

### Wetlands Australia

National wetlands update February 2014—Issue No 24



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Cover images

Front cover: Cobourg Peninsula Ramsar site in the Northern Territory contains a range of wetland types that support biodiversity (Jeanette Muirhead)

Back cover: The shorelines of Lizard Bay within the Cobourg Peninsula Ramsar site in the Northern Territory (Jeanette Muirhead)

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#### Introduction to *Wetlands Australia* February 2014

The international theme of World Wetlands Day 2014 is "Wetlands and Agriculture: Partners for Growth".

For millennia, wetlands have been used directly for agriculture, and for supplying food, fuel and fibre to support lives and livelihoods. Wetlands continue to play an essential role in supporting modern day agriculture. They provide water storage, flood buffering, nutrient removal, water purification and erosion control. Sustainable practices which support both agriculture and healthy wetlands are therefore coming to the fore.

This edition of *Wetlands Australia* includes several feature articles on wetlands and agriculture, along with many other articles on current wetland projects and programs.

Australia was one of the first countries to sign the Convention on Wetlands of International Importance (more commonly known as the Ramsar Convention), and in 1974 designated the world's first Ramsar site: Cobourg Peninsula in the Northern Territory. In celebration of the 40th anniversary of the first Ramsar designation, this edition of *Wetlands Australia* also features a series of articles celebrating Australian Ramsar sites.

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



Piccaninnie Swamp in the Piccaninnie Ponds Karst Wetlands Ramsar site in South Australia, Australia's most recently designated Ramsar site (© Copyright, Lara Johnson)



Visitors enjoying the view of the wetland from the Wine and Wetland Centre deck at Banrock Station Ramsar site (© Copyright, Banrock Station)



*The shoreline of Black Point North within the Cobourg Peninsula Ramsar site in the Northern Territory* (© Copyright, Jeanette Muirhead)

### Wetlands and Agriculture: Partners for Growth

## Wimmera wetland project benefits whole farm

Melissa Pouliot, Wimmera Catchment Management Authority, Victoria

Having a plan – whether it is for the day, the week, the month or the next 10 years – is part and parcel of farming.

Since starting in Australia in the 1950's, whole farm planning has become part of the day-to-day language of farmers, natural resource agencies, government and Landcare.

The Wimmera's whole farm planning program, FarmPlan21, is a nationally-accredited course to help farmers achieve personal, financial and environmental goals. Wimmera project officer Rob O'Shannessy says most farmers with wetland areas who complete the course are keen to manage these areas while sustaining a productive enterprise. "Through FarmPlan21, quite a few Wimmera farmers are achieving a balance between managing their wetlands and productivity gains," Rob says. In 2004, second generation West Wimmera farmer Ron Farran made a big step towards achieving his whole-farm-plan balance when he turned his attention to a five-hectare swamp on his land. His dad John, a soldier-settler known as Jack, started a fine wool merino enterprise on 'Ayrlea', near Edenhope, in 1952. In the 60s, alterations to the five-hectare marshy swamp enabled them to expand the farm's grazing area.

Ron and wife Janie, who took over the farm when Jack retired, had a soft spot for the swamp which attracted quite a few birds and featured several red gum trees. Ron was keen to improve its environmental value but with spare cash a rarity



Ron and Janie Farran stand proud on the five hectare swamp they restored on their property in the Wimmera, Victoria (© Copyright, Rachel Farran)



Nyima and Airlie Doelle with their grandparents, Ron and Janie Farran, on the Farran's five hectare wetland that they have restored to its natural state (© Copyright, Rachel Farran)

for many farmers, it remained on his whole farm planning 'wish list' for many years.

10 years ago, with funding available through the Kowree Biolink project and Wimmera Catchment Management Authority, Ron and Janie were able to make some changes. They planted trees around the swamp's border and direct seeded more plants and trees to create a vegetation corridor to join the Kowree Biolink. Ron says it was an extra incentive knowing their work was part of the four-year biolink project which established a habitat corridor between the Glenelg River and the Little Desert National Park, an area of around 948 hectares. The other part of the project was to look at drainage and make the wetland 'wet' again.

Ron says he's always been a 'natural' type of farmer so it was logical to transform the area into a more natural and sheltered habitat. He says the work has resulted in many benefits on his farm, both financial and environmental. "Being in the centre of the farm, returning this area to its natural state has enhanced the whole farm. It has created shelter belts for stock and it protects a large part of the farm from wind because it's in a central position." Ron says when water dries up over summer, native vegetation cover prevents the area's surface soil from blowing away. The return of smaller birds, ducks and three brolgas (*Grus rubicunda*), who make the swamp their home base, further enhances the area.

Ron's daughter Rachel, who has inherited her dad's passion for the natural environment, says one of the best outcomes is more noticeable by ear rather than sight. A keen frog monitor, Rachel has discovered several new frogs at the swamp including the Victorian smooth froglet (*Geocrinia Victoriana*). Although not a rare frog statewide, the Victorian smooth froglet is rare in west Wimmera pastoral areas.

When she started as the West Wimmera Landcare facilitator two years ago, Rachel says she observed much enthusiasm from West Wimmera farmers to incorporate swamp areas into their whole farm plan. "Farmers are always dropping into the office asking what they can do on their farms with their wetlands for dual financial and environmental benefit," Rachel says. "Many are also interested in how the work on their farms connects their wetland areas to their neighbours. There is definitely a lot of momentum out here to do wetland and revegetation work on agricultural land that not only provides benefits to individual farms, but the area as a whole."

#### Murray Wetland Carbon Storage project

Nicky Bruce, Murray Local Land Services, New South Wales and Sarah Ning, Murray Darling Wetlands Working Group Ltd.

The Murray Wetland Carbon Storage project aims to assist landholders to rehabilitate wetlands to increase their capacity to store carbon and improve biodiversity. The project will also support research into Indigenous values and uses of wetlands to build connections to country.

This project will deliver 400 hectares of biodiverse and high-efficiency wetland carbon stores across the NSW Murray Catchment through its first Investment Round, with 2000 hectares being delivered overall by June 2017. It is a partnership project between Murray Local Land Services and the Murray Darling Wetlands Working Group Ltd. (a not-for-profit community group), funded by the Australian Government.

A 2013/14 on-ground investment program will support landholders to replant cleared wetlands and enhance wetland and riparian vegetation on private property. Enhancement of remnant vegetation will be achieved through biodiverse plantings, altered land management (e.g. grazing management, pest and weed control) and where appropriate and possible, delivery of environmental water.

A priority area for the project is the Murray Catchment's central region. The project has been working with landholders in the Urana, Lockhart, Oaklands, Howlong, Corowa, Mulwala, Berrigan and Jerilderie areas from September 2013 with on-ground works to be completed by the end June 2014.

A number of diverse wetland sites have already been visited by Murray Darling Wetlands Working Group Ltd. and Murray Local Land Services staff. Two sites in Corowa show great potential for rehabilitation. The first wetland, 30 hectares in size, is dominated by river red gums (*Eucalyptus camaldulensis*) with a grassy understorey and is likely to attract a greater number of waterbirds with changes made to the current grazing and hydrology regimes. The second site has a good



A potential site for the Murray Wetland Carbon Storage project in the Balldale area, New South Wales (© Copyright, Sarah Ning, Murray Darling Wetlands Working Group Ltd.)

wetland seedbank consisting of species of sedges, rushes and grasses with plans to improve the grazing and management regime for the site, as well as enhancing the adjacent grey box area, therefore improving connectivity.

It is anticipated that wetland sites in the project area will achieve great results for carbon storage and biodiversity outcomes such as supporting the nesting of waterbirds like the brolga (*Grus rubicunda*) and royal spoonbill (*Platalea regia*). For further information on the project, please visit www.murray.lls.nsw.gov.au or www.murraydarlingwetlands.com.au, or contact the following Project Officers:

Nicky Bruce (Murray Local Land Services) (02) 6051 2232, Nicky.Bruce@lls.nsw.gov.au

Sarah Ning (Murray Darling Wetlands Working Group Ltd.) 0427 376 157, sarahning@murraydarlingwetlands.com.au

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A potential site for the Murray Wetland Carbon Storage project in the Lowesdale area, New South Wales (© Copyright, Nick Bruce, Murray Local Land Services)

#### Territory Conservation Agreements – helping pastoralists look after wetlands

Heidi Groffen and Ilse Pickerd, Territory Natural Resource Management, Northern Territory

The Northern Territory is renowned for its outstanding natural landscapes and ecological values.



Territory Conservation Agreements (TCA) have been introduced by Territory Natural Resource Management (TNRM) to help landholders protect areas of high conservation significance on their properties.

TCAs are voluntary, and are based upon a management plan aimed to protect significant environmental values like wetlands, consistent with the broader management goals for the property. Each TCA agreement runs for a 10 year period.

Two wetland sites within the Southern Northern Territory, the Spring Creek System in the Tanami Desert and Bluebush Swamp on the Barkly Tablelands, have joined the TCA program and developed long-term goals for the protection of their wetland assets.

These sites are just two of the 20 TCA sites contracted over the past two years, with the majority being in the Top End and Gulf/Savanna regions of the Northern Territory.

Evidence of grazing and trampling within the Spring Creek Territory Conservation Agreement site prior to on ground activities which will include large feral herbivore control, fence maintenance and soil conservation works (© Copyright, Heidi Groffen) The Spring Creek system on Coniston Station has a number of semi-permanent pools and freshwater springs. Dominated by tea trees with a mixed herb and bulrush understory, the wetland site provides important habitat for plant and animal species but has been impacted by large feral herbivores (horses, donkeys and camels) in the past. An exclusion fence has been installed and will be maintained to prevent further large herbivore impacts. The TCA has identified a number of on-ground activities to be achieved for the long-term protection of the site:

- vegetation and habitat surveys
- stock control
- feral herbivore control
- soil conservation
- fire management
- weed management
- site maintenance and ongoing monitoring.

The Bluebush Swamp on Alexandria Station is situated largely within the Mitchell Grass Downs bioregion, identified as an under-represented Australian bioregion on the Barkly Tablelands. This area of Bluebush Swamp and adjoining Mitchell Grass Downs was nominated by the land manager as an appropriate site for a TCA in 2011. The swamp is one of a string of similar swamps in the immediate area and is a valuable grazing resource, seen as a key indicator of land condition.

The site has been fenced and livestock excluded for over 40 years, and the TCA has assisted with the ongoing maintenance and repairs of the fence. The site provides a good opportunity to compare the difference between non grazed and grazed bluebush (*Chenopodium auricomum*) habitat. The information gathered as a result of the ongoing photo monitoring and annual observations has and will continue to help build a better understanding of bluebush management. This TCA site is about to undergo its second year of annual monitoring and previous survey results show the bluebush and surrounding grasslands are currently in good condition inside and outside the fenced area.

These two TCAs have been funded through Territory Natural Resource Management and the Australian Government.

Acknowledgements to the Station Managers Ross Peatling and Max Lines for joining the TCA program and supporting the Natural Resource Management activities at both sites, and special thanks also goes to Angus Duguid from the Northern Territory Department of Land Resource Management for his expert input.

Further information on the TCA program can be found at: www.territorynrm.org.au.

### Agricultural water supports wetlands and tourism

Jo Wood, Environmental Water Project Officer, Goulburn Broken Catchment Management Authority, Victoria

Kinnairds Wetland is one of more than 2000 wetlands in northern Victoria's Goulburn Broken Catchment which encompasses both southern alpine forests and agricultural floodplains in its north.

It is also one of several larger wetlands within the agricultural floodplains which are connected to a 317 000 hectare irrigation system, supplying them with about 1.5 million megalitres of water annually.

Kinnairds Wetland is a 93 hectare part-public and part-privately owned wetland complex near Numurkah, north of Shepparton and is a good example of a multi-use system within an agricultural landscape. The wetland is a deep freshwater marsh that sits at the end of the Muckatah Depression (a former stream depression) and is characterised by sparse mature river red gums over common spike-sedge, water milfoil and Moira grass.

The site is notable as a breeding ground for royal spoonbills (*Platalea regia*), little pied cormorants (*Microcarbo melanoleucos*) and wedge-tailed eagles (*Aquila audax*), and as a feeding ground for migratory species such as the Latham's snipe (*Gallinago hardwickii*). It also contains the largest known recorded population of the vulnerable ridged water-milfoil (*Myriophyllum porcatum*) in Victoria.

Kinnairds Wetland has been modified and enhanced by the Muckatah Surface Water Management Scheme earthworks, which began in 1999. This award winning scheme provides major regional drainage benefits for 60 000 hectares of irrigated agricultural land.

*A brolga* (Grus rubicunda) *dances at Kinnairds Swamp* (© Copyright, Paul Gregory O'Connor)





Kinnairds Swamp flooded (© Copyright, Paul Gregory O'Connor)

Water from the Muckatah Depression flows into the eastern side of the swamp, allowing irrigation and rainfall runoff to drain off-farm quickly and efficiently, which benefits the agricultural landscape by alleviating waterlogging and filtering water from high nutrient loads before it enters the nearby Broken Creek.

The natural landscape also benefits from being part of this surface water management system as it not only supplies water to the wetland, but in dry conditions it can be used to deliver environmental water to provide drought refuge for the wetland's flora and fauna.

With its walking tracks, boardwalks, bird hides and interpretive signage, Kinnairds Wetland has become a major tourism drawcard for the region with approximately 6-7000 people visiting the site each year.

All in all, Kinnairds Wetland is definitely a win for the region's agriculture and tourism, as well as the environment.



Aerial photo of Kinnairds Swamp in flood in 2010 (© Copyright, Keith Ward)



*Ridged water-milfoil* (Myriophyllum porcatum) *taken at Kinnairds Swamp* (© Copyright, Damien Cook)

# I'd like to order some bitterns and rice, please

Matthew Herring, Murray Wildlife Pty Ltd, Neil Bull, Rice Growers' Association of Australia, and Andrew Silcocks, BirdLife Australia

Australian farms support hundreds of thousands of constructed, agricultural wetlands. Their potential role in biodiversity conservation is often overlooked, yet it is enormous.

The Australasian bittern (*Botaurus poiciloptilus*) is a globally endangered waterbird. Its booming call helped stir up legends of the bunyip. Bitterns have been using rice crops in the Riverina region of New South Wales since at least the 1980s, but until now we didn't realise just how important they are.

Targeted surveys during the 2012-2013 season revealed the likely presence of at least several hundred

bitterns using rice crops, with 70 individuals confirmed from a relatively small sample. If these birds are breeding successfully and the population is sustainable, then these food production wetlands may support the global stronghold for the species. It would be a very unusual situation for one of Australia's most threatened species to be so strongly associated with agriculture.



Mixed farming with agricultural wetlands: rice, sheep and the endangered Australasian bittern (Botaurus poiciloptilus) (© Copyright, Matthew Herring)



Australasian bitterns (Botaurus poiciloptilus) arrive in rice crops when there is sufficient cover, about two months after sowing (© Copyright, Matthew Herring)



Rice farmers in the NSW Riverina can take the lead on bittern conservation (© Copyright, Matthew Herring)

During the 2013-2014 season, we hope to obtain an accurate estimate of the number of birds and set a benchmark for monitoring the population in the long-term. We're also keen to study their breeding success.

Once we have worked out what bitterns like most about rice crops, we aim to work with the industry to develop bittern-friendly guidelines for interested rice farmers. Many rice farmers are chuffed to be providing habitat for such a special bird and are keen to benefit them further.

Rice farmers can take the lead on bittern conservation. Where practical, they can tailor their rice-growing techniques to suit bitterns. Outside of the rice-growing season, the management of bittern habitat in storage dams, as well as suitable remnant wetlands, will also be welcome assistance to this struggling species. Australasian bitterns are not the only threatened species making use of rice crops. Surprising numbers of Australian painted snipes (*Rostratula australis*) were also found, and the significance of rice growing to the Southern bell frog (*Litoria raniformis*) was reaffirmed.

