



Wetlands Australia

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ANNUAL UPDATE FOR AUSTRALIA'S WETLAND COMMUNITY



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Water, Population and Communities

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Coolibah-blackbox woodland.
Photo: N. Penny (SEWPaC)

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Cover photos: Yellow Water Lagoon Kakadu National Park (DSEWPAC). Murray hardyhead (Michael Hammer). Acid sulfate soil - Finnis River (Department of Environment and Natural Resources' CLLMM Program). Cape York NRM region Flatback Turtle hatchling makes it to the sea (DSEWPAC). Green Tree Frog, Kakadu National Park (Robert Thorn). *Kennedia prostrata*, Becher Point Wetlands, WA (Bronwyn Goody). Grasstree, Becher Point Wetlands, WA (Bronwyn Goody).

Back cover photos: Aerial view towards Gantheaume Point Geographic (Angus MacGregor). Pink Anemonefish (DSEWPAC). Close up of flowers on Coral Gum (John Baker). Close up of flowering *Acacia* sp. WA (Michael Marriott). Lathams snipe (Brian Furby). Blue-Green Algae on Lake Burley Griffin (Bruce Gray). Endangered species Growling Grass Frog, Southern Bell Frog (Alexander Dudley).

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MINISTER'S FOREWORD



Australia's wetlands number in the many thousands. There are 64 Ramsar listed wetlands (covering around 8.1 million hectares) and over 900 nationally important wetlands in Australia. These wetlands include coastal estuaries, mudflats and saltmarshes, coral reefs, floodplain lakes and billabongs, swamps and marshes, and alpine bogs and peatlands.

Wetlands are extremely rich in biodiversity with many plants and animals being completely dependent on these ecosystems. They also provide critical habitat for threatened species such as the northern corroboree frog and Murray cod. Wetlands are important sites for migratory species and many support large numbers of waterbirds (more than 20 000), using wetland habitats for critical stages of their life-cycle, such as feeding and roosting.

Our wetlands are of enormous value to the Australian community, as they deliver important ecosystem services. Wetlands from our coasts to our river systems enhance water quality, mitigate floods, and protect our shores from wave action. They also support wildlife breeding habitats, provide refuge for wildlife in dry seasons, and are crucial for sustaining grazing after floods have receded. It is critical that we use these environmental assets wisely so they can continue to provide services to biodiversity, our economy and our communities' quality of life.

This edition of *Wetlands Australia* aligns with the theme for World Wetlands Day 2011 "wetlands and forests - forests for water and wetlands". This year is extra special as it is the fortieth anniversary of the Ramsar Convention. It also coincides with the United Nations designation of 2011 as the International Year of Forests.

Forests and wetlands are closely related. The health of all forests in our catchments is linked to wetlands, whether forested or not. Australia protects its native forests by building reserves, integrating conservation and sustainable use at the regional level, putting a value on our natural environment and improving the use and quality of our natural resources. Across Australia, over 70 per cent of known old growth forests are in conservation reserves.

Forests play a crucial role in the hydrological cycle and as a consequence, in the health of our wetland ecosystems. Forested wetlands include habitats such as mangroves, nipah swamps, freshwater swamp forests, floodplains, forested peatlands and seasonally flooded forests. An example of a forested wetland in Australia is Barmah-Millewa Forest on the Murray River.

Farmers, Indigenous communities, and other private land managers manage approximately 77 per cent of Australia's land area, including many wetlands. Conservation of biodiversity on private land is recognised by the Australian Government as an important way to protect Australia's environmental assets. *Caring for our Country* is an Australian Government initiative that supports environmental management of our natural resources, including the management of wetlands and forests through the *National Reserve System*. The goal of *Caring for our Country* is to achieve an environment that is healthier, better protected, well managed, resilient, and provides essential ecosystem services in a changing climate.

Water for the Future is the Australian Government's long-term initiative to better balance the water needs of communities, farmers and the environment. Australia is facing major challenges due to over-allocation, climate change, climate variability and reduced water availability. Water acquired under *Water for the Future* is already benefiting several wetlands across the Murray-Darling Basin through allocations of environmental water. Regional communities will also benefit from more efficient irrigation infrastructure funded through *Water for the Future* programs.

The stories told in this edition reveal the considerable work undertaken across the country to protect and restore our wetlands. A number of these articles describe work underway to increase our understanding of wetlands. There are also stories describing co-operative arrangements that include the community and Indigenous peoples' involvement in wetlands management and demonstrate the importance of communities in decision-making associated with wetlands.

These stories acknowledge the relationship between wetlands and people, and the ways in which Australia's wetlands are used wisely. Wetlands are a critical part of our natural environment and research, conservation and sustainable management will help ensure the on-going conservation and wise use of our wetlands and the ecosystem services they support.

The Hon Tony Burke MP

Minister for Sustainability, Environment, Water, Population and Communities.



AUSTRALIA AND THE FORTIETH ANNIVERSARY OF THE RAMSAR CONVENTION

Department of Sustainability, Environment, Water, Population and Communities

The Convention on Wetlands of International Importance holds the unique distinction of being the first modern treaty between nations aimed at conserving natural resources. The signing of the Convention on Wetlands took place in 1971 at the Iranian town of Ramsar. Since then, the Convention on Wetlands has been known as the Ramsar Convention. To mark the anniversary of the signing of the treaty, World Wetlands Day is celebrated on 2 February each year to raise public awareness about wetlands and promote their conservation and wise use (also known as sustainable use).

The Ramsar Convention aims to halt the worldwide loss of wetlands and to conserve, through wise use and management, those that remain. The Convention encourages member countries to nominate sites containing representative, rare or unique wetlands, or that are important for conserving biological diversity, to the List of Wetlands of International Importance (Ramsar sites). Member countries are obliged to promote the conservation and wise use of all wetlands and work to ensure that they are managed to protect their ecological values. Today the Ramsar Convention is closely linked with the Convention on Biological Diversity, International Union for Conservation of Nature and many other environment-related global and regional organisations.

The Ramsar Convention in Australia

Australia was one of the first countries to sign the Ramsar Convention, and in 1974 designated the world's first Ramsar site: Cobourg Peninsula in the Northern Territory. Australia's 64 Ramsar sites cover around 8.1 million hectares, forming an impressive estate of diverse wetland types: freshwater, marine, permanent and ephemeral.

The *Environment Protection and Biodiversity Conservation Act 1999* provides a framework for protecting the ecological character of Ramsar sites and managing our Ramsar sites in accordance with the Convention. Key actions to implement the Convention in Australia include:

- providing funds to support the conservation and sustainable use of our Ramsar sites
 - developing Ecological Character Descriptions for all Australian Ramsar sites
 - participating in the Partnership for the Conservation of Migratory Waterbirds in the East Asian–Australasian Flyway
 - participation in international treaties for the protection of migratory birds: Japan–Australia Migratory Bird Agreement, China–Australia Migratory Bird Agreement and the Republic of Korea–Australia Migratory Bird Agreement
 - regularly reviewing Ramsar site condition
 - working with state and territory governments to promote the conservation and sustainable use of our Ramsar sites
 - facilitating collaboration between the Convention's Oceania member countries
 - reforming legislation and water markets to achieve a better balance between water use for industry, agriculture and maintaining the health of rivers and wetlands.
- Australia's recent focus has been on building a better knowledge base and understanding of the values, condition and functioning of Australia's Ramsar wetlands through the development of Ecological Character Descriptions and the Ramsar Rolling Review. The Ramsar Rolling Review is a systematic nationally coordinated review of Australia's Ramsar sites to ensure every Ramsar site is reviewed at least once every three years and help determine the status of site documentation and the ecological character of Australia's Ramsar wetlands.
- Furthermore, the Australian Government's *Water for the Future* is a ten-year investment in strategic programs, improved water management arrangements, and a renewed commitment to deliver a range of water policy reforms in both rural and urban areas.
- developing national guidance on implementing the Convention in Australia, particularly mapping Ramsar wetlands, describing their ecological character and reporting in adverse changes in ecological character





The northern shoreline of Cobourg Peninsula is characterised by isolated bays, rocky headlands and beaches (2009). Photo: Michelle McAulay

In the future key actions to implement the Convention will also include the development of:

- a National Wetlands Policy Statement that sets national directions for the conservation, management and wise use of Ramsar and all other wetlands
- additional national tools and policies for: nominating wetlands to the Ramsar List, managing Ramsar wetlands, and the wise use of wetlands
- implementation of a framework for identifying High Ecological Value Aquatic Ecosystems that will inform the strategic nomination of sites to Australia's Ramsar estate and provide for establishing a comprehensive, adequate and representative estate of the wetland types across Australia.

World Wetlands Day 2011 and the fortieth Anniversary

World Wetlands Day, 2 February, is themed "Wetlands and Forests" with the slogan "forests for water and wetlands". The theme is in honour of 2011 being the United Nations International Year of Forests. This year is the fortieth anniversary of the Ramsar Convention.

To promote the Ramsar Convention in Australia and celebrate the fortieth anniversary, the Australian Government has produced a school wetland education package. This includes educational activities, origami, school book subject stickers, fact sheets on wetlands and a DVD. Copies of the education package are available at www.environment.gov.au/wetlands.

In celebration of World Wetlands Day and the fortieth anniversary community groups, non-government organisations, and other interested parties are holding various activities and events across the country. An online Calendar of Events (see www.environment.gov.au/wetlands) showcases what events are happening in your local area.

Use World Wetlands Day and 2011 to learn about your local wetland, its values and management challenges. Contact your local Natural Resource Management group, Catchment Management Authority or non-government organisation for opportunities to be involved in local wetland activities.

More information on World Wetlands Day, Australia's wetlands and the Ramsar Convention in Australia is available from www.environment.gov.au/wetlands or www.ramsar.org.

PROTECTING WETLANDS IN PLANTATION FORESTS

Simone Haigh, WetlandCare Australia

The world's natural forest area is declining as global demand for important forest products such as food, fibre and timber increases. The plantation forestry industry in New South Wales has rapidly expanded to meet some of this demand and has seen the recent establishment over 60 000 hectares of hardwood plantations in the Northern Rivers region of New South Wales alone.

Natural forests play a vital role in protecting wetlands by acting as a buffer to surrounding land uses, reducing erosion rates, limiting sediment delivery, as well as helping to capture and store water in the soil that helps to maintain water flows in drier times. Unlike natural forests, plantation forestry does not always deliver these ecosystem services as effectively. Being a monoculture means that they do not have the combined benefits of a thriving and diverse forest.

This lack of diversity can lead to insect attack which requires the application of pesticides. They also receive a regular herbicide and fertiliser regime and are often run as a joint enterprise with graziers running cattle in the interrows between trees. Site preparation such as contour ploughing can result in soil erosion and sediment entering the wetland.

All these factors affect the natural wetlands on these properties. Herbicide, pesticide, sediment and fertiliser all have detrimental effects on water quality, while unrestricted cattle access suppresses natural regeneration, causes erosion resulting in sedimentation which further reduces habitat availability and water quality.

Although there are legal directives to protect wetlands in plantations under the New South Wales *Plantation and Reafforestation Act 1999*, these do not fully address these issues. A decline in investment in the managed forestry industry also means that environmental restoration works are not always the highest priority for many companies; nor do they have the knowledge base to know what action to take to manage their wetlands and other natural ecosystems.

WetlandCare Australia addressed this problem by initiating a project directed at wetland protection in plantation estates. 'Wetland protection in high productivity forestry landholdings' started in 2009 with funding from the New South Wales Government's Environmental Trust.

WetlandCare Australia has for over 20 years been dedicated to supporting every Australian to protect and restore our precious wetlands. In this project, a partnership with local forestry industry professionals saw four high conservation values sites chosen to implement restoration

works. The wetland sites had already been subjected to prior land use pressures such as clearing, sedimentation and pollution as a result of previously been run as grazing enterprises. In some cases the hydrology had been altered due to the construction of access roads or bund walls. The sites that were chosen for restoration works are all located within extremely high conservation value regions, located between vital wildlife corridors and key habitat areas.

After an initial site assessment and gathering of baseline flora and water quality data, WetlandCare Australia and landholders carefully planned and implemented on-ground works at each of the target sites. Over 30 hectares of high conservation value wetland systems are now protected and restored through the construction of six kilometres of fencing to restrict cattle access, and the removal of dense infestations of lantana (*Lantana camara*) along riparian zones. Strategic revegetation in key areas was also undertaken to enhance natural regeneration, suppress weed invasion, and to restore and strengthen the vegetative buffer zone around the wetlands.

Although some forestry practices can be detrimental, there are many ecosystem benefits that can be gained from the establishment of plantations, such as the capture and storage of atmospheric carbon and provision of forested habitat. This partnership between WetlandCare Australia and these forestry enterprises has ensured that they have the tools and the resources to protect their wetlands and mitigate any potential damage to them from their forestry operations.



Algal scum on the surface of a wetland due to increased nutrient loading. This wetland has now been fenced off, and future improvements in water quality will be able to be measured against the baseline data taken at this site.
Photo: Simone Haigh



PANBOOLA: ENRICHING PEOPLE'S LIVES

Aimee Curtis, Pambula Wetlands and Heritage Project Incorporated, Pambula, New South Wales

'Panboola' is a local Indigenous people's term for 'place where waters meet'. It is the name that has been given to a community managed 77 hectare wetland site, 49 hectares of which is community owned. The site comprises billabongs, a tidal channel, mud flats and mangroves. It contains SEPP 14 wetland and threatened ecological communities including coastal saltmarsh and freshwater wetlands. 'SEPP 14' refers to the New South Wales Government's *State Environmental Planning Policy number 14—Coastal Wetlands*. This policy has been put in place under the *Environmental Planning Assessment Act 1979 (NSW)* to ensure that the coastal wetlands of New South Wales are preserved and protected.

Panboola lies next to the township of Pambula on the far south coast of New South Wales. It provides opportunities for locals and visitors to learn about and appreciate the values of conserving wetlands and the heritage of place.

The community acknowledges the connection to country for the traditional owners of the land and permission was sought from local Indigenous peoples for the project to go ahead. They guided place naming and their spiritual connection with place is recognised and respected through ongoing management decisions.

An active volunteer base has been established and has maintained this large environmental project since 2000, when 49 hectares of the Pambula floodplain was donated to the community by a local philanthropist. The donated land added to the existing reserve which conserves the site of the old Pambula racecourse.

Two management committees undertake cooperative management of the project under a trust arrangement, and a group of about 18 volunteers work to present Panboola to the public.

A plan of management produced in 2006 has established management guidelines for the project and the Pambula Wetlands and Heritage Project Incorporated is listed as a registered environmental organisation. Local, New South Wales and Australian Government support for the project has enabled the development of over three kilometres of cycling and walking tracks, over nine hectares of wetland vegetation restoration work, and the provision of educational media, picnic tables and bench seats at Panboola.

It is a popular site for birdwatchers and the Far South Coast Birdwatchers maintain a quarterly bird survey at the

site, which has resulted in the identification of over 130 species of birds, including migratory species.

The community project at Panboola supports the conservation of wetlands protected within the Ben Boyd National Park, which lies on the southern boundary of Panboola. Wetland conservation initiatives also provide a foundation for improved water quality within a larger catchment, and at this spatial level, Panboola supports the water quality of Pambula River, estuary and lake by supporting the filtration system of this floodplain area.

Future projects planned for Panboola include the establishment of a program for monitoring biodiversity at the site, continued restoration of the marshland, and the development of new interpretive signage.

Panboola provides a peaceful place where people of all ages and backgrounds can freely enjoy the benefits of passive recreation in a nurtured environment. The wetlands at Panboola are safely in the hands of a community that recognises the importance of wetlands for the benefits that they provide for the environment, the flora and fauna that depend on these ecosystems, and for people who enjoy the use of vibrant, open and natural spaces.

Project assistance has been received from the New South Wales Environmental Trust.

For further information refer to the website: www.Panboola.com.



*Volunteers planting at Panboola on National Tree Day.
Photo: Aimee Curtis*

CONNECTION TO COUNTRY AND THE RIVERS ENVIRONMENTAL RESTORATION PROGRAM

Jeff Hillan, Katie Ritchie and Gary Currey, New South Wales Department of Environment, Climate Change and Water

Indigenous people across Australia have a long and deep relationship with rivers and wetlands. This relationship is as important today as it was in years gone by.

The New South Wales Department of Environment, Climate Change and Water (DECCW), Country Culture & Heritage Division, Far West Regional Manager, Gary Currey said that over time the connection of Indigenous communities to wetlands and the associated cultural knowledge has become fragmented.

“Through the New South Wales Rivers Environmental Restoration Program (RERP) we are working in partnership with Indigenous communities to not only record this connection but importantly use this information to reconnect communities to wetlands of cultural significance,” he said.

The RERP Recording Aboriginal Use and Values on the Lowbidgee and Lower Lachlan Wetlands Project has helped record and document this connection.

Focus has been given to the collection of archival and historical research including pictorial, documentary and mapped information relating to Indigenous peoples’ history.

Oral histories have been collected from 12 Indigenous people in the area. “Histories that recount significant events, activities and stories, demonstrating the importance of wetlands and rivers to Indigenous communities,” he said.

The project has also recorded and mapped over 1200 Indigenous archaeological sites previously unknown including mounds, shell middens, ancestral burials, ceremonial sites and scarred trees demonstrating a long and continuous use of the Indigenous cultural landscape around the wetlands and of its resources.

“But the project is much more than this,” Mr Currey said.

Our aim has been to not only collect this information and make it available to Indigenous communities, but importantly to involve young people in the project.

Transferring cultural knowledge by having young Indigenous people working closely with elders has been integral to the success of the project. Ian Woods, from the Nari Nari Tribal Council at Hay, has suggested that this is one of the aspects of RERP that has made this project so special.

“Having young people and elders working together on country has helped instil the importance of wetlands. Seeing the sharing of knowledge and stories has been tremendous and will help ensure this information is passed onto future generations,” Mr Woods said.

A series of introductory workshops has helped develop the skills required to undertake archival and historical research, record oral histories and Indigenous sites, including teaching on the use of advanced technical equipment such as personal digital assistants (PDA's).

“Community capacity building and development has been an important element of the program, to ensure local Indigenous people are able to take advantage of opportunities to engage in and continue the work of the program,” Mr Woods said.

“The project has also employed an Indigenous Community Liaison Officer, Roland Williams, who not only promoted



Damien Kennedy records the location of a scarred tree on Tupra Station, Lower Lachlan wetlands. Photo: Roland Williams DECCW 2009



the program to Indigenous communities, but has involved private landholders whose properties contain wetlands of high cultural significance”.

“The project used the information collected on culturally significant sites as a basis for negotiations with a number of landholders to develop ‘access and use agreements’ of the wetlands by Indigenous communities on those properties. These agreements are a great result for Indigenous communities and demonstrate what can be achieved when we all work together,” Mr Woods said.

Jeff Hillan, RERP Manager, said that the project had also highlighted other opportunities, particularly full usage of the cultural water allocation under the Murrumbidgee Regulated River Water Sharing Plan (WSP). “The WSP allocates 2150 megalitres of water for use each year to help support the long-term protection of cultural values of wetlands,” he said.

“We are working with the Murrumbidgee Traditional Owners and Cultural Heritage Reference Group and Murrumbidgee Catchment Management Authority to ensure this water is used each year in support of culturally significant wetlands identified by Indigenous communities”.

“The project had also again highlighted the importance of involving Indigenous people in decision making processes in relation to water management and wetland conservation,” he said.

“Across New South Wales, Indigenous representatives are also being appointed to environmental water reference groups who make recommendations on the use of environmental water allocations,” Mr Hillan said. “Indigenous people are becoming increasingly involved in decision making related to managing their country”.

The RERP is jointly funded by the New South Wales Government and the Australian Government’s *Water for the Future* — Water Smart Australia Program and aims to arrest the decline of wetlands through water recovery and effective management of environmental water.



Brendan Kennedy records the location of a scarred tree on Paika Lake, north of Balranald. Photo: Roland Williams

TALKING PICTURES – REPRESENTING QLD WETLANDS IN CONCEPTUAL MODELS

Lana Heydon and Maria Vandergragt, Science Integration and Capacity Building, Queensland Department of Environment and Resource Management

More than 142 000 wetlands of several different types spanning all the climatic zones across Queensland have been identified. These broad wetland systems are made up of types with different hydrological, ecological and geomorphic components, processes, functions and values. The best available knowledge of the key components and processes for each habitat type of lacustrine (lake) and palustrine (swamp) wetlands have been captured through a conceptual modelling process that provides a holistic understanding of these wetlands and form a basis for their effective management.

