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Intertidal wetland habitats, such as the coastal saltmarsh found at the Moulting Lagoon Ramsar site near Swansea in Tasmania, are important breeding or nursery grounds for fish, habitats for birds and used by a range of threatened species (© Copyright, Australian Government Department of the Environment)

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Introduction

Introduction to *Wetlands Australia* August 2015

Wetlands are important for supporting threatened species.

Australia's wetlands are home to a diverse range of species, including plants, birds, fish, frogs, reptiles and mammals. Many of these species rely on wetlands for their survival, especially during important life cycle stages such as resting, feeding and breeding. In addition to endemic species, many of the threatened species in wetlands are migratory, and travel long distances in search of wetlands for food and roosting sites.

This edition of *Wetlands Australia* highlights the actions by community groups, Indigenous organisations, universities and research institutions,

non-government organisations and state and federal governments to raise awareness, restore and manage wetlands for the benefit of threatened birds, mammals, fish and frogs. Partnerships and collaborations have led to some surprising discoveries and serendipitous outcomes. We hope you enjoy this selection of articles.

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



Curlew sandpipers (Calidris ferruginea), recently listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999, are migratory birds that fly from northern Russia to Australian wetlands in spring

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Ramsar wetlands support threatened species and communities

If you care about threatened species, you care about wetlands

Gregory Andrews, Threatened Species Commissioner, Australian Department of the Environment

In the driest inhabited continent on earth, where there is water, life abounds. Wetlands feed and shelter some of Australia's rarest and most vulnerable plants, animals and ecosystems.

Needless to say, I care about wetlands. A year ago (August 2014), I was appointed as Australia's first Threatened Species Commissioner within the Australian Department of the Environment. The job brings a new national focus to efforts to conserve our threatened native plants and animals. That means raising awareness of what we stand to lose, brokering new partnerships and mobilising resources for flora and fauna at risk.

Last month (July 2015), this new national focus culminated in a landmark [Threatened Species Summit](#) and the release of a Threatened Species Strategy with hard and measurable targets for the conservation of

species on the brink. We now have a policy framework to guide our investment in threatened species at a national level. Areas of high biodiversity, such as wetlands, are a priority for us. Conservation actions that benefit multiple species are another. So too are those that engage the community in threatened species protection.

Here's an example of that approach in action. Earlier this year, the Australian Government announced it would spend \$35,200 to help restore coastal saltmarsh on Snake Island, within the Port Phillip (Western Shoreline) and Bellarine Peninsula Ramsar site in Victoria. This area of threatened temperate coastal



Threatened Species Commissioner, Gregory Andrews, with the Australian Department of the Environment

(© Copyright, Australian Department of the Environment)



The threatened fairy tern (Sternula nereis) (© Copyright, Georgina Steytler)

saltmarsh near Geelong is not only important in its own right, but also as nursery habitat for fish and feeding grounds for migratory shorebirds, including the vulnerable fairy tern (*Sternula nereis*).

Community monitoring has revealed that Snake Island has lost up to 90 per cent of its 15 000 shorebirds. This is mostly due to a simple issue - a damaged culvert that has interrupted water supply and led to toxic acid-sulphate soils and damage to habitat. Our funding of this threatened species project will help repair the culvert and reinstate those much needed flows.

We're lucky to have the help of Birdlife Australia, the Victorian Department of the Environment and Primary Industries, Corangamite Catchment Management Authority, Arthur Rylah Institute and Geelong Field Naturalists Club Inc on this project. We're lucky that organisations and community groups like these care about wetlands too, and we're willing to back their efforts to save them.

Learn more about the work of the Threatened Species Commissioner and the Department's work on threatened species here:
<http://www.environment.gov.au/biodiversity/threatened/commissioner>



Temperate coastal saltmarsh, listed nationally as a vulnerable ecological community (© Copyright, Matt White, Australian Department of the Environment)

Bitterns and rice: still on the conservation menu

Matthew Herring (Murray Wildlife), Neil Bull (Ricegrowers' Association of Australia), Andrew Silcocks (Birdlife Australia), Mark Robb, (Coleambally Irrigation), Wayne Robinson (Charles Sturt University) and Inka Veltheim (Federation University)

Australian rice crops support the largest known breeding population of the globally endangered Australasian bittern (*Botaurus poiciloptilus*), and they're home to other threatened species too. These agricultural wetlands now form part of a network of important habitats for some of our most threatened species.

Thanks to funding from Riverina Local Land Services, we've recently completed the surveys for our third rice-growing season, and it's our best sample yet. We had 80 sites covering 2050 hectares of rice on 41 randomly selected farms.

We have much analysis ahead, but it's already clear that in most years, 500-1000 bitterns descend on the rice crops of the New South Wales Riverina. That's around one quarter or one third of the global total. This year, we found eight nests, all from randomly selected rice farms, indicating widespread breeding. Importantly, we were also able to confirm successful breeding, with fully-fledged young.

Late in April, we were able to get our first bittern away with a satellite transmitter and begin discovering the network of non-breeding wetlands they use after harvest. Affectionately known as 'Robbie', the journey of this young male has been captivating.

He flew 557 kilometres, crossed two state borders and chose the recently restored Pick Swamp in South Australia, which forms part of the Piccaninnie Ponds Karst Wetlands Ramsar site. After a few days, he began

moving along the coast back into Victoria. He used habitat around the mouth of the Glenelg River, and then continued on to Long Swamp. Here, Nature Glenelg Trust has been undertaking some innovative wetland restoration trials. They think he has fine taste in wetlands and is a good endorsement for restoring them.

As a threatened species, the Australasian bittern is not alone in its use of Riverina rice fields. Remarkable numbers (hundreds) of Australian painted snipe (*Rostratula australis*) used rice during the 2012-2013 season. Equally surprising was the discovery of eastern grass owls (*Tyto longimembris*) roosting in rice during the 2013-2014 season, while the southern bell frog (*Litoria raniformis*) populations around Coleambally and in the western Murray Valley are among the largest known for the species.

For more information about the *Bitterns in Rice Project* and to follow the journey of Robbie and other bitterns in the future, check out our new website: www.bitternsinrice.com.au



This bittern chick was one of nine from three nests in adjacent rice bays, each with a female, but only one booming male, confirming polygamy (© Copyright, Matt Herring)



The journey of 'Robbie', a 3-4 month old rice-bred Coleambally male, to the South Australian coast
(© Copyright, Matt Herring)

*Australian rice crops support the largest known breeding population of the endangered Australasian bittern (*Botaurus poiciloptilus*)* (© Copyright, Matt Herring)



Freedom for the Frecklies

Grace Bourke, Hunter Wetlands Centre Australia

In a world first, the Hunter Wetlands Centre Australia, a community-owned environmental organisation, is proposing to release freckled ducks (*Stictonetta naevosa*) from our conservation breeding program and track them using satellite technology.

Located near Newcastle in the Hunter Estuary of New South Wales, the Hunter Wetlands Centre Australia is a Ramsar listed wetland of international importance. In addition to providing significant waterbird habitat to over 67 species, including the endangered Australasian bittern (*Botaurus poiciloptilus*) and the vulnerable magpie goose (*Anseranas semipalmata*), it serves as a breeding rookery and a welcome refuge for migratory bird species, especially during droughts.

Since commencing the program in 1993, the Hunter Wetlands Centre has been one of the world's most successful captive breeders of the vulnerable freckled duck. Freckled ducks are a wetland dependent waterfowl that nest in densely vegetated, inland Australian *wetlands*. They are adapted to the erratic fluctuations of water distribution, often seeking coastal refuges, such as the Hunter Estuary, in times of drought. The freckled duck is threatened from draining and clearing of vital wetland habitat, alterations to natural water flows as well as illegal shooting.

The freckled duck conservation breeding program was originally established to conserve the future of one of Australia's rarest ducks. Our largely volunteer-run program currently boasts a thriving population of 32 "Frecklies".

After years of deliberation, we have finally decided to fulfil the last stage of the program and release some of our un-imprinted freckled ducks back into the wild. The inaugural release, scheduled for autumn 2016, will launch our annual plan to release healthy juveniles, while also maintaining a viable breeding population on site.





Our freckled ducks (Stictonetta naevosa) making waves in their purpose built tepees at the Hunter Wetland Centre Australia (© Copyright, Grace Bourke)

But where will they go?

