides a platform for knowledge exchange between ecologists, Indigenous people and wetland managers. The models will assist managers to plan and manage wetlands to protect water quality amongst other wetland values.

The *Indigenous cultural and spiritual values in water quality planning* report is available on the DSEWPaC website: <http://environment.gov.au/water/publications/quality/water-quality-planning-indigenous.html>





Researchers are collaborating with Traditional Owners and rangers across northern Australia, including at Kakadu National Park, to prepare local research agreements (Parks Australia).


Engaging Indigenous Australians in environmental research

Amy Kimber, Tropical Rivers and Coastal Knowledge Research Hub

Indigenous people own and manage about a third of the landscape across northern Australia. They have detailed knowledge about the region's environment and ecological processes because their physical, social and spiritual wellbeing has been deeply connected with the land and its waterways for thousands of years.

An Indigenous Engagement Strategy has been developed to support the Northern Australia Hub of the National Environmental Research Program. This initiative builds on six years of government investment in a number of initiatives focused on improving our knowledge of northern Australia's rivers, wetlands and water resources. The largest coordinated investment has been through the Tropical Rivers and Coastal Knowledge Research Hub (TRaCK), which aims to provide the science and knowledge that governments, communities and industries need to sustainably manage northern Australia's rivers and estuaries.





TRaCK recognised that Indigenous people had rarely been effectively engaged in research on their country, and that Indigenous values associated with environmental resources tend to be poorly understood by decision makers. Additionally, many researchers that come to work in northern Australia do not have a good understanding of Indigenous culture and need help to develop appropriate ways to communicate with and involve Indigenous people in their research.

In the first phase of TRaCK, researchers set out to gain a better understanding of Indigenous values and how to better collaborate with people living in northern Australia to ensure their knowledge is included in research outputs. The lessons from this work were included in the Indigenous Engagement Strategy for a new research program, the Northern Australia Hub of the National Environmental Research Program.

The strategy was developed to ensure that the Hub's research is:

- relevant and, if possible, beneficial to Indigenous people
- conducted according to the highest ethical standards
- providing opportunities for Indigenous employment and skills development
- facilitating two-way knowledge sharing and an increase in cross-cultural awareness, and
- respectfully communicating research progress and outcomes to Indigenous people.

Many of the Hub's 16 projects require collaborative partnerships with Traditional Owners and Indigenous ranger groups. In particular, researchers are collaborating with Traditional Owners and rangers in Arnhem Land, Kakadu, the Kimberley and the Daly River region to prepare local research agreements.

Whenever possible, Indigenous rangers and Traditional Owners are invited to participate in field work on their country, and to take part in meetings and workshops. The fact that they are taking up these opportunities in most cases demonstrates a desire to be actively involved.

After the strategy's endorsement, the Indigenous Advisory Committee of the Australian Government Department of Sustainability, Environment, Water, Population and Communities encouraged all five hubs of the National Environmental Research Program to adopt its principles.

To find out more about the strategy please contact the Northern Australia Hub on (08) 8946 7619 or email nerp.northern@cdu.edu.au.





WETLAND CONSERVATION AND RESTORATION



A dune has formed in front of a former artificial outlet at White Sands (Mark Bachmann)

Unravelling the story of change at Long Swamp, south-west Victoria

Mark Bachmann, Nature Glenelg Trust

Nature Glenelg Trust is working with its partners and using a range of ecological skills to bring together information that will improve the management of important wetlands on public land.

Long Swamp is a nationally recognised wetland of significant public interest in south west Victoria, located almost entirely within Discovery Bay Coastal Park — a reserve managed by Parks Victoria. Like many wetlands across southern Australia, the hydrology of Long Swamp appears to have been altered by a range of factors, including the cutting or deepening of channels to the sea, since European settlement. As a result, there is concern within the local community about the current trends of changes within the wetland system, namely, a shift in vegetation types and loss of aquatic habitat as a result of a drying trend, and a reduction of natural flows into the Glenelg River Estuary.

Nature Glenelg Trust is now working in partnership with the local community and the agencies responsible for the management of Long Swamp to:

- better understand the current values of the system
- document the historic and current trajectory of change, and
- in time, articulate future management options that are based around a sound set of principles that are guided by the scientific work undertaken.

Coincidentally, one of the outlets to the sea (in the vicinity of White Sands) now remains naturally closed, with a dune forming in front of the former outlet. This outlet was artificially cut by fishermen decades ago, but naturally closed during the last drought. There are some interesting changes taking place as a result of water levels recovering in that part of Long Swamp.



The recovering swamp at White Sands after two years of no winter outflows to the sea, July 2012 (March Bachmann)

The Glenelg Hopkins Catchment Management Authority, with funding from the Victorian Government, contracted Nature Glenelg Trust to undertake a fish and frog study in 2012 to better understand the aquatic fauna of Long Swamp, and potential links between the swamp and the estuarine/marine environment. This information will also inform the Estuary Entrance Management Support System, a database that guides decisions regarding artificially opening estuaries, including the Glenelg River mouth.

The Trust is also hoping to undertake a comprehensive spatial analysis of historic wetland extent and vegetation change within Long Swamp, along with a similar, nearby wetland system at Piccaninnie Ponds — situated on the opposite side of the Glenelg River Estuary. This information should make it possible to objectively review the current and past values of the system and its trajectory of change, with a view to clarifying and setting goals for water management in Long Swamp that best serve the diverse ecology of this important site into the future.

Keep up to date with the Nature Glenelg Trust review into the ecology and management options for Long Swamp through its website: <http://natureglenelg.org.au>.



Wetlands at risk of weeds

**Philippa Bailey,
Friends of Edithvale-Seaford Wetlands**

Edithvale-Seaford Wetlands in the southern suburbs of Melbourne are the last remnants of the Carrum Carrum swamp. In 2001, the wetlands were listed under the Ramsar Convention as being of international significance.

The Friends of Edithvale-Seaford Wetlands, FESWI (established 1988), embarked on a steep learning curve in 2012, taking on a weed eradication project that will ultimately maintain and improve water quality at the wetlands.

The group arranged plant identification training in the wetlands with botanist Dr Graeme Lorimer, who taught group members about the variety of native plants which enhance the wetland environment and presented an example of a weed of national significance, *Juncus acutus* (spiny rush), a growing problem at Seaford wetlands.