Conceptual models are not just pretty pictures

Conceptual models are simplified representations of the real world using text and/or images. They are a tool

for researchers and scientists to communicate findings and knowledge with environmental managers and the community. They can be amended over time to capture emerging research outcomes.

Conceptual models can represent the real world in various ways; a simple but very effective form uses diagrams. The latest scientific understanding about the intricate and interconnected components of complex natural systems is often best demonstrated using symbols, pictures and colours in diagrams and illustrations. The resulting informative and accessible model, or series of models, can explain complex scientific knowledge to a wide range of audiences. The complex ecosystem processes in wetlands make them ideal subjects for conceptual modelling.

The models and their development processes can: bring to light new or obscure knowledge; establish a consensus to

underpin new management directions and needs; identify knowledge gaps and priorities; and take into account levels of uncertainty. During the process of creating conceptual models the developers and contributors, experts from a range of fields and backgrounds (scientific and non-scientific), resource managers and other interested parties, can discuss the components and messages of the model in a focused exchange of ideas. This communication can be one way (for example, idea presentation) and two way (for example, idea development).

Conceptual models for wetland habitat types

The Department of Environment and Resource Management (DERM) Science Integration and Capacity Building team has developed conceptual models of the twenty-two discrete lake and swamp wetland habitat types in Queensland. These were derived from the wetland habitat classification which defines and classifies wetlands based on the attributes that drive and differentiate wetland habitats.

The team's conceptual models use both text and diagrams (see figure 1) because large amounts of complex information and processes can be more effectively communicated by this means than text alone. The diagrams in the conceptual models use symbols to convey information about components and processes of the wetland habitat type.

These conceptual models are useful tools in many ways:

- Identifying and illustrating key features, processes, linkages, cause-effect and inputs–outputs.
- Showing what is known and what is not known about a system in an engaging format that summarises the current understanding and identification of knowledge gaps and points of contention.
- Synthesising and translating complex scientific information that can then be visualised by a wider audience.
- Integrating current understanding of system dynamics, identifying important processes, and communicating complex interactions.
- Illustrating connections between potential indicators and ecological states or processes, so providing a vital foundation and scientific framework for monitoring programs, justification for the choice of indicators, and context for understanding the results.

The refinement of the technique itself is proving useful for other science communication, community outreach, education and collaboration building projects.

Outcomes

The wetland conceptual models cover broad wetland habitat types at a regional, as opposed to local, scale. They have proved to be useful for educating government planning and policy staff, undertaking development assessments, and supporting public communications.

A recent development has been the interest that the models have created in developing local models to answer questions about the science related to local wetland management issues. The Science Integration and Capacity Building team are now undertaking case studies for selected wetlands in the Queensland Murray–Darling Basin and the Great Barrier Reef catchment where local models are being developed to show site-specific processes, species interactions and environmental flow requirements and connectivity. These projects are being conducted under the Queensland Wetlands Program – a joint program of the Australian and Queensland governments.

The conceptual model creation process is being further refined, providing a framework, guidelines and resources for the development of other local scale wetland science synthesis models.

For further information refer to the Science and Research component of the Queensland Wetlands Program's WetlandInfo website: www.derm.qld.gov.au/wetlandinfo.

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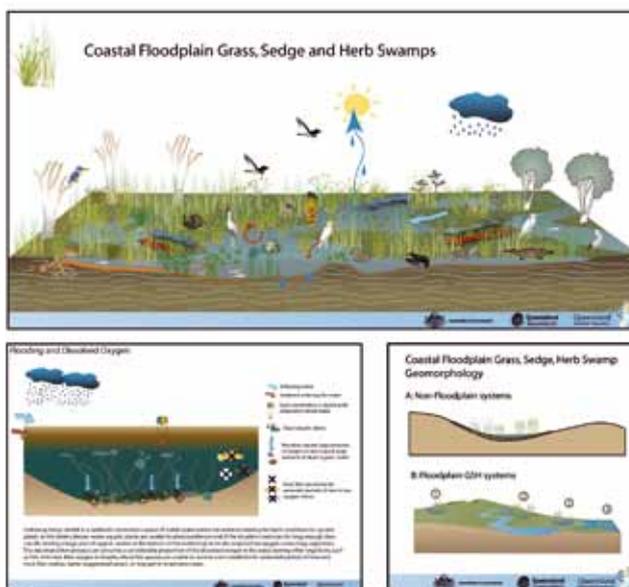


Fig 1: Example components of a conceptual model



CARBON – THE BUILDING BLOCK OF LIFE – HELPING SOUTH AUSTRALIA’S LOWER LAKES TO RECOVER

COORONG, LOWER LAKES AND MURRAY MOUTH PROGRAM

David Heath, Russell Seaman and Jason Higham, South Australian Department of Environment and Natural Resources

South Australia’s Lake Alexandrina and Lake Albert, situated at the end of the Murray-Darling Basin where the inland waters meet the ocean, are critical to the life of Australia’s greatest river system.

For millennia the lakes have functioned as a massive wetland system serving south-eastern Australia, where vital geo-chemical processes occurred, and wildlife flourished. However, in recent years the lakes and their environment have been seriously degrading. Prolonged drought across the Basin and overuse of water resources upstream have resulted in record low inflows.

In 2009, the water level in Lakes Alexandrina and Albert fell to a metre below sea level. Scientists believe this is likely to be the lowest the water has been for more than 7000 years.

As the water level declined, thousands of hectares of formerly inundated lake beds were exposed to the air for the first time, creating what was believed to be the world’s largest region of acid sulfate soils.

When exposed to air, sulfuric acid is formed in the soil. Initially no-one knew of the existence of these soils around the Lower Lakes. It was previously believed that acid sulfate soils only occurred in coastal areas, not inland. However, in 2007, the CSIRO confirmed the presence of acid sulfate soils in both Lake Alexandrina and Lake Albert.

Russell Seaman, the Environmental Manager of the Department of Environment and Natural Resources’ Coorong, Lower Lakes and Murray Mouth (CLLMM) program, says urgent action was required.

“Acidification can have a devastating impact,” he says.

“If alkalinity in Lakes Alexandrina and Albert could not buffer the amount of acid being created, both lakes could turn acidic, leading to the complete collapse of the region’s ecology.”

“The region’s native flora and fauna would be gone, the local economy would be severely impacted, the community would suffer, and there would be significant impacts on the culture of the region’s Traditional Owners – the Ngarrindjeri.”

“The acidification of the lakes could also threaten the supply of drinking water to Adelaide,” he says.

With the assistance of South Australia’s Environment Protection Authority and some of the nation’s leading soil scientists, the CLLMM team began to understand – and tackle – the issues.

“Emergency steps were taken to ensure the dangerous acid soils in Lake Albert were covered, but with record low inflows continuing, the management of the region’s acid sulfate soil problem was complex,” says Russell.

“Part of the answer lay in the soils themselves, especially the microbes that live within the soils. The soil needed carbon, which would provide energy for sulfate reducing bacteria to work against the acid.”



An area of acid sulfate soil in the Finniss River (near Goolwa). Photo: Department of Environment and Natural Resources’ CLLMM Program



Acid sulfate soil. Photo: Department of Environment and Natural Resources' CLLMM Program

This photo is of bevy cereal rye planted in acid sulfate soil. The mustard-yellow colouring in the hole is soil that's in the process of acidifying. Photo: Department of Environment and Natural Resources' CLLMM Program

"The South Australian No Till Farmers Association and Rural Solutions South Australia applied their expertise to the problem, and the conclusion was drawn that planting bevy cereal rye, which could survive in the soil, would be the means by which we could add carbon to the acid sulfate soils."

"The bevy cereal rye would grow during the winter and die in summer, creating mulch which would not only deal with dust and wind erosion issues, but would also add the much needed carbon to the soil."

"Trial plantings were conducted, including seeding over 10 000 hectares on the exposed lake beds by air, and the results indicated the proposed bevy cereal rye solution was likely to be successful."

The Australian Government agreed the CLLMM team's proposed solution to the acid sulfate soil problem in and around the Lower Lakes was feasible, and \$10 million in funding was made available through the Department of Sustainability, Environment, Water, Population and Communities' Bioremediation and Revegetation Project.

The \$10 million Lower Lakes Bioremediation and Revegetation Program has become Australia's largest ever wetland restoration project, bringing together government, scientists, industry, the community and Traditional Owners to ensure the CLLMM region has a healthy and sustainable future.

In June 2010, the Australian Government announced an additional \$4.41 million in vegetation works to build on the existing bioremediation and revegetation project.

In autumn 2010, more than 6000 hectares of exposed lake beds were aerially seeded and more than 1.1 million sedges and native grasses were planted by commercial on-ground planting teams.

Importantly the community has been directly involved in this bioremediation and revegetation work. Community-based nurseries have propagated many of the plants required for the project and teams of community volunteers have also been involved in planting work.

The community involvement has been co-ordinated by the Goolwa to Wellington Local Action Planning Board and the Lakes Hub at Milang. The Hub was created with Australian Government funding to provide a critical link between government and community members seeking information about the bioremediation and revegetation project.

The Ngarrindjeri have also played a central role in the project through seed collection, propagating, planting, pest management, and Indigenous heritage advice.

Russell Seaman says that since the autumn vegetation work, the CLLMM region has received significant inflows, lifting the water level in both lakes to around 0.75 metres above sea level.

"This rapid increase in water levels has accelerated the effects of bioremediation in the lakes by providing an instant food source for invertebrates, fish, and other organisms," he says.

"It has also increased the speed at which organic material is decomposing, which in turn is helping to mitigate acidity in the soil by increasing sulfate reduction."

The CLLMM team's work to develop a response to the serious threat posed by acid sulfate soils and the massive project to seed and plant exposed lake beds, has become a reference point for future ecosystem restoration projects.

The team's work has also been recognised by the prestigious Banksia Environmental Awards, with Russell Seaman named the 2010 Prime Minister's Environmentalist of the Year, and the CLLMM Program winning the *Land and Biodiversity – Preserving Our Ecosystems* category.



RETURNING REEDY LAGOON TO A WETLAND

North Central Catchment Management Authority (CMA), Victoria

Gunbower Forest is situated on the banks of Murray River downstream of Echuca, Victoria. Spanning 20 000 hectares, it is the second largest river red gum forest in Victoria and is a Wetland of International Importance under the Ramsar Convention.

Gunbower Forest also supports Indigenous and European cultural heritage sites as well as recreation and tourism. More than 234 species of native flora have been recorded at Gunbower Forest including 27 nationally and state listed rare or threatened species. The floodplain is home to migratory birds listed on the China-Australia Migratory Bird Agreement (CAMBA) and the Japan-Australia Migratory Bird Agreement (JAMBA) and provides habitat for native fish such as Murray cod, trout cod and freshwater catfish.

The Flooding Enhancement of Gunbower Forest project

The North Central Catchment Management Authority (NCCMA) manages the Flooding Enhancement of Gunbower Forest project in partnership with the Victorian Department of Sustainability and Environment, Goulburn-Murray Water, Parks Victoria and the Murray-Darling Basin Authority.

The aim of the project is to protect and enhance ecological communities within the forest, through improved management of environmental water. This project is part of the larger-scale Living Murray program, which is a joint initiative funded by the Australian, New South Wales, Victorian, South Australian and the Australian Capital Territory governments.

Gunbower Forest, along with Koondrook–Perricoota forests, has been identified as one of six Living Murray icon sites chosen for their environmental, cultural and economic values. The Living Murray delivers environmental water and structural works to improve the health of the icon sites.

Gunbower Forest relies on regular flooding from the Murray River to maintain a healthy floodplain landscape. River regulation and a drier climate means that the forest is now rarely flooded and as a result, over 80 per cent of river red gums in the forest are now highly stressed or dying. Extensive monitoring also shows that there is a decrease in the number and diversity of plant and animal species found in the forest and wetlands.

Water for Wetlands: Reedy Lagoon

The extended drought from the mid 1990s until recent natural flooding in mid spring 2010, meant wetlands containing water were scarce within Gunbower Forest and the surrounding landscape.

Reedy Lagoon is a 41 hectare wetland, which is recognised as one of the healthiest examples of permanent wetlands along the Murray River. Although it remains in good condition, it had been in a drying phase for approximately three years until 2009.

In spring 2009, Reedy Lagoon, an important drought refuge in Gunbower Forest, received two gigalitres (two billion litres) of environmental water from Living Murray environmental entitlements. The water was pumped into the wetland to maintain critical habitat for plants and animals such as the great egret and white-bellied sea eagle.

Achievements

By flooding Reedy Lagoon with environmental water, important sedges, aquatic plants and rushes started to regenerate, and the surrounding river red gums received a new burst of growth.

This water has enabled various animals to use the wetland as a food supply and/or breeding ground. Monitoring recorded eight species of birds, including six breeding nests of the Australasian grebe. The shallow pools in the wetland increased frog habitat and the activity of five species, such as the barking marsh frog and Peron's tree frog. Fish surveys revealed that native and exotic species were entering the wetland. Small bodied native fish such as carp gudgeon and flathead gudgeon were common, however exotic species including oriental weatherloach and goldfish and European carp were also common.

Gunbower Forest has been receiving environmental water since 2003 from the Victorian environmental watering program and The Living Murray environmental water entitlements. Previous environmental water releases to Gunbower Forest, and specifically Reedy Lagoon, have provided habitat for great egrets (endangered in Victoria), as well as little pied cormorants, ducks and herons. Reedy Lagoon will hold water until summer 2010 and is highly recommended as a place a visit to appreciate its natural beauty.



MAPPING WETLANDS OF THE SOUTH COAST, NEW SOUTH WALES

Cassie Price and Ambermoon Kelly, WetlandCare Australia

WetlandCare Australia has been mapping wetlands in the Catchment Management Authority (CMA) regions of New South Wales. We have been working in partnership with the Southern Rivers Catchment Management Authority (SRCMA) with funding from the Australian Government's *Caring for our Country* initiative to map over 150 000 hectares in the Southern Rivers region.

For over 20 years WetlandCare Australia have been dedicated to supporting every Australian to protect and restore our precious wetlands. To date, WetlandCare Australia have assisted the Northern Rivers, Hunter Central Rivers, Sydney Metropolitan, Central West and now the Southern Rivers Catchment Management Authorities to better understand their precious wetland resources through mapping. We have now mapped over 1.2 million hectares of wetland across New South Wales.

The recent Southern Rivers project titled, 'Healthy wetlands for healthy catchments in the Southern Rivers region,' aimed to map, classify and prioritise wetlands, using existing spatial data, within the Southern Rivers catchment area. The project team collected and collated data relating to wetlands from a range of sources, including Australian, state and local government and other natural resource organisations. Collated wetland polygons were classified according to the latest wetland habitat typologies, which were recently developed by the Queensland Wetlands Program. These typologies are used extensively in Queensland and may soon be utilised by other areas in Australia. The result is over 150 000 hectares of wetlands mapped and classified into 23 different classes (20 natural and three constructed) within the 32 000 square kilometre Southern Rivers catchment area.

Data relating to the wetland's value and potential threats were also collected from the aforementioned sources. These spatially available data were assigned to each wetland polygon to assist in the wetland prioritisation process, giving each wetland an overall 'potential threat score' and 'potential conservation value score'. The priority wetlands identified using this decision support system will guide wetland managers on target sites for wetland protection, conservation and condition improvement across the SRCMA.

The project culminated in an on-ground component involving wetland health assessments and corresponding

site action plans for 15 wetland complexes. The decision support database generated a priority list of wetlands for each local government area in the Southern Rivers Region. Using this method ensured a good geographical spread of priority wetland investment across the region. Sites include some iconic wetlands in the Southern Rivers region, such as Coomonderry Swamp and the Minnamurra River wetlands. The site action plans will be critical in directing further on-ground works at these important wetland sites.

For further information contact: Cassie Price on 02 6681 6169 or cassieprice@wetlandcare.com.au or see www.wetlandcare.com.au.



Wetland Assessment at Bega River. Photo: Eli Dutton



Coomonderry Swamp. Photo: Kate Heyward



NEW SOUTH WALES RED GUMS TO BE WATERED BY FLOODING PROJECT

Jamie Hearn, Murray Catchment Management Authority

The Koondrook-Perricoota Flood Enhancement Works project, managed by the Murray-Darling Basin Authority (MDBA) through The Living Murray program, is one of a number of environmental works and measures projects underway across six recognised 'icon sites'. These sites have been identified for their ecological, cultural, social and economic value and benefit to the health of the Murray River. They include the Barmah-Millewa Forest, the Gunbower-Koondrook-Perricoota forests, the Hattah Lakes, the Chowilla floodplain, (incorporating the Lindsay-Wallpolla Islands), the Lower Lakes, Coorong and Murray Mouth and the Murray River Channel.

Many parts of these icon sites have become severely stressed due to the reduced incidence of natural flooding. Without some intervention, large scale irreversible environmental effects will occur. The impacts already include the acidification of wetlands and the loss of river red gum forests.

The Koondrook-Perricoota Flood Enhancement Works project, located in New South Wales between the Torrumbarry Weir and the border towns of Barham and Koondrook, has been developed by a project team made up of New South Wales Office of Water, Forests New South Wales, the MDBA, New South Wales State Water and the Murray Catchment Management Authority. The team has also received advice from a Joint Indigenous Group (JIG). The JIG, which has representatives from the surrounding traditional owners (Barapa Barapa and Yorta Yorta) and Local Aboriginal Land Councils (LALC), has been set up specifically to ensure cultural heritage issues are addressed during the planning and construction stages.

An extensive community awareness and engagement program has also been undertaken to ensure local issues and concerns were incorporated into the design and management planning process.

Once completed, the scheme will be able to inundate up to 16 000 hectares of red gum forest and wetlands. This can be done using a fraction of the water needed to naturally flood the same area. Using the existing weir pool height, the project aims to divert environmental flows from above Torrumbarry Weir into the upstream end of the Koondrook and Perricoota forests by the construction of a 3.8 kilometre channel. The channel will incorporate a regulator, fishway and turtle ramp. The water will then take a similar course to natural floodwaters through the forest using existing natural creek systems.

A 43 kilometre levee around the downstream perimeter of the forest closer to Barham will protect adjoining properties from flooding. The final location of this levee has reflected significant input from the surrounding community. The flood runners within the forest converge into a number of major creeks which exit the forest at different locations. Regulators on these outflow points will control and measure flow leaving the forest. These exiting flows will provide additional environmental benefits to adjacent wetland systems in the Barber and Thule Creeks and the Wakool and Edward Rivers before returning to the Murray River.

Structures within the forest will also allow water to be returned directly to the Murray River, delivering better water efficiency and flexibility. Almost half of the water diverted into the forest will return to the Murray River system. The scheme will be operated to mimic a natural flood event which might have seen flooding of the forest occurring at least every three to four years for around 100 days at a time. In the case of a natural flood event, the scheme will be managed for minimal impact on natural flows.

The project will enable the watering of much of the Koondrook-Perricoota Forest, a 32 000 hectare Ramsar listed wetland, achieving significant ecological benefits. The project will also provide employment opportunities and ongoing social benefits and for the Indigenous and local communities of the area.

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



Stressed red gums. Photo: Jill Masters

PAPERBARK-DOMINATED WETLANDS: EXTENSIVE, VALUABLE AND NEGLECTED?

REHABILITATION OF PAPERBARK-DOMINATED WETLANDS OF THE GIPPSLAND LAKES RAMSAR SITE, VICTORIA

Paul I. Boon, Victoria University

Paperbark-dominated wetlands are common across much of the Australian coast, especially in low-lying and flood-prone areas just inland of mangroves or saltmarsh. Paperbarks belong to the genus *Melaleuca*, in the family Myrtaceae along with other common Australian plants, such as *Eucalyptus*, *Callistemon* and *Leptospermum*.

Paperbark-dominated wetlands provide high-quality habitat for many species of animals, including birds, reptiles and fish. Because of their high productivity and coastal location, they are involved in a wide range of ecosystem-scale and biogeochemical processes that affect nearby estuarine waters, including acid sulfate soils, estuarine acidification and, perhaps, fish kills when improperly managed. In the Gippsland Lakes region of Victoria, they are especially important in providing roosting habitat for colonial-nesting waterbirds, such as ibis, spoonbills and cormorants. They are similarly important in northern Australia, where a large variety of birds and reptiles feed or nest in dense paperbark woodlands or forests.

The most common coastal paperbark in south-eastern Australia is the swamp paperbark, *Melaleuca ericifolia*. It occurs across southern New South Wales, eastern and central Victoria, and northern Tasmania. Wetlands dominated by swamp paperbark have been cleared from much of their former range in south-eastern Australia, usually for agriculture, port or industrial development, or for housing. The sites that remain are subject to many threats, including modified water regimes, habitat fragmentation, pollution (for example, with oil or heavy metals), and grazing.