A short film, 'Bitterns Boom in Rice' (http://www.rga. org.au/rice-environment/biodiversity.aspx), has helped spread the word among Riverina rice farming families. Thanks to the Bitterns in Rice Project, there are an increasing number of farming families keeping their eyes and ears peeled for this elusive species, which helps us to learn more about them.

The Bitterns in Rice Project is a collaboration between the Rice Growers' Association of Australia and BirdLife Australia, with key support from the Murrumbidgee and Murray Local Land Services, the Rural Industries Research and Development Corporation, Coleambally Irrigation, Murrumbidgee Irrigation, Murray Irrigation, Murrumbidgee Landcare, the Murrumbidgee Field Naturalists Club, and the New South Wales National Parks and Wildlife Service.

### Burdekin cane farmer builds a wetland for the future

Queensland Department of Agriculture, Fisheries and Forestry through the Queensland Wetlands Program

Landholders can now see first-hand the benefits of healthy on-farm wetlands thanks to a new initiative developed on a Burdekin cane farm.

Sugar cane farmer John Quagliata has volunteered his time, machinery, and resources to rehabilitate a wetland on his property adjacent to Sheepstation Creek, 80 kilometres south of Townsville. Sheepstation Creek flows into one of Queensland's five Ramsar listed wetlands, Bowling Green Bay, which is also part of the Great Barrier Reef World Heritage Area.

Mr Quagliata has demonstrated to other farmers how the rehabilitation of his wetland benefits his cane

farming enterprise and the quality of water entering the local waterway and the Great Barrier Reef.

"I can see benefits to my farm, especially if I can put good quality recycled water and sediment back onto my paddocks. Also my grandchildren will be able to enjoy nature at the wetland" he said.

The Burdekin site is one of three wetland rehabilitation sites being managed by the Queensland



Site stabilization earthworks in progress (© Copyright, Terri Buono)

Department of Agriculture, Fisheries and Forestry with funding from the Queensland Wetlands Program's Wetland Management in Agricultural Production Systems project.

The department's project coordinator, Terri Buono, said the project aimed to improve the long-term health of wetlands in catchments adjacent to the Great Barrier Reef through good agricultural land management.

"The Burdekin is the largest producer of raw sugar in Australia and it is therefore important to show farmers that profitable agriculture and healthy wetlands can co-exist."

"Initial water quality monitoring conducted with Mr Quagliata has initiated some interesting discussion, raised awareness of how nutrient and farm chemicals leave farms, and the role on-farm wetlands have in filtering farm pollutants," said Ms Buono.

"This project highlights the important role of wetlands in farming areas and the benefits of looking after wetlands as part of whole of farm management."

The first stage was completed in July 2013 with earthworks undertaken on unproductive land upstream of the wetland and the planting of 830 endemic trees, providing habitat for birds, shading out weeds, and improving water quality. Local consultant Ron Shaw designed and supervised the earthworks incorporating a sediment trap and stabilising works. The sediment trap captures irrigation tail-water before entering the wetland.

The North Queensland Dry Tropics Natural Resource Management (NRM) group provided weed management advice and organised the tree planting, assisted by members of the local Gudjuda Reference Group Aboriginal Corporation NRM team and other volunteers.

Project findings have been communicated to other farmers and the general community through training days, site visits and community meetings.

Further revegetation and native fish restocking are planned for future stages.

For further information on the project, phone Terri Buono on 07 4760 1614 or 0447 108 010. For tools and information on managing wetlands and waterways in Queensland, please visit WetlandInfo: http://www.wetlandinfo.ehp.qld.gov.au



Agricultural extension officers visiting the site (© Copyright, Terri Buono)



Tree planting being supervised by staff from NQ Dry Tropics Sustainable Coasts Project (© Copyright, Terri Buono)

Ramsar wetland management in Australia

# Ramsar in New South Wales – a tale of 12 sites

New South Wales Office of Environment and Heritage

While Dickens wrote about only two places in his 'Tale of Two Cities', New South Wales can tell a tale of 12 unique sites protected under the Ramsar Convention.

The 12 Ramsar sites in NSW cover a range of climatic zones and landscapes found in the state. These unique wetland environments include icy cold alpine lakes in the Snowy Mountains, extensive mangrove forests in the mouth of the Hunter River near Newcastle, broad river red gum forests on the inland floodplains of the Macquarie and Murray rivers, and even the occasionally inundated Lake Pinaroo in the state's harsh and arid north western corner near Tibooburra.

The tale begins with Towra Point Nature Reserve on Sydney's doorstep and the Hunter Estuary Wetlands near Newcastle's busy ports, both were designated as NSW's first Ramsar sites on the same day in 1984. Both wetlands feature extensive areas of mangroves and saltmarsh and provide critical habitat for up to 34 species of migratory birds and many fish species.

Since these initial listings, a further 10 Ramsar wetland sites have been established across NSW. The Paroo River Wetlands was designated in 2007 and is NSW's 12th and most recent Ramsar wetland, containing one of the last remaining unregulated wetland systems in the State.

The 'Goddard's Lease' private property forms part of the Gwydir Wetlands Ramsar site. Also in range are the Gingham Watercourse wetlands (© Copyright, Daryl Albertson / New South Wales Office of Environment and Heritage) The NSW Government has committed, through intergovernmental agreements and partnerships, to provide for the protection, sustainable use and management of all NSW wetlands, including Ramsar wetlands. Water availability is the primary pressure on



inland wetlands in NSW. For this reason the NSW Government has recovered water for the environment which has been used to help wetlands overcome the previous impacts of drought. Leverage opportunities from more recent rainfall events will also aid in the rejuvenation of many wetland plants and animals.

Successful partnerships and communications between the Australian and NSW governments, private land managers and non-government organisations greatly enhance NSW's capacity to protect Ramsar sites, support the wise use of all wetlands, and uphold Australia's commitments under the Convention.

Learn more about Ramsar wetland sites in NSW here: http://www.environment.nsw.gov. au/wetlands/NSWRamsarSites.htm



Boolambayte Lake is part of the Myall Lakes Ramsar site, an interconnected system of coastal lakes that cover an area of 10 000-15 000 hectares (© Copyright, Fiona Miller / New South Wales Office of Environment and Heritage)



The Macquarie Marshes Ramsar site is recognised as significant due to its diversity of wetland types, extent of wetland communities and large-scale colonial waterbird breeding events (© Copyright, Jeff Hillian)

### Queensland wetlands celebrate 20 years of Ramsar listing

Queensland Department of Environment and Heritage Protection

October 2013 marked the 20th anniversary of the listing of Moreton Bay and Bowling Green Bay as Ramsar sites in Queensland.

The Moreton Bay Ramsar site is situated in south-east Queensland, close to Brisbane, extends north to the Sunshine Coast and south to the Gold Coast. Bowling Green Bay Ramsar site is situated south of Townsville and takes in Cape Bowling Green, parts of Cape Cleveland and the south-eastern portion of Cleveland Bay.

The conservation and management of these two Ramsar sites is a collaborative effort. The Australian, state and local governments work together with natural resource management groups, private industry, Traditional Owners, universities, landholders and the community to care for the sites and the amazing biodiversity they support. Various management activities also take place in catchments and other areas near the Ramsar sites. While these are outside the boundary of the sites, the activities can greatly influence the health of Moreton Bay and Bowling Green Bay, and in turn, the Great Barrier Reef that sits off Bowling Green Bay.

To mark the 20th anniversary, the Queensland Wetlands Program worked with stakeholders to record achievements in these Ramsar sites over the past 20 years. The lists encompassed amazing events and we were delighted at the number of achievements identified and the scope of management and monitoring programs in place to care for the sites.



*Moreton Bay Ramsar site* (© Copyright, Queensland Department of Environment and Heritage Protection)



*Bowling Green Bay Ramsar site* (© Copyright, Queensland Department of Environment and Heritage Protection)

Achievements include:

- The Great Barrier Reef Marine Park, which includes Bowling Green Bay, was declared a Marine Park in 1975 and Moreton Bay was declared a Marine Park in 1993. Both are multiple use areas with zoning plans and other management tools to support the management of the parks.
- Significant investment in the world class Ecosystem Health Monitoring Program for Moreton Bay which produces an annual report card, tracking ecosystem health for waterways in South East Queensland and Moreton Bay.
- Significant investment in on-ground works, training and education programs and facilities to assist with wise management of these areas.

Further information on the achievements at Moreton Bay can be found at the following link: http://wetlandinfo.ehp.qld.gov.au/resources/ static/pdf/resources/fact-sheets/fs-ramsarcelebration-20-years-231013.pdf

For more information on these Ramsar sites more broadly, please visit the Moreton Bay Ramsar site factsheet (http://wetlandinfo.ehp. qld.gov.au/resources/static/pdf/resources/ fact-sheets/fs-moreton-bay-ramsar-231013.pdf) and the Bowling Green Bay Ramsar site factsheet (http://wetlandinfo.ehp.qld.gov.au/ resources/static/pdf/resources/fact-sheets/ fs-bgb-ramsar-231013.pdf).

# Banrock Station wetland and vineyard – a perfect blend

Christophe Tourenq and Tim Field, Banrock Station, South Australia

Banrock Station Wetland Complex has experienced a long history of land and water management.

From European settlement in the 1800s until the mid-1980s, Banrock Station in South Australia's Riverland was under pastoral lease. Sheep and cattle grazing occurred on the floodplains and mallee, and the site was progressively cleared to allow for crop production.

In 1923, the construction of Lock 3 on the River Murray resulted in the site experiencing more permanent flooding. The altered hydrological conditions encouraged the introduction of the invasive European carp (*Cyprinus carpio*), a reduction in river red gums (*Eucalyptus camaldulensis*), soil salinisation and acidification.

In 1992, the landowners, B & T Engel, supported the construction of flow control structures on the wetland, which was a project funded by the Murray-Darling Basin Commission and a private donor, N. Marsh. This management action was taken to enhance wetland productivity and improve habitat diversity in the margins of the wetlands. Banrock Station's wetland was the first wetland on the River Murray to install such infrastructure for water level manipulation.



Yellow-billed spoonbills (Platelea flavipes) on Banrock Station main lagoon (© Copyright, Banrock Station)



The Musk Duck (Biziura lobata) is regularly spotted at Banrock Station during the breeding season (© Copyright, Banrock Station)

In 1994, BRL Hardy (now Accolade Wines) purchased the 1800 hectare property and continued the restoration of the wetland. In 2006, with assistance from the South Australian Government, the vineyard irrigation pump was relocated from the wetland to the river. Since this time, the wetland has been returned to a more natural wetting and drying cycle that has benefited the native fauna and flora, helped control the European carp and prevented the formation of acid sulphate soils. A number of waterbirds, including the musk duck (*Biziura lobata*) and yellow billed spoonbills (*Platalea flavipes*) are known to use the site now also. In addition, about 1.15 gigalitres of river water or 1150 Olympic-sized swimming pools, has been saved over a two-year cycle.

Opened in February 1999, the Wine and Wetland Centre has provided visitors the unique experience of enjoying Banrock Station's own wine, while admiring the view of the wetland from the deck and learning about River Murray and wetland conservation. A series of walking-trails with information huts, bird hides and boardwalks enables tourists access to the heart of the wetland.

Combined with the conventional mulch spreading to reduce evaporation losses, this high-tech irrigation system allows water to be provided on demand and closer to the rootzone, and has resulted in a 20 per cent saving in water use.



Visitors enjoying the view of the wetland from the Wine and Wetland Centre deck at Banrock Station Ramsar site (© Copyright, Banrock Station)

For all their efforts, the Banrock Station vineyard achieved the international environmental management system accreditation, ISO 14001 and in 2002, the wetland complex was designated as a Wetland of International Importance under the Ramsar Convention. Banrock Station Wetland Complex was also the proud recipient of a Ramsar and Evian Award in 2002 for the best examples of the "wise use" principle in wetlands.

Since 1996, part of the proceeds from the sale of Banrock Station wines go towards helping wetland and threatened species conservation projects worldwide through the Banrock Environment Fund. The Fund commitment to date exceeds AUD \$5 million to more than 95 projects in 12 countries, supporting projects with concrete/on the ground initiatives for environmental sustainability and biodiversity conservation.

# Record breaking flight signals the importance of conserving wetlands

Port Phillip and Westernport Catchment Management Authority, Victoria

On a February evening in 2007, a distinctive shorebird with conspicuous blue-grey legs and a long, slightly upturned bill set out on a record breaking 10 215 kilometre, seven day flight from New Zealand to the Yellow Sea in China.

The bar-tailed godwit (*Limosa lapponica*) looked much the same as her flockmates, but there was an important difference – she was carrying a tracking device, and her location was being broadcast via satellite to a team of scientists from Alaska and New Zealand. They nicknamed the bird "E7" and watched on as she made the longest known non-stop flight of any bird and also the longest journey by any animal without pausing to feed.

Like many bird enthusiasts, shorebird biologist Dr Danny Rogers of the Arthur Rylah Institute was keenly following the progress of the bird on web updates. He watched as E7 flew onward from China to Alaska, stayed there for the breeding season and on 29 August 2007, departed on a non-stop flight from Cape Avinof.

Again she flew, without pause for food, drink, or rest, to the Piako River in New Zealand, breaking her own world record: 11 680 km and nine days of non-stop powered flight! "The New Zealand team headed out and managed to get telescope views of her," Dr Rogers said. "She was skinny, having used up all her fuel – but she was alive and well."

E7 is just one of hundreds of thousands of migratory shorebirds that make the long journey around the world every year and her story underlines the critical importance of conserving wetland habitat for shorebirds at significant sites around the globe. "Rich food sources are essential to fuel their amazing migrations," Dr Rogers said. "Here in Victoria, that means Ramsar sites like the mudflats in Western Port at French Island or at Rhyll on Phillip Island."

Over the last 5 years the Port Phillip and Western Port Ramsar Protection Program has actively conserved Ramsar wetlands by treating over 17 000 hectares of land for pest animals, most commonly foxes, rabbits and feral cats. The Program has also been instrumental in treating nearly 1 900 hectares to reduce infestations of weeds like African boxthorn, serrated tussock and sweet pittosporum. As well, 432 hectares of native vegetation have been protected from domestic stock and pest animals through fencing.

This work makes a contribution to the preservation of wetlands that will offer habitat for migratory water birds like E7 into the future.

The Ramsar Protection Program is supported by the Port Phillip and Westernport CMA through funding from the Australian Government.



Bar-tailed godwits (Limosa lapponica) enjoying a well-earned rest following their southward migration from Alaska (© Copyright, Danny Rogers)

#### Environmental flows bring waterbirds to Tuckerbil Swamp Ramsar site

James Maguire and Jennifer Spencer, New South Wales Office of Environment and Heritage

In June 2013 the New South Wales Office of Environment and Heritage allocated 225 megalitres of New South Wales managed environmental water allowance to the Tuckerbil Swamp Ramsar site to re-establish wetland habitat for waterbirds.



Large flocks of waterfowl were attracted to the Tuckerbil Swamp Ramsar site after it was flooded by New South Wales environmental water in June 2013 (© Copyright, James Maguire)

Following record flooding in March 2012, Tuckerbil Swamp dried out and became choked with terrestrial weeds. The environmental flows successfully flooded about 200 hectares of the swamp (about 75 per cent of the total area) and attracted several thousand waterfowl and hundreds of resident shorebirds to the site almost immediately.

Tuckerbil Swamp is a shallow wetland that forms part of the Fivebough-Tuckerbil Wetland Ramsar site located near Leeton, in south-west New South Wales. The wetlands were listed as a Ramsar site in 2003 in recognition of their importance for threatened waterbird species, including the nationally endangered Australasian bittern (*Botaurus poiciloptilus*) and a high diversity of migratory shorebird species listed on bilateral bird agreements Australia has signed with China, Japan and the Republic of Korea.