FESWI then researched local weeds which mainly escape from household gardens and can prove hazardous in the wetlands environment. It may surprise readers to learn the colourful gazania can be a menace if left to multiply. Another prolific weed in the area is mirrorbush, which is found on many vacant plots of land and has been spotted thriving within the wetlands.

FESWI put all this new knowledge into a booklet "Wetlands at Risk of Weeds" which was launched at our Wetlands Awareness Day, held on 16 September 2012 at Seaford North Primary School.

With funds provided by the Victorian Department of Sustainability and Environment's Coastcare program, FESWI were also able to design and



The Friends of Edithvale Seaford Wetlands Weed Maze (Philippa Bailey)

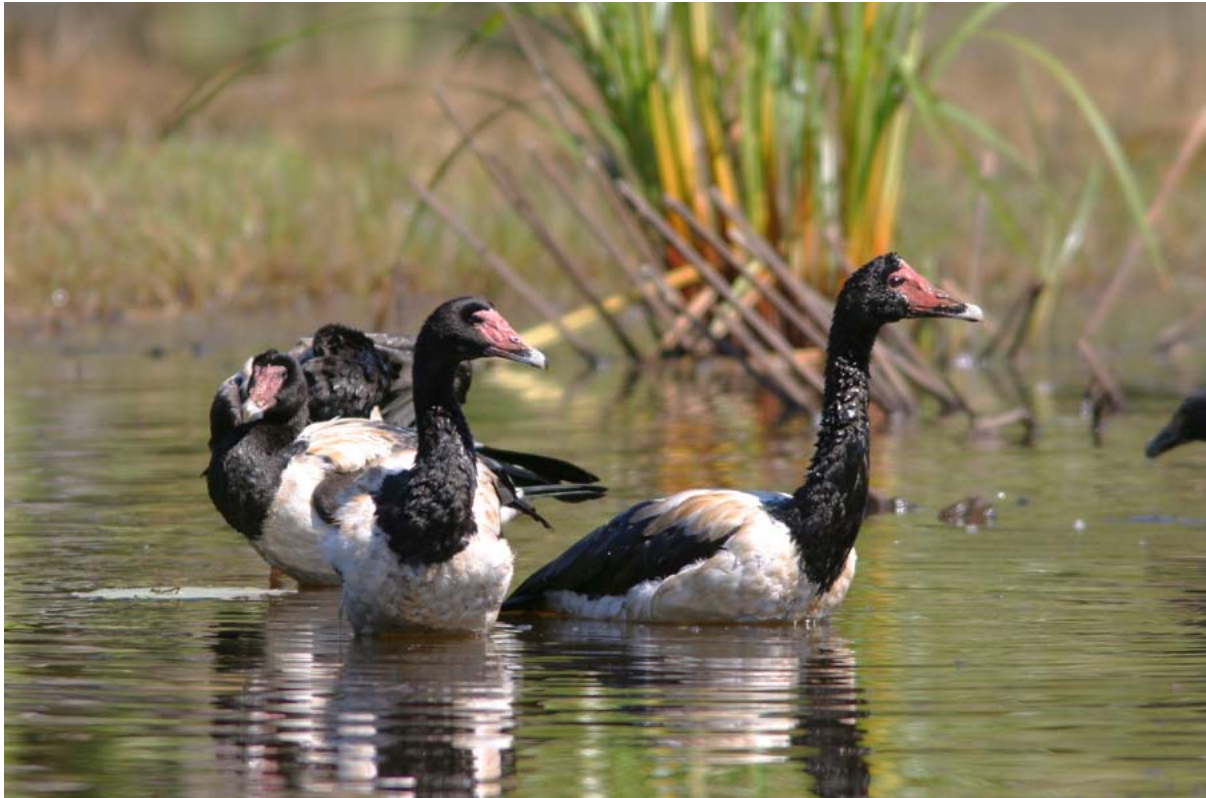
purchase a weed maze, which draws children into its compartments, where they discover information and hands on experiences with plants and weeds.

FESWI will be distributing the weed booklets through local community channels close to both wetland areas. The group will be displaying the maze at local events and hope to educate young people about the risk of weeds destroying fragile wetland environments.

For further information visit the FESWI website (<http://www.edithvale-seaford-wetlands.org/index.html>)



Launch of the *Wetlands at Risk of Weeds* booklet, September 2012 (Philippa Bailey)



Magpie geese have returned to Richardson's Lagoon (Rohan Clarke).

Authority to boost self-defence for eight priority public wetlands

Heidi Kleinert, North Central Catchment Management Authority

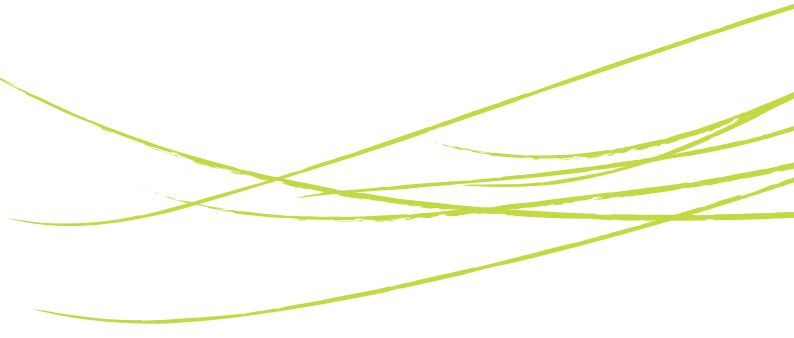
The North Central Catchment Management Authority (CMA) is undertaking a project to improve the natural values of eight public wetlands near Kerang in northern Victoria.

The eight Central Murray wetlands will be assisted with self-defence by reducing the impacts of threatening pests, such as rabbits, foxes and weeds, as well as recovery through fencing and revegetation.

The collective of wetlands to be protected and enriched comprises Lake Cullen, Hird Swamp, Johnson's Swamp, Round Lake, McDonald's Swamp, Lake Elizabeth, Lake Murphy and Richardson's Lagoon. Many of these wetlands are internationally important as part of the Kerang Ramsar site and nationally important for migratory birds and rare plant life. The project will help to ensure their high priority wetland status.