Rising sea levels pose a significant threat to all coastal wetlands, and paperbark swamps are particularly susceptible because they are not as flood- or salt-tolerant as the plant communities that occur on their seaward side. Seawater intrusions, for example, are a major threat to paperbark-dominated wetlands in the Northern Territory. As a result of the scale of historical loss, ongoing threats, and high ecological value of the sites that remain, paperbark-dominated wetlands are often

a target of rehabilitation by regional natural-resource managers. However, effective rehabilitation requires good knowledge on the distribution, life history, and ecological characteristics of the species. The necessary information is currently lacking for paperbark-dominated wetlands across almost all of Australia.

A five-year study into the ecology and rehabilitation of paperbark-dominated wetlands that fringe the Gippsland Lakes in south-eastern Victoria has been recently completed. The study focused on Dowd Morass, a large, 1500 hectare, brackish-water wetland near where the Latrobe River enters the westernmost lake of the Gippsland Lakes complex, Lake Wellington. Dowd Morass is part of the Gippsland Lakes Ramsar site and, like many other coastal wetlands in Australia, has been challenged with habitat fragmentation, pollution, altered wetting and drying regimes, and seawater intrusions. Despite these challenges, Dowd Morass is the site of one of the largest ibis rookeries in southern Australia.

The project aimed to determine how the area of different vegetation types in Dowd Morass had changed over time, what factors were responsible for the changes, if any, what was the current ecological condition of the wetlands, and how the site could be successfully rehabilitated. Figure 1 shows a typical area of Dowd Morass, where large numbers of ibis have nested and damaged the paperbark trees. Also evident is the deep and near-permanent water around the adult trees.

The main findings of the project are:

- Dowd Morass, although part of an internationally important wetland, is confronted by a wide range of environmental challenges including a highly unnatural water regime, secondary salinisation, nutrient enrichment, and the presence of acid sulfate soils.
- Contrary to anecdotal opinion, the area of swamp paperbark in Dowd Morass had increased since World War II, when good-quality aerial photographs first became available in order to check for vegetation change. Analysis of this suite of historical aerial



photographs showed that the increase in area of paperbarks had been at the expense of the area covered by common reed, *Phragmites australis*.

- The factors responsible for the change in vegetation were not clear-cut although increases in salinity appeared to be important. It seemed also that paperbarks were very effective at taking advantage of slightly raised areas in the wetland created by reed beds.
- Dowd Morass has been kept in near-permanent inundation for the past three decades or so, to prevent the intrusion of saline water from Lake Wellington, facilitate successful breeding by ibis and other waterbirds, and to provide for duck hunting. The condition of adult swamp paperbarks decreases greatly under near-permanent water-logging, and they cannot reproduce by seed unless water levels drop. Seeds are held in an aerial seedbank, and not in the soil.
- Paperbark leaves decay slowly, probably as a result of their high content of essential oils. The presence of salty water slows the decay rate even further.
- Attempts to rehabilitate degraded areas of swamp paperbark by revegetating with tube stock were mostly unsuccessful. Water-logging and high salinity limited the establishment of young plants, and acid sulfate soils probably also contributed to their poor condition. However, in other parts of South Gippsland with lower salinity regimes revegetation trials have been highly successful.



Fig 1: Ibis rookery in Dowd Morass. Photo: Paul Boon

- Attempts to rehabilitate the entire wetland by experimentally re-establishing a more natural water regime were fraught with unexpected challenges. Flood, bushfire and vandalism all compromised attempts to introduce a drying regime into the wetland to foster the sexual recruitment of the plants and to improve the condition of adult plants.
- The close collaboration of scientific researchers, government agencies and the local community was essential to the rehabilitation of the site. Researchers contributed independent, quantitative data; government agencies the critical in-kind support and practical guidance; and the local community, the drive and goodwill to see the work through to completion and its effective implementation.

Dowd Morass presents a formidable challenge for wetland managers to rehabilitate. It is a high-value (Ramsar-listed) wetland and so needs to be managed appropriately. Yet it suffers from the chronic salinisation that occurred soon after the Gippsland Lakes were linked with a permanent entrance to the Southern Ocean at Lakes Entrance in the late nineteenth century. In order to limit the extent and frequency of saline intrusions, wetland managers maintain high water levels within the morass. But the plants cannot recruit sexually under conditions of near-permanent water-logging, and the condition of adult plants decreases markedly under this water regime. It is difficult to re-instate a more natural water regime by drawing down water levels, as secondary salinisation may become more severe and acid sulfate soils could be activated. Nevertheless, our long-term project demonstrated convincingly the ecological benefits that can accrue from a carefully considered and implemented manipulation of water regimes. To achieve this outcome, it was necessary to work closely with wetland managers and the local community, especially those with a strong interest in the wetland.

For further information contact: paul.boon@vu.edu.au.

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THE ENDANGERED SOUTHERN BELL FROG (AND FRIENDS) BENEFIT FROM A DRINK IN THE LOWER MURRAY-DARLING

Sascha Healy, New South Wales Department of Environment, Climate Change and Water

The New South Wales Department of Environment, Climate Change and Water (DECCW) are committed to delivering environmental water to help restore and rehabilitate wetlands along the Murray River. Many benefits from environmental water have already been observed including waterbird breeding events, improved river red gum health and increased aquatic vegetation and diversity. Surveys of the Lower Murray-Darling wetlands which recently received environmental water have detected several species of frogs inhabiting the wetlands, including the nationally endangered southern bell frog (*Litoria raniformis*).

DECCW has been working in partnership with private landholders to deliver environmental water to the temporary wetlands known to support the southern bell frog, after populations were initially identified in 2008. These particular wetlands are shallow and as a consequence received staggered volumes of environmental water to provide opportunity for adults to breed, recruit and gain condition for subsequent seasons. Several other frogs including four species of marsh frog (*Limnodynastes* spp.), the eastern sign-bearing frog (*Crinia parinsignifera*), Peron's tree frog (*Litoria peronii*) and the

painted burrowing frog (*Neobatrachus sudelli*) have also been detected and have successfully recruited within the same wetlands that support southern bell frog populations.

The environmental water at these privately owned Lower Murray-Darling wetlands has promoted successful frog recruitment and has also contributed to the improvement of associated wetland vegetation. Lignum (*Muehlenbeckia florulenta*) and submerged aquatic plants are used by frogs as refuge from heat and predators, for foraging and as substrates to attach their eggs.

Improving and rehabilitating wetland vegetation through environmental water plays an important role in the survival of the endangered southern bell frog and other wetland dependant fauna. The delivery of environmental water is particularly important during periods of prolonged drought, where aquatic habitats are scarce within the landscape and are important drought refuges for numerous animals.

For further information contact: Sascha Healy
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32 Enterprise Way or PO Box 363 Buronga NSW 2739.



One of several privately owned Lower Murray Darling wetlands which support southern bell frog populations. Photo: Sascha Healy



Foraging adult southern bell frog. Photo: Sascha Healy



CONTINENTAL-SCALE ASSESSMENT OF AUSTRALIA'S ROCKY AND CORAL REEF BIODIVERSITY

Rick Stuart-Smith and Graham Edgar, University of Tasmania

Through a collaboration involving recreational divers, scientist and managers, the Reef Life Survey (RLS) program aims to provide biodiversity data needed to efficiently manage the marine environment and thereby improve its state. The program generates an enormous amount of species-level information on fishes, macro-invertebrates, seaweeds and corals from sites distributed across the country. These systematically-collected data are provided by a national team of experienced and highly motivated recreational SCUBA divers, who have been trained in quantitative scientific methods for underwater biodiversity assessment.

The program is directed by scientists and managers as an extension of long-term monitoring and research of southern Australian marine protected areas (MPAs). It provides outputs of both regional and global relevance to management in such areas as MPA monitoring and network design, safeguarding threatened species, marine pollution and 'State of the Environment' monitoring, and assessment of impacts of threats such as climate change, introduced species and coral bleaching. RLS differs from other community-based ('citizen-science') groups in placing primary emphasis on data quality and outputs. These are achieved by limiting the program to the best divers, through providing immediate feedback to divers' queries, and by organising collaborative surveys with researchers. Because of lower costs, RLS data allow ecological analyses based on consistent methods to be undertaken at larger geographic and temporal scales than possible for scientific dive teams.

Data quality is maintained through training by scientists on a one-on-one basis to ensure information collected is consistent and of equivalent quality to that collected by scientific teams. Since establishment three years ago, the RLS dataset now includes over 2900 transects surveyed at more than 1100 reef sites, spanning the majority of dive-able coastline around Australia, including most inshore MPAs. The coverage includes the internationally significant MPAs at Lord Howe Island, Ningaloo, and the Great Barrier Reef, plus sub-tidal reef sites in Ramsar listed wetlands at Port Phillip Bay, Myall Lakes, Moreton Bay and Gippsland Lakes. This invaluable resource represents the first circum-Australian dataset of marine biodiversity data collected using standardised quantitative methods. More

information about the methods and data collection can be found on the RLS website.

The benefits of the RLS program are not just those associated with the large scale on which information is collected. Survey effort by the RLS team can also be directed to locations of specific local management need, such as the annual collaborative surveys undertaken with the Kangaroo Island NRM Board and Rottnest Island Authority. Other examples include surveys undertaken by RLS divers on deeper offshore reefs (between 20 metres and 46 metres) in the recently-declared Cod Grounds Commonwealth Marine Reserve, which formed the baseline of faunal and floral assessment on which ongoing management will be based. Similarly, surveys by RLS divers have contributed biological information to the revision of the zoning scheme for the Lord Howe Island Marine Park, where massive coral bleaching at some lagoon sites was detected in February 2010, and to the Marine Park planning process for South Australia. New partnerships with local management and councils or boards are constantly being formed. Although rarely considered during marine planning until recently, citizen science programs such as RLS should be regarded as powerful tools for managers and scientists concerned with safeguarding our marine environment.

Reef Life Survey was set up through funding from the Commonwealth Environment Research Facilities program, an Australian Government initiative supporting world class, public good research.

For more information and contact details see the RLS website www.reeflifsurvey.com.



Reef Life Survey divers record species-level information on temperate and tropical reefs. Photo: Rick Stuart-Smith

POLLACK SWAMP – A HIDDEN BEAUTY

Jamie Hearn, Murray Catchment Management Authority

The Pollack Swamp, a hidden part of the Koondrook State Forest near Barham in New South Wales, is surrounded by private property. The wetland area within the forest is about 100 hectares in size and consists of a large saucer shape depression and a deep open water lagoon. The area is naturally watered during a major Murray River flood by way of the Barber, Barber Overflow and Cow Creeks. This happened recently in October 2010; the first time this has occurred in many years.

In 2001 the Murray Wetlands Working Group (MWWG) funded infrastructure works enabling the delivery of environmental water to the site. This was achieved with the help of the Bringan Trust Irrigation Scheme and private landowners.

A trial watering using 950 megalitres of adaptive environmental water (AEW) was conducted in spring 2003. A second flooding event was conducted in late spring 2004 using 850 megalitres. In May-June 2009, using a combination of The Living Murray program and adaptive environmental water, 1132 megalitres of environmental water was delivered to the wetland, with a further 368 megalitres delivered in October 2009. This follow up or 'top up' watering is critical to provide the best opportunity for the widest range of plants to germinate. It also provides colonial waterbirds with the 'confidence' that their food supplies will continue long enough to get through a breeding cycle.

The cooperation of the Bringan Trust Private Irrigation Scheme and the surrounding landholders is integral to providing water to this hidden beauty. Supply channel

capacity, especially during irrigation periods, must be negotiated and access to the site for monitoring and structure maintenance is only through private property. Both the Irrigation Trust and the landholders surrounding Pollack Swamp are proud of their involvement and are keen to continue assisting in the management of this site.

Locals enjoyed a field trip to the wetland to celebrate World Wetlands Day in 2010. The tour was organised by the Murray Catchment Authority and supported by The Living Murray program. Around 30 interested community members identified bird species and assisted staff collecting water bugs (aquatic macro invertebrates) and water samples. The water bugs were identified on site and, coupled with the results of the water tests, the site was found to be in excellent condition.



Flooding, Pollack Swamp. Photo: Jamie Hearn



Barham-Koondrook community members on a World Wetlands Day tour. Photo: Jamie Hearn



Sticky Everlastings at Pollack Swamp. Photo: Jamie Hearn



INDIGENOUS COMMUNITIES MONITOR THEIR SPECIAL RIVER PLACES IN THE NORTH

Jenni Metcalfe, consultant to Tropical Rivers and Coastal Knowledge research hub, Queensland

Cainan Skeen is known for his skills in hunting goanna and catching freshwater prawns. The young Gooniyandi man from the Bayulu community, east of Fitzroy Crossing in the Kimberley, learnt to swim in a local permanent water hole connected to the Fitzroy River.

“When I was a young boy, I was going hunting with my uncle and we was getting lots of goanna and kangaroo. And we were always fishing from upstream and catching lots of barra, some catfish and bream. I go with all my cousins and brothers hunting and fishing,” Cainan says.

Cainan is working with young men and elders from his extended family to choose special places along the river to protect and monitor as part of the Tropical Rivers and Coastal Knowledge (TRaCK) River Country Monitoring project. TRaCK is a research hub under the Commonwealth Environmental Research Facilities scheme, managed by the Department of Sustainability, Environment, Water, Population and Communities.

This group, known locally as the Gooniyandi rangers, chose four water places that are important to the Bayulu community for fishing, hunting, recreation, family gatherings and stories.

One of the special places for the Bayulu people on the Fitzroy River is a permanently flowing section of the main river channel called Winadjibun, or sandbar, because of the large sand area at the top end where people can launch boats. This is the place where Cainan Skeen learnt to swim as a young boy.

Local people hold big meetings out of town here and also like to camp, fish and hunt in this spot. It is the main place where young men are taught how to hunt and it's where the old people bring the young people to pass on their cultural knowledge.

TRaCK's project is working with two other Indigenous groups in the Kimberley region in Western Australia and another two groups living on or near the Daly River in the Northern Territory. Each group selects river sites important to them, chooses indicators which tell them whether the sites are healthy or not, and then monitors any changes that occur over time.

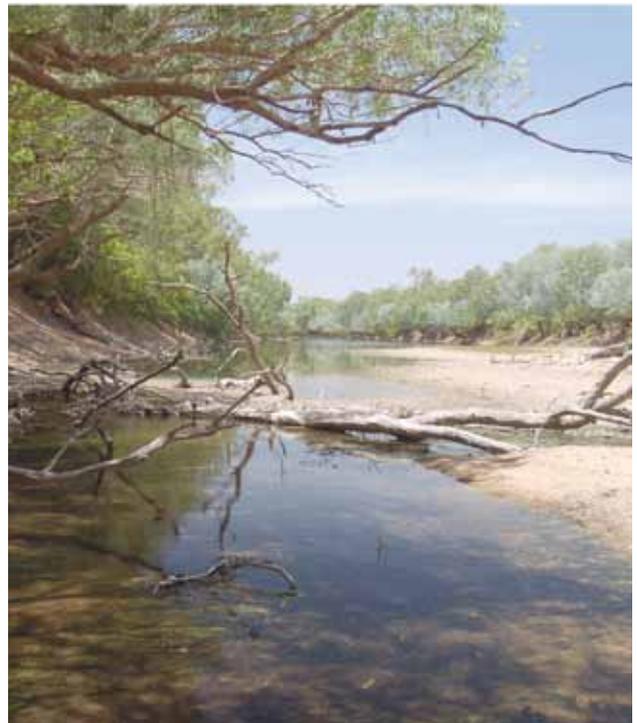
“The Indigenous people we are working with are really interested in this project,” says TRaCK researcher,

Dr Marcus Finn from CSIRO. “They want to look after their river country and they have strong connections to those places. This project allows them to be involved in measuring their rivers, and it will also help them communicate their relationships with the rivers to policy people and the broader public.”

The Gooniyandi rangers are concerned about keeping their important river places special.

“You got lots of weeds at the moment, noogoora burr. And there is a lot of rubbish,” says Cainan Skeen. “Then the cows and pigs get in and they make the water a bit off... there's a horrible smell.”

The rangers are hoping to fence off parts of the river and put up signs to stop littering. They are monitoring any changes by regularly counting bits of rubbish, taking photos from the same points, measuring any pig or cow damage along a set line and recording catches of fish and cherrabin (freshwater prawns). And they use a water quality monitoring kit to test the river's pH, turbidity and dissolved oxygen levels.



Winadjibun or sandbar is a special place for the Gooniyandi people. Photo: Jenni Metcalfe



Roneil Skeen throws a net to catch cherrabin at one of their special places. Photo: Jenni Metcalfe



Cainan Skeen (left) and Delton Cox take a photo at Winadjibun, one of their special places. Photo: Jenni Metcalfe

The Parkul Springs/Bidijul community in the Kimberley and the Malak Malak and Wagiman ranger groups on the Daly River have set up similar programs.

Dr Finn believes Indigenous peoples' monitoring is a great way of incorporating Indigenous peoples' interests and perspectives into water plans. "It's also a way of checking whether Indigenous peoples' river interests are affected by any water management actions."

The river monitoring project links with other TRaCK projects working with Indigenous communities where researchers are:

- mapping their river use over time and space
- surveying household harvest and consumption of river resources including fish, lilies, turtles, cherrabin, freshwater mussels
- finding out about the social and cultural values they place on rivers
- assisting identification of environmental indicators for use across Indigenous ranger projects funded under the Australian Government's *Working on Country* program in northern Australia.

"We are linking this knowledge with scientific knowledge about river ecology and hydrology to build a more complete picture of the ways these rivers work and the relationships people have with the rivers," says Dr Finn.

"This combination of scientific and indigenous knowledge will help water planners better understand the impacts and costs to northern Australia's Indigenous river communities from any changes to the way these rivers are managed."

For the Indigenous ranger and community groups involved, it means that they are the ones choosing the river sites to be monitored and how they will be monitored. In the process, they are developing skills for understanding and managing their own country.

The Gooniyandi rangers have weekly classes at the Karrayili Adult Education Centre, where they learn computer and report writing skills for recording and assessing the data they are collecting from river monitoring. They are also linking with other ranger groups in the region to share their knowledge and skills.

For further information contact: www.track.gov.au

CHINA AND AUSTRALIA COOPERATE TO DEVELOP WETLAND MANAGEMENT POLICY AND GUIDELINES

Richard Price, Kiri-ganai Research and Fenner School of Environment and Society, Australian National University, Australian Capital Territory

The Australian Government, through its AusAid funded Australia China Environment Development Program (ACEDP), is supporting an ambitious policy development project to help China devise a framework and guidelines for managing its vast wetland estate. The initiative can be seen as ambitious considering China's aspiration to have 90 per cent of its wetlands under protection by 2030.

Under the guidance of Kiri-ganai Research and Wetlands International, the project sees some of the world's foremost

wetland specialists working closely with China's Office for Wetland Conservation and Management.

The challenge

The Chinese wetland challenge is considerable. The first China National Wetland Inventory, carried out from 1996 to 2003, estimated the total wetland area in China was 38.5 million hectares and occupied 3.8 per cent of the total



territory. Among them, there are 5.9 million hectares of coastal wetlands, 8.2 million hectares of fluvial wetlands, 8.3 million hectares of lakes, 13.7 million hectares of marshes and 2.3 million hectares of ponds and reservoirs.

In a land where water resources are precious but often degraded due to enormous population and development pressures, many of the wetlands provide important ecosystem functions. The Inventory shows that among China's wetlands, there were 724 species of wetland vertebrates belonging to 75 families and 25 orders, and 2276 species of wild higher plants belonging to 815 genera and 225 families. The wetland vegetation was divided into seven groups encompassing 16 vegetation types and 180 formations.

Economically, China's wetlands are estimated to provide a significant amount of ecosystem services, including freshwater supply, flood regulation, wastewater storage and natural purification, wildlife habitat, and aquatic life preserves. Based on the suggested values of all the major ecosystem types, the total value of natural wetlands could account for 54.9 per cent of the estimated 903 thousand million dollars (USD) of annual ecosystem services in China.

From a social perspective, wetlands in China frequently play an important role in acting as urban refuges for people to interact with the environment within some of the world's most heavily populated and developed centres. Many of China's parks are based around wetlands, both in urban and rural settings. The government has recognised 323 natural wetland areas in China as being of national importance. These wetland areas account for 39.6 per cent of the total area of natural wetlands, including 149 lakes (with a total area of 42 800 square kilometres), 92 swamps (73 500 square kilometres), 60 coastal wetlands (21 000 square kilometres), and 22 rivers (5300 square kilometres).