Waterbird surveys taken in July 2013, as part of quarterly waterbird monitoring funded by the NSW Office of Environment and Heritage, detected 21 species of waterbirds, including the brolga (*Grus rubicunda*), which is listed as vulnerable in NSW, and six species of birds of prey.

The NSW Office of Environment and Heritage wish to acknowledge the assistance of Murrumbidgee Irrigation for delivering the environmental flows and Dr Keith Hutton for providing waterbird survey data for the Fivebough and Tuckerbil Swamp Ramsar site. For more information contact James Maguire, Senior Environmental Water Management Officer – Murrumbidgee (ph: 02 6022 0604 or email: james.maguire@environment.nsw.gov.au).

The NSW Office of Environment and Heritage manages a portfolio of environmental water licenses for the Murrumbidgee Catchment and the Gwydir, Macquarie, Lachlan, Murray and Lower Darling catchments. For further information see: http://www. environment.nsw.gov.au/environmentalwater/ manageenvwater.htm.

# Managing weed and sea level rise threats to Kakadu's tropical river floodplains

Amy Kimber, Northern Australia Hub – National Environmental Research Program, Charles Darwin University

### Climate change and weed invasion are key management issues for Kakadu National Park.

Para grass (*Urochloa mutica*) and olive hymenachne (*Hymenachne amplexicaulis*) are exotic grasses that are spreading across some areas of Kakadu floodplains, replacing native grasses and significantly reducing biodiversity. By the end of this century large areas of floodplains may also be inundated with saltwater due to rising sea levels.

The combined effects of weeds and climate change could seriously affect Traditional Owners, the tourism sector and the environment. Managers are now faced with complex decisions about where to dedicate limited resources to conserve the most valuable areas.

A team of researchers funded by the National Environmental Research Program is working with Parks Australia staff and Traditional Owners to predict which areas of Kakadu's floodplains are most at risk from saltwater intrusion, and how sea level rise and weeds might affect the habitats of important wildlife such as the iconic magpie geese (*Anseranas semipalmata*). These waterbirds are critically dependent



Murrumburr Traditional Owner and Kakadu National Park Ranger Jessie Alderson (L) provides advice to Northern Australia hub researcher Samantha Setterfield (R) on highly valued sites within Kakadu (© Copyright, Michael Douglas)



*Kakadu Traditional Owners are helping researchers understand when and what they are harvesting from the floodplains* (© Copyright, Michael Douglas)

on a handful of freshwater aquatic plants for food and nesting, and these plants will be susceptible to saltwater inundation and the spread of aquatic weeds in the future.

Knowing which areas are most at risk from weeds and saltwater will help Traditional Owners and park managers prioritise areas for investment. For example, the Boggy Plain-Mumakala wetlands on the South Alligator River floodplain contain the most important magpie geese dry season refuge in Australia because its extensive stands of water chestnut (*Anas castanea*), a tall sedge with bulbs, provide a critical food source. Up to 80 per cent of the magpie geese population are dependent on these wetlands during the dry season.

Charles Darwin University lead researcher Dr Samantha Setterfield believes it is important not to lose the gains that have been won managing other weeds in Kakadu National Park, like mimosa.

"Kakadu has invested more in weed control than most other national parks, but strategic decisions still need to be made about how and where to invest the funding available," Dr Setterfield said. "For decades, park's staff have made a concerted effort to control weeds, and prompt action has meant the park remains free of mimosa infestations. However, the resources available are still not adequate to control all the highest priority weeds within Kakadu.

"The good news is there is very little para grass on the South Alligator River floodplain, meaning that with a relatively small budget and a strategic approach, we can eradicate these infestations.

"We now have a model that can predict the spread of weeds over the next 10, 20 and 30 years across all Kakadu floodplains, and by layering other maps we are developing which show important bush tucker spots and predicted sea level rise, we start to get a very good picture of which areas need immediate attention."

By mid 2014, the project is expected to deliver a map-based decision support tool that will draw all aspects of the research together. The research team is also working with park's staff and Traditional Owners to develop agreed and clearly defined management targets and indicators to monitor floodplain health.

### Wetland conservation and restoration

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#### An update on wetland restoration on private land in South Australia and Victoria

Lachlan Farrington, Nature Glenelg Trust

A wetland restoration project in south-west Victoria and south-east South Australia has kicked off with some immediate results.

The Nature Glenelg Trust project was introduced to *Wetlands Australia* readers in Issue 21 (September 2012).

Nature Glenelg Trust (NGT), with Australian Government funding, is working to restore the hydrology of wetlands on private property by targeting wetlands that, as a result of artificial drainage, are now either completely dry or only hold water for a much shorter duration than would have occurred historically.

Landholders, both old and new, are realising the many benefits of retaining water on their properties, including the aesthetic pleasures which can be derived from these biodiversity havens. This restoration project also involves both visually and scientifically recording and demonstrating the positive ecological changes which can occur when you "just add water" to drained wetlands.

In the first year of this five year project, NGT has undertaken restoration actions at five sites, ranging from the installation of trial sandbag weirs through to fully-operational fixed regulators. These early works have also made the most of a short, sharp burst of rainfall during July and August 2013, and in a year when the rains arrived late and finished early, are already having a very positive influence on wetland plant and animal life cycles.



Sandbag weir structure near Portland in western Victoria: from construction through to flow regulation during a 1:50 year rain event and the resulting wetland inundation, July and August 2013 (© Copyright, Lachlan Farrington)



Visitors and beneficiaries of newly recreated wetland habitat near Coleraine in western Victoria, November 2012 (© Copyright, Lachlan Farrington)

A major focus of the project is building relationships with landholders and their neighbours to ensure long-lasting outcomes. As part of this process, careful and demonstrated planning is vital to developing trust with participating landholders. Our use of sandbags in early trials is great for building a shared level of confidence and understanding at sites where there are uncertainties regarding how much area might be re-inundated and potential impacts on neighbouring properties.

For other larger wetlands (90-140 hectares) we have been able to employ state of the art remote sensing technology and digital elevation modelling in order to project inundation scenarios. There is no job too big or too small, with every restored wetland increasing landscape connectivity for wetland dependant biota and increasing soil carbon storage potential.

More information on the project, including the early works case studies referred to in this article, can be viewed at www.natureglenelg.org.au.

#### Protecting and enhancing the wonderful Moolort Wetlands of Victoria

Nick Layne, Project Manager, North Central Catchment Management Authority, Victoria

A large area of highly biodiverse wetlands are being protected in central Victoria through the efforts of local landholders and the North Central Catchment Management Authority with funding from the Australian Government.

The Moolort wetlands form a complex of over 50 wetlands, situated on the Victorian Volcanic Plain. Only two wetlands in the complex are protected in public land reserves, with the majority of wetlands under private ownership. The Victorian Volcanic Plain is the only national biodiversity hotspot found entirely in Victoria. It is classified as a biodiversity hotspot due to a high number of native species that are unique to the region.



Bakers Swamp (© Copyright, Nick Layne)

A wide range of wetland types are represented in the complex, such as red gum wetlands, lignum wetlands, cane grass wetlands, shallow freshwater marshes and freshwater meadows. These habitats provide important feeding grounds and breeding sites for a large number of species. Some of these are threatened, such as the brolga (*Grus rubicunda*), Australian painted snipe (*Rostratula australis*), black falcon (*Falco subniger*) and growling grass frog (*Litoria raniformis*).

The rare water lily, entire marshwort (*Nymphoides geminata*), was found in one of the wetlands during a flora survey. The plant was propagated and planted into other wetlands in the complex to increase the viability of the species locally. This was the first record of the species in the western half of Victoria.

The wetlands are highly valued by local landholders, which was evident by the significant level of project

participation. In all, 14 farmers participated in protection and enhancement activities. The wetlands provide a sanctuary for wildlife in a landscape dominated by cropping and grazing enterprises.

The project has protected almost 400 hectares of wetland area. Included in this total were nine Trust for Nature covenants covering 116 hectares. The project protected 40 per cent of private wetlands in the complex. Activities included revegetation, fencing, threatened species actions, development of management plans and monitoring.

The Moolort Wetlands Project was funded by the Australian Government.



Merin Merin Swamp (© Copyright, Nick Layne)

#### Using historical mine pits in Western Australia to create a wetlands complex for the benefit of water bird conservation and the local community

Dr Per Christensen, Blackwood Basin Group

An innovative project to develop wetland habitat at a former mine site is set to take place in Western Australia.

In the driest state in a dry continent there are few natural wetlands and many of these are salty and semi-permanent in nature, very few are fresh. Climate change is already affecting the precious few natural wetlands, resulting in some water bodies being inundated for shorter periods of time or drying up altogether. At Talison Lithium's Greenbushes Operations, 75 kilometres south of Bunbury, the Blackwood Basin Group (BBG) has a unique opportunity to create an interconnected group of fresh water wetlands in an area with reliable rainfall and existing high value remnant vegetation.



Representatives from Balingup Carbon Neutral and Talison Lithium planting trees at Schwenkes Dam Greenbushes, Western Australia (© Copyright, Debbie Walsh)
Past mining has created some two dozen water bodies varying in size from one hectare up to twenty hectares in extent. A grant from the Australian Government will support a project to elevate water levels by means of shallow excavations, construction of dykes and other earthworks to create a network of waterways interspersed with planted beds of sedges and rushes, with fringing paperbark trees.

Many species of waterbirds already frequent small patches of wetland habitat which fringe some of the existing water bodies. The wetland complex that will be created has the potential to provide a permanent or seasonal home for at least 42 species of waterbirds, including six migratory species. The rehabilitation will particularly aim to attract the endangered Australasian bittern (*Botaurus poiciloptilus*), and the State priority listed little bittern (*Ixobrychus minutus*) and black bittern (*Ixobrychus flavicollis australis*) whose habitats have declined drastically in recent times.

The project will proceed in several phases over the coming years, with a long-term aim to span decades and incorporate a number of conservation, research and community engagement initiatives. In establishing strong partnerships with industry, agencies, research organisations and the local community, this multifaceted project aims to create an environment that enhances biodiversity and ecosystem resilience, increases knowledge in rehabilitation methodology and meets the needs of the local community while inspiring appreciation and care for our natural assets.

As birds start to inhabit the area, plans for walkways and bird watching facilities will be developed. At later stages, some of the deeper water bodies will be developed for recreational activities such as bush walking and canoeing.

Our vision is to have a nationally important bird conservation area as well as a unique visitor attraction in the region in the not too distant future.

This project is supported by the Blackwood Basin Group, through funding from the Australian Government.

### Doing it together – a good news story about the fairies and the ferry

Judy Reizes, Manly Environment Centre, New South Wales

Back in 1991, a long-time resident, John McGary, told Manly Council that we had penguins in Manly. We thought it was a fairy story and he was having us on!

To convince us, he took us to the bottom of a local resident's garden one evening and there they were, a colony of shy little penguins (*Eudyptula minor*) nesting in rocky crevices around the foreshore of Manly Point. John's action brought Manly Council and government entities together to protect the penguins.

The penguins haven't always had it easy in Manly. People started to tell us stories of how there used to be penguins everywhere in Manly, that 300 were shot in 1952 at North Head and that another 100 died when there was a leaking gas pipe. However, there were still so many penguins in Spring Cove in the 1960s that you could see them fishing around the harbour in the daytime. Once dogs began entering Spring Cove from boats in the 1980s, they became restricted to the residential area.

When dogs destroyed the colony in Eden on the South Coast of New South Wales, the Manly penguins became the only breeding colony on the mainland of New South Wales. In 1997 the penguins were listed as a threatened population under the NSW Threatened Species Conservation Act 1995. At that time there were only 35 birds in the colony, however numbers began to eventually build up and they returned to Spring Cove in Sydney Harbour National Park. The numbers slowly climbed to 60 pairs and our penguins became international movie stars when National Geographic made a 45 minute video about them called "The Secret of Sydney Harbour". Some years later following a number of deaths from dogs, the BBC spent a week in Manly filming and interviewing residents about the penguins.

It was inevitable that people would want to see our penguins, but they were visible only at night and safe access wasn't feasible around our rocky foreshores. One evening Angelika Treichler, a local environmentalist, saw a penguin coming ashore near Manly Wharf and realised that there was a nesting pair under the wharf. She soon realised that the penguins were at risk from dogs, drunks and curious tourists and arranged for other people from the community to help her keep them safe. Thus, the Manly Penguin Wardens were born and these wonderful volunteers keep watch from dusk until late at night from June to February each year.

Seven years ago the Taronga Zoo Learning Centre and the Northern Beaches Learning Alliance started a Conservation Education Project called Project Penguin. As a result of this project, approximately 7000 students from primary and secondary schools have learnt about our penguins and have come up with amazing ideas to educate people.

Felicity Pulman has written a book called 'The Little Penguins of Manly Wharf', which tells the story of our community and their battle to save the penguins. You can buy it from all good bookstores and the funds go towards research on the Manly penguin colony.

Further information on the Penguin Project can be found here: http://taronga.org.au/education/ conservation-education-programs/projectpenguin/project-penguin-at-taronga-zoo

#### From little things, big things grow

Judy Reizes, Manly Environment Centre, New South Wales

Following the construction of the six lane Burnt Bridge Creek freeway in the Northern Beaches area of Sydney over 20 years ago, a group of concerned residents got involved in removing weeds and rubbish from a nearby section of Manly's only creek, Burnt Bridge Creek.

The commitment and effort by the residents led to Manly Council providing assistance and support for further work along the creek. Over time, the resident's worked at a number of sites up and down the creek, including above the Witches Glen waterfall and opposite the Seaforth Community Centre. They even created a lovely reserve at Cross Street. Their work became demonstration sites and they were able to enthuse others and were able to organise larger groups to get involved in the restoration work along Burnt Bridge Creek. The group successfully lobbied to save two areas of open space from development by stopping another tennis court in the Cross Street Reserve and preventing encroachment of industrial/ retail use into the creek corridor.



Before and after images along Burnt Bridge Creek following restoration works by committed Manly Council residents (© Copyright, Manly Environment Centre)

When Manly Council organized its first Environmental Conference, 'Meeting the Challenges' in 1992, they led the enthusiastic participants on a field trip along Burnt Bridge Creek. This resulted in the Council allocating additional funds for the restoration of the creek

This early restoration work raised the profile of the Burnt Bridge Creek, and attracted approximately \$4 million from Manly Council's Environmental Levy and \$2 million in NSW government grant funding for a Stormwater Harvesting Project. The before and after photos speak for themselves, and demonstrate the great work that can be achieved through the dedication of the community!

# Successful rehabilitation of a Waterbird Refuge

Dr Swapan Paul, Sydney Olympic Park Authority, New South Wales

A 10 hectare Waterbird Refuge was created in the 1950's in the Sydney Olympic Park precinct from an initial attempt to establish industrial land by pumping sediment from Homebush Bay, however the project was not completed and was later abandoned. Water pooled within the bunds, and over time the area developed into a significant waterbird habitat with a high abundance and diversity of birdlife.



Migratory shorebirds such as the bar-tailed godwit (*Limosa lapponica*) and red-necked stint (*Calidris ruficollis*) were commonly recorded in the wetland before it degraded. These species are protected under international intergovernmental agreements including Australia's migratory bird agreements. Such birds had left the site until it was rehabilitated in 2007.

As part of the rehabilitation, a new tidal gate (SlipGate) was installed to provide a flexible means of enabling tidal exchange and managing wetland hydrology. The gate is solar-powered, fully-automated, and allows daily exchange of tides between the Waterbird Refuge and the Parramatta River estuary. Water flow settings can be adjusted electronically (remotely), as needed.