Due to changed water flows for irrigation many of these wetlands have been cut off from natural flooding. Since 1987 some of the wetlands have received an allocation of environmental water to maintain their health. The environmental water has benefited waterbird numbers in particular- at Richardson's Lagoon Magpie Geese have





returned. The water has also provided drought refuge for critically endangered fish populations such as the Murray-hardyhead at Round Lake.

The new project will focus on how land is managed within and adjacent to the wetlands. Over the next four years the project will:

- undertake wetland condition assessments
- reduce rabbit and fox populations
- protect threatened flora and fauna species
- protect cultural heritage sites
- provide fencing and revegetation
- reduce soil erosion
- raise awareness and offer support
- undertake mapping and monitoring works.

Pest animals and weeds don't recognise private and public land boundaries. The North Central CMA will be working with a broad range of partners, including Indigenous and community groups, Parks Victoria, Goulburn-Murray Water and surrounding landholders. A well-planned and integrated approach to combatting rabbits, foxes and weed issues will ensure the job gets done and protects everyone's interest.

Wetlands that receive environmental water need a helping hand with on-ground complementary land management works. This project will be a great showcase of what environmental outcomes can be achieved when investment is secured, neighbours talk, and water and land management is coordinated.

The project is funded by the Victorian Government's On Ground Works Program. For more information visit www.nccma.vic.gov.au



Delivering biodiversity dividends in the Barratta Creek Catchment

Kate Maltby, WetlandCare Australia

WetlandCare Australia is commencing a new project funded by the Australian Government's Biodiversity Fund to protect, manage and enhance the high ecological values of the Barratta Creek Catchment. Barratta Creek forms the main artery of the Bowling Green Bay wetlands, the only Ramsar site in north Queensland. It is one of the highest integrity floodplain creek systems on the developed east coast of Queensland.

The wetlands and waterways associated with the Barratta Creek catchment have exceptionally high ecological and functional values. The area includes some endangered regional ecosystems, as well as flora and fauna listed under the *Nature Conservation Act 1992* (Qld) and *Environment*

Protection and Biodiversity Conservation Act 1999 (Cth). There is a diverse range of adult and nursery fish habitats, including ephemeral brackish swamps and deepwater lagoons. These deep water lagoons of the Barratta Creek system provide perennial aquatic habitats within a seasonally dry environment.

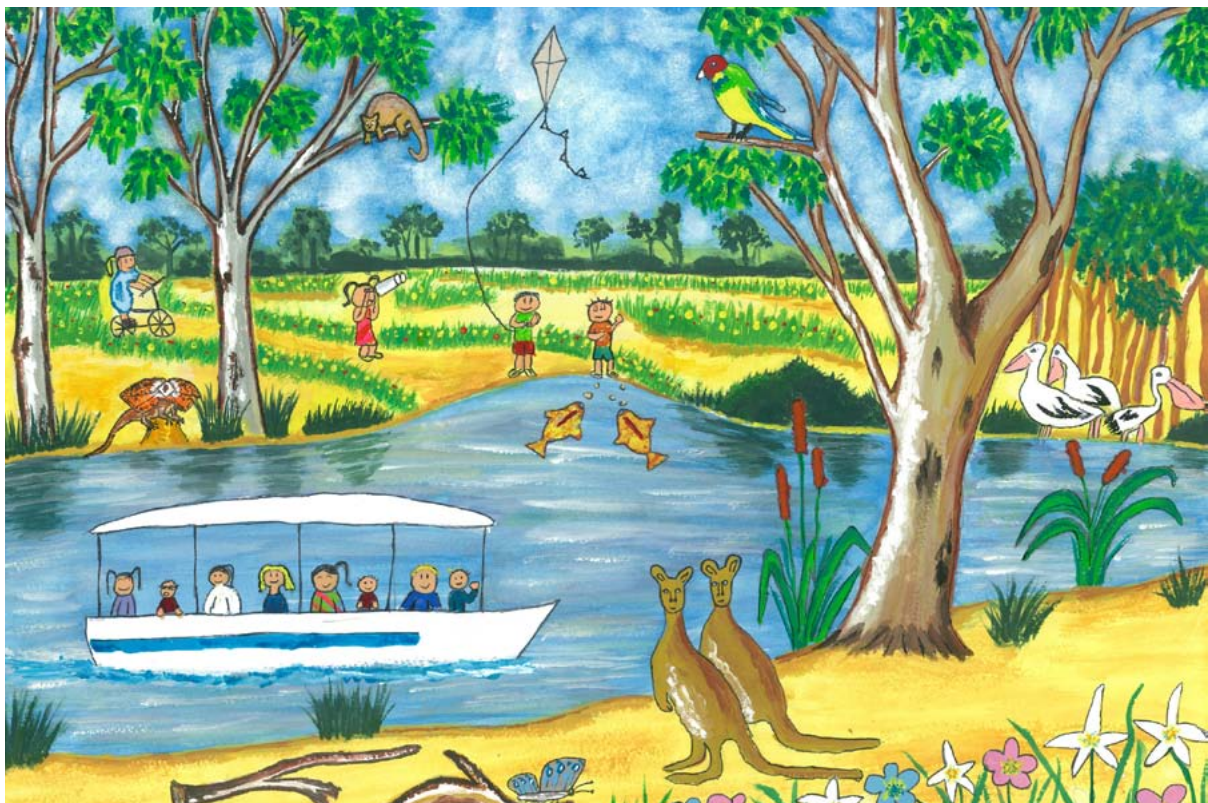
Since the introduction of intensive irrigated agriculture, the creek and wetlands have suffered serious impacts through a lack of understanding and lack of active management. Issues include invasive aquatic and terrestrial weeds, hot and frequent fire regimes and excessive and nutrient-rich tail-water flows.

WetlandCare Australia is uniting multiple stakeholders to improve biodiversity outcomes in the Barratta Creek Catchment and the internationally listed Ramsar site through integrated, catchment-based management.



Barratta Creek (Kate Maltby).

WETLAND MANAGEMENT




Summer Wetlands by Leticia Shiu, winner of the 2012 Children's Art category, WetlandCare Australia National Art and Photography Competition.

WetlandCare Australia National Art and Photography Competition

Liz Hajenko, WetlandCare Australia

This annual competition, established in 2007, celebrates World Wetlands Day and aims to encourage people of all ages to explore, engage with and share their local wetlands and waterways through art and photography.