Freckled ducks, dispersive and nomadic by nature, may migrate thousands of kilometres in search of greener pastures. Based on expert advice and comprehensive research, we have decided that our best choice for monitoring their dispersal is the highly regarded but expensive satellite transmitter technology. This will allow individual birds to be tracked in real time, providing novel information on the distribution patterns and habitat use of the freckled duck.

The Hunter Wetlands Centre's ambitious *Freedom for the Frecklies* project, subject to funding and approval, will be a valuable contribution to the conservation management of this rare and vulnerable wetland dependent species.

For further information on the *Freedom for the Frecklies* project, please visit www.wetlands.org.au, email projects@wetlands.org.au or phone 02 49516466.

*Walking to Freedom? An inquisitive male freckled duck
(Stictometta naevosa) coyly approaches at the Hunter
Wetlands Centre Australia. The base of the male's
bill turns crimson during breeding season*

(© Copyright, Gary Williams)



Discovering the secret life of microbialites in the Peel-Yalgorup System Ramsar wetland in Western Australia

Dr Michael Coote (Western Australian Department of Parks and Wildlife), Assoc. Prof. Ryan Vogwill (University of Western Australia), Mike Whitehead (Independent ecologist) and Jill Pryde (Western Australian Department of Parks and Wildlife)

These microbial communities do not swim, run or fly, they don't flower or shoot, but they have a character that is unique and their biology and chemistry have excited research groups around the world for decades.

Microbialites have been forming for thousands of years along the shores of the Yalgorup Lakes, in the Peel-Yalgorup System Ramsar site on the west coast of Western Australia. The microbialite community in Lake Clifton has been the subject of research since the early 1980s and recent investigations by independent researcher Mike Whitehead, and Ryan Vogwill from the University of Western Australia, are starting to unravel the geochemical and hydrological drivers that are responsible for the formation of these ancient limestone structures.

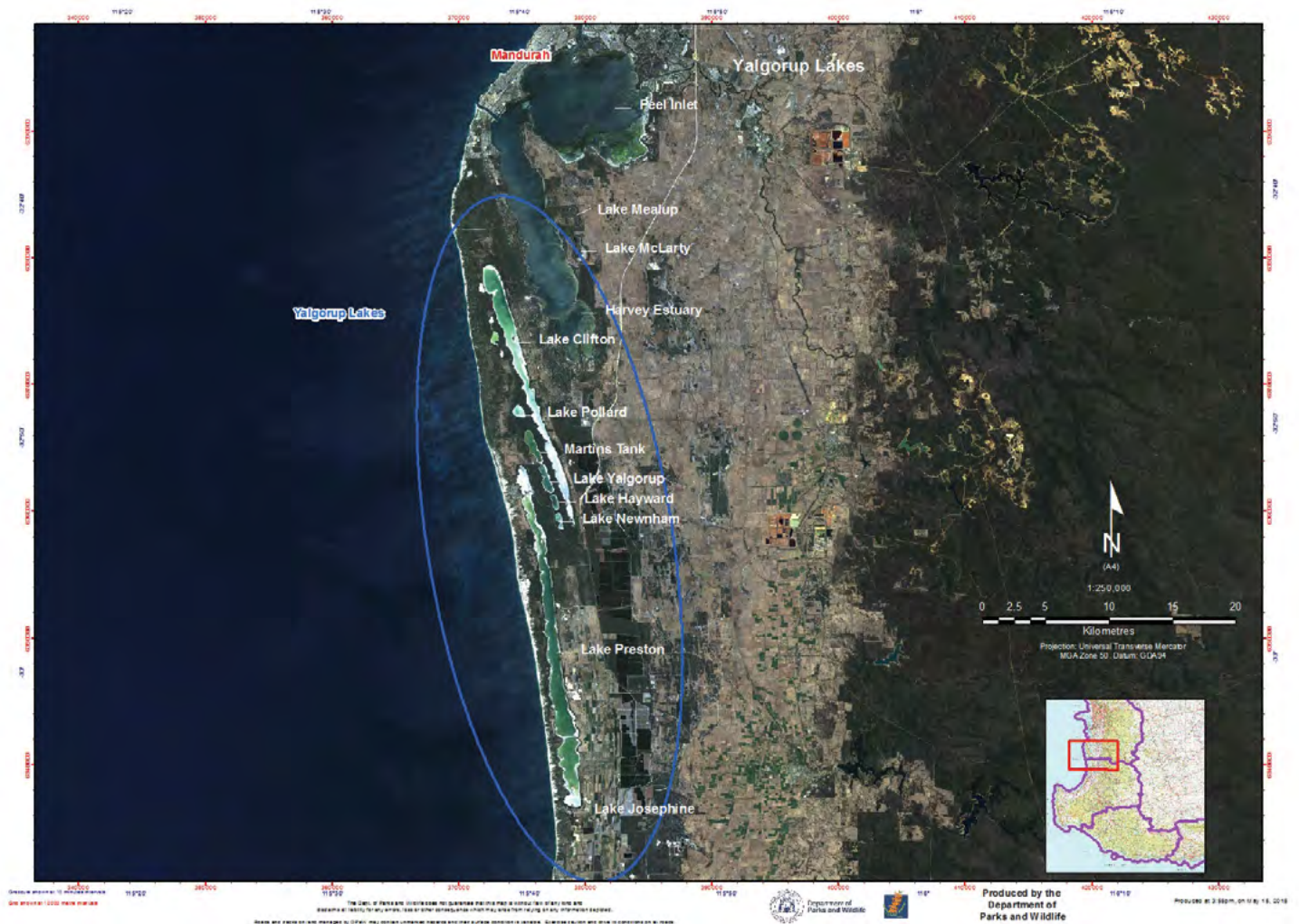
The microbial community at Lake Clifton has developed since the isolation of the lake from the ocean during the Holocene. The microbialites demonstrate variation in their structures, ranging from symmetrical domes to linear tent-like (tepee) structures and have been found along the shores of another of the Yalgorup Lakes, called Lake Preston, also in the Peel-Yalgorup System Ramsar site. Much of the historical research has associated the formation of these structures solely with the microbial communities that reside on the outer surface. The current research demonstrates that a set



The microbialite community at Lake Clifton, part of the Peel-Yalgorup System Ramsar site on the west coast of Western Australia (© Copyright, Michael Coote)



Researchers examining the microbial community structure, showing the lamina of bacterial communities that make up the limestone structures (© Copyright, Michael Coote)



Location of Yalgorup Lakes in The Yalgorup National Park where the microbialite community exists, 100 kilometres south of Perth on the west coast of Western Australia (© Copyright, Michael Coote)

sequence of naturally occurring geochemical, biological and hydrological processes involving the whole habitat are implicated in the formation process with even the historic geomorphology of the habitat type playing a role.

Although there is evidence of active microbialite formation in some Yalgorup Lakes, all the lakes are under significant pressure from anthropogenic stressors in the setting of a drying climate. Urgent research is required to unravel the connection between changes in climate, local groundwater use, land use and the ecohydrology of the Yalgorup Lakes to ensure protection of this vital biodiversity asset.

The microbialite community at Lake Clifton is listed as a critically endangered ecological community under the Commonwealth's *Environment Protection and Biodiversity Conservation Act (1999)*. The Department of Parks and Wildlife in Western

Australia coordinate the preparation and implementation of recovery plans in consultation with recovery teams which are established to oversee the conservation and recovery of threatened and priority ecological communities. The Lake Clifton Recovery Team brings together conservation managers, scientists, land managers, local government, community organisations and individuals, who recommend the best ways to manage threats and recovery of the threatened microbialites of Lake Clifton and other microbial communities in south-west Western Australia.

For more information on the Yalgorup Lakes microbialite community, please visit:
<http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities/127-wa-microbialite-research>

Building fences and strong partnerships to protect vulnerable saltmarsh in the Moreton Bay Ramsar site

Cheryl Bolzenius (WetlandCare Australia) and Jock Mackenzie (TropWATER, James Cook University)

A community-based monitoring program in south-east Queensland is helping to inform effective rehabilitation of vulnerable saltmarsh ecosystems.

Since 2012, WetlandCare Australia has been working with the Moreton Bay Regional Council, scientists from James Cook University (JCU) MangroveWatch and community volunteers from the Redcliffe Environmental Forum (REF) to rehabilitate approximately two hectares of coastal saltmarsh located in a Council reserve at Hays Inlet Conservation Park, part of the Moreton Bay Ramsar site.