*Waterbird refuge automated Slip Gate* (© Copyright, Kerry Darcovich)

Since the tidal restoration works, wetland health and biodiversity have improved with several key outcomes to date:

- Saltmarsh has greatly expanded its distribution.
- Filamentous algae coverage has dropped from ecologically-damaging levels pre-restoration to almost nil after restoration, with a corresponding dramatic reduction in unpleasant odours.
- Water quality has improved noticeably, from super saline to normal estuarine water.
- Benthic fauna such as marine worms have increased in abundance and diversity, providing better resources for feeding birds.
- The number and diversity of waterbirds has increased with over 800 birds recorded on some days.
- Large numbers of migratory shorebirds have returned to the wetland – with frequent sightings in the order of 250 bar-tailed godwits and 70 sharp-tailed sandpipers. These birds use a network of habitats on the Parramatta River estuary, and are most frequently recorded within the Waterbird Refuge in the evenings, with bar-tailed godwits representing almost the entire population in this estuary.

- Black-winged stilts (*Himantopus himantopus*) nested on a low island that was created as part of the works, and produced over 50 chicks in one season.
- The diversity of estuarine fish species has increased.
- The wetland has become a prime bird-watching spot, both for local residents and international tourists and bird enthusiasts.

This is perhaps the first tidal gate automation of this kind installed to benefit migratory shorebirds in Australia.

For more information on the restoration of the waterbird refuge, please contact Dr Swapan Paul on Swapan.Paul@sopa.nsw.gov.au

#### Kids tell companies to mind their business

Judy Reizes, Manly Environment Centre, New South Wales

Manly Lagoon, in the Northern Beaches of Sydney, looks a lot better now than when local students first started monitoring the water quality in 1990 as part of a Streamwatch program.

At the time, Manly Lagoon was one of the most polluted recreational waterways in New South Wales and the banks were bare of vegetation. Now, the foreshore is thick with vegetation planted by students from infant, primary and secondary schools in the area and the waters are much cleaner.

The Streamwatch students were involved in a number of awareness raising events, for example, a Waste Information Forum in the Balgowlah Industrial Estate which involved approximately 250 businesses. Kids, Companies & Creeks (KCC) was a joint initiative of Blackmores (a leading natural health products manufacturer, based locally), OzGREEN (Global Rivers Environmental Education Network Australia) and the Manly Environment Centre.

The KCC project encouraged local business to help control pollution within Manly Lagoon through the adoption of practices that minimise environmental impacts and increasing awareness about waste reduction, water pollution and catchment protection and involving all key stakeholders in the Manly Lagoon Catchment.

The project brought together the Streamwatch students, environmentalists, industry, the local community and waste management experts to share information about ways to clean up local waterways through cleaner production processes and waste reduction.

Banners produced by school kids as part of the Streamwatch programs (© Copyright, Manly Environment Centre) Students made personal contact with managers and proprietors in a carefully planned and supervised program, inviting them to participate. The students were powerful ambassadors for the environment.

Marcus Blackmore commented "It is rather ironic that with the KCC initiative we in business are responding to a challenge put to us by school children from our own community. Perhaps as business people we should have been more pro-active about our environmental responsibility before it got to this stage... we must congratulate the kids for having the temerity and the enthusiasm to bring these environmental issues to our attention."

Such a project has a snow-balling and far-reaching effect beyond the local area where a mindset change has occurred and environmental gains have been made. The hundreds of young people who have moved on after their school days will continue as ambassadors because they know that they have the power to influence decisions and improve their world.



#### Students and surf club – the clean-up team!

Greater Sydney Local Land Services, New South Wales

Local students and surf club volunteers have been recognised in the 2013 NSW State Landcare Awards for the removal of marine debris from Brisbane Water and the lower reaches of the Hawkesbury River located on the NSW central coast.

The biennial NSW Landcare awards celebrate individual and community volunteer projects that have made significant contributions to the environment in local communities around the state.

The Brisbane Waters Estuary Clean Up program involves volunteers from MacMasters Beach Surf Life

Saving Club who picked up the People's Choice Award and Brisbane Water Secondary College, a runner up in the Coastal Communities category.

Tessa Jakszewicz, CEO of Landcare Australia, praised the winners for their exceptional work. "The high calibre of this year's winners demonstrates the



Members of the community, MacMasters Beach Surf Club and Brisbane Water Secondary College involved in the Brisbane Waters Estuary Clean Up program. From left: Graham Johnston (MacMasters Beach Surf Club), Member for Gosford, Chris Holstein MP, Vicki Elliott (National Parks and Wildlife Service), Warren Brown (Gosford City Council), Nicole Heta (Community Environment Network), Rob Cararro (Greater Sydney Local Land Services) and students from Brisbane Water Secondary College (© Copyright, Maree Whelan)

dedication and vibrancy of the Landcare community in New South Wales, and the essential role it plays in the management of the state's natural resources."

Since early 2012, groups of students from Brisbane Water Secondary College and volunteers from MacMasters Beach Surf Lifesaving Club have worked collaboratively to collect and record the diversity and quantity of over 27 tonnes of rubbish from these local waterways.

The college students from both the Umina and Woy Woy campuses are involved in the challenging and sometimes back-breaking clean ups. The completion of data sheets indicate they are collecting items such as plastic, glass and aluminium drink containers, polystyrene packaging and also an alarming amount of trays and plastic mesh. These are all items that you'd never expect to find in the natural environment.

The removal of marine debris helps to protect local wildlife from the direct and harmful effects it has on the local environment while improving the health of local marine habitat such as mangroves and saltmarsh. A key focus has been the clean ups on Pelican Island Nature Reserve located in Woy Woy, home to endangered vegetation communities such as saltmarsh, and habitat for the endangered bush stone-curlew (*Burhinus grallarius*). The Brisbane Waters Estuary Clean Up program could not have achieved this success without the support of partners that include Greater Sydney Local Land Services, Gosford City Council, Community Environment Network, NSW Oceanwatch, National Parks and Wildlife Service and local oyster growers.

The Brisbane Waters Estuary Clean Up program received funding from Greater Sydney Local Land Services through the Australian Government.

For more information contact the Brisbane Waters Estuary Clean Up program coordinator, Graham Johnston from MacMasters Beach Surf Club on jonomacs@bigpond.com or visit the Clean4Shore Facebook site – https://www.facebook.com/Clean4shore to view a video story and follow the program.

### Water management and wetlands

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#### Environmental watering in the Lower Lachlan River catchment, New South Wales

Commonwealth Environmental Water Office

The Lower Lachlan River and its many wetlands have benefited from the largest ever environmental watering action in the Lachlan catchment.

Starting on 7 June 2013, more than 88 billion litres of Commonwealth and New South Wales environmental water was released over 40 days from Lake Brewster with the aim of improving the condition of native floodplain and wetland vegetation communities that are still recovering from the stresses induced by droughts and river regulation.

The delivery of this water was carefully planned in close consultation with landholders and local and regional stakeholders through the Lachlan Riverine Working Group.

The flows contributed to improving the health of over 620 kilometres of the Lachlan River system and

replenished key wetlands and swamps downstream of Lake Brewster, including Moon Moon, Lower Lachlan, Peppermint, Baconian and Great Cumbung swamps as well as Lake Waljeers. On-ground and aerial monitoring has confirmed that around 63 000 hectares of river, wetland and floodplain habitats have been watered, resulting in vigorous flowering of river red gums, black box and lignum.

It is expected that the generation of trees and shrubs that germinate and grow will contribute to the ongoing recovery of the region. The reed beds of the Great Cumbung Swamp at the end of the Lachlan River were fully inundated and vigorous growth from the warmer months will provide important habitat for



*River red gums* (Eucalyptus camaldulensis) of *Moon Moon Swamp* (© Copyright, Daniel Rothenfluh)



*River red gums* (Eucalyptus camaldulensis) *and native vegetation inundated along the Lachlan River* (© Copyright, Daniel Rothenfluh)



Environmental water in the Great Cumbung Swamp (© Copyright, Daniel Rothenfluh)

waterbirds and aquatic species. Waterbirds have already responded with over twenty different species seen foraging and nesting in the areas where the flows have been, including the endangered bush stonecurlew (*Burhinus grallarius*) which has been heard calling in the lower Lachlan Swamps area.

The positive outcomes of this watering action are a result of the cooperation across all levels of government with the involvement of the local community, providing an example of how projects applied meaningfully within a local environment can contribute to the health of the Murray-Darling Basin.

A video of the environmental watering event in the Lower Lachlan River catchment is available on the Department of the Environment's YouTube channel: http://www.youtube.com/watch?v=gF\_tZ7MWhp8

# To wade or not to wade – hydrological management effects on species composition

John Lizamore and Michael Coote, Western Australian Department of Parks and Wildlife

Monitoring and adaptive management of the Ramsar listed Lake Warden Wetland System is already providing results for shorebirds.

Amongst the 73 species recorded in the system, 25 are regular visitors that are listed under Australia's migratory bird agreements. The system is also home to greater than 1 per cent of the global population of the chestnut teal (*Anas castanea*) and the hooded plover (*Thinornis rubricollis*).

The wetland system was listed under the Ramsar Convention in 1990 and encompasses more than 90 wetlands. It covers an area of 1999 hectares on the edge of the south coast town of Esperance in Western Australia. The four sub-catchments that feed into the system interact hydrologically, depending on rainfall and runoff intensity. The dynamic nature of the geohydrology over the 212 000 hectare catchment presents real challenges for management of the system and much is still to be learnt about how to effectively balance water quality with water levels that maintain sufficient beach areas for shorebirds.

Clearing of 85 per cent of native vegetation in the catchment for agriculture has altered the driving hydrology of the system, resulting in increased



Breeding plovers at Station Lake (© Copyright, Kimberley Page)



Sandpipers utilising the exposed shore at Lake Windabout © Copyright, John Lizamore)

catchment runoff, increased lake depths and secondary salinity. Since 1996, research has been conducted to understand the hydrology and establish management objectives and targets to recover as many of the critical ecosystem services of the Lake Warden Wetland System as possible.

The key concern for the Lake Warden system was the increased recharge and volume of water being stored and the resultant reduction in shorebird habitat areas as beaches that were normally exposed became inundated for longer periods of time.

This has been managed through drainage works to dewater the central zone of the system, with early results showing shorebird abundance responding to intervention and re-exposure of beach habitat. This was not the end of the story as the alteration of water levels in the system contributed to increased salinity fluctuations which are now a management priority.

Lake Warden demonstrates the need for continuing monitoring and adaptive management. There is a need to include threshold and trigger values for future management actions. For example, historically set water level targets are currently under review in relation to salinity increases over the past two decades to make better management decisions.

For more information on Ramsar sites in Western Australia including the Lake Warden Ramsar site, please visit: http://www.dec.wa.gov. au/management-and-protection/wetlands/ internationally-recognised-wetlands-ramsar/ was-ramsar-sites.html



*Hydrological response to management interventions for Lake Wheatfield (blue) and Lake Warden (red)* (© Copyright, John Lizamore, Michael Coote and Kimberley Oswald)



Shorebird abundance at Lake Warden before and after intervention (purple block indicates flooded conditions) (© Copyright, John Lizamore, Michael Coote and Kimberley Oswald)



Different lower water level thresholds for Lake Warden based on historic hydrological pattern, historic bird abundance and current salinity level increases (© Copyright, John Lizamore, Michael Coote and Kimberley Oswald)

### Partnering to restore the Mallowa Creek floodplain wetlands

New South Wales Office of Environment and Heritage

The New South Wales Office of Environment and Heritage, the Commonwealth Environmental Water Office and landholders in the Mallowa have embarked on a 42 kilometre watercourse wetland restoration project aiming to rebuild the ecological health of the Mallowa wetland system.

The Mallowa Creek floodplain wetlands are located amongst agriculturally productive lands in the Gwydir Catchment, NSW. Since the early 1800s the local area has supported cattle grazing and, more recently, rotational cropping (predominantly dry land farming).

The Mallowa Creek floodplain contains many important wetland vegetation communities with the dominant vegetation type being river cooba/black wattle (*Acacia stenophylla*), lignum and wet meadows dominated by spike rush (*Eleocharis acuta*) and water couch (*Paspalum distichum*). Prior to upstream dam development and associated river regulation, the Mallowa supported large waterbird rookeries within its western floodplain wetlands.

Many wetlands survive in regulated river systems as incidental recipients of annual irrigation water deliveries. However, such deliveries occur away from the Mallowa watercourse, with annual water deliveries of stock and domestic flows being the primary water flows in Mallowa Creek. These limited flows have helped to maintain areas of remnant wetland vegetation across the floodplain.

*River cooba on the private property 'Valetta' prior to receiving environmental water* (© Copyright, Jane Humphries / New South Wales Office of Environment and Heritage)





Vegetation ecologist Sharon Bowen monitoring vegetation response following environmental water delivery (© Copyright, Jane Humphries / New South Wales Office of Environment and Heritage)

Under this restoration project, the Gwydir Environmental Contingency Allowance Operations Advisory Committee and Mallowa landholders have come together with NSW Office of Environment and Heritage and Commonwealth Environmental Water Office to support a three year environmental watering strategy. The most recent delivery of Commonwealth environmental water in September 2013 marks the second year of environmental watering. A volume of 15 000 megalitres of Commonwealth environmental water was delivered in a series of peaks to support positive wetland outcomes in this system.

The benefits are already apparent, with growth in the remnant wetland vegetation extent almost doubling expectations. Environmental water to the Mallowa in the previous watering year totalled 10 000 megalitres of NSW and Commonwealth environmental water, providing over half the total flow (~18 000 megalitres) measured in the Mallowa during 2012/13, the remainder consisting of stock and domestic releases and natural flows.

Environmental flows have been delivered in close consultation with landholders along the watercourse and timed to minimise any potential interference with



*River cooba* (Acacia stenophylla) *and lignum wetlands on the private property 'Valetta' following an environmental water delivery* (© Copyright, Jane Humphries / New South Wales Office of Environment and Heritage)

farming activities. Many Mallowa landholders have been thrilled to see waterbirds returning to their properties and expanses of healthy vegetation. Mr Peter Guyer, owner of the property 'Valleta', has been an advocate and driving force for the provision of environmental flows. Mr Guyer has been very pleased with the initial results and the abundance of waterbirds which have returned to the watercourse.

### Wetland management and research

#### Queensland Indigenous Land and Sea Ranger Program

Queensland Department of Environment and Heritage Protection

Bowling Green Bay, south of Townsville, celebrated its 20th anniversary as a Ramsar site in October 2013. With the help of the newly appointed Gudjuda Rangers this beautiful and significant site will maintain its important Ramsar values into the future.

Indigenous Land and Sea Rangers play an important role in implementing a wide range of environmental services across Queensland, with a focus on caring for pristine waterways, national parks and protected species.

Through funding recently provided by the Queensland Department of Environment and Heritage Protection's (EHP) Queensland Indigenous Land and Sea Ranger program, five new Gudjuda Rangers care for the land and sea country which includes the Bowling Green Bay Ramsar site.

Gudjuda Rangers ensure the unique ecologies of Queensland's natural environment are better managed and preserved by:

- managing weeds, feral animals and other threats
- performing fuel reduction and ecological burning
- collecting data on protected species and habitats
- supporting disaster recovery efforts
- managing visitor activity
- recording traditional stories
- helping manage national parks.

Many of the rangers employed through EHP's Queensland Indigenous Land and Sea Ranger program are Traditional Owners of the land on which they work. These rangers have a cultural sense of ownership of their land and a real connection with the tasks they undertake.

The Gudjuda Rangers will continue to care for land and sea country and work closely with government, local authorities, schools and community groups to achieve environmental outcomes and raise awareness of the importance of looking after country.



Gudjuda Rangers: Joe Tallis, Diane Smallwood, Tracey Lampton, Eddie Savage and Eddie Smallwood (© Copyright, Kate Maltby)

A Land and Sea Ranger recently said 'Being a ranger to me means a lot, because I'm looking after my culture, something that is part of me, our country.'