Each year entrants from all around Australia submit works investigating wetland themes. Animals, plants, people interacting with wetlands and the impacts of a changing climate are some of the many topics explored in the diverse artistic and photographic works submitted, demonstrating the key message of 'No matter where you live in Australia, wetlands are important to you'.



The prize-winning works from the competition are displayed in an online gallery on the WetlandCare Australia website for 12 months, and are also utilised to develop posters and other wetland education materials which are widely distributed. In 2013 the winning entries were unveiled at the Hunter Wetlands Centre in Newcastle on World Wetlands Day (2 February), and can be viewed in WetlandCare Australia's on-line gallery at **www.wetlandcare.com.au**

For further information and photo opportunities contact Liz Hajenko, Competition coordinator WetlandCare Australia on 02 66816169 or by emailing **lzhajenko@wetlandcare.com.au**





Development of the Wetland Tender metric

Dr Andrea White, Victorian Department of Sustainability and Environment

Wetland Tender is a method that is used to assess and compare bids from landholders for works that aim to improve the condition of wetlands on private land. Wetland Tender identifies projects that represent the best value for money, while ensuring that the wetlands in the best condition and with the highest values get priority for funding. Early in 2012, the Victorian Department of Sustainability and Environment began a process to review the method and calculators that form the basis of the Wetland Tender metric.

The Wetland Tender metric is used to predict the increase in condition expected from specific landholder interventions (the 'gain'). The first version of the Wetland Tender metric was developed in 2010, and has been used extensively in Market Based Instrument (MBI) projects.

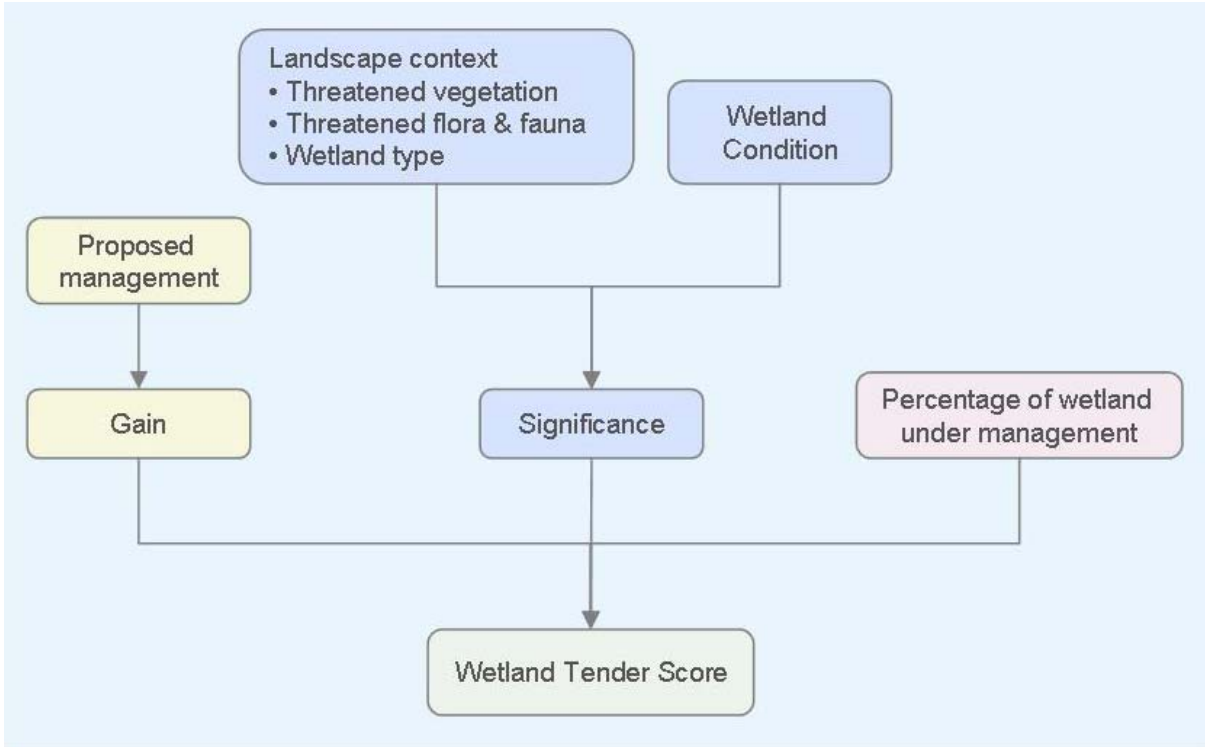
The review of the metric identified a number of areas for improvement. The metric takes into account only a limited number of management actions and the actions are not linked to all the wetland functional components that could be improved by the intervention. Index of Wetland

Condition (IWC) data is used to inform condition of the candidate wetlands; however, the current metric does not make use of the full range of IWC data collected. The current metric also tends to reduce the threat score to zero when a management intervention is proposed regardless of the level of threat or the amount of intervention.

The redevelopment of the metric will make improvements in these areas. The full range of possible management interventions will be included, based on the findings of a recently completed conceptual model project which identifies a comprehensive list of management activities that reduce threats to wetland values.

The management interventions will be closely mapped to the relevant condition measures. This will enable a gain to be scored for all of the activities that the landholder proposes to undertake and ensure that where an activity is likely to affect several system components, this is reflected in the gain calculation. The magnitude of the improvement in condition from a given level of management intervention will reflect our best understanding of the system response, and will be probabilistic, ie the likelihood of a range of different outcomes will be estimated. For more information on this work please contact Andrea White (andrea.white@dse.vic.gov.au).





Wetland Tender metric uses the gain expected from the proposed management actions, the significance of the site and the percentage of the wetland under management to calculate the overall Wetland Tender score. The final step in the process is to consider the cost of the proposed management actions, before comparing bids from different landowners (Victorian Department of Sustainability and Environment).





‘Walking the landscape’ — a whole-of-system framework for understanding and mapping environmental processes and values

**Queensland Wetlands Program,
Queensland Department of
Environment and Heritage Protection**

‘Walking the landscape’ is a systematic and transparent science synthesis framework which integrates existing data with expert knowledge through hands-on workshops to create a common understanding among multidisciplinary teams.

The framework incorporates all the available knowledge on landscape components (e.g. groundwater dependent ecosystem, lacustrine wetland, vegetation etc.) and processes (hydrological, geological etc.) and uses the information to produce conceptual models which link to a map.