Subtropical and temperate coastal saltmarsh is a threatened ecological community, listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act (1999)*. Saltmarshes, whilst dominated by a low diversity of plant species, are highly productive and perform a wide range of ecosystem services. They provide essential habitat for species such as crabs, snails, birds, fish and mammals



Partnerships between communities, land managers and scientists are helping to restore saltmarsh communities at Hays Inlet in south-east Queensland (© Copyright, WetlandCare Australia)

and contribute to fisheries productivity. Acting as a buffer and filtering system for sediments and nutrients, they improve the quality of water entering nearby waterways. Saltmarsh ecosystems are increasingly recognised as sites of high carbon storage and sequestration, playing an important role in mitigating climate change.

The Hays Inlet reserve has historically been impacted by recreational use, vehicles and hydrological change, leading to a loss of vegetation, increased erosion and reduced habitat function. Threats to the biodiversity values of the reserve include invasive weed species, feral pests, uncontrolled domestic animals, litter and vandalism. These impacts reduce ecosystem service capacity and increase vulnerability to climate change.

A community-based monitoring program using a Beyond-BACI (Before, After, Control, Impact) design has been in place since 2012 to inform and monitor site rehabilitation success, with REF volunteers contributing over 500 monitoring hours. Scientists from JCU MangroveWatch have been instrumental in the implementation of monitoring methodology and continue supporting volunteers with training and data analysis.

Rehabilitation works have considered the requirements of Council and Energex (SEQ electricity provider) for their continued management and maintenance activities at the reserve, such as ensuring vehicle access is retained in nominated areas. Works to date include topographic surveys, construction of fencing around approximately two thirds of the saltmarsh vegetation to restrict access, weed control, and revegetation in adjacent bushland, improving the buffer around the saltmarsh.

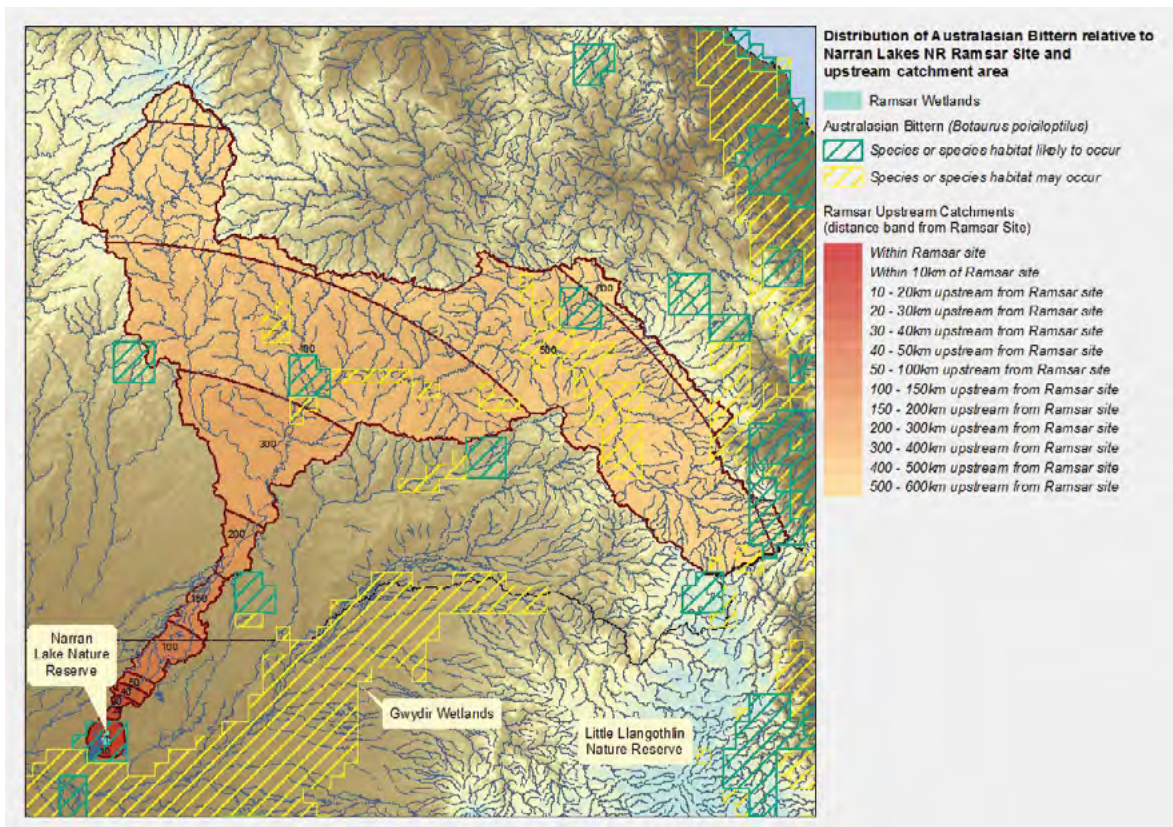
Fauna surveys show the reserve provides valuable ecological function for various fish species, crustaceans, molluscs and birds. Data analysis indicates signs of recovery and increased vegetation cover within the fenced area, however, this is offset by continued negative impacts on the unfenced area where vehicle impacts are now more concentrated. Continued monitoring is essential to determine the success of rehabilitation efforts and to enable alternative solutions to be found.

This program is an example of the benefits of developing community-management-science partnerships to inform effective rehabilitation of vulnerable saltmarsh ecosystems.

Spatial data available for matters of national environmental significance

Australian Government Department of the Environment

New open licensing arrangements for environmental spatial data are helping to improve public access to information on matters of national environmental significance, including wetlands and threatened species.



New open licensing arrangements allows users to obtain environmental data on specific catchments, including catchments containing Ramsar wetlands and threatened species (© Copyright, Australian Government Department of the Environment)

The Australian Government has adopted a default position of openly releasing spatial data for each of the 'matters of national environmental significance' that are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Spatial data can be used for mapping and analysis in either Geographic Information System (GIS) software or various other mapping applications such as Google Earth.

Some of the benefits of openly releasing spatial data include reducing the 'red-tape' associated with accessing and using data and raising awareness of the EPBC Act protected matters. This article highlights some recent releases of open data relevant to wetlands that are available from the Department of the Environment's 'Find Environmental Data' website.

Australia's 65 wetlands of international importance (Ramsar wetlands) are one of the EPBC Act protected matters and, for the first time, each site's boundary data has been compiled to a national spatial dataset. Basic attribute information for each site is included, with links to both the relevant Australian Wetlands Database page and each data providers' source metadata.

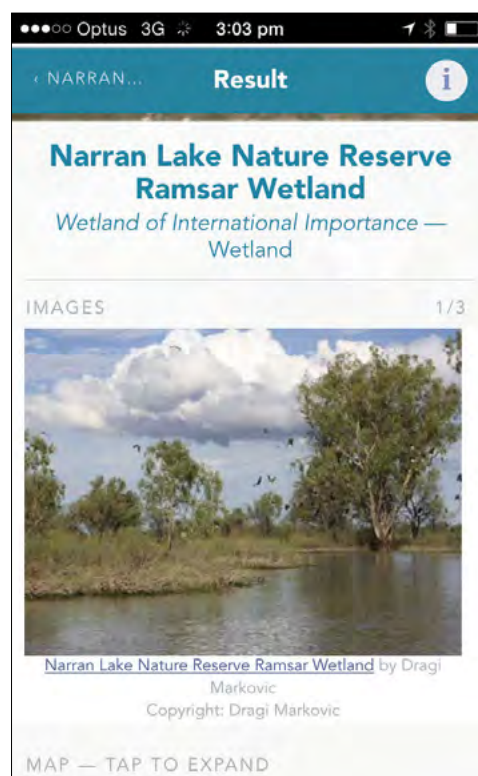
Complimenting the Ramsar spatial data is the release of data representing the upstream surface water catchment area of each Ramsar site. This was developed using the Australian Hydrological Geospatial Fabric (Geofabric) to trace the catchment network that contributes to inflows of each site. This data is used within the Department's Protected Matters Search Tool to help inform whether a proposed activity may have a downstream impact on a Ramsar site, and could also be useful for researchers and wetland managers alike.

Occurrence data of EPBC Act listed threatened species and ecological communities are also now available in a generalised polygon grid format for coarse scale visualisation and analysis. A modelled distribution for species is presented at a 10 kilometre grid resolution with a presence rank included to indicate the likelihood of occurrence. The example map shows what this distribution data looks like for the Australasian bittern (*Botaurus poiciloptilus*) relative to the Narran Lakes Nature Reserve Ramsar site.