The ranger groups are highly regarded and make positive contributions to their local community by becoming role models for youth and leaders in a social, cultural and environmental context in their community.

The program has a strong emphasis on providing training and support to rangers and their communities to equip them with the skills and knowledge they need to care for the natural environment.

Rangers also recognise the importance of educating the next generation about looking after country and become mentors to children through the Junior Ranger program. Information on Queensland Indigenous Land and Sea Ranger program can be found here: http://www.ehp.qld.gov.au/ecosystems/ community-role/ranger/index.html

For more information please email Dave Wildermuth, dave.wildermuth@ehp.qld.gov.au, Manager, Queensland Indigenous Land and Sea Ranger Program.

#### The Finke River – salty & lovin' it

Angus Duguid, Wetland Ecologist, Northern Territory Government Department of Land Resource Management

#### Recent Lake Eyre Basin monitoring work has revealed fascinating new information about the Finke River in the Northern Territory.

The river starts in the MacDonnell Ranges, emerging from deep gorges and canyons like a vast snake of sand. The snake winds its way south–east, but the water it occasionally carries hasn't reached Kati Thanda-Lake Eyre for hundreds or thousands of years.

Sheltered within the ranges are permanent waterholes that have long been regarded as vital refuges. Indigenous people have always known, valued and depended on these waterholes, long before the language of 'critical aquatic habitats' and 'high ecological value aquatic ecosystems' (HEVAE).



Scientific surveys of the area date back to the early European explorers of the nineteenth century, in particular the Horn Scientific Expedition of 1894. The shaded refuges of the ranges include pools that are fed by startlingly fresh permanent springs. Some of these springs, including the significant macroinvertebrates they harbour, are relatively well documented from a scientific perspective. Surprisingly, until recently scientists have virtually ignored the rest of the Finke River and its waterholes.

Over the past decade, efforts have been made to understand and keep track of river health across the Lake Eyre Basin. The Finke River is the biggest of the distinct drainage systems in the Northern Territory portion of the Lake Eyre Basin and supports nine fish species including three endemic species.

The Lake Eyre Basin River Assessment (LEBRA) is a monitoring program that has been established at sites across the Lake Eyre Basin focusing on fish, hydrology and water chemistry. Choosing LEBRA sites for the Finke River threw a spotlight on the lack of knowledge about fish species distributions in the river and a similar lack of knowledge about the location and characteristics of the drought refuges. Work over the past three years has been addressing these gaps and yielding some fascinating results.

Waterhole on the Finke River, Northern Territory (© Copyright, Angus Duguid)

Saline waterhole on the Finke River, Northern Territory (© Copyright, Angus Duguid) Both aerial and ground-based surveys have been conducted along the main Finke River and in the previously unsurveyed Palmer River sub-catchment. Fish data has been recorded along with vital habitat information like waterhole location, size, depth, water chemistry and the influence of groundwater. This program has been led by the Northern Territory Government in collaboration with Territory Natural Resource Management, the Central Land Council, the Australian Government and the South Australian Government.

Parts of the Aquatic Ecosystem Toolkit have been applied in the mid-section of the Finke, confirming it as an HEVAE. This area has permanent and nearpermanent drought refuges that are now regarded as critical habitat for two of the endemic Finke River fish. The mid-Finke has a surprising diversity of waterholes, with a few relatively fresh waterholes being outnumbered by many saline to highly saline ones. The Finke River lives up to its Arrernte name 'lhere pirnte' which means salty river. Much of the river is on cattle stations where the fresher waterholes are important water sources for cattle. However, all the Finke River fish tolerate substantial salinity and several tolerate highly saline water that is undrinkable to cattle. It seems that the salt naturally limits cattle impacts: an effect I am calling the salty fence. The Finke River is salty and the fish are 'lovin it'.

For further information on the Finke River in the Northern Territory, please contact Angus Duguid on (08) 8951 9264 or angus.duguid@nt.gov.au

#### Novel ecosystem, novel approaches

Jane Roberts, Member, Board of Management, Jerrabomberra Wetlands, Canberra

Jerrabomberra Wetlands Nature Reserve is a special place in the heart of Canberra. The site has open space, ecological diversity and floodplains with cattle grazing, giving a sense of being a little untamed.

This important wetland satisfies criteria 3 and 6 of the Directory of Important Wetlands in Australia due to its routine use by migratory species, notably Latham's Snipe (*Gallinago hardwickii*), and as an archive of human utilisation of floodplain resources.

The Reserve is not pristine, few of its 25 wetlands have their "natural" shape and nearly all have an altered hydrology. The floodplains have been changed by soil dumps and excavations, and opportunistic, invasive and planted species have replaced the native vegetation. As Canberra and the surrounding region continue to grow, with the population expanding and infrastructure increasing, the resulting pressures (pests, pets, vandalism, pollution risks, encroachment and isolation) mean pro-active management is needed to safeguard these wetlands into the future.

Restoration to its natural state is not achievable, as water levels are largely determined by Canberra's Lake Burley Griffin. Modifying the area into highly designed wetlands, such as ornamental water gardens or Water Sensitive Urban Design ponds, is not considered acceptable as this would sacrifice the



Shallow ephemeral wetland in the Jerrabomberra Wetlands Nature Reserve used by migrating Latham's Snipe, an EPBC listed species, in an area currently zoned as Wildlife Refuge. Willow control program (not evident in this photo) is constrained to particular times of the year to avoid disturbing Latham's Snipe. Lake-side residential developments are increasing population pressures at the wetland-city interface (© Copyright, Mark Lintermans)

essence of Jerrabomberra and repeat elements of the Canberra landscape. The growing city and nearby airport constrain what can be done.

However, a future is emerging out of this seemingly intractable situation, made possible thanks to four novel ingredients.

The first is the vision of governance. This breaks with convention by vesting managerial responsibility in a Board of Management. The Board is a working partnership of independent appointees and government (Parks and Conservation Service), governed by a memorandum of understanding. Funds for major projects are to be raised by a Trust.

The second is the process for scoping the future. The Board used standard tools (workshops, external facilitator and writing) to forge a vision, and scope guiding principles. It then used new studies in compiling a 'Resources & Values' document, an agreed point of reference, as a platform for the Master Plan. This document stands as a collective statement, with contentious points having been addressed through facilitated workshops. Although exhausting, challenging, and at times emotional, the Board is now a team strengthened by mutual understanding and respect. The third is a relatively new ecological paradigm – novel ecosystems – which gave the Board insights. A novel ecosystem is one subjected to anthropogenic disturbance, which cannot be restored but is stable. It has its own ecological values and functions differently from its prior state.

The fourth is the recognition that the floodplain landscape is a place of on-going cultural and spiritual renewal for local Ngunnawal Aboriginal people.

This future will be set out in the Master Plan, to be finalised early in 2014.

## Sixth Lake Eyre Basin Conference – cross-border collaboration

Australian Government Department of the Environment



Attendees at the Sixth Biennial Lake Eyre Basin Conference, The Institute Theatre, Port Augusta, South Australia, 17-19 September 2013 (© Copyright, Matthew Turner)

The 6th Lake Eyre Basin (LEB) Biennial Conference, held at the Institute Theatre in Port Augusta on 17 to 19 September 2013 under the theme 'Basin Voice: shared understanding and action for a sustainable LEB Future – Linking science and management', sought to:

- share knowledge of water and natural resources, their use, enjoyment and management across the LEB; and
- advance Strategic Adaptive Management (SAM) in the LEB.

Biennial LEB conferences, convened under the LEB Intergovernmental Agreement, seek to give all sectors of the Basin community the opportunity to have a voice and share views about the future of the Basin. Over 2.5 days, the conference brought together 137 people from all sectors of the Basin community, including industry groups (mining, petroleum, grazing and tourism), water and land management agencies, Aboriginal communities, local councils, members of parliament, research institutions, private conservation organisations and interest groups, regional NRM organisations and landcare groups.

Delegates commended the event for creating a space where community and science could interact comfortably. This highlighted a strong community desire to be involved in discussions about new knowledge of the condition of the Basin's rivers and catchments, and what this means for the management of the Basin's water resources. In his opening address, the Hon. Ian Hunter MLC, South Australian Minister for Sustainability, Environment and Conservation, said that ongoing support and involvement of communities is essential for the LEB Intergovernmental Agreement.

Conference talks and posters from a wide range of community, industry, government and scientific presenters highlighted the natural, cultural, economic and social resilience of the Basin under five key themes:

- Extractive resource industries in the Basin
- Communities of the Basin
- Regional natural resource management and adaptive management challenges
- Enjoyment of the Basin
- Water resource management and development.

The conference provided an opportunity for delegates to participate in Strategic Adaptive Management (SAM), a process that allows us to connect what we know (our knowledge base) with what we do (our decisions) in a learning-by-doing cycle that builds collaboration with genuine buy-in from all players. Workshops took delegates through a test run of the Thresholds of Potential Concern process, exploring the warning signs that would tell us that we may be approaching undesirable changes in natural resource condition.

The Conference Proceedings are available on the Lake Eyre Basin Ministerial Forum website at: http://www.lebmf.gov.au/conference/index.html

Celebrating the 40th anniversary of the Ramsar Convention in Australia – a showcase of Australian Ramsar sites

#### Cobourg Peninsula Ramsar Site, Northern Territory The world's first Ramsar site

In 2014 the Australian Government is celebrating the 40th anniversary of Cobourg Peninsula being listed as the world's first Wetland of International Importance under the Ramsar Convention. In May 1974 Australia showed its initiative, leadership and commitment to the Convention by listing this remote and unspoilt wilderness area in the Northern Territory.

Australia's commitment to identifying and conserving its environmental assets, especially those of global significance, continues to the present day. Australia now has 65 wetlands on the Ramsar list, covering 8.3 million hectares.

#### Ramsar designation: 1974

**Location**: On the far northern coast of the Northern Territory

Size: 220 700 hectares

Cobourg Peninsula's Ramsar status recognises its diversity of inland, coastal and marine wetland habitats, and its role in supporting biodiversity, including threatened species.

Green turtles (Chelonia mydas) use the beaches of Cobourg Peninsula Ramsar site for nesting (© Copyright, Tony Howard)





Saltwater crocodile (Crocodylus porosus) taking a break on a sandbar off the coast of the Cobourg Peninsula (© Copyright, Jeanette Muirhead)

Very few people have visited the Cobourg Peninsula. Its isolated location on the far northern coast of the Northern Territory, about 570 kilometres by road north-east of Darwin, means it is relatively undisturbed and retains many of its natural values. Cobourg is about 100 kilometres north of Kakadu National Park, Australia's second Ramsar wetland.

Most of the Cobourg Peninsula Ramsar site is managed as part of Garig Gunak Barlu National Park. *Garig* is a local language name, *Gunak* means land and *Barlu* means deep water. Land uses include conservation, regulated tourism, education, fishing and Indigenous use.

The Arrarrkbi are the Traditional Owners of the Cobourg Peninsula who uphold traditional land management practices, customary law and cultural practices. Cobourg Peninsula is managed jointly by the Traditional Owners and the Parks and Wildlife Commission NT. The health of Cobourg's plants and animals is dependent on traditional Indigenous management practices, including burning, established over a long period of time.

Cobourg has a huge diversity of habitats, including sandy beaches, rocky headlands, small islands, mangroves, eucalypt forests, coastal vine thickets, patches of rainforest, lagoons, tidal flats and estuaries, coral reefs and seagrass meadows.

The beaches provide regular nesting habitat for a number of species of threatened marine turtles (including the green turtle (*Chelonia mydas*), flatback



Rock formations at Smith Point on the Cobourg Peninsula (© Copyright, Jeanette Muirhead)



Cobourg Peninsula Ramsar site supports large populations of the adult roseate tern (Sterna dougallii) (© Copyright, Graeme Chapman)



*Coastline near the Victoria Settlement, Cobourg Peninsula* (© Copyright, Michelle McAulay)

turtle (*Natator depressus*), leatherback turtle (*Dermochelys coriacea*) and olive ridley turtle (*Lepidochelys olivacea*)) and the waters around Cobourg support the internationally vulnerable dugong (*Dugong dugon*). Significant seabird breeding colonies are found on the islands and some headlands support large populations of crested terns (*Thalasseus bergii*), bridled terns (*Onychoprion anaethetus*), black-naped terns (*Sterna sumatrana*) and roseate terns (*Sterna dougallii*).

Permanent wetlands provide a dry season refuge for animals including waterbirds, reptiles such as saltwater crocodiles, and amphibians. Cobourg Peninsula provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish including barramundi (*Lates calcarifer*), giant trevally (*Caranx ignobilis*), mangrove jack (*Lutjanus argentimaculatus*), black bream (*Acanthopagrus butcheri*) and barracuda (*Sphyraena barracuda*). Cobourg has Australia's only population of banteng (*Bos javanicus*), wild cattle that came from Indonesia with Macassan traders in previous centuries.

Cobourg Peninsula has a fascinating history and includes a number of historical and cultural sites. Aboriginal people have lived there for over 40 000 years, and continue to practise traditional hunting and fishing, including for dugong, turtle, magpie geese (*Anseranas semipalmata*), fish, crabs and oysters.

Macassans traded with Cobourg's Indigenous people for centuries, seeking trepang (sea cucumbers). In 1838, Europeans established Victoria Settlement in Port Essington, in response to British fears of Dutch and French expansion into northern Australia. The settlement was abandoned in 1849, due to disease and isolation, leaving ruins which are a popular destination for visitors. Since the mid 1800s, Cobourg Peninsula has supported industries such as cattle grazing, forestry, pearling and tourism.

The environmental values, Indigenous social and cultural values, and historical significance of Cobourg Peninsula make it one of Australia's most fascinating Ramsar sites. This peninsula of diverse tropical landscapes extending into the Arafura Sea is a place worth celebrating in 2014.

You can take a virtual tour of Cobourg Peninsula Ramsar Site at the following link: http://www. environment.gov.au/water/topics/wetlands/database/ virtual-tours/1-vt/index.html



Cobourg Peninsula is located on the far northern coast of the Northern Territory, and was the world's first Ramsar site (© Copyright, Department of the Environment)

#### Kakadu National Park Ramsar Site, Northern Territory

One of Australia's most iconic wetlands features a diversity of important cultural and ecological values.

Kakadu National Park stretches from the mangrovefringed tidal plains in the north to vast floodplains, lowland hills and the sandstone cliffs of the Arnhem Land escarpment.

It is home to one third of Australia's bird species including magpie geese (*Anseranas semipalmata*), egrets, wandering whistling ducks (*Dendrocygna arcuata*) and brolga (*Grus rubicund*). Kakadu supports 20 per cent of Australia's native freshwater fish species and nearly 1600 plant species.

Ramsar designation: 1980

**Location**: Approximately 220 kilometres east of Darwin in the Northern Territory

Size: 1 979 766 hectares



Birdlife alongside Yellow Water Lagoon in Kakadu National Park (© Copyright, Michelle McAulay)



Nourlangie Rock and Anbangbang billabong in Kakadu National Park (© Copyright, Allan Fox)



Indigenous cave paintings and rock art at Ubirr Rock, Kakadu National Park (© Copyright, Michelle McAulay)

Kakadu National Park is also a World Heritage Site and is one of very few places listed for both its cultural and natural values. The land and its people have always been linked. Kakadu has one of the greatest concentrations of rock art sites in the world, and one of the longest historical records of occupation by a group of people.

The park features a successful model of joint management between the Aboriginal Traditional Owners and the Australian Government's Director of National Parks. The Aboriginal people of Kakadu (known as Bininj in the north and Mungguy in the south) work together with park staff to combine traditional skills and knowledge with contemporary park management, enabling the park to be managed in accordance with world's best management practices.