Wetlands in China are facing serious threats and the current scenario for their condition is far from optimistic. Mining construction and other human activities have caused the destruction of more than 40 per cent of natural wetlands over the past 50 years.

Policy drivers

While the challenges outlined above present their own call for action, China is party to a large number of international agreements, including the Ramsar Convention, that are relevant to wetland conservation and biological diversity. Although the Chinese Government has taken efforts to protect wetlands, issues still remain and need to be addressed to achieve effective wetland management, both to satisfy the terms of various agreements and to help achieve the 90 per cent protection target set for 2030.

This is where the ACEDP project will play a vital part. First among its objectives is to develop guidelines for:

- the management planning and monitoring of Internationally Important Wetlands

- the construction and assessment of National Wetland Parks
- wetland restoration.

Each of these guidelines must be seen within quite distinct policy contexts, and while the State Forestry Administration has major carriage of China's policy and administrative functions in respect to wetlands, the implementation of these functions is subject to considerable negotiation and consultation with other ministries, including those responsible for water resources, the environment, industry development and economic planning. These relationships must be taken into account in the process of developing the guidelines.

Likewise, the inter-relationships between the central and provincial jurisdictions cannot be ignored. In most cases, those responsible for implementing new wetland management guidelines will be employees of provincial governments, and while the provincial governments and their employees will be obliged to implement the guidelines within the centralist framework, it will be critical that the development of the guidelines recognises local ecological, social and economic drivers and conditions.

The project

A team of overseas and Chinese wetland experts will take responsibility for the development of the following five wetland management guidelines:

- Monitoring of internationally important wetlands.
- Management planning for internationally important wetlands.
- Wetland park construction.
- Wetland park assessment.
- Wetland restoration.

The overseas team comprises experts from Australia and Malaysia. Both the Chinese and overseas experts report to, and are funded directly by the Australian research company, Kiri-ganai Research. Indeed, for the purposes of the ACEDP project, the State Forestry Administration is a sub-contracted agent of this Canberra-based private company.



Homebush Bay. Presenter with (L-R) Yuan Jun, Li Xiaowen and Chen Jing. Photo: Doug Watkins

COMMONWEALTH ENVIRONMENTAL WATERING IN THE MURRAY-DARLING BASIN

Department of Sustainability, Environment, Water, Population and Communities

Over-extraction and the effects of the recent drought have put rivers, wetlands and floodplains of the Murray-Darling Basin (the Basin) under significant stress. Protecting and restoring their health is a long-term challenge, particularly in areas where a changing climate will exacerbate the decline in water availability.

The Australian Government is recovering water for the environment across the Basin to address the decline in these systems. As at October 2010, more than 950 billion litres of water entitlement had been acquired by the Commonwealth under its *Water for the Future* programs.

Over 211 billion litres of water has been delivered to the rivers, wetlands, and floodplains of the Murray-Darling Basin from the start of the program to October 2010. Sites that have benefited from Commonwealth environmental water include the Chowilla floodplain, Hattah-Kulkyne Lakes, Coorong and Lakes Alexandrina and Albert, the Warrego and Darling Rivers, the Lowbidgee floodplain, the Darling Anabranche and Macquarie Marshes.

The objective of most of the watering actions to date, consistent with drought conditions, has been to prevent the permanent loss of the environmental values. In particular, water has been used to: provide refuges for threatened species including southern bell frog, Murray hardyhead and the regent parrot; benefit river red gums and wetland and floodplain communities; and provide flows to promote recruitment of native fish.

The results so far of Commonwealth watering have been encouraging, and include ecological benefits such as improved tree health, decreasing salinity, and benefits to populations of rare and endangered species. Sites receiving follow-up watering have shown better results underscoring the importance of environmental water in the ongoing management of water dependent ecosystems.

The volume of Commonwealth water allocations is expected to grow as more water is recovered and as water availability improves. Larger allocations will enable the scope of environmental watering to expand to protect or restore a broader range of environmental assets. The Commonwealth will be able to consolidate environmental watering activities undertaken in previous years and more. For example, the number of sites watered will be increased and larger volumes will be provided to sites. Further,

in-channel flows down rivers and streams, and potentially larger floodplain inundation events, will be possible.

The Gwydir catchment in northern New South Wales is an example of an area where environmental water is being used to help the recovery of environmental assets after the drought. The Commonwealth has over 108 billion litres of water entitlement in the Gwydir catchment. During the drought, allocations were close to zero, but following recent rainfall, the first Commonwealth allocations in the catchment became available.

In spring 2010, 3056 million litres of water was used to top up river flows. This watering action will help boost soil moisture and vegetation growth in the area. Watering actions like this also 'prime' the environment so that when widespread inundation does occur, it is more likely to trigger breeding of migratory water birds such as the glossy ibis, cattle egret, and the white ibis. As water availability improves, the Commonwealth is well placed to provide environmental benefits in the Gwydir catchment into the future.



The Coolibah woodland ecological community (pictured) is listed as endangered under NSW legislation. The Coolibah is commonly found in 'riparian' zones and requires periodic flooding in order to propagate. Photo: N. Penny (SEWPaC)





Coolibah-blackbox woodland.
 Photo: N. Penny (SEWPaC)



Water couch, a narrow leaf Australian native with a v-shaped seedhead, competes with the much maligned introduced species, Lippia. A small, broad-leafed perennial grass originally from South America, Lippia is a major threat to biodiversity and riparian areas in general. Also shown in this photo are the milfoil and pin rush. Photo: A. Hutchinson (SEWPaC)

The wetlands and floodplains of the Gwydir catchment once covered an area of approximately 180 000 hectare, but now cover just over 115 000 hectare. Extensive terminal wetlands are still present in the catchment as a series of natural and constructed channels and swamps, providing flood mitigation and contaminant filtering for downstream areas.

The wetlands of the Gwydir catchment are characterised by one of the largest stands of water couch remaining in New South Wales. There are also large areas of coolibah woodland, a listed ecological community under the New South Wales *Threatened Species and Conservation Act*.

The wetlands, particularly the Old Dromana wetland area, provide breeding and feeding grounds for colonial water bird species and habitat for many threatened species. There have been 75 water bird species observed in the wetlands, including the Australasian bittern and the Australian painted snipe. Of these, six migratory species are listed under international agreements. One such bird, the Latham's snipe, migrates from as far away as Japan.

The area is also home to native mammals, including several bats, eastern water rat, swamp wallaby, narrow-nosed planigale, and the five-clawed worm skink. Fourteen different frog species have been recorded in these wetlands, including the barking marsh frog, the broad palmed frog, the crucifix frog and the water-holding frog. Both the Murray cod and silver perch forage and breed in these wetlands.

The wetlands have socio-economic, cultural and spiritual significance for the Gamilaroi peoples and traditionally provided a range of edible plants and animals and drought refuge. Many archaeological and cultural sites remain, with many Gamilaroi continuing to hold and pass down their traditional knowledge of wetland resources.

More information about the Commonwealth environmental watering program can also be found at www.environment.gov.au/water/policy-programs/cewh/index.html



Straw-necked ibis. Photo: N. Penny (SEWPaC)



Black-winged stilt. Photo: A. Hutchinson (SEWPaC)

A CALL FOR ACTION: ADDRESSING DEVELOPMENT IMPACTS IN RAMSAR WETLANDS AND DECLARED FISH HABITAT AREAS

Mary Lawrence, John Beumer and Dawn Couchman, Queensland Department of Employment, Economic Development and Innovation

A project to create an inventory and prioritise instream structures and their impacts within Queensland's Ramsar sites and declared Fish Habitat Area (FHA) network has recently been completed. The Ramsar Inventory Project forms part of a five-year program to conduct inventories of structures in coastal wetlands. The project was conducted by staff from Fisheries Queensland, a service of the Department of Employment, Economic Development and Innovation, and funded by the Australian Government's Department of Sustainability, Environment, Water, Population and Communities, under the Queensland Wetlands Program (the Program).

Ramsar listed wetlands are internationally important wetlands that contain key habitats for a range of aquatic animal species. There are 64 Ramsar sites across Australia with four located along Queensland's coastline. The Bowling Green Bay Ramsar wetland near Townsville and the Shoalwater and Corio Bays Ramsar wetland near Yeppoon are located in catchments of the Great Barrier Reef, adjacent to the Bowling Green Bay, Cleveland Bay and Corio Bay declared FHAs. These wetlands face increasing pressures as demands for agricultural, industrial and urban development in the coastal zone continue to increase. Construction of instream structures in coastal areas can modify flow regimes, cause physical disturbances with direct losses of fish habitats or may form barriers to the migrations and movements of fish and other aquatic species through wetlands. This leads to population declines, reduced distributions of species and degraded aquatic habitats, with further detrimental effects on recreational, Indigenous and commercial fisheries.

As a result of the project, a Response Action Plan (RAP) was developed for each of the Bowling Green Bay and Shoalwater and Corio Bays project areas. Each RAP included a list of priority structures and identified recommended management response actions for these. A key issue in addressing priority 'problem' structures was integration of the diverse policies, legislation and management regimes of the different agencies involved in management and approval of structures in coastal wetlands. The RAPs called on local and state government

agencies and natural resource management bodies to address the impacts of priority structures and develop an integrated approach towards this goal.

A working group of key stakeholders, including the Queensland Department of Environment and Resource Management, Rockhampton Regional Council, Fitzroy Basin Association and the Great Barrier Reef Marine Park Authority was established to implement the Corio Bay RAP. During 2010-2011, the group will work together to achieve integrated outcomes with a common goal of protecting the region's important wetland values. A key role is to develop a regional communications plan targeted at community and other stakeholders to promote and create awareness of the fish habitat and wetland values of the Corio Bay Ramsar site, declared FHA and other fish habitats in the Corio Bay region. Delivery of the RAP and its communications plan will further promote an awareness of the benefits of the Queensland Wetlands Program in Central Queensland.

For further information contact: Fisheries Queensland on telephone 13 25 23 or visit www.deedi.qld.gov.au



Mangrove and saltmarsh wetlands are under increasing pressure from coastal development. This photo shows Barratta Creek, adjacent to Bowling Green Bay Ramsar wetland and declared Fish Habitat Area. Photo: Queensland Department of Employment, Economic Development and Innovation



UPPER MURRUMBIDGEE FLOODPLAINS – A REDUCTION IN RESILIENCE

**Luke Johnston, Upper Murrumbidgee Demonstration Reach Project Manager,
and Tanya Rucosky Noakes, Upper Murrumbidgee and Australian Capital Territory
Waterwatch Facilitator**

Historically, significant tracts of the flood zone adjoining the upper Murrumbidgee were riparian woodlands dominated by ribbon gum (*Eucalyptus viminalis*) above 550 metres and by river she-oak (*Casuarina cunninghamiana*) below 550 metres.

Ribbon gum woodlands on the southern New South Wales and Australian Capital Territory floodplains suffered from clearing during the early pastoral phase of the region leaving only isolated remnants. Less than 10 per cent of the presumed pre-European distribution now occurs within the Australian Capital Territory. Further, in the Australian Capital Territory, the dramatic fire event of 2003 burnt almost the entire river she-oak community along the Murrumbidgee River and many of its tributaries.

Based on recent survey work in the flood-prone woodland communities of upper Murrumbidgee, clearly their health is heavily and negatively impacted by reduced flow regimes and less frequent flooding events. Since the construction of Tantangara Reservoir, 99.6 per cent of inflows of the upper Murrumbidgee's headwaters have been diverted to the Snowy HydroElectric Scheme, creating a significant change in the hydrology of the river downstream. A review of flow gauging data at Mittagang Crossing near Cooma showed a reduction in flow variability, base flows, and a lower level of subsequent flood events. These hydrologic changes have had a serious impact on the woodlands on the floodplain due to the reduction of overbank flooding.

Clearing and fire, in combination with a lack of overbank floods, have significantly affected the woodland communities of the region. Both of the dominant flood tolerant species have suffered a heavy reduction in former cover and ecosystem health and in the case of the ribbon gum dominated woodlands, distribution.

It was noted in a survey of the Murrumbidgee in the Australian Capital Territory, following the 2003 fire event, that nearly all adult river she-oak displayed signs of post-fire vegetative regeneration. However, fire affected she-oak woodlands only recovered at the well-watered river edge, those on the dried-out floodplain, subsequently died. This indicates the importance of water to the species recovery. Clearly, increased frequency of overbank flows enhance the long-term resilience of the ecological community in this environment.

Further, where true riparian woodland species tolerant of frequent periodic inundation had not recovered, dry woodland eucalypt seedlings have successfully established (*Eucalyptus bridgesiana* and *Eucalyptus blakelyi*). Although this is in combination with a catastrophic fire event, the recent findings highlight the vulnerability of species naturally adapted to flood-prone wetlands when their natural hydrologic cycles have been artificially tampered with. Despite large scale planting efforts by the Australian Capital Territory Government, with the current flow regime, natural regeneration of ribbon gum dominated woodlands are unlikely.

Climate change predictions for the upper Murrumbidgee region are generally indicating hotter, drier conditions. This will translate into more frequent fires, which will limit she-oak recruitment and recovery, and eventually their distribution is expected to move up the catchment over 500 metres above sea level in a thin fringe only. Already anecdotal evidence is emerging of large scale dieback of ribbon gums in the upper Murrumbidgee flood zone. Climate change is expected to cause a reduction in distribution biased toward high elevation montane sites with higher rainfall.

Drier conditions will also place more pressure on human populations and in all likelihood increase their reliance on the upper Murrumbidgee as a water source. This behaviour will further lower surface flows and lengthen the time between overbank flood events. All these conditions will decrease the resilience of riparian woodland communities in the upper Murrumbidgee, and must be addressed now to prevent the loss of ribbon gums from upper Murrumbidgee River.



Upper Murrumbidgee River. Photo: Luke Johnston

MANGROVEWATCH BURNETT MARY REGION IS ONE YEAR OLD! OUTCOMES AND LESSONS LEARNED

Jock Mackenzie, Norm Duke, Karin Baba, Apanie Wood, Britt Rogers, Alex Haller and Julian O'Mara, Mangrove Hub, School of Biological Sciences, University of Queensland

MangroveWatch Burnett Mary Region has successfully completed its first year and established itself as a powerful community driven environmental monitoring method with outcomes relevant to our scientific understanding, improved management of tidal wetlands, and climate change adaptation. Here we outline the role of MangroveWatch, how it works, and why it works.

Australia is fortunate in having the third largest area of mangroves in the world. This expanse of tidal wetlands provides many benefits for coastal environments supporting reefs, bays and estuaries on which we rely for our economic, cultural and social wellbeing. Unfortunately, natural tidal wetland ecosystems are under serious threat.

Coastal development, catchment modification and sea level rise all threaten the ecological integrity of these ecosystems and limit their capacity to provide valuable ecosystem services. These pressures come in addition to the many natural pressures that influence tidal wetland ecology in the dynamic coastal zone.

In order to maintain healthy tidal wetland habitats, particularly in the face of impending sea level rise due to global climate change, it is important to identify the range of existing pressures and to mitigate those that can be controlled. For example, we might start by reducing localised anthropogenic pressures, like improving catchment land use management. Effective mitigation is more likely to be achieved when management responses are based on best-available knowledge of natural biological processes associated with tidal wetlands.

The identification of pressures and determining appropriate actions for mangrove and tidal ecosystems presents a number of challenges for both scientists and managers. First, mangroves exist in a diverse range of dynamic hydrological, geomorphic and climatic settings imparting markedly different functions, forms and productive capacities. We need to further develop our scientific understanding of mangrove ecosystems and their response to different pressures in each environmental setting.

Second, to effectively assess change and degradation of tidal wetlands we need to establish a baseline from which to assess future change and identify drivers of disturbance.

For many tidal wetland systems there is only limited information currently available.

Third, identification of pressures and prevention of environmental degradation requires long-term regular ecosystem monitoring with the information reported back to environmental managers to ensure appropriate action is taken. To meet these challenges requires the implementation of a nationwide, long-term mangrove monitoring program. Until recently, such a program was not possible as no effective rapid assessment and monitoring method was available and the logistical and spatial scale was too big to be economically effective.

MangroveWatch specifically set out to address these challenges. The first year of the program in the Burnett-Mary region, funded with a *Community Coastcare* grant from the Australian Government's *Caring for our Country* initiative, has highlighted the potential of this program to provide such a nation-wide long-term mangrove monitoring program.

The MangroveWatch program has been highly successful in developing a monitoring method that can identify large-scale influences on the functional dynamics of mangrove ecosystems. To overcome prior logistic and spatial challenges, the program has tapped into an army of enthusiastic individuals and community groups concerned for their local mangrove wetlands. For our program trial in the Burnett Mary Region, the method has proven community volunteer support as a wide-ranging, cost-effective means of monitoring threatened tidal wetlands and estuarine margins.

Community volunteers have been trained to collect geo-tagged, digital video of mangrove shorelines and estuary banks. The video data is sent to the Mangrove Hub team, consisting of mangrove scientists and student volunteers at the University of Queensland. At the Hub, data are analysed using criteria-based visual assessment for features that relate to physical process, vegetation structure and condition and human influences. The results are used to generate Mangrove Condition Report Cards which are delivered back to the Burnett Mary Region community through workshops, as well as being made publicly available on a new, dedicated website.



Since its inception in early 2009, 72 keen local MangroveWatch enthusiasts have videoed over 300 kilometres of mangrove-lined estuaries and shorelines between Bundaberg and Tin Can Bay. Through their involvement in the program, these and others supporting MangroveWatch have increased their knowledge of local mangroves and estuaries in the region. Importantly, they have also developed a greater sense of authority and ownership of local coastal habitats, helping increase community capacity for improved environmental stewardship of such vulnerable habitat. Data collected will be adapted further, as needed, for direct application by local environmental management officers. In this, the key environmental issues have been identified by local community members to identify priority areas for mitigation and/or restoration, and other areas that require greater protection. By providing a permanent record of shoreline and mangrove condition, MangroveWatch provides a fully-developed reference platform from which: to assess future environmental change; to identify important and endangered habitat; and, to assess degradation of tidal wetlands and coastal shorelines.

The success of MangroveWatch, thus far, has come from linking science and community volunteers along with other important benefits. Using the powerful, yet easily used tool of digital video recording to monitor shoreline condition, community volunteers are not required to make scientifically objective judgements. Consistent, high quality scientific observations have been standardised where assessments are prepared by trained volunteers and assistants at the Hub. In addition, community volunteers in the field are not required to physically access tidal wetlands: a good thing for the environment since it reduces trampling access damage; and it's safer for volunteers since there are fewer risks of injury and discomfort in their boats.

Community volunteers have shown further that they have additional valuable and complimentary contributions to make, with some creative surprises. Some volunteers are willing and able to make detailed scientific assessments with further support from the Mangrove Hub. Others have useful and interesting anecdotal, historical evidence with stories which we hope might enhance an online social-environmental community network. For this, plans are underway to further develop the website. In addition, there are some who have gathered brilliant thematic photographic collections, like Lindsay Titmarsh, and others with created wondrous illustrative art works, such as Sarah Mitchell and Liz Sawrey.

There has been so much gained with this program already. A fundamental achievement has been the generation of report cards, especially where these have been useful in drawing attention to local issues in local tidal wetland systems. The report card is in an easily communicable format, it is publicly available on the web, it is useful to both the community and management, and it allows for the identification and targeting of specific issues and mitigation

of priority threats to tidal wetlands, as well as in highlighting priority areas for conservation.

On the back of our recent success in the Burnett Mary region, MangroveWatch is seeking to expand around other coastal regions in Australia, as well as establish programs in Vietnam and the Solomon Islands. The challenge, as with all environmental community programs, is in gaining the funding and necessary support to achieve this in a sustainable way. If you would have any suggestions, or you have a story about mangroves, or you would like to support MangroveWatch, or you would like to be involved, please contact the University of Queensland Mangrove Hub (07) 3365 2073 or at mangrovewatch@gmail.com. In any case, please visit our website www.mangrovewatch.org.au

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Community MangroveWatch members collect geo-tagged video imagery of shorelines of the Burrum River estuary, Central Queensland, during June 2010. Photo: Norm Duke

WORKING TOGETHER TO MONITOR SEAGRASS IN QUEENSLAND'S RAMSAR SITES

Len McKenzie and Rob Coles, Fisheries Queensland, Queensland Department of Employment, Economic Development and Innovation

Shallow water and intertidal seagrass meadows are a key ecological characteristic of four of Queensland's five Ramsar wetland sites. These marine and estuarine dominated Ramsar sites are Bowling Green Bay, Shoalwater and Corio Bays, Great Sandy Strait and Moreton Bay. During low tide, the intertidal meadows provide globally significant feeding areas for shorebirds. During high tide they provide the primary food source for dugong, endangered green turtles, fish and numerous other animals.