These products help answer questions like how the landscape contributes to flood behaviour or why groundwater dependent ecosystems occur in certain locations.

Aim of ‘Walking the landscape’

The primary aim of the framework is to help develop a whole-of-landscape understanding to improve evidence-based decision making for the sustainable management and restoration of ecological systems.

In broad terms the framework for ‘Walking the landscape’ involves two stages:

1. Assimilating available information through participatory workshops.
2. Synthesising and developing it into a revised understanding or product.

‘Walking the landscape’ captures information about an entire environment in a comprehensive, systematic and rigorous way. The main points of distinction from other science synthesis projects are that it:

- develops a new shared understanding by linking available research and data to expert opinion
- centres the understanding around the environmental processes
- presents the information in a simple accessible format, using familiar mapping tools (e.g. ArcGIS, Google maps)
- addresses one of the major criticisms of broad-scale mapping—the lack of integration of knowledge from local experts into datasets used by policy and decision makers.

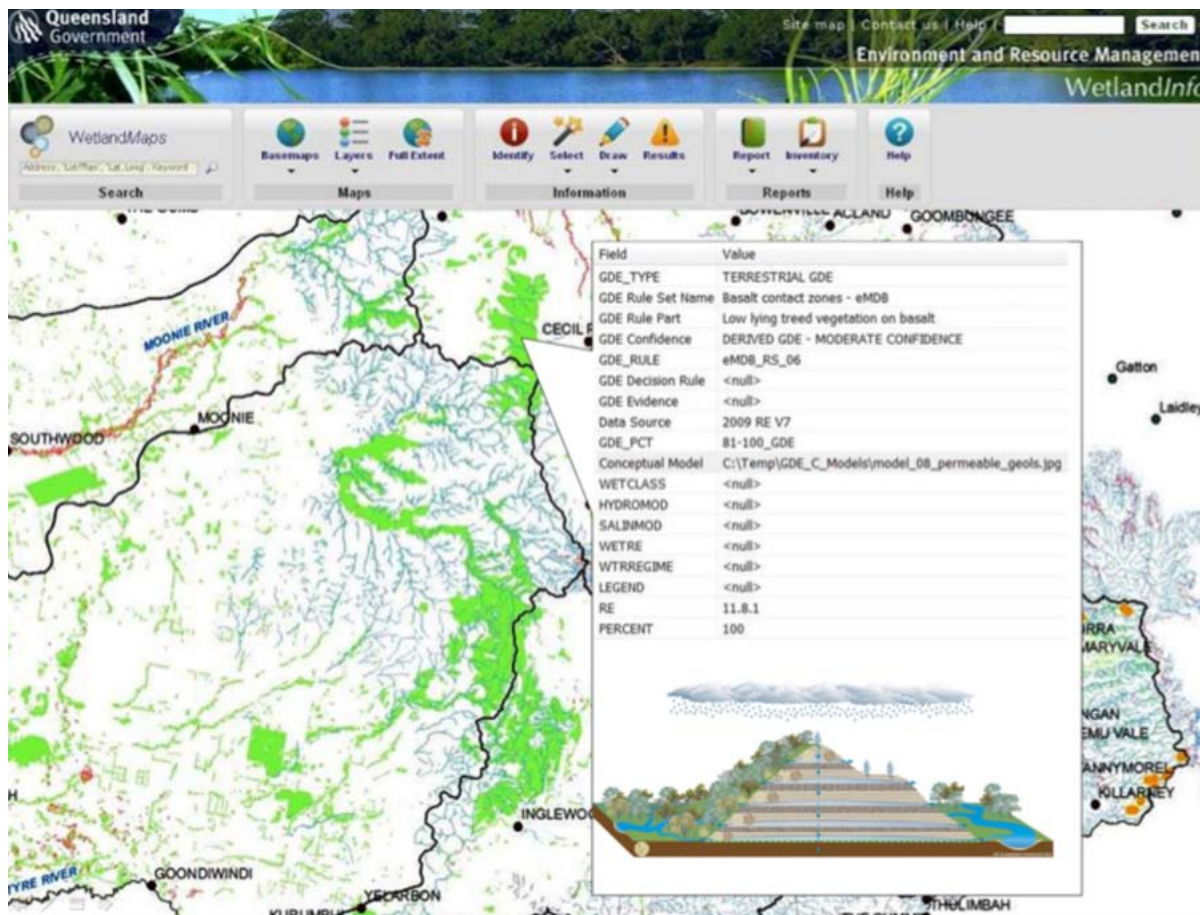
Outcomes and outputs of ‘Walking the landscape’

The framework generates a whole-of-system map linked to the conceptual understanding of how the environment functions. The final outputs are:

- a series of conceptual models describing aspects of landscape function in terms of its components and processes
- a series of decision rules and rule sets that describe the application of the conceptual models to spatial data
- a map of the landscape, derived from the application of the rule sets and linked to the conceptual models
- supporting documentation for the project (e.g. literature review, framework, metadata, workshop reports).

Application of ‘Walking the landscape’

The framework itself is quite flexible. It can be applied to develop a holistic overview of environmental function, for example, the Great Barrier Reef Marine Park Authority’s coastal ecosystems program. It can also be used to



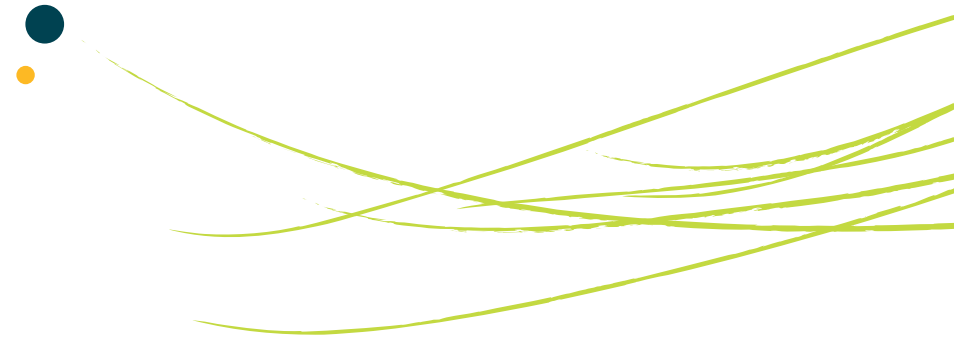
A demonstration of the final mapping and spatially linked pictorial conceptual models for the Queensland Groundwater Dependent Ecosystem (GDE) Mapping Project. An area of the landscape, as displayed through an online mapping tool (WetlandMaps) has been identified as a terrestrial ecosystem potentially dependent on groundwater. This terrestrial GDE is linked to a pictorial conceptual model representing the key attributes supporting groundwater and ecosystem interaction that are likely to be relevant to this GDE (Queensland Department of Environment and Heritage Protection).

develop more technical mapping products (eg groundwater dependent ecosystem mapping) and community engagement tools for management and planning outcomes (eg wetland and floodplain resilience conceptual modelling).