The Australian Government has also released a redeveloped mobile friendly web site MyEnvironment which provides location based snapshots of nationally significant environmental features. This allows the public to find out what is significant about their local environment. One of the most exciting new functions of MyEnvironment is that users can now upload their own stories and photos for a particular environmental feature.

For further information, please visit the following links:

- Find Environmental Data - www.environment.gov.au/fed
- Australian Hydrological Geospatial Fabric (Geofabric) - www.bom.gov.au/water/geofabric
- Protected Matters Search Tool - www.environment.gov.au/epbc/protected-matters-search-tool
- MyEnvironment - www.environment.gov.au/myenv/
- Australian Wetlands Database - www.environment.gov.au/topics/water/water-our-environment/wetlands/australian-wetlands-database



The mobile friendly MyEnvironment web site provides location based information on matters of national environmental significance. Users can interact with the site by uploading stories and photos from their local environment (© Copyright, Australian Government Department of the Environment)

Environmental water benefits wetlands and threatened species

Environmental water creates a hive of activity at wetland dam

Melissa Pouliot, for Wimmera Catchment Management Authority

Watchem farmer Mary Fielding's remote property which borders the Wimmera, Mallee and North-Central Victorian catchments is usually a fairly quiet and peaceful part of the world. But since December 2014, when water from the Wimmera Mallee Pipeline started flowing into one of her wetland dams, 'Newlands' has become a hive of activity.

Mary, whose family settled in the district in 1868, says she needed a traffic policeman at the gate for the number of neighbours driving in to witness the historic occasion. Not to mention the animals who are now frequenting the area.

The water is part of Victorian Environmental Water Holder's 1000 megalitre wetland entitlement that

provides water via a pipeline to a number of wetlands in the three Catchment Management Authority (CMA) areas. Before water started flowing into her dam, Mary made the dam smaller to improve water storage, and landscaped around the edge with old logs to make it more environmentally friendly. She also put logs in the centre so birds could seek refuge from foxes or cats.



*Australian wood ducks (*Chenonetta jubata*) (foreground) and a grey teal (*Anas gracilis*) are among a long list of visitors to Mary's wetland dam, which has received environmental water from the Wimmera Mallee Pipeline wetland allocation* (© Copyright, Greg Fletcher)



*A white-faced heron (*Egretta novaehollandiae*) comes in to feed on frogs and invertebrates at the wetland dam on the property of Mary Fielding in Victoria's Wimmera Mallee* (© Copyright, Greg Fletcher)

“First the kangaroos and wallabies arrived,” Mary says. “Then came various birds like bluebonnets (*Northiella haematogaster*), red-rumped parrots (*Psephotus haematonotus*) and eastern rosellas (*Platycercus eximius*), plus crows, magpies, water birds, white-faced herons (*Egretta novaehollandiae*) and ducks. We’ve also got remote sensor images of the goannas coming down to drink.”

From the air, all you see is large cleared farming land with a few stands of trees here and there. But when you look more closely, as wetland consultant Damien Cook did, you’ll be amazed at the diversity of plants and animals who call this place home.

Wimmera CMA asked Damien to survey 13 sites connected to the pipeline to help them understand their environmental values and environmental water requirements. Damien surveyed Mary’s dam, describing it as having some plants of very high conservation significance. The most obvious find was an old black box (*Eucalyptus largiflorens*) with a girth of six metres and culturally significant scarring. Mary calls this the Magic Faraway Tree, and as a child she and her siblings would pretend they were part of the popular Enid Blyton story.

Damien also found three plants listed as rare or threatened in Victoria – buloke mistletoe (*Amyema linophylla* subsp. *Orientalis*), dwarf brooklime (*Gratiola pumilo*) and inland club-sedge (*Isolepis australiensis*). They also found seven bird species, including the threatened brown treecreeper (*Climacteris picumnus*).

Wimmera CMA chief executive David Brennan said stories like Mary’s and Damien’s research were critical in understanding the value of environmental water releases to wetlands, creeks and rivers.

The community is encouraged to contact Wimmera CMA with their observations to include in Environmental Watering Management Plans. Please contact 03 5382 1544, fill out a survey online at www.wcma.vic.gov.au or post comments on the CMA’s Facebook page www.facebook.com/WimmeraCMA



*This black box (*Eucalyptus largiflorens*) with culturally significant scarring sits on the banks of Mary Fielding’s wetland dam. As children, Mary and her siblings referred to it as the Magic Faraway Tree* (© Copyright, Greg Fletcher)

Prioritising for native fish in the Murray-Darling Basin

Commonwealth Environmental Water Office

Environmental watering in a number of catchments in the Northern part of the Murray-Darling Basin is proving beneficial for native fish.

The Commonwealth Environmental Water Office (CEWO) works closely with its delivery partners to deliver Annual Basin Priorities. CEWO, the New South Wales Office of Environment and Heritage, and New South Wales Department of Primary Industries undertook environmental watering in a number of catchments in the Northern part of the Murray-Darling Basin with the specific objective of supporting the survival and enhancement of native fish populations.

In late August 2014, five gigalitres of Commonwealth environmental water from tributary inflows downstream of Wyangala dam was protected from regulation, and allowed to flow the length of the Lachlan system. This approach preserves the chemical signatures and carbon/nutrient profiles contained by overland run-off in flow from unregulated tributaries, and provides cues for native fish movement and breeding. Preliminary sampling indicates that a number of native species spawned after the event, including Murray cod (*Maccullochella peelii*), Australian smelt (*Retropinna semoni*), freshwater (or eel-tailed) catfish (*Tandanus tandanus*) and carp gudgeon (*Hypseleotris sp.*).

In May 2014, a cold water pollution curtain was installed in Burrendong Dam. The curtain aims to minimise the release of cold water from the bottom of the dam and is anticipated to improve native fish habitat within the river immediately below the dam.

Whilst native fish breeding in response to water temperature is very well documented, how native fish respond to river flow to stimulate and support breeding and movement activity is less well understood.

In order to create favourable opportunities and better outcomes for native fish in the Macquarie River, 10 gigalitres of Commonwealth environmental water and 18.5 gigalitres of New South Wales environmental water was delivered in early October through to December 2014. Fish sampling before and after indicated the presence of both state and nationally listed threatened species, including the eel-tailed catfish, silver perch (*Bidyanus bidyanus*), trout cod (*Maccullochella macquariensis*) and Murray cod. All large-bodied fish were measured, weighed and any conditions or parasites were noted, and the fish were returned, unharmed, to the river. Additionally, larval and juvenile fish were collected for otolith (ear bone) ‘back-dating’, to determine the timing of their hatching in relation to the flow event. This is a painstaking process and it is early days yet, but stay tuned to see what the analysis reveals!

For further information on the Commonwealth Environmental Water Office, please visit:
<http://www.environment.gov.au/water/cewo>



*Sam Davis and Jerom Stocks from Fisheries NSW wrangling an adult Murray cod (*Maccullochella peelii*) in Dubbo, March 2015* (© Copyright, Sam Davis, Fisheries NSW)



*Juvenile eel-tailed catfish (*Tandanus tandanus*) sampled in the Macquarie River* (© Copyright, Jerom Stocks)



*Daily aged otolith (ear bone) of a 20 millimetre Australian smelt (*Retropinna semoni*), aged at 63 days* (© Copyright, Jerom Stocks)

Environmental water safeguards threatened frog

New South Wales Office of Environment and Heritage, and the Institute for Land, Water and Society, Charles Sturt University

Southern bell frogs benefit from environmental water being used to improve wetland health in south-western New South Wales.

The southern bell frog (*Litoria raniformis*) (also known as the growling grass frog) was once widespread across south-eastern Australia. However, altered flow regimes, prolonged periods of drought, loss of habitat and pressure from introduced fish have contributed to a significant decline in the species. Today, southern bell frogs are locally extinct in many of their former strongholds in the Lachlan, Murrumbidgee and Murray River catchments. The species is now listed as nationally vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*, red-listed by the International Union for Conservation of Nature and recognised under State threatened species legislation (NSW, SA, Victoria and Tasmania).