The Bininj/Mungguy are proud to share their country with visitors. Each year up to 225 000 people visit Kakadu National Park to see Indigenous art sites, bushwalk, bird watch and go on boat cruises of the wetlands of Kakadu.

You can take a virtual tour of Kakadu National Park Ramsar Site at the following link: http://www. environment.gov.au/water/topics/wetlands/database/ virtual-tours/2-vt/index.html



Kakadu National Park is a major tourist destination. Here, tourists enjoy a boat ride on Yellow Water Lagoon in Kakadu National Park (© Copyright, Sally Greenaway)



Magpie geese (Anseranas semipalmata) at a paperbark swamp in Kakadu National Park (© Copyright, Allan Fox)



Kakadu National Park Ramsar site is located in the Northern Territory (© Copyright, Department of the Environment)

#### Barmah Forest Ramsar Site, Victoria

The largest stand of river red gum forest in Australia is found on the extensive floodplains of north Victoria, along with the adjoining New South Wales Millewa Forest.

The Barmah Forest Ramsar site is one of sixteen Ramsar sites in the Murray-Darling Basin. It is also one of six 'icon sites' under *The Living Murray* program, chosen for its high ecological and economic value as well as its cultural significance.

#### Ramsar designation: 1982

**Location**: On the Murray River floodplain between Tocumwal and Echuca in Victoria

Size: 28 500 hectares

The majority of the forest functions as a single floodplain system and is dependent on seasonal flooding. Vegetation consists of river red gum and black box forest and woodland, as well as floodplain marshes.

The site is particularly important for species that depend on river red gums for foraging, shelter and breeding. An extensive range and number of waterbirds are found within the Ramsar site, including herons, ibis, spoonbills and terns, sometimes in large breeding colonies. Eight fauna species within the Barmah Forest are nationally threatened, including the endangered Australasian bittern (*Botaurus poiciloptilus*), trout cod (*Maccullochella macquariensis*) and winged peppercress (*Lepidium monoplocoides*), and the vulnerable superb parrot (*Polytelis swainsonii*) and Murray cod (*Maccullochella peelii*).

There are hundreds of sites of cultural significance to Indigenous people within the forest, including occupation sites, burial grounds, mounds, middens, scarred trees and stone artefacts. Current uses of the Ramsar site include recreation, tourism, education and scientific research.



The Barmah Forest Ramsar site is significant for supporting at least seven wetland dependent species, including the superb parrot (Polytelis swainsonii) (© Copyright, Kirsty Wilkes)



The Barmah Forest Ramsar site helps to support Australia's largest river red gum forest (© Copyright, John Baker)



A diversity of waterbirds are found at the Barmah Forest Ramsar site, including spoonbills (© Copyright, John Baker)



Natural features of the Barmah Forest Ramsar site include major streams, anabranches, swamps, billabongs and permanent lakes (© Copyright, Jim Mollison)



The Barmah Forest Ramsar site supports the nationally vulnerable Trout cod (Maccullochella macquariensis) (© Copyright, Gunther E Schmida)



Barmah Forest Ramsar site is located along the Murray River in northern Victoria (© Copyright, Department of the Environment)

#### Flood Plain Lower Ringarooma River Ramsar Site, Tasmania

Threatened species, migratory birds and dairy cattle are all residents of this coastal wetland in Tasmania.

The Flood Plain Lower Ringarooma River site consists of a mosaic of landforms including dunefields, lunettes, natural levees, active and abandoned stream channels, sand splays, lakes, ponds, lagoons and intermittent wet areas. While these landforms and habitats are part of a naturally dynamic system, the rate of geomorphic change has been accelerated by the input of sediments from historic mining activities in the catchment.

#### Ramsar designation: 1982

Location: On the far north-east coast of Tasmania

Size: 3519 hectares

Vegetation comprises a range of wetland species, with some communities listed as rare or threatened in Tasmania, including the coast paperbark swamp forest, blackwood swamp forest, scented paperbark scrub, freshwater aquatic rushland and sedgeland, saltmarsh, coastal heathland and wet heathland.

The site supports a range of mammals, fish and birds, including the threatened dwarf galaxias (*Galaxiella pusilla*) and spotted-tailed quoll (*Dasyurus maculatus gracilis*). Eleven migratory birds listed under international agreements related to the East Asian-Australasian Flyway use the site, including the cattle egret (*Ardea ibis*), great egret (*Ardea alba*), Latham's snipe (*Gallinago hardwickii*) and the curlew sandpiper



The Flood Plain Lower Ringarooma River Ramsar site supports a number of threatened species, including the Spotted-tailed quoll (Dasyurus maculatus gracilis) (© Copyright, Dave Watts)



A diversity of wetland habitats exist within the Flood Plain Lower Ringarooma River Ramsar site (© Copyright, Michelle McAulay)
(*Calidris ferruginea*). The site also provides feeding and breeding habitat for the Australasian shoveler (*Anas rhynchotis*), little tern (*Sternula albifrons*), hooded plover (*Thinornis rubricollis*) and fairy tern (*Sternula nereis*).

Just over half of the Flood Plain Lower Ringarooma River Ramsar site (the eastern portion) is freehold title land used for dairy cattle grazing. The dairy operators are continually adapting and improving their land-use practices under the management plans to ensure 'wise-use' principles are applied to their dairying activities.

You can take a virtual tour of the Flood Plain Lower Ringarooma River Ramsar Site at the following link: http://www.environment.gov.au/water/topics/ wetlands/database/virtual-tours/9-vt/index.html



The Flood Plain Lower Ringarooma River Ramsar site contains excellent examples of wetland systems for the Flinders Biogeographic Region, within the Tasmanian Australian Drainage Division. These include a floodplain with a system of permanent and seasonal marshlands and a large river estuary (Boobyalla Inlet) (© Copyright, Michelle McAulay)



A number of migratory birds use the Flood Plain Lower Ringarooma River Ramsar site, including the Latham's snipe (Gallinago hardwickii) (© Copyright, Graeme Chapman)



The Flood Plain Lower Ringarooma River site is located between Cape Portland and Tomahawk in Tasmania (© Copyright, Department of the Environment)

### Gippsland Lakes Ramsar Site, Victoria

A diverse array of wetlands on the south-east coast of Victoria forms the largest coastal lagoon system in Australia.

The Gippsland Lakes Ramsar Site includes a diversity of wetland types ranging from coastal lagoons and seagrass beds, to saltmarshes and tree-dominated wetlands. The wetland habitats support a variety of fauna species, including many waterbirds.

### Ramsar designation: 1982

Location: On the south-east coast of Victoria

Size: 60 000 hectares

The lakes are linked to the sea by an artificial entrance near the eastern end, opened in 1889, where the town of Lakes Entrance is now situated.

Gippsland Lakes provide important feeding, roosting and breeding habitat for about 80 waterbird species, in numbers up to 50 000. This includes many migratory shorebirds that fly between Australia and north-east Asia. The lakes support at least one per cent of the population of seven waterbird species, including black swan (*Cygnus atratus*), musk duck (*Biziura lobata*), chestnut teal (*Anas castanea*), fairy tern (*Sternula nereis*), little tern (*Sternula albifrons*), sharp-tailed sandpiper (*Calidris acuminate*) and red-necked stint (*Calidris ruficollis*).

The fish community within the Gippsland Lakes Ramsar site is diverse, with approximately 179 species. Seagrass beds are particularly important to many species of fish as a nursery area and the lower reaches of the rivers are spawning sites for key species of fishery significance such as black bream and dusky flathead.

The site supports permanent refugia and breeding sites for two nationally threatened frog species; the growling grass frog (*Litoria raniformis*) and the green and golden bell frog (*Litoria aurea*).

Gippsland Lakes Ramsar site is important for conservation, tourism, recreation, education, scientific research, and commercial activities such as fisheries.



The Port of Lakes Entrance in the Gippsland Lakes Ramsar site provides for a variety of recreational and commercial boating activities (© Copyright, Yarden Oren)



McLennan Straits and Victoria Lagoon contribute to the diversity of wetland types found within Gippsland Lakes Ramsar site (© Copyright, Yarden Oren)



Gippsland Lakes Ramsar site supports at least 1 per cent of the population of Black swans (Cygnus atratus) (© Copyright, Nick Raines)



Green and golden bell frogs (Litoria aurea) breed within the Gippsland Lakes Ramsar site (© Copyright, Dave Watts)

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The Gippsland Lakes Ramsar site is located between Sale and Lakes Entrance on the south-east coast of Victoria (© Copyright, Department of the Environment)

### Logan Lagoon Ramsar Site, Tasmania

Thousands of shorebirds visit an island wetland in Bass Strait on their annual migration between the northern and southern hemispheres.

Logan Lagoon Ramsar Site is enclosed within the Logan Lagoon Conservation Area and is part of the extensive eastern Flinders Island parallel dune–coastal barrier system.

### Ramsar designation: 1982

**Location**: On the south-east corner of Flinders Island in Bass Strait, Tasmania

Size: 2257 hectares



Logan Lagoon Ramsar site is one of three large estuarine lagoons which make up a coastal lagoon system along the south-east coast of Flinders Island (© Copyright, D. Ziegeler)

The site is an excellent, regionally representative example of a coastal estuarine wetland system, and comprises a diverse range of seasonal and permanent marshlands, grass and heathlands, forests, and woodlands, many of which support threatened species.

More than 160 bird species have been recorded on Flinders Island, many of which occur in the Ramsar site which is an important part of the East Asian-Australasian Flyway. Twenty-one migratory waders have been recorded at the site including the red-necked stint (*Calidris ruficollis*), common greenshank (*Tringa nebularia*), eastern curlew (*Numenius madagascariensis*), bar-tailed godwit (*Limosa lapponica*) and double-banded plover (*Charadrius bicinctus*). Other non-avian fauna with conservation value that use the site for foraging, breeding, or as habitat refuge include the threatened dwarf galaxias (*Galaxiella pusilla*).

The site is used for conservation, education, research, and recreation activities including walking, sightseeing, bird watching, off-road vehicle driving and beach fishing.



Several migratory birds have been recorded at Logan Lagoon Ramsar site, including the common greenshank (Tringa nebularia) (© Copyright, Georgina Steytler)



The Logan Lagoon Ramsar site is located on Flinders Island in Bass Strait (© Copyright, Department of the Environment)

### Moulting Lagoon Ramsar Site, Tasmania

The largest and most significant wetland area in Tasmania is also an important breeding area for large numbers of Black Swans.

Moulting Lagoon Ramsar site is a coastal estuarine lagoon system that has areas of both shallow and deep water and is surrounded by periodically exposed mudflats and saltmarsh. The western shore has been largely cleared and is used for livestock grazing and viticulture, while the eastern shore is relatively undisturbed and covered with native vegetation.

#### Ramsar designation: 1982

Location: On the central-east coast of Tasmania Size: 4507 hectares



Large concentrations of chestnut teals (Anas castanea) use Moulting Lagoon Ramsar site during the summer (© Copyright, Brian Furby)

The site supports large numbers and a high diversity of waterbirds. Twenty-two species of resident and migratory waders have been recorded onsite, with nine species regularly using the area. Moulting Lagoon also provides an important staging area for many species of waterfowl in Tasmania, with particularly large summer concentrations of the Australian shelduck (*Tadorna tadornoides*) and chestnut teal (*Anas castanea*).

The Ramsar site is the prime site for black swan (*Cygnus atratus*) breeding in Tasmania, and provides year round habitat for over 7000 swans. It has been estimated that up to 85 per cent of historic black swan breeding in Tasmania occurred at Moulting Lagoon. The name Moulting Lagoon is derived from black swans shedding their flight feathers, which can often be seen piled up along the shoreline. Moulting is considered a critical life-stage for waterfowl, as the birds are flightless during the moult of primary flight feathers and require protection from predators.



Moulting Lagoon Ramsar site supports a range of vegetation, including saltmarsh communities (© Copyright, Michelle McAulay)



*Moulting Lagoon Ramsar site supports large numbers of breeding black swans* (Cygnus atratus) (© Copyright, Michelle McAulay)

The area was historically used for the harvest of waterfowl and their eggs by Indigenous people who lived around the lagoon. Current use of the Ramsar site includes recreational activities such as fishing and hunting, and commercial activities such as aquaculture and tourism. You can take a virtual tour of the Moulting Lagoon Ramsar Site at the following link: http://www. environment.gov.au/water/topics/wetlands/database/ virtual-tours/3-vt/index.html



Moulting Lagoon Ramsar Site is located on the central-east coast of Tasmania, between the townships of Swansea and Coles Bay (© Copyright, Department of the Environment)

# Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site, Victoria

The natural and artificial wetlands of this unique site combine to make it the most important area in Victoria for migratory waders.

The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site is comprised of many different wetland types including freshwater lakes, mangrovelined estuaries, seasonal freshwater swamps, sewage ponds, saltmarshes, intertidal mudflats and seagrass beds. The site comprises six distinct areas that include Point Cook/Cheetham, Werribee/Avalon, Point Wilson/Limeburners Bay, Swan Bay, Mud Islands, and the Lake Connewarre Complex.

Ramsar designation: 1982

Location: Near Geelong in Victoria

Size: 22 897 hectares

A large number of migratory species have been recorded at the site including pied oystercatchers (*Haematopus longirostris*), banded stilts (*Cladorhynchus leucocephalus*), red-necked stints (*Calidris ruficollis*), sharp-tailed sandpipers (*Calidris acuminate*), Australasian shovelers (*Anas rhynchotis*), red-necked avocets (*Recurvirostra novaehollandiae*), blue-billed ducks (*Oxyura australis*) and freckled ducks (*Stictonetta naevosa*).

The Ramsar site supports a range of biodiversity. Six nationally threatened species are known to occur there – the Australasian bittern (*Botaurus poiciloptilus*), orange-bellied parrot (*Neophema chrysogaster*), Australian painted snipe (*Rostratula australis*),



Swan Bay near Queenscliff in the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site supports important shoreline vegetation (© Copyright, John Baker)



The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site supports the vulnerable growling grass frog (Litoria raniformis) (© Copyright, Alexander Dudley)

fairy tern (*Sternula nereis*), Australian grayling (*Prototroctes maraena*) and growling grass frog (*Litoria raniformis*). The critically endangered orange-bellied parrot, in particular, uses habitat around Port Phillip Bay during winter. Over 50 species of fish have been recorded in Swan Bay (a component of the Ramsar site) and the seagrass beds are an important feeding and nursery ground for commercially important fish species. There are a number of important Indigenous sites within the wetlands, including burial sites, middens and artefacts. The oldest known midden in the area is at least 5000 years old. More than three million people live around Port Phillip Bay and the area is used for recreation, nature conservation, sewage treatment, aquaculture, fishing and salt production.



Lake Borrie in the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site is the site of the largest breeding colony of Pied Cormorants in Victoria (© Copyright, B. Edgar)



The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site supports the Australian painted snipe (Rostratula australis) (© Copyright, Graeme Chapman)



The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site is located near Geelong in Victoria (© Copyright, Department of the Environment)

## Hunter Estuary Wetlands Ramsar Site, New South Wales

Community education, wetland conservation and wise use principles are actively promoted by the Hunter Wetlands Centre Australia, a very important part of this New South Wales Ramsar site.

The Hunter Estuary Wetlands Ramsar site consists of two components – the Kooragang component in the estuary of the Hunter River, and the Hunter Wetlands Centre Australia. These components are not adjacent to each other but they have hydrological and wildlife links.

### Ramsar designation: 1984

**Location**: Near Newcastle in New South Wales

Size: 2968 hectares

Habitats at Kooragang include mangrove forests, samphire saltmarsh, paperbark and she oak forests, brackish swamps, mudflats and sandy beaches. Hunter Wetlands Centre Australia is a small but unique complex of wetland types largely surrounded by urban development. This previously degraded site has been restored to semi-permanent freshwater and brackish ponds and marshes, freshwater swamp forests and a coastal estuarine creek.