The framework and its fundamental concepts and principles are outlined in 'Walking the landscape': A whole-of-system framework for understanding and mapping environmental processes and values.

A number of key projects directly contributed to the principles found in the 'Walking the landscape' framework which is available on WetlandInfo. (<http://www.wetlandinfo.ehp.qld.gov.au>). These include the Aquatic Biodiversity Assessment and Mapping Method (AquaBAMM), Groundwater Dependent Ecosystem Mapping Project, the framework for evaluating aquatic ecosystem connectivity and the Great Barrier Reef Marine Park Authority's coastal ecosystems project.





Pictures worth a thousand words — a guide to pictorial conceptual modelling for wetland managers and scientists

Jan Tilden, Lana Baskerville and Maria Vandergragt, Queensland Department of Science, Information Technology, Innovation and the Arts. Hsuan Lammers and Mike Ronan, Queensland Department of Environment and Heritage Protection.

Pictorial conceptual modelling has been developed as a suite of knowledge visualisation practices to help ensure that scientific knowledge is used for greater benefit to people and the environment. With this broad aim in mind, pictorial conceptual models (PCMs) aid communication among natural resource managers, scientists and the community, especially in environmental management.

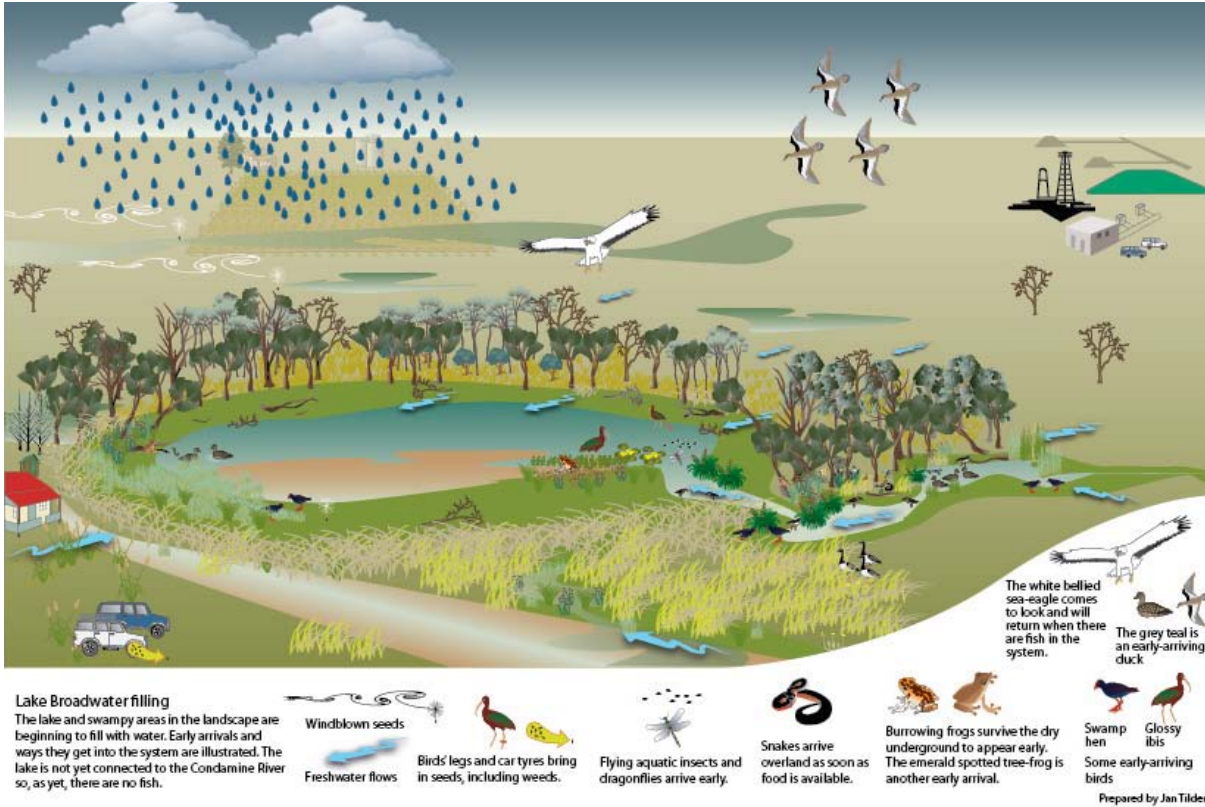
The process behind creating these lively scientific pictures is just as important as the pictures themselves. Across sectors and disciplines, scientists and other stakeholders collaborate to synthesise the science that underpins the models, often participating in the drawing exercise itself. A good process engages people and all voices will be heard. If the sources of information are systematically recorded and validated, the result is new synthesised science with a wide audience appeal.

This process is the focus of a new guide to pictorial conceptual modelling compiled by a group of scientists and communication practitioners working for the Queensland Department of Science, Information Technology, Innovation and the Arts under the Queensland Wetlands Program (the Program).

The Program, along with affiliated Queensland Government agencies and other stakeholders, has used pictorial conceptual modelling very effectively for communicating wetland science to decision makers. Some resulting products include:

- *The Queensland Wetlands Program typology models*
(<http://wetlandinfo.derm.qld.gov.au/wetlands/ScienceAndResearch/ConceptualModels.html>)
- Wetland conceptual model case studies
(<http://wetlandinfo.derm.qld.gov.au/wetlands/ScienceAndResearch/ConceptualModels/case-study.html>)
- *Wetland Rehabilitation Guidelines for the Great Barrier Reef catchment*
(<http://wetlandinfo.derm.qld.gov.au/resources/static/pdf/final-reports/qw-rehab-guidelines-jan09.pdf>)

'Pictures Worth a Thousand Words: a Guide to Pictorial Conceptual Modelling' available on *WetlandInfo*— (www.wetlandinfo.ehp.qld.gov.au)—shares experiences of those connected to the Program in advancing the use of this powerful and practical communication tool.