There are approximately 58 000 hectares of seagrass meadow within the boundaries of Ramsar wetlands in Queensland. This is approximately 13 per cent of the seagrass meadows along the east coast of Queensland.

The pressures on these habitats are increasing due to our activities on the land and on our coasts. Fisheries Queensland is working closely with community groups and other government agencies to report on the condition of our seagrass meadows and the general health of our nationally and internationally important wetlands. We now have good information on the status of seagrass in our Ramsar sites.

Great Sandy Strait

The Great Sandy Strait Ramsar site is an estuary in southern Queensland. This was the location of the inaugural Seagrass-Watch monitoring site (August 1999). Seagrass-Watch is a participatory program which involves community groups and agencies in monitoring changes to coastal seagrass meadows in Queensland, as well as nationally and globally, providing an early warning of coastal ecological decline.

The 23 Seagrass-Watch long-term monitoring sites in the Great Sandy Strait have been monitored by the Great Sandy Strait Flora and Fauna Watch community group for the last eight years, with assistance of Burnett Mary Regional Group and the Cooloola CoastCare Association. The monitoring sites have been strategically located to gather information on marine resources in areas critical for fisheries, dugong and turtle. The monitoring provides information for strategic marine park planning, and assessments of impacts both on local and regional scales. Currently the status of seagrass in the Great Sandy Strait is rated as fair.

Shoalwater and Corio Bays

The Shoalwater and Corio Bays Ramsar site on the central Queensland coast includes many wetland types including fringing coral reefs, rocky shores, beaches and sandbars, mangrove forests, melaleuca woodland, freshwater lagoons or swamps, intertidal mudflats as well as shallow open water with seagrass meadows.

The land surrounding Shoalwater Bay is owned by the Australian Defence Force and since the mid 1960s has been used as a military training exercise area with only limited access to the public. The bay has one of the highest tidal ranges in Queensland, up to seven metres, and contains extensive intertidal mud banks which support shallow seagrass meadows. Approximately 16 700 hectares of seagrass are within the Ramsar area. These meadows support a wide diversity of fish species and are visited by many threatened species of turtles (green, loggerhead, hawksbill and flatback) and are home to the threatened dugongs.

The seagrasses within Shoalwater Bay are monitored to assess water quality and habitat resilience as part of the Great Barrier Reef marine monitoring program, a component of *Reef Rescue*, an initiative under *Caring for our Country*. These assessments confirm that seagrass meadows in Shoalwater Bay are in a good condition.



Great Sandy Strait Flora and Fauna Watch volunteers (from left: Pat Cottle, Hanne Larson and Robyn Bailey) monitor the intertidal seagrass meadows at Tinnanbar, Great Sandy Strait. Photo: Len McKenzie



Bowling Green Bay

The most northern Ramsar site in Queensland is Bowling Green Bay, just to the south of the regional Queensland city of Townsville. Bowling Green Bay contains examples of the richest coastal habitats typical of north-east Australia's coastal dry tropics.

Dugong and turtle feed in these meadows with extensive areas of feeding trails and groups of dugong observed during recent surveys by Fisheries Queensland. The seagrass meadows are close inshore and combine with the mangrove forests and wetlands to form a highly productive nursery habitat for commercial and recreational fish and prawn species.

Unfortunately recent monitoring in nearby areas has shown intertidal seagrasses to be in a poor state; although most meadows have a high resilience to impacts and a capacity for relatively fast recovery. Whether this situation also applies to the seagrasses of Bowling Green Bay is unknown, as currently there is no monitoring within the site.

While there are no direct threats to the marine environment, the hydrological connectivity of various aquifers, interactions with surface waters, and how irrigation activity in the adjacent catchments affects regional groundwater hydrology needs further assessment. Increases in pesticides and nutrients, as well as fine sediment from agricultural tail-waters may pose a long-term threat to seagrass meadows.

Moreton Bay

Located in one of Australia's fastest growing regions is the Moreton Bay Ramsar site in southern Queensland. The site covers more than 110 000 hectares and includes the offshore sand islands, intertidal mudflats and seagrass meadows, marshes, sandflats and mangroves. This variety of wetlands enhances the Bay's biological diversity with an overlap of wildlife species normally considered tropical or temperate. Approximately 33 500 hectares of seagrass meadows are within the Ramsar site.

The threats to seagrass in this site are many as the population of Brisbane has more than doubled in the last 20 years, resulting in a rapid growth in housing and coastal development. Keeping the bay clean and the productive seagrasses healthy will depend on effective management. Approximately 50 Seagrass-Watch sites are monitored throughout the area, providing information on the condition of the seagrass habitats. Community volunteers, conservation organisations and government agencies have been working together to monitor seagrass since 2001. Current seagrass condition is rated as good, with no sustained losses in the last 10 years.

The future

In the next 10 to 20 years it is expected that changes in climate, for example increasing temperature, sea-level rise and tropical storm frequency, will increase stress to coastal habitats. This will add to impacts on seagrass meadows that support fisheries productivity. The best defence against unnecessary habitat loss will be to use high quality, long-term information in decision making regarding coastal development and management. Monitoring change in seagrass performance and understanding the factors underpinning trends in change, resilience and recovery processes will be critical to understanding the changes occurring in Ramsar wetlands.



Dugong grazing trails (zigzagging marks in foreground) are evidence of the importance of Bowling Green Bay seagrass meadows to local dugong populations. Photo: Rob Coles

TESTING AND APPLYING THE INDEX OF WETLAND CONDITION IN VICTORIA

Phil Papas¹, Janet Holmes² and Shanaugh Lyon¹

The Index of Wetland Condition (IWC) was developed in 2005 to rapidly-assess the condition of naturally occurring wetlands in Victoria (see *Wetlands Australia* issue 14). The key drivers of its development were to inform wetland management and meet state, national and international reporting obligations. The IWC is structured as a hierarchical index with six subindices: physical form, hydrology, water properties, soils, biota and wetland catchment. Each sub-index has a number of measures; there are 14 altogether which collectively provide an indication of condition.

The IWC was developed to suit all wetlands types in Victoria and to be able to measure condition during wet and dry phases. The Victorian Department of Sustainability and Environment and Catchment Management Authorities are currently the key users of the IWC for statewide and regional condition reporting and for regional investment programs on public and private land.

Testing the IWC

In 2008, the Index was tested to ensure it measured condition consistently across a condition gradient, in different wetland types and between assessors.

Testing was undertaken by comparing IWC unweighted sub-index scores to condition scores obtained independently from quantitative data from 27 wetlands in the Wimmera region. Expert opinion was used to derive wetland condition information from the independent data set using the same scoring system allocated to the IWC; numeric scores from one to ten and five condition categories; very poor, poor, moderate, good and excellent. Fuzzy classification modelling used the expert opinion data to weight the IWC subindices. Comparisons between the IWC scores and the derived expert opinion scores for the 27 wetlands revealed significantly different values for the physical form sub-index, hydrology sub-index and unweighted total condition score. Biota was assigned the largest weight, followed by water properties, hydrology, wetland catchment, soils and physical form. The way the IWC total score is calculated was modified based on these weights. Once weightings were applied,

there was no significant difference between the weighted IWC total score and the derived expert opinion total score.

In testing for consistency between assessors, IWC scores for the same wetlands were compared between a trained and untrained group of assessors. For the untrained group, IWC scores differed significantly to the mean expert opinion scores for three subindices and the total unweighted score. However, the trained assessor group IWC scores only differed significantly in two subindices.

Training of the first assessor group may have contributed to the better alignment of their scores to the expert opinion scores.

The IWC was applied to six wetland types and did not appear to bias condition scores for any particular type. It was not possible to test whether the IWC measured condition consistently between a drying and filling phase as drought conditions prevailed throughout Victoria over the testing period.



Phil Papas discusses IWC results from teams undertaking IWC assessments during an IWC training exercise.
Photo: Diane Crowther

1 Arthur Rylah Institute for Environmental Research,
Department of Sustainability and Environment, Victoria
2 Department of Sustainability and Environment, Victoria



Statewide assessment program

The tested version of the IWC was used in 2009 to assess the condition of 640 nationally and internationally significant wetlands in Victoria. This was the first time a systematic assessment of wetland condition had been made. Eight of Victoria's ten Catchment Management Authorities assisted in undertaking assessments, together with a team of botanists and wetland consultants. The assessment teams were trained in the use of the method at a number of wetlands close to Melbourne.

Assessments revealed that most of the nationally and internationally significant wetlands in Victoria were in moderate and good condition. Wetlands on private land were generally in poorer condition than wetlands on public land.

Assessments in spring 2009 will be performed on a broader selection of wetlands that are representative of type.

Results and information on the statewide assessment program are available on the Department of Sustainability and Environment's IWC website www.dse.vic.gov.au/iwc.



*Highly modified wetland with a very poor condition rating.
Photo: Ben Goonan*

HUNTER WETLANDS CENTRE CELEBRATES 25 YEARS

**Christine Prietto, Hunter Wetland Centre Australia Chair,
Ramsar NGO CEPA Focal Point**

Hunter Wetland Centre demonstrates what education can do to build a better understanding of wetlands and their contribution to human health and well-being.

Shortland Wetlands Centre, now trading as Hunter Wetlands Centre Australia, is celebrating 25 years of educating people about wetlands. On World Environment Day, 5 June 2010, the 100 000th plant was planted by Professor Max Maddock and Dr Paddy Lightfoot, who were central to the campaign to save the wetlands in the early 1980s. This represents a major milestone in our history as one of Australia's first dedicated wetland centres.

Hunter Wetlands Centre is located north-west of Newcastle, New South Wales in the Ironbark Creek Catchment, a sub-catchment of the Hunter Estuary. Hunter Wetlands Centre incorporates a unique complex of wetland types surrounded by urban development along three boundaries. The site is freehold land owned by Shortland Wetlands Centre Ltd, trading as Hunter Wetlands Centre Australia, a company limited by guarantee and owned by its members. It operates as a not-for-profit conservation organisation and is managed by a volunteer board of directors.

In earlier years it had suffered the fate of many urban wetlands and had been drained, filled and developed as a sporting complex. In 1984 the actions of the local conservation group gained support for the restoration of the degraded wetlands. Shortland Wetlands Centre was given its 'Certificate of Incorporation of a Public Company'

on 25 July 1985. Newcastle Council, the New South Wales Department of Education and community groups such as the Hunter Wetlands Trust, the Newcastle Branch of the Australian Plant Society, Hunter Bird Observers Club and Native Animal Trust Fund were all pivotal partners in the ambitious venture to turn what had been a well-loved rugby ground back into a wetland centre with the key objectives of wetland conservation, education and community participation.

Since the initial campaign to save and restore the wetlands, the Hunter Wetlands Centre Australia (HWCA) has retained its importance in the fabric of the local community and the restoration work has been supported by the investment of many thousands of volunteer hours and valuable partnerships with relevant interest groups. This investment was rewarded in October 2002 with the listing of HWCA as an extension to the Hunter Estuary Wetlands Ramsar site.

Today the centre continues to attract strong community support and involvement in site management, project development, plantings, education programs and administration. Australia has around 20 wetland centres but HWCA is unique. It's the only one to be managed by a community not-for-profit company and to house a Ramsar site and staffed education facilities in the same location. HWCA was the joint winner in the first Ramsar Convention's Award for Education in 2005 for its achievements over 20 years.



Anniversary planting at Hunter Wetlands Centre. Aerial view of the Hunter Wetlands Centre. Photo: Christine Prietto
 Photo: Christine Prietto

As an ecotourism facility, HWCA provides a genuine nature-based tourism opportunity that complements other attractions in Newcastle. The 45 hectare facility is open seven days a week and offers easy access to high-conservation-value wetlands and provides a window on the 5000 hectares of wetlands elsewhere in the Hunter River Estuary.

As a conservation organisation HWCA serves as a hub for many community-based conservation activities and provides facilities for wetland research projects such as a program with Newcastle University to reintroduce green and golden bell frogs to the site. HWCA plays an important liaison role for Australian wetland centres by maintaining communication among centres and representing centres in the international arena, most recently at the opening of China's newest wetland centre at Hangzhou Bay.

As a community managed Ramsar site, HWCA epitomises the core objectives of the Ramsar Convention, especially its objectives for wise use and for communication, education participation and awareness. The knowledge capital and capacity building from the work at Shortland has contributed significantly to the understanding of wetlands in the Hunter region and has supported many major wetland restoration projects and broad conservation of all local wetlands. The restoration of Throsby Creek, the Kooragang Wetlands Rehabilitation project, the Hexham Swamp project, the establishment of Hunter Wetlands National Park and the development of Belmont Wetlands State Park have all been supported by HWCA.

As a centre for wetland education and training, HWCA supports a very active volunteer program and a highly successful and well used school education program. Since opening to school students in February 1986, over 200 000 students from all education sectors have passed through the doors. New South Wales Department of Education and Training has been a critical supporting partner on site since the centre opened.

In 2011 as the Ramsar Convention celebrates its fortieth Anniversary, Hunter Wetlands Centre will be opening

its new Environmental Learning Centre through funding from the Australian Government's *Local Schools Working Together Program*. The Environmental Learning Centre will be a shared education facility supported by a partnership between Hunter Wetlands Centre Australia, New South Wales Department of Education and Training and Catholic Schools Office. The facility will significantly enhance the school education program and provide new opportunities for community visitors to experience and learn about wetlands.

Wetlands have an important role to play in responding to climate change but we face many significant challenges in aiming for better management and conservation of our wetlands in Australia. Managing wetlands better requires better understanding of how wetlands function, greater appreciation for what we get out of wetlands. Investment in wetland education programs and facilities will guarantee greater understanding and support for wetlands. We also need better tools and partnerships for turning research results into education and training products. HWCA encourages governments at all levels to recognise this and assure that investment in wetland research, education and training becomes a cornerstone requirement for any wetland funding in the future.



Anniversary planting day attendees at the Centre.
 Photo: Christine Prietto



GRAZING AND COASTAL WETLANDS: MANAGING GRAZING FOR PRODUCTION AND COASTAL WETLAND HEALTH

Carla Wegscheidl, Queensland Department of Employment, Economic Development and Innovation

Many coastal freshwater wetlands in Queensland occur on privately owned or managed land, many of which are grazing properties. Wetlands provide important services to landholders including the provision of water and feed for stock, flood mitigation, nutrient cycling, biodiversity and recreational opportunities.

In the past, inappropriate and uninformed management regimes led to the degradation of many coastal wetlands through vegetation removal, pollution, draining, filling, and weed invasion. These changes have not only affected the ecological functionality and biodiversity values of the wetlands but also the production benefits available to the landowner.

It is now recognised that both productivity and good wetland health can be achieved with well-managed grazing.

Supporting wise coastal wetland management

To promote and showcase grazing management that leads to good wetland outcomes, the Queensland Wetlands Program through the Queensland Department of Employment, Economic Development and Innovation (DEEDI), is developing tools and supporting graziers to improve management of coastal wetlands.

The project, which started in 2009, is part of the Queensland Wetlands Program, a joint initiative of the Australian and Queensland governments. The project has four main areas of activity:

1. Funding on-ground works projects to demonstrate good wetland management practices.
2. Developing guidelines for grazing in and around coastal wetlands.
3. Preparing grazing case studies, with economic analyses.
4. Providing graziers with economic decision support tools to explore the costs and benefits of good land and wetland management practices.



The fencing and revegetation on-ground works project helps to control stock access to a wetland in the Sunshine Coast hinterland. Photo: Carla Wegscheidl



Fencing and installation of an off-stream watering point was undertaken to reduce cattle access to the Auburn River near Mundubbera. Photo: Carla Wegscheidl



Managed grazing of wetlands can help support both productivity and wetland health. Photo: Carla Wegscheidl

Managing grazing and coastal wetlands

On-ground works projects were undertaken to demonstrate how grazing and wetland health can be co-managed. Four graziers were funded to complete on-ground wetland management projects.

Two graziers near Mundubbera and two from the Sunshine Coast hinterland between them installed almost five kilometres of fencing and off-stream watering points to manage grazing in approximately ten hectares of wetlands. The fencing and off-stream watering allows the graziers to manage stock access to the wetlands, improve pasture management, and better control their herd. Stock is excluded from the wetlands during the wet season to prevent bogging and erosion of wetland soils, and to enable recruitment of wetland plants. Strategic grazing during the dry season provides relief feed for stock, controls weeds, and keeps grasses down, which reduces fire fuel loads.

One of the graziers has found that the fencing makes it easier to move stock around the property, rest pastures and strategically graze the creek banks, and they have seen an improvement in the pasture condition, with fewer weeds. They have also noticed less erosion of the creek banks and more birds, frogs and fish living in the creek.

These strategic grazing management projects demonstrate the advantages of managing grazing for both production and wetland health.

Despite the clear benefits, wetland management actions such as fencing, off-stream watering and managed access can be costly and not an immediate priority for grazing properties.

Feedback from the graziers involved in the on-ground works projects was that financial incentives, such as those provided through the Queensland Wetlands Program or by natural resource management organisations, under the auspices of *Reef Rescue*, provide the impetus for carrying out desired management actions.

Developing grazing management guidelines

Grazing management lessons learned from the on-ground works projects will help inform guidelines being developed on managing grazing in and around Queensland's coastal wetlands. These guidelines will identify how grazing can be managed for healthy coastal wetlands.

Economics of good grazing management

To accompany the guidelines, case studies with economic analyses will highlight the costs and benefits of different wetland management practices in grazing systems.

Economic decision support tools have also been developed and delivered to help graziers explore the economics behind different land and wetland management practices, such as improving land condition and managing wetlands and frontage country. These tools provide graziers with the opportunity to look at different enterprise and land management options for their grazing enterprise and what it means for their bottom line.

The suite of products, tools and support provided by DEEDI, as part of the Queensland Wetlands Program, will help graziers throughout Queensland protect and manage their wetlands, and maintain the production and community services provided by our wetlands.



ADAPTATION OPTIONS FOR WETLANDS AND WATER MANAGEMENT: WHERE DO WE BEGIN?

Margrit Beemster, Institute for Land, Water and Society, Charles Sturt University, New South Wales

Managing wetlands in the Murray-Darling Basin is challenging and is expected to be even more so in the future in the face of climate change. But just what can we expect; what are the issues that will challenge us the most; and what actions should we take?

These were the questions that a group of 18 technical wetland and water management experts tackled at a workshop on 'Adaptation options for wetlands in the Murray-Darling Basin', organised by the Institute for Land, Water and Society (ILWS) and the National Climate Change Adaptation Research Facility (NCCARF) in Canberra last July.

ILWS is a major research centre within Charles Sturt University which combines the expertise of more than 200 ecological scientists, social researchers and economists. Its principal focus is on integrated research which contributes to improved social and environmental sustainability in rural and regional areas.

The Australian Government established NCCARF in 2007 to lead the research community in a national interdisciplinary effort to generate the information needed by decision-makers in government and in vulnerable sectors and communities to manage the risks of climate change impacts.

"Wetlands in the Basin are already under intense pressure from past and current management practices, including water allocations, and the drought," said wetland ecologist and ILWS director, Professor Max Finlayson. Professor Finlayson heads the 'Wetlands and climate change' theme of the Scientific & Technical Review Panel (STRP) for the Ramsar Convention on Wetlands.

"Climate change is expected to exacerbate all these issues and further complicate how we manage our wetlands with large parts of the Basin, particularly in the south-east, expected to be warmer and drier in the future," he said.

The workshop also included representatives from the Murray-Darling Basin Authority, the Australian Government's (former) Department of the Environment, Water, Heritage and the Arts, New South Wales Department of Environment, Climate Change & Water, CSIRO's Water for a Healthy Country Flagship, and the Australian National University.

Among those attending was the Deputy Secretary General of Ramsar, Dr Nick Davidson, who is based at the organisation's Swiss headquarters in Gland, Switzerland. Dr Davidson, an adjunct professor with ILWS, provides a summary of the key issues identified at the workshop.

Overview

Three key overarching issues: scale, variability and risk, need considering for climate adaptation planning.