Over the eight years to 2015, the NSW Office of Environment and Heritage has managed environmental water on behalf of the NSW Government and in partnership with the Commonwealth Environmental Water Holder to restore and maintain habitat for wetland-dependant fauna, including the southern bell frog. This began in the later stages of the millennium drought when systematic surveys showed that southern bell frogs were persisting in a small number of river red gum and lignum-black box wetlands. After widespread flooding in the southern Murray-Darling Basin between 2010 and 2012, a small number of bell frogs re-populated many of their former wetland sites. Subsequent multi-year environmental flows also saw southern bell frogs re-appear further afield in several

targeted wetlands throughout the Murrumbidgee and Murray River valleys. To date, over 31 gigalitres of environmental water has been directed to 22 bell frog sites in the Lachlan, Murrumbidgee and Murray River valleys to support bell frogs and other wetland-dependent fauna.

The southern bell frog is found in permanent and seasonally-flooded wetlands. They are sensitive to prolonged drying of their wetland habitat and availability of aquatic vegetation for breeding. Maintaining refuges during droughts and timing wetland flooding to coincide with bell frog peak breeding activity in spring and summer are critical factors for aiding the recovery of this species.

The fate of the southern bell frog in inland NSW will be determined by the availability of environmental water to flood sites where they are known to occur and our ability to protect the species from additional pressures such as introduced fish. New South Wales and Commonwealth funded monitoring to date has been crucial for determining the presence of bell frogs and evidence of breeding, including egg masses, tadpoles and juvenile frogs, to inform the timing and duration of follow-up watering actions across the frog's range.

For further information, please visit:
<http://www.environment.nsw.gov.au/environmentalwater/index.htm>



*A Southern bell frog (*Litoria raniformis*) with a green and gold warty back, and visible pale green mid-dorsal stripe*
(© Copyright, Joanne Ocock, NSW Office of Environment and Heritage)



*A key southern bell frog (*Litoria raniformis*) site in the Lowbidgee Floodplain - Two bridges swamp, Yanga National Park* (© Copyright, James Maguire, NSW Office of Environment and Heritage)



*A key southern bell frog (*Litoria raniformis*) site on private land in the mid-Murray - Murray Downs*
(© Copyright, Emma Wilson, NSW Office of Environment and Heritage)

Finding a new wetland home for a threatened fish in the Murray-Darling Basin

The Murray-Darling Freshwater Research Centre

Research, land and water management agencies and state government department's work together to provide a new wetland home for the threatened Murray hardyhead (*Craterocephalus fluviatilis*).

The Murray hardyhead is a small fish native to the wetlands of the lower Murray River system, which for the last few decades has faced a very real threat of extinction. As few as nine remnant populations survive in Victoria and South Australia, all of which required a helping hand to avoid extinction during the recent millennium drought.

A revised draft Recovery Plan for the species identified two key recovery objectives for the species:

1. Protect, maintain and monitor known populations, and
2. Increase the area of occupancy of the species. One method to achieve this is to translocate fish from existing populations to carefully selected and prepared floodplain wetlands, from which natural dispersal will be possible in future flood events.

Monitoring by the South Australian Department of Environment, Water and Natural Resources (DEWNR) of Riverland populations of Murray hardyhead in February 2015 identified high abundances in two wetland systems: Dishers Creek and Berri disposal basin. These high abundances were likely a reflection of recent conservation efforts by DEWNR, involving carefully timed delivery of environmental water supplied by the Commonwealth Environmental Water Office (CEWO). This presented an ideal opportunity to progress Objective 2 of the Recovery Plan by translocating a sub-population of Murray hardyhead from the Riverland sites to another suitably prepared wetland.

Fortunately, a long collaboration between the Murray-Darling Freshwater Research Centre (MDFRC), the Mallee Catchment Management Authority (MCMA) and Victorian Department of Environment, Land,



Murray hardyhead (Craterocephalus fluviatilis) is a small native fish found in the lower Murray River system

(© Copyright, Iain Ellis)



Lara Suitor (SA DEWNR) and Iain Ellis (MDFRC) netting Murray hardyhead (Craterocephalus fluviatilis) in a Riverland wetland

(© Copyright, Scott Huntley)

Water and Planning (DELWP), has developed translocation sites including Brickworks Billabong in Victoria, a wetland just a few hundred kilometres from the Riverland. Water from the Commonwealth and Victorian Environmental Water holders has been delivered to Brickworks Billabong since 2013 specifically to establish suitable habitat for Murray hardyhead.

Both Victorian and South Australian state departments were able to fast track approval for the translocation of Murray hardyhead. Meanwhile, the MCMA and CEWO concurrently delivered environmental water to Brickworks Billabong in order to increase available habitat, and prompt a production boom in the wetland, enhancing food supply in readiness for the addition of Murray hardyhead.

The MDFRC and DEWNR then captured and translocated a sub-population of Murray hardyhead (approximately 2500) from the Riverland to Brickworks Billabong in a transport trailer generously supplied by the Victorian DELWP. Future monitoring

of Brickworks Billabong will evaluate the success of survival and recruitment following the translocation, with all parties keen to see a thriving new population in the Mallee.

We believe this is the first coordinated interstate translocation of threatened fish between South Australia and Victoria. This recovery action was only possible due to large-scale cooperation and collaboration involving research, land and water management agencies and state government departments. Cooperation is paving a path for the streamlining of threatened freshwater fish recovery processes.

For more information, please visit:

<http://www.mdfrc.org.au/projects/featured/MHHtranslocation.asp>, or read the 2014 review of the status of Murray hardyhead: <http://www.mdfrc.org.au/projects/featured/Mhhworkshop.asp>



Some of the Riverland catch of Murray hardyhead (Craterocephalus fluviatilis) in March 2015 (© Copyright, Scott Huntley)

Threatened species benefit from wetland restoration

Wetland restoration assisting in the national recovery of dwarf galaxias

Lauren Veale and Mark Bachmann, Nature Glenelg Trust

Wetland restoration in south-eastern Australia is proving beneficial for threatened species.

The dwarf galaxias (*Galaxiella pusilla*) is a tiny, slender, freshwater fish that grows to a maximum length of 40 millimetres. The nationally vulnerable species is endemic to south-eastern Australia, where it typically favours the shallow, densely vegetated habitats of freshwater wetlands – habitats that have been widely lost due to extensive artificial drainage for farming.

With funding from the the Nature Foundation SA Inc., surveys undertaken by ecologists at Nature Glenelg Trust revealed the partial recovery of previously identified populations and detected new populations of the species, after the breaking of the millennium drought. These surveys also highlighted the crucial role of wetland restoration in enabling natural aquatic species recovery. A prime example of

this is the restoration of Pick Swamp (previously drained and cleared for grazing) and the regulation of the artificial channel from the adjacent Piccaninnie Ponds, recreating additional shallow, seasonal habitat across the Piccaninnie Ponds Karst Wetlands Ramsar site which has greatly aided population recovery of dwarf galaxias.

Further sites where the species has benefitted from wetland restoration works undertaken in the coastal region of the South East of South Australia over recent years include private wetlands at Middle Point Swamp and public land at Bucks Lake Game Reserve. Most importantly, hydrological works of this nature provide a self-sustaining solution to a key threatening process and hence are a cost-effective mechanism for long-term threatened species recovery.



A male (top) and female (bottom) dwarf galaxias (Galaxiella pusilla) (© Copyright, Michael Hammer)

As readers of Issues 22 and 25 of *Wetlands Australia* magazine may have noted, Nature Glenelg Trust also has a long-term project underway in Long Swamp, over the border in south-western Victoria. In partnership with key community groups and with funding from the Victorian Government, the final stage (phase 3) of trial restoration works has just been completed.

The third phase trial structure, which consists of just under 7000 sandbags, was built with substantial community volunteer support and completed over nine days of works throughout the month of April in 2015. This weir is higher than the first phase of the trial (reported in Issue 25 of *Wetlands Australia*) and

as a result will influence a much larger area of wetland habitat upstream in Long Swamp. Ecologists at Nature Glenelg Trust will continue to evaluate the response of native flora and fauna in Long Swamp to the trial, including fish; noting that dwarf galaxias are expected to colonise new areas of the wetland in response to an increase in aquatic habitat availability and connectivity.

For further information, please contact Nature Glenelg Trust by email: info@natureglenelg.org.au or visit our website: www.natureglenelg.org.au.