Lake Broadwater filling – an example of a pictorial conceptual model (Queensland Department of Environment and Heritage)

While the new guide was developed to support wetland ecosystem science and management in Queensland, its methods are equally applicable to other environments and localities. The guide examines pictorial conceptual modelling as it

relates to modelling more generally. It explores the use of PCMs to inform wetland management and engage the broader wetland community. A step-by-step process is presented, along with flow charts and checklists for managing each step.





GOVERNMENT UPDATES

Australian Government Update

Department of Sustainability, Environment, Water, Population and Communities

Australian Ramsar Site Nomination Guidelines

The Australian Ramsar site *nomination guidelines* (www.environment.gov.au/water/publications/environmental/wetlands/ramsar-nomination-guidelines.html), published in October 2012, outline the Australian Government's processes and requirements for adding sites to the list of Ramsar wetlands, and provide a nationally consistent framework for Ramsar site nominations in Australia and its offshore Territories.

Site nominations can be made by the Australian or state/territory governments, non-government organisations, community entities, trusts, Traditional Owners, individuals, private landowners or a company. Proposed nominations on state or private land require support from the relevant state government. Nominations for sites wholly within Commonwealth land require Australian Government support. The development of a Ramsar site nomination should be the result of a collaborative process between site managers/landowners and the Australian and state or territory governments.

These guidelines are the fourth module of the *National Guidelines for Ramsar Wetlands* (www.environment.gov.au/water/topics/wetlands/ramsar-convention/australian-guidelines.html) and were developed in consultation with the states and territories through the Wetlands and Waterbirds Taskforce.


Wetlands Fact Sheets

A series of wetland fact sheets have been published to provide information on wetland management in Australia and guidance on use of the Ecological Character Descriptions being progressively published for each Australian Ramsar site. These fact sheets include:

- Wise use of wetlands in Australia (<http://www.environment.gov.au/water/publications/environmental/wetlands/wise-use-wetlands-factsheet.html>)
- Wetlands in Australia – roles and responsibilities (www.environment.gov.au/water/publications/environmental/wetlands/roles-responsibilities-factsheet.html)
- Limits of acceptable change (www.environment.gov.au/water/publications/environmental/wetlands/acceptable-change-factsheet.html)
- Notification of change in ecological character (www.environment.gov.au/water/publications/environmental/wetlands/notification-change-factsheet.html)

A new Aquatic Ecosystems Toolkit — a framework for mapping and classifying aquatic ecosystems

The Aquatic Ecosystems Toolkit (<http://www.environment.gov.au/water/topics/aquatic-ecosystems.html>) is a set of good practice tools designed for identifying and understanding the importance of aquatic ecosystems. It was developed in collaboration with states and territories.



Aquatic ecosystems are collectively the wet parts of the environment. They can be rivers, streams, swamps, lakes, estuaries, marine systems, and underground aquifers. They have biodiversity values as well as resource values and provide many services to the environment and humankind. These can be provisioning (food and water), regulating (floods, droughts), supporting (soil formation, nutrient cycling) and cultural (recreational, spiritual).

Identifying and understanding the importance of aquatic ecosystems is a difficult and time-consuming process. Some tools to do this have been developed in Australia by different authorities and researchers, but until now there has not been a nationally consistent framework for mapping and classifying aquatic ecosystems, identifying high ecological value aquatic ecosystems (HEVAE) through the systematic application of ecological criteria, delineating and describing aquatic ecosystems, and assessing their ecological condition.

Commonwealth Environmental Water Office update

Commonwealth environmental water is managed to protect and restore rivers, wetlands and other environmental assets in the Murray–Darling Basin. In 2011–12, 680 gigalitres of Commonwealth environmental water was delivered to the Basin environment, bringing the total delivery of Commonwealth environmental water to over 1200 gigalitres since 2009.

Commonwealth environmental water is planned and delivered in partnership with a range of stakeholders such as state government agencies, catchment management authorities, local community groups, landholders and the Murray-Darling Basin Authority.

Some of the wetlands that benefited from Commonwealth environmental watering in 2011–12 included the Gwydir, Booligal and mid-Murrumbidgee wetlands. The results of *Commonwealth environmental watering in the Murray-Darling Basin* can be found in the Commonwealth environmental water outcomes reports and scientific monitoring reports.

The Commonwealth Environmental Water Office has developed *Annual water use options for 2012–13* for the ten catchments in the Basin in which it holds environmental water entitlements. Watering actions will continue to build on the improved ecological conditions that have resulted from the past two years of wetter conditions. Further information on the management of Commonwealth environmental water can be found at: www.environment.gov.au/ewater/index.html.





New South Wales Government Update

Office of Environment and Heritage

Wetland communities and river systems in NSW have made significant progress towards recovery following the second consecutive year of natural flooding and the continued support of NSW environmental water delivery and on-ground works and infrastructure.

In 2011–12, NSW delivered over 795 300 megalitres of environmental water sourced from NSW, Australian Government and The Living Murray environmental water accounts. This water supported wetlands and rivers and supplemented the natural inflows where necessary across the Gwydir, Macquarie, Lachlan, Murrumbidgee and the Murray and Lower Darling valleys. Wetland and aquatic vegetation responded with vigour, providing greatly enhanced breeding opportunities for waterbirds, frogs and fish.

In the Gwydir Valley, thousands of waterbirds returned to breed and fledge their young in the first successful major colonial waterbird breeding event in the region since 1999. Images can be viewed in the Waterbirds Return as the Gwydir Floods photo essay: http://brg.cma.nsw.gov.au/uploads/ECA/WaterbirdsRetnGwydirFloods_0712.pdf

Paika Lake, in the Murrumbidgee Valley, hosted more than 20 000 waterbirds, including three threatened species, following the delivery of environmental water managed by the NSW Government in collaboration with a small group of landholders. A short film that captured the project can be viewed at: <http://www.environment.nsw.gov.au/environmentalwater/watergallery.htm>

The NSW Riverbank program was completed in 2012. This \$105 million program was the first in Australia dedicated to the purchase of water entitlements for the environment, successfully securing 94 166 megalitres of water entitlements from willing sellers. This brings the total acquired NSW environmental water holdings to 358 940 megalitres.