"In the Murray-Darling Basin there is a particularly big challenge, of understanding not only how the Basin currently functions and what is going on over the short term, but also to set this in the context of much longer pattern of cycles of climatic change in the Basin," said Dr Davidson. "There is strong evidence that the Basin has gone through long cycles of dry and wet periods. We know from records of the past 100 years or so that there have been drier and wetter periods with a pronounced drought for much of the past decade preceded by a relatively wet period. What we don't know is whether this is typical and if it is, for how long do such periods last? What we are now scratching our heads about is what added effects the warming impacts of climate change will have on what is already a dry period for the southern part of the Basin. Planning for the future, informed by the past, is a challenge because past conditions are unlikely to be what we face in the future. Our historic experience may not be that helpful in helping us adapt to what we (both people and the natural environment) may face in the future."

Dr Davidson said there was a general perception that if you have a dry wetland and put water back you will have the same wetland back again. "You will get back a wetland but it may not be the same type of system as previously," said Dr Davidson. "You may get different responses from species; you may have invasive species that take over... However, these may be just initial responses and not what the system evolves into in the long-term."

The workshop looked at what sorts of future climate scenarios are the most appropriate to use to predict what might happen.

"In general people have been looking at the 'average' or 'median' of the different climate prediction models," said Dr Davidson. "However, the discussion identified that this might not be the best approach on which to base



Fivebough Swamp near Leeton.
Photo: Margrit Beemster

Fivebough Swamp near Leeton. Photo: Margrit Beemster

adaptation strategies, since there is uncertainty about what the climate trajectory will actually be in the Basin. It may be more appropriate in terms of risk strategies to plan for the more extreme or driest scenarios, since otherwise we will not be prepared for how to respond. But whatever happens with the future climate of the Basin, the studies show us that the impacts we already have from existing water extractions are of a greater magnitude than the likely added change induced by a warmer climate. Our understanding of that is a very important component of a knowledge base for working out what sort of adaptation responses can be made; what is feasible within the current system of management; how extreme may be the need to make major changes in water management; and who will be affected by that?"

While understanding how ecological systems in the Basin would be affected by current and predicted future changes, and how to manage for that is important, absolutely critical is understanding the socio-economic implications of the changes, and of the possible ecological responses. "Connecting the social story to the ecological story is critical, something strongly recognised during the workshop," said Dr Davidson. "Social scientists and the ecologists must work together to assess what the likelihood of success is for any adaptation responses."

The workshop identified the need to compile better Basin-wide information on the full range of different types of wetlands, their distribution and importance, as the basis for determining how and where to best maintain the full range of types of wetland.

"There's been a focus on floodplains at the moment because they are under particular pressure but there is a whole portfolio of wetlands in the Basin," said Dr Davidson. "The challenge for the future is what to focus on and what to let go. The issue of managing wetlands for change is something that the Ramsar Convention recognises but doesn't necessarily have the portfolio of tools and responses to help countries do. The experiences that are coming out of Australia's discussions on the Murray-Darling Basin will provide significant intelligence and understanding of a practical situation and how it may be addressed. This will be highly relevant to other countries that may have not yet gone as far down this line of thinking nor have the legislative policy framework as strongly in place as does Australia."

What Dr Davidson also gained from the discussions at the workshop and is taking back into the current work of Ramsar's STRP on guidance for designating Ramsar sites and describing and maintaining their ecological

character, includes the particular experiences and challenges for managing for wetland wise use in a naturally highly variable system such as the Basin, with the added implications of a changing climate – and what this means for a country in meeting its Ramsar commitments.

"The particular ecological character of a designated Ramsar site at the time of its designation in places like the Murray-Darling Basin will be hugely dependent on what point in a wet-dry cycle a site was designated," said Dr Davidson. "If you happen to designate your site in a wet period, the ecological character description of the site may not take into account that this varies according to which stage of a natural cycle it is in; its character in a dry period will be just as important a feature of how such a wetland functions. This needs to be understood and factored in to assessing 'limits of acceptable change', how to identify when the character of such a wetland has gone beyond its natural variability. Trying to force sites back to a reference condition at the point of their designation may not be the appropriate or effective response, especially with a changing climate. I don't think that is as well grasped as it could be, and the guidance we have currently under the Convention doesn't yet speak strongly to these sorts of issues."

The workshop recommended that the experience of the adaptation approaches used and being developed for the Murray-Darling Basin be prepared as a 'case study' for Ramsar on managing wetlands for global change, including with a changing climate, and particularly in periods of water stress and shortage.

A second follow-up action from the workshop is to look more closely within the Murray-Darling Basin at what ecosystem services the wetlands provide now and have provided in the past, for example, assessing and codifying these services for the different wetlands.

"We need to better understand the range and value of services provided by wetlands," Dr Davidson said. "When you have to make the hard decision of whether to put water into a wetland, you need to know what the implications of that are in terms of climate change adaptation responses. We need to look not just at nature conservation but other services as well; not just services to people locally but to the Basin as a whole. Some parts of the Basin still have a single sector (nature conservation) management approach. Such an approach can undervalue the overall importance of a wetland and its services, and risk decisions about the fate of the wetland being made in ignorance of its true value to people and climate adaptation."



PROTECTING POPULATIONS OF MURRAY HARDYHEAD IN LAKE ALEXANDRINA, SOUTH AUSTRALIA

Pip Taylor¹, Adrienne Frears¹ and Arkellah Hall²

Two populations of the nationally 'vulnerable' (*Environment Protection and Biodiversity Conversation Act 1999*) and internationally 'endangered' (International Union for Conservation of Nature Redlist) native freshwater fish; Murray hardyhead (*Craterocephalus fluviatilis*), have been saved from the effects of drought through the delivery of environmental water from The Living Murray program and proactive intervention. The South Australian Murray-Darling Basin Natural Resources Management Board (SA MDB NRM) and the Department of Environment and Natural Resources (DENR) are involved in a collaborative project to monitor and manage threatened fish populations at wetlands in Lake Alexandrina, South Australia.

Lake Alexandrina forms part of the Coorong, Lower Lakes and Murray Mouth (CLLMM) Wetland of International Importance, under the Ramsar Convention listed 1985, and is noted for its unique ecological components and abundance of ecologically significant species of fauna and flora. Lake Alexandrina is also an icon site under The Living Murray program.

In 2008, a threatened fish condition monitoring program, carried out by the University of Adelaide, located a population of more than 500 adult Murray hardyhead in Boggy Creek on Hindmarsh Island, Lake Alexandrina. The population was stranded as a result of drought conditions, with receding water levels concentrating the fish in a small section of the creek. Due to the extended disconnection from Lake Alexandrina, ongoing drought and high evaporation rates, the site was in danger of completely drying out in early 2009. As part of DENR's Drought Action Plan, approximately 200 Murray hardyhead were removed and maintained in a specialised captive breeding program undertaken by the Murray-Darling Freshwater Research Centre (MDFRC) before the site dried completely in February 2009.

After successful breeding of Murray hardyhead at MDFRC during early 2009 approximately half of the fish were released back to Boggy Creek after the site received

environmental water from Waterfind's Healthy Rivers Australia.

The remaining captive-bred fish were released into a surrogate refuge site in the Eastern Mount Lofty Ranges. The site now holds a 'back-up' population from which stock can be reintroduced back into the Lower Lakes when conditions improve.

Environmental water from The Living Murray program has been delivered to the site since April 2009 following development of successful proposals through the Department for Water. Monitoring was conducted in November 2009 and repeated in March 2010 and indicated very encouraging results. Mostly young-of-year Murray hardyhead were captured in November 2009, and an abundant adult cohort was sampled in March 2010. Therefore, a successful recruitment event was confirmed for the 2009-2010 breeding season. This signals the



Murray hardyhead were found in Boggy Creek October 2008. Photo: Adrienne Frears



Boggy Creek February 2009 (pre-pumping) Photo: Adrienne Frears

1 South Australian Murray-Darling Basin Natural Resources Management Board

2 South Australian Department of Environment and Natural Resources



Murray hardyhead were fed brine shrimp at their temporary home. Photo: Adrienne Frears



Murray hardyhead in Boggy Creek. Photo: John Kruger

success of the watering intervention, which prevented the habitat from drying, enabling the population of threatened fish to be maintained.

The watering of Boggy Creek most likely triggered a food-web response that provided food for Murray hardyhead as all fish captured in March 2010 were, visually, in very healthy condition. With the aim of informing future management options at Boggy Creek and other sites in the Murray-Darling Basin, a study comparing zooplankton emergence and fish diet at Boggy Creek with un-watered 'control' sites on nearby Mundoo Island has been undertaken to identify some of the specific factors that resulted in the successful recruitment. The study was managed by the South Australian Murray-Darling Basin Natural Resource Management Board and funded through The Living Murray 'Intervention monitoring' program and undertaken by researchers from the University of Adelaide.

A report has been produced outlining the impacts of watering on the zooplankton community and Murray hardyhead recruitment as well as a dietary analysis of Murray hardyhead compared with the introduced fish species *Gambusia*.

Due to the drought, the number of wild populations of Murray hardyhead in Lake Alexandrina and Albert has dropped dramatically since spring 2008 when 14 healthy populations were recorded by The University of Adelaide and the South Australian Research and Development Institute, Aquatic Sciences. Boggy Creek is now one of only a few remaining freshwater channel systems in the Lower Lakes and is one of only four remaining sites that currently host Murray hardyheads in the Lower Lakes.

Since April 2010 water levels in Lake Alexandrina have continued to rise. In September the site was reconnected with the rest of the Lake and the Murray hardyheads now have the chance to recolonise to other parts of Lake Alexandrina. Monitoring by the University of Adelaide later in the year will identify any newly established populations. An environmental water allocation has also been approved through The Living Murray program which will ensure water to the site for the remainder of the financial year if needed.

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

WETLAND TENDER PROGRAM SUCCESS STORY IN WESTERN VICTORIA

Wimmera Catchment Management Authority, Victoria

For some people it's seeing the brolgas, swans, herons, ducks, spoonbills and frogs. For others it's looking after the majestic river red gums and appreciating wetland plants such as the rushes and sedges, water-ribbons, cane grass, bright yellow swamp billy-buttons and striking purple Broughton pea flowers.

For others it's about wanting to conserve and protect their part of the natural world and help return their wetlands to their original glory. For others it's wanting to make sure their wetlands are a functioning part of their overall goal

to carve out a sustainable existence on their land. And for others it's just about appreciating the value of the Wimmera region's 3000-plus wetlands, which equates to 25 per cent of wetlands in Victoria.

So what is it about the Wimmera's wetlands that are so special? First, the region is home to the internationally significant Lake Albacutya, which is Ramsar-listed. As well, 14 of the region's wetlands are recognised as nationally significant in the 'Directory of Important Wetlands in Australia'.



The diversity of the Wimmera's many wetlands is what makes them significant. There is a diversity of wetland types in the area and also a vast variety of regional and migratory birds, animals and plants including many that are on Australia and Victoria's threatened species lists. These include the growling grass frog, brolga, blue-billed duck, freckled duck, golden-rayed blue butterfly, red-necked avocet, red capped plover, salt paperbark, ridged water-milfoil and swamp she-oak.

What's also significant is what these wetlands mean to Wimmera people. When Apsley farmers Don and Jo Murdoch had a chance to buy a 20 hectare wetland near their south west Wimmera property, a large expanse of water with a staggering amount of birdlife including black-winged stilts, they described it as finding their own Knoydart.

And then there's Mareeta Cox, who has returned to her family farm between Coleraine and Harrow after living and working overseas. "It's like having a big garden. It's a bigger piece of Australia that you're looking after. It's not just about imposing your will on the countryside by planting grasses for stock, it's a new learning curve working out how to get native species back to the way you imagine they once were."

But it's not all good news for Wimmera wetlands. When researchers mapped the region's wetlands in 2004, they discovered that 18 per cent of them had been lost since mapping ten years earlier. Shallow seasonal freshwater wetlands are at particular risk – with continuous dry years in the region resulting in many landholders being able to crop and graze wetlands areas usually under water.

Recognising the value of Wimmera wetlands and a need to restore, revegetate and better manage them, the Victorian Government has made a significant investment into wetland management programs.

For many years this government investment was in the form of traditional incentive programs for improved wetland management. In recent years, these proved to have limited appeal to landholders and Wimmera Catchment Management Authority and the Department of Sustainability and Environment needed an alternative. With more than 90 per cent of Wimmera wetlands on private land, a successful partnership between landholders and natural resource management agencies was the critical factor.

So they turned to the Habitat Tender program, a market-based tender approach that gives private landholders the opportunity to bid for the price they would like to receive to conserve and improve the health of wetlands on their properties.

Paul and Liz Jackman are just one of many south-west Wimmera landholders that are part of the Habitat Tender program. The couple has made a commitment to protect and improve a 68-hectare wetland on their

property. "This is a real partnership," Paul says. "Nature's doing it partly, we're partly doing it and Wimmera Catchment Management Authority's helping too. It's a real combination of efforts."

This is why Habitat Tender works so well; the result is of benefit to the landholder as well as to the plants, birds and animals that our wetlands sustain.

Currently in its third year, the wetland conservation part of the program had resulted in more than 1300 hectares under management agreement, including 57 wetlands and their buffer areas containing substantial remnant native vegetation. About 20 per cent of this total area will be protected by conservation covenants.

The Habitat Tender program has also led to conservation of more than 120 hectares of threatened Buloke woodland.

For Mareeta Cox, one of the best aspects of the program is the professional advice from natural resource management agencies. "It's just so nice to have a program that's rewarding farmers for looking after their natural resources. I know I couldn't have afforded to do it otherwise," she says. "To be financially compensated to protect and better manage existing wetlands and native vegetation is a great investment for everyone's future. It's also good to be able to put a financial value on farm land that people previously thought had little value, like scrubby areas. So if people start thinking that protecting these areas of land could be financially valuable to them, then we'll see more people looking after their native vegetation."

Don and Jo Murdoch, who have made a five year commitment to a 20 hectare wetland on their property,



Jo and Don Murdoch at their 'Knoydart' freshwater meadow wetland. Fencing, controlled grazing plus weed and pest animal control are part of their Habitat Tender management plans for the site. Photo: David Fletcher

also see many benefits of the program. “Through this program we are able to make more money from doing environmental work than what we would in trying to run sheep on this wetland.” Habitat Tender also fits perfectly with their whole farm planning and doesn’t impact on productivity. “The funding side has certainly motivated us at this site because we’re being paid for management as much as the infrastructure. It’s a reasonably sized site that you might not tackle yourself and it’s also great to tap into

the knowledge that’s available at Wimmera Catchment Management Authority. We’re enthusiastic but not knowledgeable, so it’s great to have access to people who are so helpful and motivating.”

For more information about Wimmera wetlands phone Wimmera Catchment Management Authority on 03 5382 1544 or visit website www.wcma.vic.gov.au

PROCESSES THAT LINK AQUATIC HABITATS ACROSS THE LANDSCAPE

Kay Morris^{1,2}, Elisa Raulings² and Phil Papas¹

Loss of connectivity

Reduced wetland connectivity, in addition to pressures from climate change, pose a serious threat to wetland biodiversity. Processes that connect habitat patches across the landscape have been altered by human activities. For example, the diversion of water for human use has decreased flows in rivers and reduced the frequency and extent of flooding. In addition, the extensive loss of wetlands since European settlement has increased distances among aquatic habitats. These changes have reduced the ability of organisms to move among wetland habitats.

Protecting and restoring connectivity in the landscape will help to maintain the biodiversity and resilience of aquatic ecosystems. To achieve this, an understanding of how aquatic habitats are linked across the landscape is needed. Work undertaken at Monash University, and a new project at the Department of Sustainability and Environment’s Arthur Rylah Institute, is identifying how wetlands are linked across the Victorian landscape by dispersal.

The role of dispersal in connecting aquatic habitats

Wetlands can be viewed as islands surrounded by inhospitable land. Despite this seeming isolation, wetlands are often linked across the landscape by dispersal. Dispersal is the movement of an organism among habitat patches and plays an important role in how ecosystems function. In wetlands, dispersal helps to maintain biodiversity as it facilitates the re-establishment of species

that perish during a disturbance event, such as prolonged drought as well as allowing certain species to optimise habitat availability at a local, regional or continental scale as wetlands fill and dry. Dispersal also allows new species and new genotypes to colonise a site that may be more adapted to the local conditions. This is especially important in systems that have changed due to threats such as salinity or altered water regime.

Aquatic organisms move across the landscape in different ways. For example, waterbirds are highly mobile and can move among wetlands separated by tens and sometimes thousands of kilometres. These movements are triggered by changes in the availability of water or represent migratory movements. Other organisms, such as plants and many invertebrates, rely on wind, water and waterbirds to disperse their propagules to new sites. Propagules include the seeds and vegetative fragments of plants, and the desiccation resistant eggs of invertebrates.

Wind, water and waterbirds not only disperse different types of propagules, but connect habitats in different ways. Wind disperses propagules that are very small and light, or that have special adaptations. For example, *Phragmites* seeds have a feathery appendage (known as a ‘pappus’) that helps them to stay in the air and disperse further. Dispersal in wind is more effective in connecting wetlands in regions that experience strong winds, and when wetlands are close together and aligned with the direction of the prevailing wind.

Water connects habitats longitudinally, laterally and vertically. In rivers, habitat patches are connected longitudinally, by the movement of propagules from upstream sites to downstream sites. Sites are connected laterally when propagules move between the river and floodplain. Movement of organisms in water can also connect the riverbed to the hyporheic (subsurface) zone. Floods are important dispersal events as they flush seeds that have accumulated within vegetation into streams, and they fragment and uproot plants which are then dispersed

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2 Australian Centre for Biodiversity, School of Biological Sciences, Monash University Clayton, Victoria Australia 3800



in floodwaters to distant sites. Buoyant propagules are usually dispersed further than those that sink.

Waterbirds disperse propagules when they become attached to their feet, feathers or bill, or when they are consumed and survive gut passage. Waterbirds have the potential to disperse propagules to sites not connected by water and are important in dispersing propagules across catchments. In this way waterbirds play a critical role in connecting aquatic habitats.

Research to improve our understanding of connectivity

Research at Monash University has focused on assessing the dispersal of aquatic plant propagules by wind, water and waterbirds into wetland systems in the Gippsland Lakes, south-eastern Australia. To assess these vectors, traps designed to capture seeds in transit were placed around the perimeter of wetlands, and rivers adjacent to the wetlands were trawled using nets. Propagules carried by waterbirds were assessed from faecal pellets, and by opportunistically sampling the feet and feathers of ducks that were collected by hunters. Propagules were collected regularly over a year and germinated for species identification.

The sampling is now completed and the dispersal potential of each vector is being appraised by comparing native and alien species carried by each vector, their relative abundance, and seasonal patterns of dispersal.

At the Arthur Rylah Institute, a review of wetland connectivity is being undertaken for a range of aquatic organisms including invertebrates, frogs, plants, and waterbirds. The review will summarise the dispersal biology of these key groups and identify the factors that impede or facilitate their movement among aquatic habitats. This knowledge will improve our understanding of the processes that connect aquatic habitats and will provide the basis for developing a model of how Victorian wetlands are connected.

Applications of the research

The two research projects, along with information on wetland values and threats will help assist the management of aquatic habitats at local and landscape scales. For example, understanding patterns of connectivity in the landscape will help to identify wetlands that form key linkages in the landscape. These sites are likely to be pivotal to the resilience of the wetlands that they connect. For degraded wetlands, understanding landscape connectivity will help to identify if a loss in connectivity could be contributing to poor condition, and how connectivity may be restored. Knowledge of connectivity may also be used to limit weed invasion. Importantly, understanding how dispersal connects habitats in the landscape will allow sites for restoration, acquisition or creation to be identified that will have flow on benefits to other habitats through dispersal.

WETLANDS ON FARMS IS A WINNER FOR LONG-TERM SUSTAINABILITY

Libby McIntyre and Sam Davis, Industry and Investment New South Wales

To a large degree, the health of wetlands in New South Wales is in the hands of our farmers, as the majority of wetlands are found on private property. For the past three years, the Wetlands on Farms project team has been assisting landholders of inland New South Wales to integrate wetland management into longer term farm planning.

The Wetlands on Farms project spanned eight inland catchments, with a total of 52 wetland management plans completed for many locally and regionally significant wetlands. Recommendations ranged from managing livestock around huge ephemeral lakes near Tibooburra in the far west, to weed control in delicate upland swamps near Breadalbane in the south east.

Staff from the Conservation Action Unit of Industry and Investment New South Wales facilitated the development of the plans, which were designed to increase the landholder's knowledge and enhance the conservation of their wetlands. Each plan contained details specific to the property location, providing descriptions of local hydrology, soils, flora and fauna. Landholders supplied information about current and proposed property infrastructure such as location of fences and watering points and described threats to their wetlands. In general, unmanaged stock grazing, weeds, pest animals and changes to flow regime were cited as the main problems.