Wetland habitat at Pick Swamp in June 2012 (right), recreated from farmland – shown here in May 2007 just before restoration works commenced (left) (© Copyright, Mark Bachmann)



*Dwarf galaxias (*Galaxiella pusilla*) habitat at Pick Swamp in 2014* (© Copyright, Lauren Veale)



The phase 3 trial structure (foreground) has begun to regulate wetland levels in Long Swamp (background) by restricting flows from the Nobles Rocks outlet (© Copyright, Mark Bachmann)

Critically endangered and charismatic crayfish threatened by smooth operator

Western Australia Department of Fisheries

In a region known internationally for its wine and surf breaks, a smooth operator has invaded the Margaret River in south-west Western Australia and is threatening a local, charismatic crayfish.



Hairy marron (Cherax tenuimanus) captured from Margaret River in August 2014 as part of the survey work

(© Copyright, Rodney Duffy, Western Australia Department of Fisheries)

The critically endangered hairy marron (*Cherax tenuimanus*) is only found in the Margaret River and has been rapidly declining in numbers since the early 1980s, coinciding with the first identification of smooth marron (*Cherax cainii*) in the river system. There is now nowhere in the Margaret River catchment where hairy marron occur that smooth marron have not invaded.

The Western Australia Department of Fisheries (DoF), in conjunction with Cape to Cape Catchments Group (CCG) and South West Catchments Council (SWCC), have been busy implementing actions aimed at preventing the extinction of the species from this unique region. One of the major actions is an intensive effort aimed at physically fishing out and removing

smooth marron from hairy marron habitat. The first intensive year of this activity in 2014 resulted in the capture and removal of nearly all reproductively mature smooth marron from a test site. This resulted in an increase in the proportion of hairy marron in the population from less than 10 per cent to over 25 per cent. The success of this trial has resulted in the expansion of effort to the three sections of the river where hairy marron persist.

An established captive breeding program at the DoF owned Pemberton Freshwater Research Centre now contains more than 400 hairy marron. Some of these animals have been used to establish a display at Perth Zoo, to enhance awareness of the plight of this rare species. It is expected the others will be used to establish future hairy marron “ark” sites within the Margaret River catchment.

A new recovery plan for the species, funded by SWCC, has been written and is awaiting state and federal ratification. The recovery plan outlines the importance of the continued effort to remove smooth marron from habitats where hairy marron are present;

increasing numbers of hairy marron in the captive breeding program to allow restocking; and of finding suitable sites where restocking can occur with minimal risk of invasion from smooth marron. In addition, it highlights knowledge gaps and potential roadblocks to success.

Conservation work requires long-term commitment and a dedicated team to implement recovery actions. The hairy marron is lucky to have the support of DoF, CCG, SWCC and a dedicated team of hardworking volunteers. It is a long road to success, but great results are already being achieved.

This project is supported by SWCC with funding from the Australian Government’s National Landcare Programme, and the Government of Western Australia.

To follow progress of this activity, please subscribe to the Freshwater Guardian newsletter: <http://www.fish.wa.gov.au/Sustainability-and-Environment/Aquatic-Biodiversity/Freshwater-Biodiversity/Pages/Freshwater-Guardian.aspx>



*Anniq Harris, Western Australia Department of Fisheries, releases genetically tested and tagged hairy marron (*Cherax tenuimanus*) into a captive breeding pond at the Pemberton Freshwater Research Centre in May 2015* (© Copyright, Rodney Duffy, Western Australia Department of Fisheries)



*The tufts of hair are buoyant, and give the hairy marron (*Cherax tenuimanus*) a furry appearance when submerged* (© Copyright, Rodney Duffy, Western Australia Department of Fisheries)

Restoring connected habitat corridors benefits threatened wetland species in northern New South Wales

Laura White, WetlandCare Australia

The Northern Corridor Connections project is improving key habitat corridors on the New South Wales North Coast, achieving significant outcomes for wetland-dependant threatened species.

The project, which commenced in October 2014, is funded by North Coast Local Land Services under the National Landcare Program and the New South Wales Catchment Action Program. Project manager, WetlandCare Australia, has built an innovative partnership team delivering environmental outcomes across over 200 hectares of native vegetation and fauna habitat in the Tweed and Ballina areas. Working with other local natural resource management providers including Bushland Restoration Services, EnviTE, Jali Local Aboriginal Land Council and Reconeco Ecological Consultants, WetlandCare Australia has delivered a range of targeted vertebrate pest and environmental weed management activities that protect core habitat in key biodiversity corridors.

Through this project, on-ground restoration works were undertaken within a remnant of the critically endangered Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community adjacent to North Creek estuary in East Ballina. A pest management program was initiated at the site commencing with the installation of motion sensor cameras which have recorded the occurrence and behaviour of the vertebrate pest populations, especially the European Red Fox (*Vulpes vulpes*), and their impacts on the area.

In an unexpected and exciting twist, the cameras captured an image of the cryptic wetland bird, the black bittern (*Ixobrychus flavicollis*), which is listed as

vulnerable in New South Wales under the *Threatened Species Conservation Act (1995)*. This species of heron, which inhabits both freshwater and estuarine wetlands, was not previously known to occur at the site.

Disturbingly though, the cameras also captured an actively hunting fox population at the same location, including an image of an adult fox with freshly caught prey in its mouth. A large inhabited fox den was also located within the site. The fox is a listed threat to the black bittern, which often roost and feed on the ground.

Cage trapping and den fumigation activities were subsequently undertaken by vertebrate pest management specialists Reconeco at the North Creek site to target the troublesome fox population for the protection of the black bittern and other native fauna. Regenerators from WetlandCare Australia and Jali Local Aboriginal Land Council combined skills and knowledge to undertake weed management to further restore the habitat values of this important wetland.

Similar works undertaken within coastal heath and wetlands and riparian rainforests in the Ballina and Tweed areas under the project have contributed similar outcomes for threatened flora and fauna across the region.



*A motion sensor camera at North Creek near Ballina in Northern New South Wales captured this threatened black-bittern (*Ixobrychus flavicollis*), and later in the same location, a European Red Fox (*Vulpes vulpes*) with freshly caught prey* (© Copyright, WetlandCare Australia)



Before (top) and after (bottom) photos of bush regeneration works undertaken to restore fauna habitat at North Creek near Ballina in Northern New South Wales

(© Copyright, WetlandCare Australia)

Love me Tender

Nick McCristal, Corangamite Catchment Management Authority

Four Catchment Management Authorities have used single auction bids to encourage public and private landholders to protect coastal saltmarsh in Victoria.

The Corangamite Catchment Management Authority (CMA) received \$1 million in funding from the Australian and Victorian governments for a multi-regional project targeting coastal saltmarsh and associated vegetation. Coastal saltmarsh provides habitat for a number of nationally threatened species, including the critically endangered orange-bellied parrot (*Neophema chryogaster*). Subtropical and temperate coastal saltmarsh is also listed as a vulnerable community under the federal *Environment Protection and Biodiversity Conservation Act (1999)*.

The project has been led by the Corangamite CMA, but covers four CMA regions along the Victorian coast. Coastal saltmarsh within Victoria has been impacted by a range of threatening processes and has decreased in extent significantly since European settlement. Key threats include uncontrolled stock access and associated trampling, weed infestation, altered hydrology from drainage and urban development.

The project encourages the conservation and restoration of coastal saltmarsh and associated vegetation by public and private landholders across the four CMAs. The project has been delivered utilising a market based instrument in the form of a single bid auction (or tender). Land managers interested in protecting coastal saltmarsh on their property are encouraged to register an expression of interest with the CMA. During a subsequent site assessment, vegetation is assessed using the Habitat Hectare methodology. Landholders submit a bid based on the management plan they receive following the site assessment. Project proposals are ranked in order of cost versus benefit. Successful participants are invited to enter into a five year contract with the CMA to undertake works to protect the coastal saltmarsh.

The project has been implemented across multiple tenures with varied levels of duty of care. As a result, this project has included design elements to manage this additional complexity. The EnSym environmental systems modelling platform, developed by the Victorian Department of Environment, Land, Water & Planning, has been utilised to develop management plans and assess multiple biophysical outcomes of proposed projects. This sophisticated software has enabled the project to deal with complex design and administrative issues with relative ease.

A summary of the results from the project include:

- 30 Expressions of Interest registered from 21 land managers
- Total of 1486 hectares of native vegetation eligible for funding
- 660 hectares of native vegetation under contract (five years) with management to include woody weed control, stock exclusion and pest animal control.
- 17 land managers (public and private) under contract at 18 sites
- 4.75 kilometres of new fencing installed for the protection of native vegetation.