Victorian Government Update

Department of Sustainability and Environment

Victoria is in the process of completing a number of significant achievements for wetlands that have been in development over the last four years.

In October 2012, the Draft Victorian Waterway Strategy was released for public comment. The draft Strategy outlines a policy and planning framework for the integrated management of rivers, wetlands and estuaries. The State Strategy, when finalised in 2013, will lay the foundation for the preparation of regional waterway strategies by Victoria's catchment management authorities and Melbourne Water. For further information see *Victoria moves to a fully integrated program for rivers, wetlands and estuaries* (Link to full article).

State-wide surveys on the condition of wetlands using the Victorian Index of Wetland Condition (IWC) were undertaken in 2009–10 and 2010–11. The materials which support the IWC were also updated, including the report on the assessment of wetland vegetation using the IWC and the second edition of a field guide to wetland vegetation. Reports outlining the results of the IWC surveys are on the Victorian Department of Sustainability and Environment (DSE) website (<http://www.dse.vic.gov.au/>).

Victoria updated its 1994 state-wide wetland inventory in 2012. The new 2012 wetland inventory incorporates wetland mapping that has been undertaken over the last decade in many parts of the State. At the same time, the wetland classification system has been updated and applied to the inventory. The classification follows the Australian National Aquatic Ecosystem classification framework (<http://www.environment.gov.au/water/publications/environmental/ecosystems/ae-toolkit-mod-2.html>).

A number of reports have been completed or are near completion on aspects of wetland management. These are being made available on the DSE Arthur Rylah Institute for Environmental Research website (<http://www.dse.vic.gov.au/arthur-rylah-institute/publications/reports#topic112485>) and include reports on wetland connectivity, wetland conceptual models for associations between values, threats and management interventions and investigation of wetland hydrological regimes.

The DSE commissioned a consultant to assign wetland ecological vegetation classes to water regime categories based on expert knowledge of wetland vegetation. The information can be used to assist in environmental water management planning. It is available on the DSE website (www.dse.vic.gov.au).





Queensland Government Update

Queensland Wetlands Program

The Queensland Wetlands Program (the Program) is a joint initiative of the Australian and Queensland governments that supports projects that will result in long-term benefits to the wise use, management, conservation and protection of wetlands in Queensland.

The Program has supported more than 70 projects since its inception in 2003 to deliver a range of new mapping, information and decision-making tools. Major milestones and groundbreaking initiatives have been delivered throughout 2012.

The mapping of Queensland's wetlands to 2009 is a key output of the Program. It integrates satellite imagery, regional ecosystems and topographic data, and new ways of using mapping classification. It is based on an innovative mapping and classification methodology (link to be provided) developed by the Program and is useful for State of the Environment reporting.

WetlandInfo (<http://wetlandinfo.ehp.qld.gov.au>) will soon contain groundwater dependent ecosystem (GDE) mapping datasets for the eastern Murray-Darling Basin and Wide Bay-Burnett, pictorial conceptual models, FAQs and a glossary of terms relating to the Queensland GDE Mapping Project.

The Queensland Government and the National Water Commission funded this initiative as part of a project to further develop the National Atlas of GDEs.

'Walking the landscape' is a new groundbreaking whole-of-system framework for understanding and mapping environmental processes and values developed by the Program in collaboration with other Queensland Government departments and the Great Barrier Reef Marine Park Authority. It is a systematic and transparent science synthesis framework which integrates existing data with expert knowledge through hands-on workshops to create a common understanding among multidisciplinary experts.

A new framework for evaluating aquatic ecosystem connectivity was developed through expert workshops involving policy makers and scientists from a wide range of disciplines from state, local and federal government bodies and universities. It provides a way of understanding and applying connectivity at between and within aquatic ecosystems at any level of spatial scale to inform management decision-making.

The Program has also developed a guide to pictorial conceptual modelling to support wetland ecosystem science and management in Queensland, a wetland buffer case study for Lake Broadwater as well as guidelines and a template for preparing wetland management plans for primary producers (grazing, dryland cropping) in Queensland's inland catchments. These guides are applicable to Australia generally, not just to Queensland.



Tasmanian Government Update

Department of Primary Industries, Parks, Water and Environment

Although the 2012 winter was considered slightly drier than the last two, it was sufficient to keep wetlands full, especially in the north of the state. As of October 2012, the Lake Crescent Ramsar site was fully inundated and the lake overflowing.

The unusually wet conditions across the state in recent years have allowed Australasian bitterns to recolonise some of the shallow wetlands in the interior of the state that had been dry for many years. Surveys were carried out at several locations in 2011 and surveying continued in 2012.

The Glamorgan-Spring Bay Council and NRM South secured a Caring for Our Country grant to carry out work on the Apsley Marshes Ramsar site. The work will include surveys to fill knowledge gaps identified in the site's Ecological Character Description and will also tackle some of the serious weed issues at the site. One of the outcomes of the project will be a ten year plan of management for the area which is entirely privately owned. On ground work commenced in 2012 and will continue until 30 June 2013.

Workshops have been held to develop a Natural Heritage Strategy for the state. This will replace the Nature Conservation Strategy that expired in 2006. A consultation draft is being circulated to stakeholders and it is hoped that a final draft can be provided to the Minister in December.





2013 CALENDAR OF EVENTS

2 February 2013	World Wetlands Day www.environment.gov.au/water/topics/wetlands/world-wetlands-day/index.html
3 March 2013	Clean Up Australia Day www.cleanupaustraliaday.org.au
5–7 March 2013	Water Education, Water Efficiency and Water Skills National Conference, Sydney www.awa.asn.au/EventDetail.aspx?id=4294974580
22 March 2013	World Water Day http://www.unwater.org/worldwaterday/
7–9 May 2013	Ozwater'13 Conference, Perth www.ozwater.org
11 May 2013	World Migratory Bird Day http://www.worldmigratorybirdday.org/
5 June 2013	World Environment Day http://www.unep.org/wed/
18–22 August 2013	Australian Society for Fish Biology Conference, Hamilton NZ www.asfb.org.au/events/
8–11 October 2013	Greenhouse 2013: Water Wind and Wine, Adelaide www.greenhouse2013.com