The Ramsar site provides important feeding, roosting and refuge habitat for waterbirds and is a stopover site for migratory species, many of which are listed under international agreements. The site regularly supports a significant proportion of the eastern curlew (*Numenius madagascariensis*) and red-necked avocet (*Recurvirostra novaehollandiae*) populations. Threatened species found within the site include the green and golden bell frog (*Litoria aurea*), red goshawk (*Erythrotriorchis radiates*), estuary stingray (*Dasyatis fluviorum*) and Australasian bittern (*Botaurus poiciloptilus*).



The Hunter Wetlands Centre Australia was restored from a previously degraded site, and now promotes wetland conservation and wise use through community education and involvement. (© Copyright, Sarah Stuart-Smith)

The Ramsar site was traditionally used by Indigenous groups and there are numerous middens and campsites scattered throughout the area. The Kooragang component is currently used for recreational and nature-based activities.



The Hunter Wetlands Centre Australia component of the Ramsar site regularly supports a number of waterbird species (© Copyright, Sarah Stuart-Smith)



The Hunter Estuary Wetlands Ramsar site includes a diverse range of wetland habitats (© Copyright, Sarah Stuart-Smith)



*The Hunter Estuary Wetlands Ramsar site regularly supports large numbers of eastern curlews* (Numenius madagascariensis) (© Copyright, Brian Furby)

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The Hunter Estuary Wetlands Ramsar site is located just north of Newcastle in New South Wales (© Copyright, Department of the Environment)

### Towra Point Ramsar Site, New South Wales

The largest wetland of its type in the Sydney Basin region provides an important sanctuary for migratory birds within the surrounding urban and industrial areas.

The estuarine Towra Point Ramsar site includes a mixture of spits, bars, mudflats, dunes and beaches. Habitats include seagrass meadows, mangroves, saltmarshes, dune woodlands, casuarina forest, some littoral rainforest and sand dune grasslands. The Ramsar site contains a large proportion of the remaining mangrove and saltmarsh communities in Sydney.

#### Ramsar designation: 1984

**Location**: On the northern side of Kurnell Peninsula near Sydney in New South Wales

Size: 603.7 hectares

Towra Point is important for birds. Approximately 200 species of birds have been recorded at the site, including numerous migratory species listed under international agreements. The birds roost in the



Ruddy turnstones (Arenaria interpres) are known to breed within Towra Point Ramsar site (© Copyright, Georgina Steytler)



Mangroves at the Towra Point Nature Reserve (© Copyright, David Heap)

saltmarsh communities in the Ramsar site and feed in the intertidal zone along the shoreline of Botany Bay to replenish their fat reserves before embarking on a long northward migration. Large numbers of eastern curlews (*Numenius madagascariensis*), lesser golden plovers (*Pluvialis dominica*) and ruddy turnstones (*Arenaria interpres*) have been recorded within the complex. Little terns (*Sternula albifrons*) and pied oystercatchers (*Haematopus longirostris*) are known to breed there also.

Towra Point Ramsar site provides significant habitat and a food source for at least 60 species of fish, of which 25 are of economic significance. Fish utilise the saltmarsh, mangrove and seagrass habitats at and adjacent to Towra Point for food, protection and as nursery habitat during the early stages in their life cycle.

Evidence of Indigenous links to the site includes middens, rock shelters, engravings, burial sites and other items of Indigenous heritage. Captain Cook anchored at Botany Bay in 1770 and Towra Point was explored, mapped and used as a source of fresh water. It was at this site that the ship's botanist, Sir Joseph Banks, took the first recognised botanical samples of Australian flora.



*Early morning mist over the Towra Point Nature Reserve* (© Copyright, Bruce Gray)



Birds roost in the saltmarsh areas of the Towra Point Ramsar site (© Copyright, Daryl Chapman)



Towra Point Ramsar site is located near Sydney in New South Wales (© Copyright, Department of the Environment)

# The Coorong and Lakes Alexandrina and Albert Ramsar Site, South Australia

This unique mosaic of 23 wetland types has received substantial publicity in recent years due to its significance at the end point of the Murray-Darling Basin.

The Coorong and Lakes Alexandrina and Albert Ramsar site is a long, shallow brackish to hyper-saline lagoon that stretches for 140 kilometres in length. It is separated from the Southern Ocean by a narrow sand dune peninsula. The Lakes Alexandrina and Albert are comprised of fresh to brackish/saline waters.

#### Ramsar designation: 1985

**Location:** At the downstream end of the Murray River, in south-east South Australia

Size: 140 500 hectares

The site provides habitat for a large number of waterbirds and 43 species of fish, including nationally threatened species such as the orange-bellied parrot (*Neophema chrysogaster*), the southern Mount Lofty Ranges emu wren (*Stipiturus malachurus intermedius*), the Murray hardyhead (*Craterocephalus fluviatilis*), the Yarra pygmy perch (*Nannoperca obscura*) and the Murray cod (*Maccullochella peelii*).



Meningie Lakefront within the Coorong and Lakes Alexandrina and Albert Ramsar Site (© Copyright, South Australian Department of Environment, Water and Natural Resources)

The site also contains (in part) the critically endangered 'Swamps of the Fleurieu Peninsula', as well as the threatened *Gahnia* sedgeland ecosystem and a number of nationally listed plant species. The site is also significant because it forms the only estuarine habitat in the Murray-Darling Basin and is the only access point for diadromous fish species within the Basin.

The area is popular for recreational activities such as fishing, camping, boating, walking, bird watching, canoeing, sailing, water-skiing, picnicking and research. The area also supports tourism, commercial fishing and farming.

The Ngarrindjeri Indigenous people have a close association with the area and some of the northern islands within the Coorong lagoon are reserved for their use. This association is expressed through Creation stories about Yarluwar-Ruwe (Sea Country), which reveal the significance of the relationship between the country and the people, both practically and spiritually.



Pelicans (Pelecanus conspicillatus) at Goolwa Channel in the Coorong and Lakes Alexandrina and Albert Ramsar Site (© Copyright, Russell Seaman)



Bird watching is a popular activity in the Coorong and Lakes Alexandrina and Albert Ramsar Site (© Copyright, Paul Wainwright)



The Coorong and Lakes Alexandrina and Albert Ramsar site is located near Victor Harbor on the south coast of South Australia (© Copyright, Department of the Environment)

### Macquarie Marshes Ramsar Site, New South Wales

One of the largest freshwater wetland systems in the Murray-Darling Basin is also one of the most biologically diverse.

The Macquarie Marshes Ramsar site encompasses semi-permanent wetlands that include forests, woodlands, reed beds, marshes, rushlands and open water lagoons.

#### Ramsar designation: 1986

**Location**: Within the Murray-Darling Basin in central-northern New South Wales

Size: 19 850 hectares

Permanent habitat is provided for nationally threatened species including the silver perch (*Bidyanus* 

*bidyanus*), Murray cod (*Maccullochella peelii*), Australasian bittern (*Botaurus poiciloptilus*) and Australian painted snipe (*Rostratula australis*).

The habitat also supports significant colonial nesting waterbird breeding events and particularly high levels of microinvertebrates, which form the basis of the food web for many animal species. The marshes are located at the lower end of the Macquarie catchment and native fish such as silver and golden perch (*Macquaria ambigua*) move into the floodplain to breed and spawn in high flows.



A number of native fish breed within the network of water bodies at Macquarie Marshes Ramsar site (© Copyright, Bruce Gray)

Vegetation communities range from river red gum woodland and water couch grasslands to extensive beds of common reed, coolibah, black box, lignum, reed swamp, cumbungi and river cooba.

The Macquarie Marshes are an iconic natural area with significant cultural values. Many people have attachments to the site based on family history, agricultural production, scientific research and conservation. Aboriginal cultural values relate to both the deep history of Aboriginal involvement with the wetlands, and the values, interests and aspirations of contemporary Aboriginal communities with custodial relationships to the wetlands.



The Macquarie Marshes Ramsar site features a diversity of wetland types (© Copyright, Allan Fox)



The Macquarie Marshes Ramsar site supports the endangered Australian painted snipe (Rostratula australis) (© Copyright, Tim Hosking, NSW Office of Environment and Heritage)



The Macquarie Marshes Ramsar site is located at the lower end of the Macquarie catchment in central-northern New South Wales (© Copyright, Department of the Environment)

## Coongie Lakes Ramsar Site, South Australia

Migratory birds from around the world descend on Australia's largest Ramsar site to breed and feed following major floods.

Coongie Lakes Ramsar site is an extensive and complex ephemeral and semi-permanent freshwater wetland system in the floodplain of Cooper Creek, which is one of the world's largest rivers still in a natural state.

#### Ramsar designation: 1987

**Location**: In the Lake Eyre Basin near Innamincka, South Australia

Size: 2 million hectares

The hydrology of the site is one of the most variable in the world, and is linked to El Nino Southern Oscillation events because the upper catchment area of the Lake Eyre Basin lies on the southern edge of the tropical zone. Some wetlands in the system fill only rarely, others hold water for a limited period after flooding, and others are permanent.

A major flood heralds a period of flourishing plant growth and an influx of wildlife. Large numbers of waterbirds, especially pelicans, cormorants, herons, ibises, spoonbills, ducks and waders congregate to feed and breed, dispersing as waters recede. Other fauna includes native fish such as the Cooper Creek catfish (*Neosiluroides cooperensis*) and the Kati Thanda-Lake Eyre callop (*Macquaria ambigua*), and frog species including the water-holding frog (*Cyclorana platycephala*) and the



Coongie Lake Ramsar wetland is made up of a series of ephemeral and semi-permanent freshwater wetlands (© Copyright, Paul Wainwright)



The hydrology of Coongie Lake is highly variable (© Copyright, Paul Wainwright)

trilling frog (*Neobatrachus sudellae*). Notable reptiles include red-naped snake (*Furina diadema*), black-headed goanna (*Varanus tristis*) and the woma python (*Aspidites ramsayi*).

A significant number of Indigenous cultural sites have been found within the Ramsar site, including examples of archaeological sites (occupation sites), burials, art sites, ritually significant locations, tool manufacturing sites, grindstone quarries, remains of wiltjas, early historic campsites and stone arrangements. European settlement and pastoralism came to the area in the 1870s following the expeditions of Charles Sturt in 1845 and Burke and Wills in 1861. Present day activities at the site include cattle grazing and oil and gas production, however the site is becoming increasingly important for recreation and tourism.



Coongie Lakes Ramsar site regularly supports in excess of 20 000 waterbirds, including populations of the freckled duck (Stictonetta naevosa) (© Copyright, Brian Furby)



Cooper Creek flows into Lake Coongie Ramsar site (© Copyright, Derek White)



Coongie Lakes Ramsar site is located in the Lake Eyre Basin, near Innamincka, South Australia (© Copyright, Department of the Environment)

## Eighty-mile Beach Ramsar Site, Western Australia

Each year hundreds of thousands of migratory birds use northern Western Australia as a stopover point on their southward migration.

Eighty-mile Beach Ramsar Site is comprised of two separate areas, Eighty-mile Beach extending 220 kilometres along the coastline from Cape Missiessy to Cape Keraudren and the adjacent intertidal mudflats of Mandora Salt Marsh 40 kilometres to the east.

#### Ramsar designation: 1990

**Location**: Between Port Headland and Broome in northern Western Australia

Size: 175 487 hectares

Eighty-mile Beach includes extensive white sand beaches, tidal mudflats, sand dunes and the most inland occurrence of mangroves in Western Australia. Mandora Salt Marsh contains peat deposits estimated to be about 7000 years old and contains one of only two inland mangrove communities in Australia.

Mound springs from water deep within the Broome sandstone aquifer rises through fractures in the rock, resulting in permanent mostly fresh surface water that supports unusual plant assemblages. The permanence



*Flatback turtles* (Natator depressus) *are known to nest within the Eighty-mile Beach Ramsar site* (© Copyright, Great Barrier Reef Marine Park Authority)

of these freshwater wetlands makes them extremely important to biodiversity in the arid area, providing habitat and drinking water in an otherwise dry environment.

Eighty-mile Beach is part of the the East Asian-Australasian Flyway Network and contains the most important wetland area for waders in northwestern Australia. The site supports up to 336 000 birds, and is considered to be the most important site in Australia for migrant shorebirds on their southward migration between August and November each year. In addition, flatback turtles (*Natator depressus*) regularly nest at scattered locations along Eighty-mile Beach.

Eighty-mile Beach is used for recreation including four-wheel driving, motorcycling, fishing and shell collecting. Mandora Salt Marsh is mainly used for cattle grazing. The site is traditionally part of Karajarri Country in the north, Nyangumarta Country in the south and Ngarla Country in the southern end of Eighty-mile Beach.



Eighty-mile Beach Ramsar site is one of the most important sites in the world for the migration of the great knot (Calidris tenuirostris) (© Copyright, Brian Furby)



Sand dunes behind Eighty-mile Beach (© Copyright, Sarah Stuart-Smith)



*Eighty-mile Beach Ramsar site is located south of Lagrange Bay in northern Western Australia* (© Copyright, Department of the Environment)

# Lake Toolibin Ramsar Site, Western Australia

An innovative groundwater pumping solution has been put in place to protect this site from salinity in the Western Australian wheatbelt.

Lake Toolibin Ramsar site is located in a low rainfall zone and fills from surface water runoff. It is intermittently inundated and generally fills in years of above average rainfall. As the lake is perched above the saline groundwater table, it is the only natural wetland in the bioregion that has not become saline. Infrastructure has been put in place to pump groundwater away from the site to prevent salinity issues.

#### Ramsar designation: 1990

**Location**: 40 kilometres east of the town of Narrogin in south-west Western Australia

Size: 493 hectares

Lake Toolibin provides important habitat for native fauna, particularly waterbirds. A total of 50 waterbird species have been recorded, 25 of which were observed breeding. It is the last, large, *Casuarina obesa*-dominated wetland in the inland agricultural area of south Western Australia. Wetlands of this type were formerly widespread, however, most have become severely degraded by rising saline groundwater.

The Lake is reserved for nature conservation, and current activities include a low level of nature-based recreation.



Lake bed vegetation at Lake Toolibin Ramsar site provides important habitat for birds (© Copyright, Amanda Smith)



Thickets of Casuarina obesa inundated during a high flow event at Lake Toolibin (© Copyright, Roger P Jaensch)



Successful revegetation at Lake Toolibin (© Copyright, Kate Reid)



Lake Toolibin Ramsar site is located approximately 200 kilometres south-east of Perth in Western Australia (© Copyright, Department of the Environment)

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## Peel-Yalgorup System Ramsar Site, Western Australia

Ancient thrombolites, sometimes called living rocks, are part of this geomorphically complex and biologically diverse Western Australian wetland.

The Peel-Yalgorup System Ramsar site includes the Peel Inlet, Harvey Estuary, Lake McLarty, Lake Mealup and ten Yalgorup National Park wetlands. It is made up of shallow estuarine waters, saline, brackish and freshwater wetlands.

### Ramsar designation: 1990

**Location**: Near Mandurah on the south-west coast of Western Australia

Size: 26 530 hectares

The site is the most important area for waterbirds in south-western Australia. Large populations of waterbirds utilise the estuary and lakes and there is a diversity of fish, aquatic invertebrates and fringing salt marsh vegetation.

The system also contains rare microbial communities in the form of thrombolites. The thrombolites at Lake Clifton are considered to be 2000 years old. They are one of only two examples of living thrombolites in Western Australia, with only a handful known in the world.



View of Lake Clifton in the Peel Yalgorup System Ramsar site (© Copyright, Nerida Sloane)

The Peel-Yalgorup Ramsar site lies within Pinjarup country, a dialect group of the Nyoongar. The Ramsar site contains sites of significance to the Indigenous community, including sites of artefact scatter, camps, ceremonies, fish traps, and skeletal remains.