For further information on the work of the Corangamite Catchment Management Authority, please visit:
<http://www.ccma.vic.gov.au/Home.aspx>



These before (top photo, July 2013) and after (bottom photo, May 2015) photos show the return of coastal saltmarsh to a Victorian property that received funding under the project (© Copyright, Jessie McMaster)

Successful industry offsetting: the NCIG Green and Golden Bell Frog Compensatory Habitat Program

Phil Reid, Newcastle Coal Infrastructure Group

The Newcastle Coal Infrastructure Group (NCIG) has established a program to offset the impacts to the green and golden bell frog (*Litoria aurea*) of the development of its coal terminal at Kooragang Island, near Newcastle, New South Wales.

The NCIG Green and Golden Bell Frog Compensatory Habitat Program was established to offset the impacts to the species and its habitat associated with the development of the Coal Terminal. The program ties together planning and cooperation with relevant regulatory authorities, extensive ecological surveys,

academic research, and consultation with land managers and stakeholders. The offset site for the species is located a short distance from the impact site, on Ash Island within the Hunter Wetlands National Park.



Green and golden bell frog in the NCIG compensatory habitat (© Copyright, Nathan Juchau, NCIG)



Construction of the NCIG green and golden bell frog habitat (© Copyright, Michael Godschalk, NCIG)



Aerial view of the NCIG green and golden bell frog habitat, Ash Island, Hunter Wetlands National Park

(© Copyright, Roger Sherack, Skycam Photography).

The threatened *Litoria aurea* is a large mobile native frog species that has disappeared from over 95% of its previous habitat. Historically, there have been difficulties in re-introducing the species, as it is particularly sensitive to key threatening processes. These include habitat loss, introduced predatory species, water pollution and disease caused by an introduced water-borne fungus, known as chytrid fungus. Previous attempts in NSW to establish a *Litoria aurea* population in constructed habitat have failed, not persisted after one breeding event or required intensive management and habitat development.

The NCIG Project has transformed 78 hectares of disused former pastoral leases (gazetted since 2006 as national park) into *Litoria aurea* habitat, including 18 ponds, wetland vegetation, basking and overwintering habitat. The work was completed in November 2014, and the project is considered to be the largest single-species conservation project in the southern hemisphere.

The NCIG program has been able to find ways not only to successfully introduce a captive-bred population to the constructed habitat, but also to

achieve breeding in the habitat, far sooner than expected. This is due to multiple reasons, including funding of extensive research into the species in areas such as behavioural ecology and habitat preference. Research has been conducted both at laboratory scale at the University of Newcastle and in a specially designed “Trial Site” in the Hunter Wetlands National Park.

The breeding achieved in the habitat in January and February 2015 is considered by all stakeholders to be a huge achievement so early in the program. While there is still no estimate on the number of tadpoles produced from the combined breeding across numerous ponds, one clutch of tadpoles was estimated to be well in excess of 2500 individuals.

The interim success of this project provides credibility to the overall principles of offsetting, developed by government and practised by industry.

Learn more about the project at:
<http://www.ncig.com.au/SustainableDevelopment/Environment/tabid/143/Default.aspx>

Restoring swamp sclerophyll forest for koalas in the Hunter Estuary in New South Wales

Louise Duff, WetlandCare Australia

When you think of koalas, do swamps spring to mind? Swamp mahogany trees found in wetlands are a preferred food species for this much-loved threatened species.

The Hunter Region Botanic Gardens is a natural attraction that showcases native and exotic flora in theme gardens managed entirely by volunteers. The site is owned by Hunter Water. One of many natural assets at the Gardens is the Wet Sclerophyll Forest that borders a freshwater wetland. The forest is listed as an Endangered Ecological Community under the New South Wales *Threatened Species Conservation Act (1995)*. Towering swamp mahoganies (*Eucalyptus robusta*) are abundant in the forest.

Swamp mahogany is one of three preferred food trees for the koala (*Phascolarctos cinereus*) in Port Stephens. Smooth-barked apple (*Angophora costata*) is also present in the surrounding Coastal Open Woodland. Many koala sightings at the gardens have been recorded on the Atlas of Living Australia. As a result, the Swamp Sclerophyll Forest is covered by State Environmental Planning Policy (SEPP) number 44: Koala Habitat Protection.

WetlandCare Australia (WCA) received funding from the New South Wales Environmental Trust to rehabilitate 40 hectares of koala habitat at the Gardens, with additional support from the Great Eastern Ranges Initiative's Stepping Stones project, and funding from the Australian Government. The

two year project ran from July 2013 to June 2015. A dense blanket of lantana (*Lantana camara*) covered the forest, inhibiting succession of swamp mahogany and other winter forage species.

Under the project, WCA undertook a native vegetation survey, weed density survey and prepared a lantana control plan for the site. We engaged bush regeneration crews, including two Indigenous workers trained through our Newcastle Wetland Connections project, which is funded by the Australian Government. The works were monitored with photo points and vegetation surveys, showing a dramatic increase in juvenile koala forage trees, an increase in the abundance of ground orchids and a 90 per cent reduction in lantana at the project site.

WCA also undertook a baseline and follow up koala survey with the assistance of volunteers. We found no koala scats during the baseline survey and were excited to find numerous scats in the following survey. While we cannot demonstrate a link between our project works and the scats, it was good to confirm koalas still use the site. We also produced a poster on Endangered Fauna at the Gardens, and ran a habitat hike for volunteers.

WCA maintains long-term relationships with project sites to sustain outcomes beyond the life of the project. On this occasion, we have booked two Green Army teams to continue follow-up regeneration of the site, ensuring the Hunter Region Botanic Gardens will continue to provide forage and shelter for this iconic threatened species.

For further information, please contact
Louise Duff on 02 4951 1425 or
louiseduff@wetlandcare.com.au



Volunteers of all ages are important for wetland restoration and monitoring activities (© Copyright, WetlandCare Australia)

Using mature vegetation to create ready-made wetland habitat in Western Australia

Blackwood Basin Group

Now in its second year, the Blackwood Basin Group's (BBG) *Priority Bittern and Waterbird Biodiversity Enhancement Project* has both success and learnings to share.

The Project aims to create a wetland haven from historic mining dams in Greenbushes in south-west Western Australia, to provide vital habitat for endangered waterbird and migratory species. In partnership with Talison Lithium Ltd and supported by the Western Australia Department of Parks and Wildlife, the project is run by the Blackwood Basin Group with funding from the Australian Government.

The focus species for the rehabilitation are the endangered Australasian bittern (*Botaurus poiciloptilus*), little bittern (*Ixobrychus minutus*), and black bittern (*Ixobrychus flavicollis*). These species require tall, dense and reedy habitat in emergent freshwater, hence revegetation forms a major part of the project along with large-scale feral animal and weed control, dam modification, flora and fauna surveys and community engagement activities.

The BBG has trialed a number of methods to revegetate seasonally inundated areas for waterbird habitat, some with more success than others. The jointed twig rush (*Baumea articulata*) is the primary species being used, with mature clumps being divided from a large reed bed source nearby using both manual and machinery methods.

In wetlands with variable water levels, using machinery to relocate mature clumps offers many advantages over manual handling methods or seedlings. We found that once the winter rains arrive, water levels increase rapidly to inundate approximately three hectares of

beds that are exposed during low water level. This is unfavourable for seedlings as they can easily be flooded and drowned if planted before the rains, or left exposed and vulnerable to drying out and predation by herbivores in the summer. Manually planting clumps led to damage of the stems during the unloading stage which resulted in some being flooded and dying completely, while in others growth was hindered as new shoots emerged only once water levels reduced.

Using expert and precise excavator drivers to remove, load, unload, and plant mature clumps reduced handling and subsequent damage, and allowed for larger clumps to be planted. These are much less likely to be predated by herbivores and, with less damage and more of the stems standing upright, are unlikely to drown. A technique of tying bunches at the loading stage also assisted more clumps to stand upright.

Using mature vegetative divisions with machinery-assisted planting keeps the root system intact, complete with a microbial ecosystem that will allow the plant to thrive, grow and provide a ready-made wetland for the protection of threatened waterbird species.