Landholders were also asked about their aspirations for their property, with a particular focus on wetland areas. This

information assisted in the development of wetland specific goals. The goals were then translated into on-ground activity and tailored actions, budgets and timelines. These plans now provide an important resource that landholders can utilise to assist with applying for incentive funding. Project staff were then able to assist landholders to complete funding applications for on-ground works as opportunities arose and many works have now been carried out.

In addition to the 98 landholders that participated in the project, a local council and an Indigenous landcare group in the Western Catchment also opted to formulate a plan for wetlands under their care. The focus of these groups and private landholders has been a vital part of the success of this project. Overall response to the project from landholders was noted as “a rewarding and positive experience”.

Although Wetlands on Farms focused on delivering management actions for sustainable long-term use of wetlands through the planning phase, it also provided opportunities for knowledge exchange. The learning process helped change attitudes and raised considerable awareness amongst numerous landholders, many of whom were already knowledgeable and willing, but were unsure how to put it into practice to care for their wetlands. Landholders were also particularly interested in learning how to identify wetland plants and animals and pursue further training opportunities to manage their wet areas.

The Wetlands on Farms project was jointly funded by the Australian and New South Wales governments through National Action Plan Strategic Reserve Activities, *Natural Heritage Trust* and *Caring for our Country* funding. Industry and Investment worked with eight inland Catchment Management Authorities, the Murray Wetlands Working

Group, Department of Environment, Climate Change and Water (DECCW) and many enthusiastic wetland landholders to ensure the success of the project.

Wetlands on Farms has provided an opportunity for private, community and government managers to affect change in management practices around wetlands and associated rivers and creeks. To date, a total of 113 916 hectares of wetlands and 383 kilometres of riparian zone across New South Wales now have a Wetland Management Plan.

For further information: Senior Conservation Manager, Sam Davis sam.davis@industry.nsw.gov.au

Further reading: Recommendations for managing wetlands on farms in inland New South Wales

www.dpi.nsw.gov.au/fisheries/habitat/rehabilitating/fish-friendly-farms/recommendations-for-managing-wetlands-on-farms-in-inland-new-south-wales.



Wetland filling with water from the Darling River near Wilcannia. Photo: Libby McIntyre

WETLANDMAPS – MAKING WETLANDS INFORMATION AVAILABLE TO EVERYONE

Steve Jones, Queensland Department of Environment and Resource Management

WetlandMaps, the online mapping application of the Queensland Wetlands Program, provides an interactive map service that gives users fast and easy access to wetland information through a web-based geographic information system (GIS). The WetlandMaps function, funded and developed by the Queensland Wetlands Program delivers the most rigorous, accurate and current mapping of wetlands in Australia.

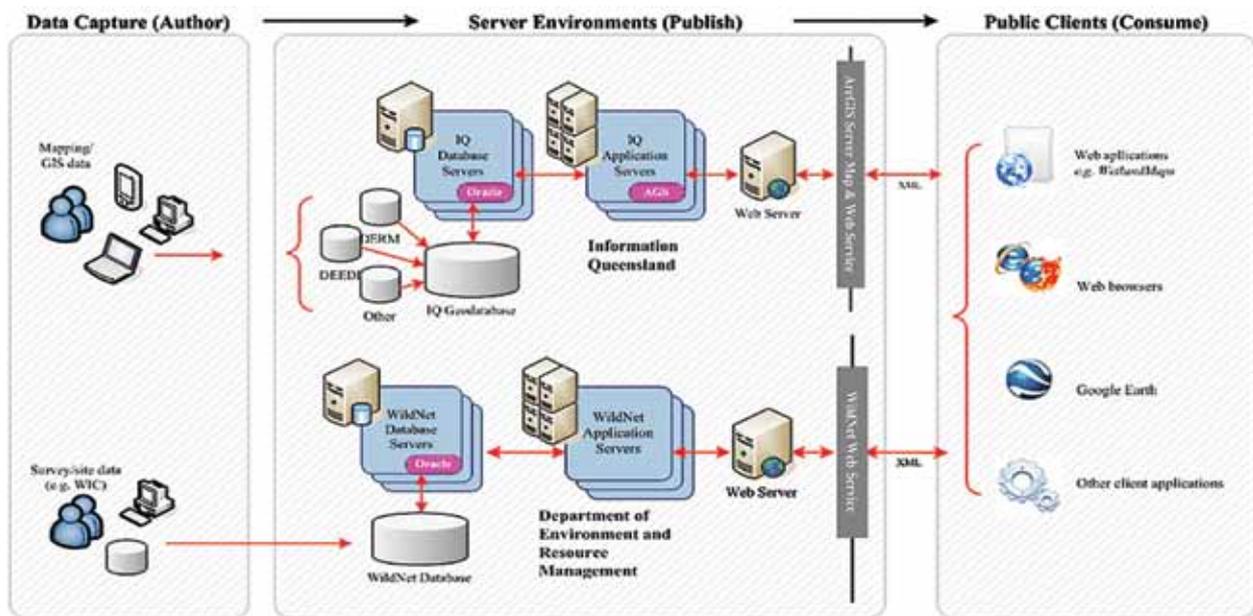
No other mainland Australian state has mapped wetlands at such a scale over an area the size of Queensland. WetlandMaps makes wetlands information available to everyone: government, business and community.

Background

The Queensland Wetlands Program, was established in 2003 to support projects and activities that result in long-term benefits to the sustainable management, use and protection of wetlands in Queensland, particularly the Great Barrier Reef catchments. The Queensland Wetlands Program is a joint initiative of the Australian and Queensland governments to manage and protect wetlands across Queensland.

Early in 2006 the Wetland Mapping, Classification and Inventory project of the Queensland Wetlands Program conducted extensive stakeholder consultation throughout Queensland by way of an online questionnaire and a





How WetlandMaps works: integrating wetland inventory and wildlife data into WetlandMaps. Because of the spatial nature of the environmental information, GIS technologies provide an appropriate solution for integrating and linking environmental information. WetlandMaps uses web services to dynamically extract information from WildNet, which enables users to examine changes in wildlife numbers and distributions in relation to the locations of wetlands and to examine and discover relationships. WetlandMaps provides an important mechanism for improving public access to a range of disparate information, potentially resulting in increased public debate and government responsiveness on topical issues, such as climate change.

series of workshops and meetings. The purpose of the workshops was to determine what wetland information stakeholders wanted and in what format. Comments from the consultation clearly identified the need for an easy-to-use interactive interface for wetland information discovery and delivery. The information had to be current and easily available to all sectors of government, community and industry. The workshops also demonstrated that for clients to use the information gathered through the Queensland Wetlands Program on a regular basis, it needed to be delivered through an accessible website and web map server with data download capabilities.

The findings of the workshops and the requirements for an interactive map server resulted in the Wetlands Map Server project developing WetlandMaps.

WetlandMaps became operational in 2009 and currently provides an interactive map service that gives users fast and easy access to wetland information by way of a web-based geographic information system.

What WetlandMaps delivers

WetlandMaps delivers more than just maps; the system is based on dynamic databases, so users can mine the map interface to reach current information on wetland species, ecosystems and the latest survey material. WetlandMaps uses innovative web services to interface to the WildNet and Wetland Information Capture System databases, internal Queensland Department of Environment and Resource Management (DERM)-based systems, to return wildlife and wetlands inventory information to users. These web services allow computer systems to exchange information. This is a world class, innovative feature.

The interactive nature of WetlandMaps allows all users to target specific locations and obtain customised information and reports about wetlands.

Spatial visualisation also adds an extra dimension to the user's experience. Location intelligence has been a valuable tool for communicating information about wetlands and other environmental data to users.

WetlandMaps makes wetland information available to everyone and delivers information about the environment and natural resources and promotes community awareness of wetland environmental values in Queensland. Community members create their own customised, high quality maps that provide information about the environment and natural resources. The public accesses the same information available to the government thus ensuring complete transparency in government process.

WetlandMaps contributes to sustainable outcomes by promoting community awareness and educating the public about wetlands and biodiversity within Queensland. The system provides the public with an opportunity to assess a range of environmental values associated with a specific area, including rare and threatened species habitat, protected area estate boundaries, and regional ecosystem information.

The service of WetlandMaps delivers efficiencies for business. Previously users needed to contact an office of the Queensland Government to request these maps or visit an office to obtain maps. Now maps are accessed online by members of the public from their homes or offices. Because the maps are produced from the same information used by government decision-makers, there is no additional cost to maintain this information or to make the information publicly available.

Access WetlandMaps through:

<http://www.derm.qld.gov.au/wetlandinfo/site/MappingFandD/WetlandMapsAndData/WetlandMaps.html>

MAKING THE CONNECTION TO A HEALTHY CORNER INLET

West Gippsland Catchment Management Authority, Victoria

Have you ever heard of a southern gobbleguts or iridescent southern dumpling squid? What about seastars, sea squirts, urchins, anemones and broad-leafed seagrass? Are you aware of what impact your land activities have on the health and survival of underwater creatures in southern Victoria's Corner Inlet?

These are among questions posed to the Corner Inlet community as part of a landscape-scale approach to natural resource management. The response is inspiring. Increasingly people are starting to talk about what is so special and unique about this part of the world.

Corner Inlet is the most easterly, and consequently the warmest, of Victoria's large bays and adjoins Wilsons Promontory National Park. The 67 000 hectares of wetlands provide habitat to tens of thousands of migratory birds and a home to the southern-most stand of white mangrove in the world. The significance of Corner Inlet is recognised world-wide with the area listed as a Wetland of International Importance under the Ramsar Convention.

The inlet's 2300 square kilometre catchment supports natural landscapes, primary industries such as commercial fishing, beef and dairy farming, and is a major drawcard for tourists and recreational fishing. The catchment area also takes in Corner Inlet and Nooramunga Marine and Coastal Parks, Tarra Bulga National Park and the Strzelecki Ranges.

Corner Inlet is also getting the attention of both the Victorian and Australian governments that have identified it as a priority area for investment and action. Their natural resource management investment aims to improve practices across the catchment and within the Ramsar site to help reduce the impact of poor water quality and protect the unique values of Corner Inlet.

One of the reasons the area remains prominent in the minds of investors is because of the work of Corner Inlet Steering Committee, which formed in 2007 to help protect and enhance the health of Corner Inlet and its surrounding catchments. The group involves landholders and organisations such as dairy groups, water corporations, fishing representatives, Parks Victoria, the Department of Primary Industries, Landcare, the Department of Sustainability and Environment, local government and West Gippsland Catchment Management Authority (West Gippsland CMA).

In early 2010 the steering committee formalised its integrated approach by adopting a new name and a new brand: Corner Inlet Connections... Committed to a healthy Corner Inlet.

Geoff Hocking, West Gippsland CMA chief executive and steering committee chair says: "This committee provides an opportunity for like-minded organisations to advocate more effectively for funding for natural resource management work in the Corner Inlet area. And the great thing is, it's worked. Government investors are starting to recognise just how important the Corner Inlet catchment is and we have been able to attract significant investment to the region."

Geoff says another great outcome of the Corner Inlet Connections brand and approach is that people are talking about Corner Inlet. He says an increasing number of people are sharing their experiences in natural resource management work on farms and across landscapes. "With the shared vision and key message of: Committed to a healthy Corner Inlet, the collective resources of the committee help support and build upon the great work already being done by landholders and community groups."

Corner Inlet landholder Garry Ardley, who farms beef cattle on the Agnes River between Toora and Welshpool, is part of the Corner Inlet Steering Committee. "The amount of information that I can pass onto my Landcare group members from the Corner Inlet Steering Committee is invaluable," Garry says. "It's certainly been good to be in the loop of what's happening in the bigger picture and giving feedback to the committee from a landholder perspective. By working together at a group level, network level and committee level we all gain from it – and at the end of the day, the environment gains from it."

But you don't have to be part of the committee to see the benefits of linking your on-farm activities to the health of Corner Inlet. Third generation Albert River dairy farmer Richie Egan is one of many landholders who sees a strong link between farming practices and the health of local fishing. His family works closely with natural resource management agencies on projects that provide on-farm gains and also benefit the health of local waterways. Approaches include fencing off and revegetating stream banks and steep gullies, managing salinity, improving soil health, and reducing nutrient and sediment run-off.

"Ten to 15 years ago, people would send their effluent straight down the drains and into rivers and not give a thought to where it would end up," he says. "But these days people see that it is an asset, so they put it into holding ponds then straight back onto their pastures. It's good for farms and for the hip pocket. It helps clean-up the rivers and it improves the health of Corner Inlet's estuaries, and that's got to be good for fishing."





Franklin River. Photo: WGCMA



Landholders Michael and Anna Green. Photo: WGCMA

Dairy farmer Michael Green, who is taking an active role in natural resource management on his farms at Toora and his ‘turnout block’ at Welshpool, does a great job in summing up the relationship between what happens in the hills and underneath the surface of Corner Inlet.

“It’s a pretty intensive farming area around here so we need to be aware of the impact that our farms have on Corner Inlet,” Michael says. “The local fishing industry is important and a few of my fishing friends are a bit concerned about the matter that comes down the waterways into the inlet. Fencing off this steep gully and tributary at Welshpool is one way we can contribute to a broader effort to protect the waterways that run into Corner Inlet.”

Another local who is passionate about the link between farming and fishing is Yarram Yarram Landcare Network coordinator Paul Martin.

Paul believes there’s been a shift in focus towards farming more cohesively with the environment – in the four years he has worked in his landcare role he has seen a growing sense of community awareness of how farming activities impact on waterways and estuarine ecosystems.

“There’s some really great links around here to ensure all the efforts by landholders, the community and natural resource management agencies complement one other,” Paul says.

“These activities ultimately lead to an improved quality of habitat for migratory wading bird populations, seagrass meadows and marine life in the wetlands of Corner Inlet and Nooramunga Marine and Coastal Park.”

To find out more about Corner Inlet Connections, contact West Gippsland Catchment Management Authority on 1300 094 262 or visit www.wgcma.vic.gov.au.

‘LAST PIECE OF THE JIGSAW’: REGULATIONS IN PLACE TO PROTECT WETLANDS AND REEF

Paul Roff, Queensland Department of Environment and Resource Management and Rosemary Lancaster, Queensland Wetlands Program

Lack of water is one of the biggest threats to wetlands. High impact earthworks change the hydrological function of wetlands; they change the manner in which water flows to wetlands and how much water flows in and out. When water flows to wetlands are altered, the ecosystem services they provide are compromised. Protecting wetlands from losing their hydrological function is an important government objective. While water supply to critical assets is dealt with at a landscape level through the water planning process in Queensland, finer scale, wetland specific water diversions are usually dealt with through land use planning processes.

The health of wetlands in the Great Barrier Reef catchments in Queensland has a positive impact on the healthy future of the Reef. It was recognition of the value of these wetlands and their ongoing loss that prompted the Queensland Government in 2009 and early 2010 to put in place additional statutory protection for these vital wetlands.

Wetland and reef protection is the responsibility of all levels of government and the community. As a signatory of the Reef Water Quality Protection Plan (Reef Plan) with the Australian Government, the Queensland Government is responsible for meeting the outcomes of Action 7 under

the Reef Plan: no net loss of the extent and condition of wetlands.

In Queensland, existing legislation afforded considerable protection to wetlands. Previously the Queensland Government legislated to increase this protection by extending the vegetation clearing controls under the *Vegetation Management Act 1999* to riparian and wetland areas. Also new requirements were introduced requiring land holders to develop Environmental Risk Management Plans to reduce the run-off of sediments, nutrients and pesticides into waterways and wetlands.

To address the regulatory gap that left some wetlands poorly protected from high impact earthworks, the Queensland Government introduced the “Temporary State Planning Policy: Protecting wetlands of high ecological significance in Great Barrier Reef Catchments” (SPP Wetlands) and a new assessable development trigger that targets earthworks. This package of statutory planning measures is focused on wetlands of high ecological significance within the Great Barrier Reef catchments and is viewed by the Queensland Government as a ‘last piece of the jigsaw’ to achieve protection of wetlands from the impacts of development.

Why did the government choose regulation to protect these wetlands? The irreversible nature of the damage to wetlands of high ecological significance from high impact earthworks required a solution that was prompt, consistent and enforceable. So regulation was the appropriate solution, combined with education and best practice management guidelines.

In addition, the SPP Wetlands complements existing planning and regulatory frameworks administered by local government authorities. The consistent and transparent process of the statutory planning system offers certainty to stakeholders through the existing integrated development assessment system.

How will the SPP Wetlands afford greater protection for wetlands of high ecological significance within the Great Barrier Reef catchments? The policy identifies works that might impact on the hydrological or ecological functioning of wetlands, including high impact earthworks such as draining and filling wetlands – and requires them to meet the outcomes of the SPP Wetlands code. A new development trigger was created for high impact earthworks and DERM was given responsibility for assessment of such development.

The planning policy seeks to maintain the environmental values of wetlands including the ecological and hydrological connectivity of wetlands to other wetlands. In doing so, it provides additional water security for land holders concerned about disruptions to overland flows or groundwater flows caused by works on neighbouring properties.

The planning policy isn't a list of banned activities; proposed operational activities will be assessed against the policy outcomes and criteria set out in the SPP Wetlands. Artificial wetlands, low-impact agricultural and domestic activities are excluded from assessment. Associated fencing or the construction of small structures such as sheds will remain exempt from the laws and routine agricultural activities such as crop rotation, fallowing fields and harvesting will not require approval.

The planning policy is underpinned by the rigorous mapping and identification systems developed by the Queensland Wetlands Program, a joint initiative funded by the Australian and Queensland governments to manage and protect wetlands across Queensland.

The wetlands covered by the planning policy have been identified using the Aquatic Biodiversity Assessment and Mapping Methodology (AquaBAMM), a rigorous, peer-reviewed assessment process.

Another important underpinning of the planning policy is the ‘Queensland wetlands definition and delineation guideline’. This guideline will be the standard by which to judge the extent of a wetland covered by the planning regulation. Queensland is the first Australian jurisdiction to formalise such a rigorous definition of wetlands.

What will be achieved by this regulation? The additional protection it offers to vulnerable wetlands will contribute to the reduction of the run-off of nutrients, pesticides and sediments into the Reef caused by high impact earthworks. The assessment requirements, which involved input from all levels of government, complete the network of laws that protect the Great Barrier Reef and its supporting wetlands.



Expansion of canefields into wetlands. No buffer areas have been left and a drain has been excavated to speed up the rate of drainage from the cane fields resulting in concentrated discharges to wetlands and waterways. The State Planning Policy is seeking to retain wetland areas to slow discharges to waterways. Photo: Department of Environment and Resource Management



ENHANCING THE LOWER LACHLAN WETLANDS

Fin Martin, Lachlan Catchment Management Authority, New South Wales

The Lachlan Catchment contains eight nationally important and nine regionally significant wetlands that are major bird breeding sites when flooded. However, impacts through reduced river flows, less flooding, poor grazing management and invasive weed and animal species has seen these wetlands decline in condition.

The Great Cumbung Swamp, Booligal Wetlands and Lachlan Swamp have been singled out by the Murray-Darling Basin Authority (MDBA) as key assets that could be recipients of environmental water purchased under the Australian Government's *Water for the Future* initiative and New South Wales Government's Riverbank program. In August 2010 there was 107 000 megalitres of general security and 733 megalitres of high security water available for environmental purposes. This was on top of 20 000 megalitres for ecological contingencies under the New South Wales Water Sharing Plan (WSP) for the Lachlan River, which has been suspended since 2004 due to severe drought.

Previous use of environmental water delivered through the WSP has achieved successful bird breeding events by topping up stock and domestic allocations in Merrowie Creek in 2005 (straw-necked ibis) and Lake Brewster in 2006 (pacific herons, cormorants and pelicans).

Although recent rains in the catchment have boosted Wyangala Dam, the main storage, to 39 per cent as at 25 October 2010 resulting in a 10 per cent allocation to general security licence entitlements, tough decisions need to be made about which wetlands and streams receive the relatively small parcels of environmental water. Not all wetlands will receive water and those that do need to have sufficient water to be effective. For example, maintain a bird breeding event until the independence stage. There will also be a community expectation that any water delivery of this nature will be monitored to assess its effectiveness to achieve expected outcomes.

The Lachlan Catchment Management Authority (LCMA) in conjunction with Lower Lachlan landholders, State Water, New South Wales Office of Water, and the Department of Environment, Climate Change and Water have joined forces to develop a management plan to help determine the most effective use of environmental water to improve the Lachlan's riverine and wetland assets.