The Peel Inlet and Harvey Estuary are mainly used for recreational and commercial fishing, and other aquatic activities. The estuary system supports the largest professional and amateur estuarine fishery in Western Australia.



*Lake Clifton supports important thrombolite communities* (© Copyright, Kate Reid)



Black swans (Cygnus atratus) on Lake Clifton in the Peel Yalgorup System Ramsar site (© Copyright, Jeanette Muirhead)



The Peel-Yalgorup System Ramsar site is located between Mandurah and Binningup on the south-west coast of Western Australia (© Copyright, Department of the Environment)

### Blue Lake Ramsar Site, New South Wales

At 1800 metres above sea level the air is clear and the water is fresh in this alpine wetland.

Blue Lake Ramsar site is one of only four cirque lakes on mainland Australia. The others are Cootapatamba, Albina and Club Lake also in New South Wales. Blue Lake is the deepest, at up to 28 metres in depth. Together with Hedley Tarn, another glacial lake, these are Australia's highest alpine lakes.

#### Ramsar designation: 1996

**Location**: In the Kosciuszko National Park in New South Wales

Size: 338 hectares

The shores of Blue Lake are lined with boulders and pebbles. The water surface is frozen for approximately four months of the year, thawing and then overflowing in spring. Tall alpine herbfield communities surround the north-eastern area with wet heaths and grasses abutting the shoreline of the lake.

The Ramsar site is known to support one nationally listed species, the vulnerable anemone buttercup (*Ranunculus anemoneus*). The endangered mountain pygmy possum (*Burramys parvus*) is also found in the surrounding area.

The first official European exploration of the region was undertaken by the Polish explorer, Paul Edmund Strezelecki, who climbed and named Mt Kosciuszko in 1840. Historically, Indigenous people did not live permanently in the alpine area but probably visited in summer to perform ceremonies and collect bogong moths for food. Blue Lake is a popular tourist destination within the national park.



Blue Lake Ramsar site was created during the Pleistocene by glacial action (© Copyright, John Baker)



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Part of the shoreline of the Blue Lake Ramsar site is rocky with wet heaths and grasses (© Copyright, Sarah Stuart-Smith)



Blue Lake Ramsar site is located in the alpine region of New South Wales, within the Kosciuszko National Park (© Copyright, Department of the Environment)

# Ginini Flats Wetland Complex Ramsar Site, Australian Capital Territory

South-east Australia's largest, deepest and least disturbed subalpine sphagnum bog is critical for supporting an endemic species.

Ginini Flats Wetland Complex provides critical breeding habitat for the critically endangered northern corroboree frog (*Pseudophryne pengilleyi*) which is endemic to the southern highlands of New South Wales and the Australian Capital Territory. The numerous pools scattered throughout the bogs and wet heaths at the site provide habitat for the species.

#### Ramsar designation: 1996

**Location**: In the Namadgi National Park in the Australian Capital Territory

The site includes subalpine sphagnum bogs and associated wet heath and wet grassland habitats. Peat has developed up to two metres deep beneath areas of wet heath and bog and is estimated to be over 3000 years old.

Snow cover on the subalpine ranges in this area provides a significant winter water storage that is released slowly as the snow melts. Snowmelt is thought to be an important factor in maintaining the hydrological conditions that encourage sphagnum development within the wetlands.



The vulnerable northern corroboree frog (Pseudophryne pengilleyi) breeds within the Ginini Flats Wetland Complex Ramsar site (© Copyright, Murray Evans, Australian Capital Territory Government)

Size: 40 hectares

Between 1936 and 1969 the site was adjacent to a ski lodge, evidence of which can still be seen today. Today the site is used for conservation, catchment management, education and recreational activities such as bushwalking and cross-country skiing.

A video of the Ginini Flats Wetland Complex Ramsar site is available on the Department of the Environment's YouTube channel: http://www.youtube. com/watch?v=2R77wTnmOSo



Ancient rocks amongst the wetland growth in the Ginini Flats Wetland Complex Ramsar site (© Copyright, Nerida Sloane)



Early season snow in the Ginini Flats Wetland Complex Ramsar Site (© Copyright, Di Conrick)

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Ginini Flats Wetland Complex is located in the Namadgi National Park in the Australian Capital Territory (© Copyright, Department of the Environment)

## Great Sandy Strait Ramsar Site, Queensland

The largest and least disturbed sand passage estuary in south-east Queensland is a significant site for a number of internationally listed migratory species.

The Great Sandy Strait Ramsar site includes many different types of wetlands and occurs at the transition between tropical and temperate zones which results in a rich biodiversity. The site also supports rare patterned fens that, alongside those adjacent to the Ramsar boundary, are the only known sub-tropical fens and the only known examples in the world of patterned fens flowing into tidal wetlands.

#### Ramsar designation: 1999

**Location**: In south-east Queensland between the mainland and Fraser Island

#### Size: 93 000 hectares

The Great Sandy Strait is a significant site in the East Asian-Australasian Flyway for migrating shorebirds. It supports at least 25 migratory species. Numbers of shorebirds have been recorded at over 20 000, with the world's largest number of far eastern curlews (*Numenius madagascariensis*) gathering here. The site also provides feeding habitat for four nationally threatened turtle species, as well as dugongs (*Dugong dugon*). It supports the nationally and internationally vulnerable humpback whale (*Megaptera novaeangliae*) during its southward migration to Antarctic waters.

The Great Sandy Strait is highly valued for commercial fishing, recreational fishing, boating and tourism related activities. The site is also of significance to Traditional Owners, with evidence of occupation in the area dating back at least 5500 years. The site is part of the traditional lands of the Butchulla Nation (including Wondunna clan), and is currently used by these people.



Dugongs (Dugong dugon) feed on the vast seagrass meadows of the Great Sandy Strait Ramsar site (© Copyright, Paul Anderson (CALM))



The Great Sandy Strait Ramsar site provides a number of benefits and services. Here, onlookers watch humpback whales (Megaptera novaeangliae) in Hervey Bay on their southward migration (© Copyright, Robert Thorn)



The Great Sandy Strait Ramsar site is an outstanding example of a sand passage estuary. Large, well developed expanses of sand and mud flats, salt flats, mangroves and seagrass beds are widespread along the Strait (© Copyright, Paul Candlin)



The Great Sandy Strait Ramsar site is located near the World Heritage-listed Fraser Island in the south-east of Queensland (© Copyright, Department of the Environment)

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# Banrock Station Wetland Complex Ramsar Site, South Australia

Wine-makers, nature lovers, scientists, red gums, fish and frogs are just some of the visitors and residents that are happily co-existing at Banrock Station in South Australia.

The Banrock Station Wetland Complex Ramsar site is a floodplain wetland complex typical of the lower River Murray floodplain. It includes areas of freshwater and areas of secondary salinised floodplain with discrete wetland basins and channels.

### Ramsar designation: 2002

**Location**: On the River Murray floodplain, downstream of Kingston in South Australia

Size: 1375 hectares

Floodplain vegetation at the site includes river red gum woodland, black box woodland, lignum shrubland, and sedgelands. Aquatic herblands are present in Banrock Lagoon providing significant habitat value for aquatic biota.

The freshwater catfish (*Tandanus tandanus*), rare broad-shelled turtle (*Chelodina expansa*) and the nationally vulnerable southern bell frog (*Litoria raniformis*) are all found at the site. The site is one of the few locations in South Australia where the rare river snail (*Notopala sublineata*) has been successfully reintroduced and bred. The site also supports 138 species of bird including the freckled duck (*Stictonetta naevosa*) and regent parrot (*Polytelis anthopeplus*).

Murray-Darling Basin-wide water management and use in the 1920s led to an alteration of the natural water regime resulting in the original ephemeral wetland system becoming permanently inundated. Since 2007 the site has been managed to mimic more natural wetting and drying regimes in order to improve the long-term health of the wetland. This has seen the re-emergence of many plant species and the return of waterbird species.

Banrock Station demonstrates the Ramsar concept of 'wise use' providing for recreation, tourism, education and scientific research. The site adjoins a vineyard that is managed in a manner complementary to conservation of the wetland. In 2002 Banrock Station Wines received a Ramsar Wetland Conservation Award.



The Wine and Wetland Centre promotes wetlands conservation and ecologically sustainable land use practices. Nearly 100 000 people visit the centre each year and experience the series of interpretive walking trails, boardwalks and bird hides (© Copyright, John Baker)



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One of the many lakes of the Banrock Station Wetland Complex (© Copyright, Paul Wainwright)

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The Banrock Station Wetland Complex Ramsar site is located along the River Murray in South Australia (© Copyright, Department of the Environment)

# Elizabeth and Middleton Reefs Ramsar Site, Coral Sea Islands Territory

The most southerly open ocean platform reefs in the world are home to a rich diversity of marine flora and fauna.

Elizabeth and Middleton Reefs are remote coral reef atolls that occur on isolated, oceanic sea mounts approximately 50 kilometres apart from each other.

### Ramsar designation: 2002

**Location**: In the northern Tasman Sea, approximately 180 kilometres north of Lord Howe Island

Size: approx. 188 000 hectares

The Ramsar site supports a diverse range of tropical and temperate marine life, including both warm water and cold water corals and an abundance of fish species. This diversity, including many species at either the northern or southern limit of their distribution, is a result of their location in an area where tropical and temperate ocean currents meet.

The reefs support several vulnerable and endangered species, including species of whale, the green turtle (*Chelonia mydas*) and the black cod (*Epinephelus* 



*Elizabeth Reef has a small sand cay, and at low tides much of the reef flat at both reefs are exposed by the receding waters* (© Copyright, Director of National Parks)

*daemelii*). A number of migratory seabirds use the site for feeding (including the sooty tern (*Onychoprion fuscata*), masked booby (*Sula dactylatra*), wandering albatross (*Diomedea exulans*) and white-bellied storm petrel (*Fregetta grallaria*) and it is a breeding ground for the common noddy (*Anous stolidus*).

At least 30 ships have been recorded wrecked on the reefs, dating back to the late 18th century. Except for the remains of more recent wrecks, which are striking features of the Ramsar site, the majority of wrecks have not been accurately located. The wreck *Fuku Maru* on Middleton Reef supports a small breeding colony of sea terns, which due to lack of suitable dry land, otherwise would not occur at the Ramsar site.

The reefs were designated as a marine reserve in 1987 and are currently managed within the Lord Howe Commonwealth Marine Reserve by Parks Australia. The Sanctuary Zone around Middleton Reef is a 'Strict Nature Reserve', managed principally for scientific research and environmental monitoring, while allowing passive use. The Habitat Protection Zone located around Elizabeth Reef is managed for scientific research, environmental monitoring and habitat protection.



Monrey Frontier wreck on Middleton Reef (© Copyright, Director of National Parks)



*Elizabeth and Middleton Reefs Ramsar site supports several species of whale, including the Southern right whale* (Eubalaena australis) (© Copyright, Georgina Steytler)

### The Dales Ramsar Site, Christmas Island

This Christmas Island wetland supports a number of unique ecological features, including significant numbers of seabirds and endemic crabs.

The Dales Ramsar site is a near pristine system of seven watercourses which include permanent and perennial streams, and permanent springs. It also contains the majority of surface water on Christmas Island.

**Ramsar designation**: 2002

**Location**: On the western coastline of Christmas Island

Size: 583 hectares

The Dales includes anchialine (a mixture of fresh and salt water) caves where basalt and limestone meet. It is also comprised of surface karst (limestone) communities, including the unique stepped tufa deposits at Hugh's waterfall.



Waterfall within The Dales Ramsar site on Christmas Island (© Copyright, Parks Australia)



*Each year, millions of red crabs* (Gecarcoidea natalis) *migrate across Christmas Island during the breeding season* (© Copyright, John Hicks)
There are a significant number of breeding colonies of seabirds at The Dales, including the world's last active breeding colony of the endangered Abbott's booby (*Papasula abbotti*). Other noteworthy bird species at the site include the vulnerable Christmas Island frigate bird and the migratory redfooted booby (*Sula sula*) and brown booby (*Sula leucogaster*). The Dales also supports all twenty land crab species found on Christmas Island including the endemic blue crab (*Discoplax hirtipes*), the robber crab (*Birgus latro*) and the iconic red crab (*Gecarcoidea natalis*).

The site is used for conservation and recreation activities, including sightseeing, walking and camping.



The Dales Ramsar site on Christmas Island (© Copyright, Parks Australia)



The Dales Ramsar site is located on the western coastline of Christmas Island (© Copyright, Department of the Environment)

## Piccaninnie Ponds Karst Wetlands Ramsar Site, South Australia

Exceptional karsts and coastal fen wetlands characterise Australia's most recently designated Ramsar site.

The karst wetlands at Piccaninnie Ponds have been created by limestone rocks being dissolved over thousands of years. The water is discharged from a groundwater aquifer and is fresh, clear and cool – almost always between 14 and 15°C. The pools are renowned for their water clarity and support aquatic vegetation up to 15 metres below the surface. It is one of the few remaining permanent freshwater wetlands in the lower south-east of South Australia.

#### **Ramsar designation**: 2012

**Location**: South-east of Mount Gambier in South Australia

Size: 862 hectares

The wetlands support a number of nationally threatened species, including the orange-bellied parrot (*Neophema chrysogaster*) and the Australasian bittern



Spectacular underwater view of cave divers in the Main Ponds area of the Piccaninnie Ponds Karst Wetlands Ramsar site (© Copyright, Richard Harris)

(*Botaurus poiciloptilus*). They also provide breeding and spawning habitat for native fish species such as the Yarra pygmy perch (*Nannoperca obscura*) and dwarf galaxias (*Galaxiella pusilla*).

Each year around 20 000 people visit Piccaninnie Ponds Karst Wetlands. One of the main attractions is cave diving in the crystal clear deep water. Visitors can snorkel or dive down into the underwater caverns to explore the majestic white walls of sculptured limestone.

A video of the Piccaninnie Ponds Karst Wetlands Ramsar site is available on the Department of the Environment's YouTube channel: http://www.youtube. com/watch?v=0QlEuVwDotU



Birdlife at Pick Swamp in the Piccaninnie Ponds Karst Wetlands Ramsar site (© Copyright, Dragi Markovic)



*Piccaninnie Ponds Karst Wetlands Ramsar site supports the critically endangered orange-bellied parrot* (Neophema chrysogaster) (© Copyright, Graeme Chapman)



The Piccaninnie Ponds Karst Wetland Ramsar is located in the far south-east of South Australia, bordering Victoria (© Copyright, Department of the Environment)

# Calendar of events

### 2014 Calendar of Events

31 January 2014 10th Annual West Australian Wetland Management Conference http://cockburnwetlandscentre.wordpress.com/ world-wetlands-day/

2 February 2014 World Wetlands Day www.environment.gov.au/water/topics/wetlands/ world-wetlands-day/index.html

2 March 2014 Clean Up Australia Day www.cleanupaustraliaday.org.au

22 March 2014 World Water Day www.unwater.org/wwd2014.html

29 April – 1 May 2014 Ozwater'14 Conference, Brisbane www.ozwater.org/

10-11 May 2014 World Migratory Bird Day www.worldmigratorybirdday.org/ 22 May 2014 International Day for Biological Diversity www.cbd.int/idb/2014/

5 June 2014 World Environment Day www.unep.org/wed/

30 June – 4 July 2014 Australian Society for Fish Biology Conference, Darwin www.asfb.org.au/events/2014-asfb-conference/

31 August – 5 September 2014 World Water Week www.worldwaterweek.org/

September 2014 Biodiversity Month www.environment.gov.au/node/14287

12-19 November 2014 IUCN World Parks Congress, Sydney www.iucn.org/about/work/programmes/gpap\_home/ gpap\_events/gpap\_wpc/

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