The Lachlan Environmental Water Management Plan (LEWMP) offers an open and transparent decision making process to:

- document the current knowledge
 - determine priorities and opportunities for riverine investment
 - coordinate roles and responsibilities
 - engage the community
 - integrate riverine management within government agencies and community stakeholders
 - allow adaptive management through monitoring and evaluation.
- provide direction in riverine management

“With the reality of climate change and expected lower rainfall, this plan will help to improve the health and increase resilience (ability to recover from a drought) of our riverine ecosystems”

Lisa Thurtell, Project Manager, Lachlan CMA.



Ibis breeding at Merrowie Creek. Photo: Lisa Thurtell

“The delivery of environmental water is a work in progress. We don't have all the answers but through some trial and hopefully not too much error, we will be able to monitor the outcomes of supplying water to our wetlands and learn from this.”

Fin Martin, Catchment Coordinator, Lachlan CMA.

WETLANDCARE AUSTRALIA: CELEBRATING 20 YEARS WORKING TOWARD THE CONSERVATION AND WISE USE OF WETLANDS

Liz Hajenko and Kate Heyward, WetlandCare Australia

This year is an important year for wetlands around the world, and those working in wetlands will be celebrating the fortieth Anniversary of the Ramsar Convention established in 1971.

This year WetlandCare Australia will also be celebrating its twentieth anniversary of operation. WetlandCare Australia was established during 1991 in South Australia, with a vision of 'wetland wellbeing for all communities'.

Our founders envisaged networks of wetlands across Australia providing the connectivity to ensure healthy functioning ecosystems that support life. WetlandCare Australia pioneered wetland rehabilitation in the Murray-Darling Basin and has grown since then to become the leading not-for-profit wetland conservation organisation in Australia. WetlandCare Australia has worked towards the protection, conservation and the 'wise use of wetlands' by creating partnerships, building capacity, establishing best practice and celebrating wetlands.

Community capacity building for the wise use of wetlands

Everyone can help protect wetlands. WetlandCare Australia has conducted an impressive 360 training, field days and workshops with 12 500 participants to spread the word and encourage action on the wise use of wetlands across Australia. One of our key tools for community capacity building is the *Wetland assessment techniques manual for Australian wetlands*. This manual has empowered numerous community groups and individuals, often without any technical or scientific training, to assess the health of their local wetlands over time. This technique can also facilitate assessment of the impacts of rehabilitation works, and other external factors such as climate change, into the future.

Partnerships and networks for the wise use of wetlands

Collaboration on projects is fundamental to WetlandCare Australia's project delivery. Over the years we have partnered with at least 25 government agencies and 20 other non-government organisations. Through these

partnerships we have planted an outstanding 196 000 trees and conducted 5500 hectares of weed control to protect and rehabilitate aquatic ecosystems into the future. As secretariat for the Australian Wetland Alliance, WetlandCare Australia is also working at a national and international level to represent those working in wetlands and to raise wetlands on the political agenda.

Best practice for the wise use of wetlands

At WetlandCare Australia all of our work culminates in on-ground change to the benefit wetlands. We set out to implement best practice in wetland protection, conservation, restoration and management by investing in qualified wetland experts and using latest the research and science available. In its 20 years of operation WetlandCare Australia has delivered on-ground works over an amazing 111 000 hectares. This has provided the organisation with a wealth of experience and ability to set the standard for best practice in the industry. Some of the most recent documents to this effect are the *SmartCane riparian and wetland areas on cane farms best management practice guidelines* and the *Wetland rehabilitation guidelines for Queensland's Great Barrier Reef catchments*.

Celebrating 20 years of the wise use of wetlands: the fourth annual WetlandCare Australia national art and photography competition

To celebrate 20 years of hard work, WetlandCare Australia are again holding our national art and photography competition. This year the competition will celebrate the theme of forested wetlands; their importance and wise use. The theme was developed to reflect the theme for World Wetlands Day 2011: wetlands and forests, and to encourage entrants in the competition to consider the vastly diverse ecosystems of forested wetlands and their role in the Australian landscape.

The WetlandCare Australia national art and photography competition celebrates World Wetlands Day on a national



scale, and each year entries are received from a wide diversity of people across Australia with an interest in, and passion for wetlands. The competition has categories for children and adults in art and photography, which gives professional and hobbyist photographers and artists, school groups and community art societies, and anyone who cares about wetlands the opportunity to win prizes and have their artworks and photography exhibited and promoted.

The competition plays a crucial role in raising the public awareness about wetlands in local communities, and many entrants and members of the public are often surprised to learn about the diversity of wetlands in their local area. Parents of children who entered have commented that the competition had facilitated family discussions about wetlands and visits to local wetlands. Teachers from schools which have entered the competition have said that it was a fascinating experience for students and teachers.

Our celebration of wetlands has attracted an incredible level of support. In a first for both WetlandCare Australia and the New South Wales Catchment Management Authorities (CMAs), ten of the thirteen CMAs in New South Wales have banded together to sponsor the competition as a platinum sponsor. This unprecedented show of support indicates the ground-breaking and innovative nature of the competition, and its effectiveness as an inclusive means of spreading the wetland message.

The winners in the 2011 competition will be announced, and the winning works unveiled, on 1 February at the CSIRO Discovery Centre in Canberra, in a celebration of World Wetlands Day 2011. The works will be displayed there for one week, and will then be move to regional exhibitions, hosted by the sponsoring organisations of the competition.

WetlandCare Australia is looking forward to another twenty years of protecting, restoring, and raising the public awareness of our precious wetlands.

For further information refer to the WetlandCare Australia website: www.wetlandcare.com.au.



Wetland safety zone. Photo: Nicholas Duckworth

CLIMATE CHANGE AND MANAGEMENT OPTIONS FOR SPHAGNUM BOGS AND FENS IN THE ACT

Conservation Planning and Research, ACT Government

The mountains of Namadgi National Park rise from the 'Limestone Plains' of the Australian Capital Territory, creating a beautiful natural setting for the city of Canberra and other nearby communities. Within this mountainous region are numerous, mostly small, Sphagnum bog and fen wetlands which are found on peat and other organic-rich soils due to water logging, acidity and cool temperatures.

These fens and bogs play a role in the interception, filtration, storage and slow release of large volumes of water to streams and rivers, and help make the Cotter River catchment within the Namadgi National Park a high quality source of drinking water for Canberra.

The peatlands have characteristic vegetation that sharply distinguishes them from the surrounding woodland-grassland and support a limited number of plant communities including shrubland, moss hummock and sedgeland. They are important as animal habitat, particularly during dry periods.

The Australian Government has listed alpine sphagnum bogs and associated fens as an endangered ecological community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Namadgi National Park wetlands are identified as part of this endangered community.

The Ginini Flats Wetland Complex is one of the larger Sphagnum bogs in Namadgi and is listed under the Ramsar Convention as a Ramsar site. It contains a diverse assemblage of subalpine flora and fauna that are generally restricted to this wetland type, and provides important breeding habitat for the vulnerable northern corroboree frog (*Pseudophryne pengilleyi*). Latham's snipe, (*Gallinago hardwickii*), which is a migratory bird protected under international agreements, also uses the wetland in small numbers.

The 2003 bushfire burnt many of the Namadgi wetlands and several have had extensive rehabilitation to prevent stream entrenchment and subsequent bog drying and loss. Trials to assess bog rehabilitation techniques were carried out as part of this rehabilitation program. Assessment of this work has been based on vegetation recovery.

To support the recovery of the bogs, the Australian Capital Territory Government recently funded and released the *Sphagnum Bog Mapping and Recovery Plan* (Recovery Plan) to contribute to the Australian Capital Territory *Climate Change Strategy Action Plan 2007-2011*. The Recovery Plan was developed through a workshop process whereby expert participants identified threatening processes and long-term management options. It also incorporated mapping developed to identify and characterise peatlands throughout the Australian Capital Territory.

The workshop concluded that climate change is likely to significantly affect sphagnum bogs and fens, threatening ecosystem resilience through drought, increased temperatures, increased incidence of wildfire and invasive species impacts.

A starting point to help manage these important ecological communities has been to establish the location and extent of peatland communities (bogs and fens), which the Sphagnum bog mapping and recovery plan did across the Australian Capital Territory. The mapping is based on orthorectified aerial photographs of the Cotter River catchment, taken immediately after the 2003 bushfire, and pre-fire air photos and Landsat imagery in the Gundgenby River and Naas River catchments. The project was undertaken by the Australian National University, under the direction of Professor Geoffrey Hope from the Department of Archaeology and Natural History.

Three levels of mapping were undertaken, with: identification of 166 peatlands through visual scanning of aerial images and by using existing point data sets; digitisation of boundaries of all peatlands greater than 0.5 hectares in size; and mapping of simplified vegetation units in selected large peatlands. The major peatland sites were visited to field validate, check the digital maps, and to assess their condition. These maps provide land managers with a base line assessment of the wetland distribution, extent and vegetation type distribution of the significant peatlands against which future changes in their characteristics can be assessed. The mapping project also estimated peat volumes and carbon storage of the peatlands. Three management recommendations are made in the recovery plan, to:

- continue the rehabilitation and monitoring of fire affected bogs to prevent stream entrenchment and loss of bog function
- establish long-term monitoring in representative Sphagnum bogs to assess changes in bog functionality due to rehabilitation actions and climate change
- address the threats of invasive species, fire and recreational impacts.

Since the development of the Recovery plan, the Australian Government has funded the development of a Ginini Flats Ecological Character Description, which will further assist in the management of this significant wetland.

For further information on the recovery plan and mapping project go to:

http://www.tams.act.gov.au/_data/assets/pdf_file/0020/172703/Technical_Report_20_Sphagnum_Bog_Mapping_and_Recovery_Plan.pdf

http://www.tams.act.gov.au/_data/assets/pdf_file/0006/172698/The_Peat-Forming_Mires_of_the_Australian_Capital_Territory_screen.pdf



Snowy Flats Sphagnum bog. Photo: Murray Evans



THE RAMSAR MANAGERS' NETWORK: HELPING WETLANDS FOR THE FUTURE

Grant Morgan, Ramsar Managers' Network Coordinator

The New South Wales Ramsar Managers' Network is a group of private and government wetland managers. They are working together to create a sustainable future for Ramsar wetlands that are located on privately owned land or Ramsar wetlands that are community managed.

The Network was established by the New South Wales (NSW) Minister for the Environment in 2003 to give a voice to managers of private and community managed Ramsar wetlands. It was acknowledged that these wetland managers do not have the same resources available to them as do government wetland managers.

The members of the network are responsible for management of some valuable parts of Australia's environmental estate and make an enormous contribution to meeting Australia's obligations under the Ramsar Convention.

There are seven private and community managed areas across six Ramsar sites throughout New South Wales:

- Hunter Estuary Ramsar Site — Hunter Wetlands Centre Australia (formerly Shortland Wetlands) are community managed through the Hunter Wetlands Centre Australia Ltd. The Hunter Estuary Wetlands Ramsar site comprises Kooragang Nature Reserve, which was designated to the Ramsar list in 1984, and the Hunter Wetlands Centre Australia.
- Wilgara Wetlands component of the Macquarie Marshes Ramsar site covers 583 hectares of privately owned land within the greater Macquarie Marshes. It became a component of the Macquarie Marshes Ramsar site in 2000. There are other significant privately owned sites within the Macquarie Marshes also managed with the support from the Network.
- "Goddard's Lease", "Crinolyn" and "Windella" are privately owned components of the Gwydir Wetlands Ramsar site, located between 60 - 80 kilometres west of the town of Moree.
- Fivebough and Tuckerbil Swamps, situated near Leeton in the Riverina district, were designated a Wetland of International Importance on 21 October 2002. Fivebough and Tuckerbil are cared for by a community trust.
- The Paroo River Wetlands Ramsar site is made up of the Nocholeche Nature Reserve Component and the Peery

and Mandalay blocks in the Paroo Darling National Park and is situated in the north-west of New South Wales. It is operated by the New South Wales Parks and Wildlife Service (NPWS) in conjunction with its Traditional Owners.

- From its designation in 2003 until 1 July 2010, the Central Murray State Forest Ramsar site near Deniliquin was operated in community trust by Forests NSW. However, land tenure changes across the three components of the site mean that only the Koondrook-Perricoota State Forest Group component remains under the management of Forests NSW while the Millewa component has been gazetted as National Park with a joint management between NSW NPWS and the Yorta Yorta Indigenous Nation and the Werai Forests component is scheduled to become an Indigenous Protected Area.

This year has been a landmark year for the Ramsar Managers' Network with the appointment of a new coordinator and a shift of administrative functions from Dubbo to the Hunter Wetlands Centre Australia in Newcastle, New South Wales.

Having the efforts of the private and community Ramsar managers recognised is an important part of the Network's actions. Meetings with relevant Australian Government and New South Wales Ministers, and local members of parliament, have helped raise the profile of the Network.

To raise the Networks' profile in the community we have begun developing an online presence with a web portal that will provide reciprocal links to like-minded organisations, supported by social media including Twitter and Facebook.

As Australia's wetlands continue to be threatened it is increasingly important for organisations like the Ramsar Managers' Network to communicate how important wetlands are and demonstrate wise use of wetlands, through industry, ecotourism and education.

For further information contact: Grant Morgan, Ramsar Managers' Network Coordinator, PO Box 292, Wallsend 2287, telephone (02) 4951 6466, email ramsar@wetlands.org.au.

TOM THUMB LAGOON

Renae Riviere, Conservation Volunteers Australia

Originally, Tom Thumb Lagoon wetland, just south of Wollongong central business district, was one of the largest estuarine wetlands along the New South Wales coastline, extending some 500 hectares. Saltmarsh, mangroves and reed beds fringed the wetland channels, along with dense stands of swamp oak and swamp paperbark communities.

Unfortunately, like so many of our coastal wetlands, these natural values were not always recognised and the site was seen to be an ideal location for a deep water port to support the rapid expansion of the steel industry during the 1930s. Subsequently, over the next 40 years much of the wetland was resumed by the creation of a harbour and relocation of dredging materials, and from 1960 until 1991 the site was used as a builders tip. The result of this is that today just 7.7 hectares of saltmarsh, tidal mudflats and ponds remain.

This 7.7 hectares plays a vital role in providing habitat for a diverse range of plant and animal life; including the endangered green and golden bell frog.

The wetland also contains stands of coastal saltmarsh and swamp oak floodplain forest; both of which are listed as endangered ecological communities under the *Threatened Species Conservation Act 1995* (NSW).

In response to the issues facing Tom Thumb Lagoon, The Friends of Tom Thumb Lagoon and Wetland was formed in 1993, initiating works such as weed removal, revegetation, walkway construction, landscaping, minor earthworks, flora and fauna monitoring.

In 2001, Wollongong City Council (WCC) opened Greenhouse Park, encompassing Tom Thumb Lagoon, as a Bushcare site. Conservation Volunteers Australia (CVA) joined forces shortly after, thanks to funding from the corporate sector as well as Southern Rivers Catchment Management Authority and Wollongong City Council.

Together, CVA and WCC host up to 40 volunteers on site two days a week, all year round. This dedicated band of people carry out weed and rubbish removal, seed collection, plant propagation, wetland monitoring, frog surveys as well as planting up to 7000 native plants per year. Last year alone, CVA volunteers contributed a whopping 722 individual volunteer days to the site, weeding 5660 square metres and collecting 295 kilograms of rubbish!

Last year CVA launched the Tom Thumb Lagoon Education Kit, a resource which links aspects of school syllabus to activities able to be delivered on site at Tom Thumb Lagoon.

In 2010 CVA has attracted funding from both state and Australian governments; a Community Action Grant is allowing us to offer educational visits to primary and secondary schools at no cost to the school, other than transport. Since launching this program in April we have had over 140 students visit the site to link classroom learning to their local environment.

A New South Wales Environmental Trust Grant has seen us employ a part time team leader to work on site two days a week co-ordinating a team of CVA volunteers to work on a section of the park recently selected for the installation of two frog ponds for attracting the green and golden bell frog. Over the next two years volunteers will remove 18 600 metres square of environmental weeds and plant over 2000 plants in the area surrounding the ponds, they will also undertake biannual frog surveys as well as participate in workshops such as seed collecting and monitoring and evaluation.

CVA also hosts National Tree Day, National Tree Day for Schools and Business Clean Up Australia Day on site each year in partnership with Wollongong City Council. Tree day events in 2010 were attended by 376 people who planted 1677 native trees, shrubs and grasses.



Main Channel looking East 2009. Photo: Renae Riviere



Volunteers at work 2005. Photo: Renae Riviere



SHOREBIRDS 2020 NATIONAL POPULATION MONITORING PROGRAM

Joanne Oldland, Shorebirds 2020

Australia provides critical non-breeding habitat for millions of migratory shorebirds that use the East Asian-Australasian Flyway (the Flyway) each year. As a signatory to the Ramsar Convention on Wetlands of International Importance (and a number of international conventions and agreements; namely Bilateral Migratory Bird Agreements with Japan, China and the Republic of Korea, Australia has obligations to protect and conserve migratory shorebirds.

Yet current monitoring of shorebird populations in Australia carried out under Birds Australia's Shorebirds 2020 Program suggests significant declines of both resident and migratory shorebird species. Population declines in species of between 10 to 75 per cent over 28 years are becoming apparent, with new analyses suggesting that some of the more common migratory shorebirds may also be declining by up to 10 to 30 per cent over 28 years. Recently, Shorebirds 2020 helped to gather evidence for great knot and eastern curlew to be listed as vulnerable under IUCN, for Flyway-wide declines averaging greater than 50 per cent over 25 years and a rapid 20 per cent Flyway-wide decline over less than five years, respectively.

The critical places these birds use to refuel along the Flyway are being destroyed at an alarming rate and this appears to be driving both long and short term population declines in migratory shorebirds. Not surprisingly, given all the area a migratory shorebird relies on to survive each year, their conservation is not simple. It requires international cooperation to maintain the habitats from Siberia to Australia that they rely on to survive. However, here in Australia we are uniquely placed to use good science to inform with much greater confidence how shorebird populations may be changing. Without that knowledge there can be little hope of making the case for protection of shorebird habitats.

Birds Australia's Shorebirds 2020 National Population Monitoring Program, which is part funded by the Department of Sustainability, Environment, Water, Population and Communities and the *Caring for our Country* program, has been running for over three years now and is raising awareness and actively engaging the community to participate in gathering the information needed to conserve shorebirds. A robust monitoring program has been designed, delivering significant improvements in the quantity and quality of data being collected. There is now a clear understanding of what level of change in national shorebird population trends that data will be capable of reporting.

Importantly, the program is also helping to highlight the importance of protecting Australia's wetland habitats; over

30 of the program's regular monitoring sites are Ramsar wetlands. However, there are many more wetlands outside the Ramsar listed ones that are also vitally important for shorebird populations and that require better recognition and protection. The Shorebirds 2020 program has advocated strongly for increased recognition and protection of these wetlands through the establishment of a tier of nationally significant wetlands for shorebirds to be recognised under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Some of the main achievements of the Shorebirds 2020 Program over the last three years include:

- increased the number of shorebird areas being counted (from 30 core sites to 155 core sites and an additional 225 areas), the number of counters (from 200 to 1300), and the number of people who know about and are interested in shorebirds
- designed a national shorebird monitoring program with clear achievable goals; to identify national population trends of 25 to 52 per cent change in five years for 19 shorebird species and 50 to 80 per cent change in seven species in ten years
- will also greatly improve our understanding of habitat change, threats to shorebird areas, and the role of disturbance in changing shorebird numbers
- identified declines in shorebird populations ranging from 10 to 80 per cent although further work is required to increase certainty in the scale and magnitude of apparent declines
- delivered over 20 workshops on the Shorebirds 2020 program and monitoring methods to more than 700 people throughout the country
- precisely mapped over 200 shorebird areas and over 2000 count areas, which will allow for more systematic data to be collected, and remote sensing analysis
- grown the National Shorebird Database to over one million records, with all records now available online at: <http://data.shorebirds.org.au>
- developed a number of resources on shorebirds and shorebird monitoring, mostly available on our website www.shorebirds.org.au.

Shorebirds 2020 thanks all the dedicated volunteers out there who continue to give up their time to monitor shorebirds at their local beach or wetland.

For more information or to get involved contact Shorebirds 2020 at shorebirds@birdsaustralia.com.au; (03) 9347 0757: www.shorebirds.org.au.



If you would like to tell your story in the next edition of *Wetlands Australia*, or have any feedback on this edition, please contact the Wetlands Section of the Department of the Sustainability, Environment, Water, Population and the Communities on 02 6274 1111 or email: wetlandsmail@environment.gov.au

www.environment.gov.au/wetlands