For more information on this project, please go to the website www.blackwoodbasingroup.com.au



*Trucks are used to transport mature clumps of jointed twig rush (*Baumea articulata*), and heavy machinery is used to remove, load, unload, and plant the clumps to create a ready-made wetland habitat* (© Copyright, Blackwood Basin Group)



Wetlands are being restored in Western Australia using mature vegetative divisions to provide habitat for a variety of threatened waterbirds (© Copyright, Blackwood Basin Group)

Building partnerships that benefit wetlands and threatened species

Flyway Network Site on Delta Downs in Kurtijar People's Traditional Country hosts threatened shorebirds

Roger Jaensch (Independent ornithologist), Paul Richardson (Normanton Land & Sea Rangers, Carpentaria Land Council Aboriginal Corporation) and the Queensland Department of Environment and Heritage Protection

In the South-East Gulf of Carpentaria, collaboration between Indigenous people, graziers, ornithologists and governments has raised prospects for protection of threatened migratory shorebirds.

Broad intertidal mud and sand flats along 300 kilometres of Queensland's coastline in the South-East Gulf of Carpentaria provide non-breeding refuge for 50 000 to 100 000 migratory waterbirds. Among the 20 regularly occurring species, the eastern curlew (*Numenius madagascariensis*) (listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999*) and great knot (*Calidris tenuirostris*) are both globally threatened, being listed as vulnerable on the IUCN Red List. Both populations are in rapid decline.



Pelican Island sandbars on the Delta Downs Coast, South-East Gulf of Carpentaria, Australia's most recently designated Flyway Network Site under the Partnership for the East Asian–Australasian Flyway (© Copyright, Roger Jaensch and Carpentaria Land Council Aboriginal Corporation)

The primary reason for decline is loss of habitat in the East Asian–Australasian Flyway, especially at critical stop-over sites in the Yellow Sea region. Here, 65 per cent of intertidal flats have been lost or modified over the last five decades to meet the demands of escalating economic development.

To improve prospects for migratory waterbirds and their habitats, the Partnership for the East Asian–Australasian Flyway was formed in 2006. The Partnership promotes cooperation across the Flyway's 22 countries. Its Flyway Site Network is a voluntary non-binding arrangement with over 120 sites spread from New Zealand to Russia and Alaska.

The Carpentaria Land Council Aboriginal Corporation (CLCAC) Normanton Land and Sea Rangers recognised the importance of the South–East Gulf of Carpentaria for threatened and other migratory waterbirds and in 2014 approached local Traditional Owners, the Kurtijar People, about nominating a Flyway Network Site on their country. The Kurtijar run about 40 000 head of cattle on Delta Downs pastoral lease (Morr Morr Pastoral Company). Using survey data collected by the Queensland Wader Study Group, a site 43 kilometres long and about four kilometres wide along the Delta Downs coast, was identified. The site includes prime intertidal habitat for shorebird feeding and areas important for roosting at high tide.

After consultations with Traditional Owners and other stakeholders, the site was nominated by the Australian Government to be included in the Flyway Site Network. In December 2014, the Flyway Partnership designated the site as Australia's 20th Flyway Network Site and the sixth in Queensland.

This new Flyway Network Site will raise awareness of the 20 000 kilometre round trip that these amazing shorebirds travel every year and the importance of providing habitat in the South–East Gulf of Carpentaria for these species.

The inclusion of the site in an international network is a source of great pride for the Kurtijar People who nominated the site to continue to provide habitat for threatened and other species on their country.

For further information, please visit:

<http://wetlandinfo.ehp.qld.gov.au/wetlands/>
and <http://www.eaaflyway.net/about/the-flyway/flyway-site-network/>



Large flock of knots and godwits at a roost site on the South-East Gulf of Carpentaria coast (© Copyright, Roger Jaensch and Carpentaria Land Council Aboriginal Corporation)



Eastern curlew (Numenius madagascariensis) (foreground) and whimbrels (Numenius phaeopus) (background) are among the migratory shorebirds occurring in the new Flyway Network Site on the Delta Downs coast of the South-East Gulf of Carpentaria (© Copyright, Roger Jaensch and Carpentaria Land Council Aboriginal Corporation)

Indigenous Wetland Wardens

Andrew Morrison, Rhys Collins (Port Phillip and Westernport Catchment Management Authority) and Dan Weller (BirdLife Australia)

In February 2015, Port Phillip and Westernport Catchment Management Authority (PPWCMA) and BirdLife Australia held the inaugural *Indigenous Wetland Wardens* workshop within Victoria's Western Port and Port Phillip Bay Ramsar sites.



The inaugural Indigenous Wetland Wardens pose for a photo (© Copyright, Andrew Morrison)

This free training event for Indigenous Australians aims to provide participants with the skills and knowledge to identify shorebirds and gain an understanding of how to manage and preserve their critical wetland habitat.

Staff from BirdLife Australia, PPWCMA, Parks Victoria and conservation rangers from Hobsons Bay City Council led the enthusiastic group through a range of topics including wetland conservation, shorebird ecology and identification, environmental monitoring and pest plant and animal management.



Green and golden bell frog in the NCIG compensatory habitat (© Copyright, Nathan Juchau, NCIG)

Phillip Island Nature Parks Environment Ranger, Shani Blyth said, “this workshop was a great opportunity to learn more about shorebirds from such enthusiastic and experienced people who work to protect critical wetland and coastal habitats”.

Stage 1 of the workshop was conducted over two-days in Altona with a mix of classroom based learning and practical field based activities at important shorebird sites, including Cheetham Wetlands and Altona foreshore.

Stage 2 was hosted at the Willum Warrain Aboriginal Gathering Place in Hastings over three-days. Participants gained an insight into wetland habitat and the threats to shorebirds throughout the Western Port Ramsar region.

Indigenous Wetland Wardens training helps bring together Indigenous Australians from a variety of backgrounds, with some participants already employed or completing formal training in natural resource management, and others attending to learn brand new skills with the hope of gaining meaningful employment in the future.

French Island resident Nola White loved the practical side of the workshop noting, “Going out to sites like Cheetham Wetlands, Coolart Wetlands and particularly St Andrews Beach and seeing the hooded plovers with their babies, watching how they reacted to people being around, looking for food and seeing how camouflaged they really were in their natural environment was a real eye opener”.

The five-day training program was provided by PPWCMA's Ramsar Protection Program and funded through the Australian Government's National Landcare Programme.



A pair of sooty oystercatchers (Haematopus fuliginosus) mid-flight along St Andrews Beach

(© Copyright, Andrew Morrison)

New partnership network helps to protect Australian mangroves and saltmarsh

Norman C. Duke, Jock Mackenzie, Apanie Wood and Damien Burrows (James Cook University TropWATER Centre and MangroveWatch Ltd.)

MangroveWatch and the new Australian Mangrove and Saltmarsh Network are helping to link communities and promote information sharing to improve monitoring and management of coastal habitats.



Butch' Lindsay Titmarsh, Fraser coast cattle grazier proudly shows Dr Norm Duke, mangrove scientist, an amazing 700 year old mangrove tree on his patch (© Copyright, Norman C. Duke)

Tidal wetlands and mangroves around the world are seriously threatened by rapid rates of coastal expansion and development resulting in mangroves disappearing at an alarming rate, with 30 per cent lost in the last 30 years (Duke et al., 2007).

In Australia, while mangroves are threatened as sea levels rise and climate changes, they are arguably more degraded and lost by impacts from conversion, nutrient pollution, herbicide runoff and altered hydrology.

These factors reduce the capacity of tidal wetland plants to respond effectively. Better management is required urgently before these wetlands and their significant benefits are lost forever.

Around Australia, local communities readily understand the valuable contributions mangroves provide. For example, mangroves provide coastal protection and risk minimisation from erosion and wave damage; somewhere to secure your boat in a

storm; a carbon sink five times greater than any other habitat; as well as marine nurseries and places to catch fish and crabs by all fishers. Losing mangroves also means losing biodiversity, including threatened species such as Illidge's ant-blue butterfly (*Acrodipsas illidgei*), water mouse (*Xeromys myoides*), ant plant (*Myrmecodia beccarii*) and mangrove orchid (*Dendrobium mirbelianum*).

MangroveWatch is a program that partners scientists with community and government and industry partners to monitor the condition of coastlines. Partners include local non-government organisations (such as the Wildlife Preservation Society Queensland), traditional owner groups (including the Gidarjil Development Corporation and the Balkanu Cape York Development Corporation), Natural Resource Management bodies (such as SEQ Catchments, Burnett Mary Regional Group and Torres Strait Regional Authority), environmental education facilities, government agencies (through programs like Reef Rescue), and industry advocates (including Brisbane Airport Corporation and Gladstone Ports Corporation).

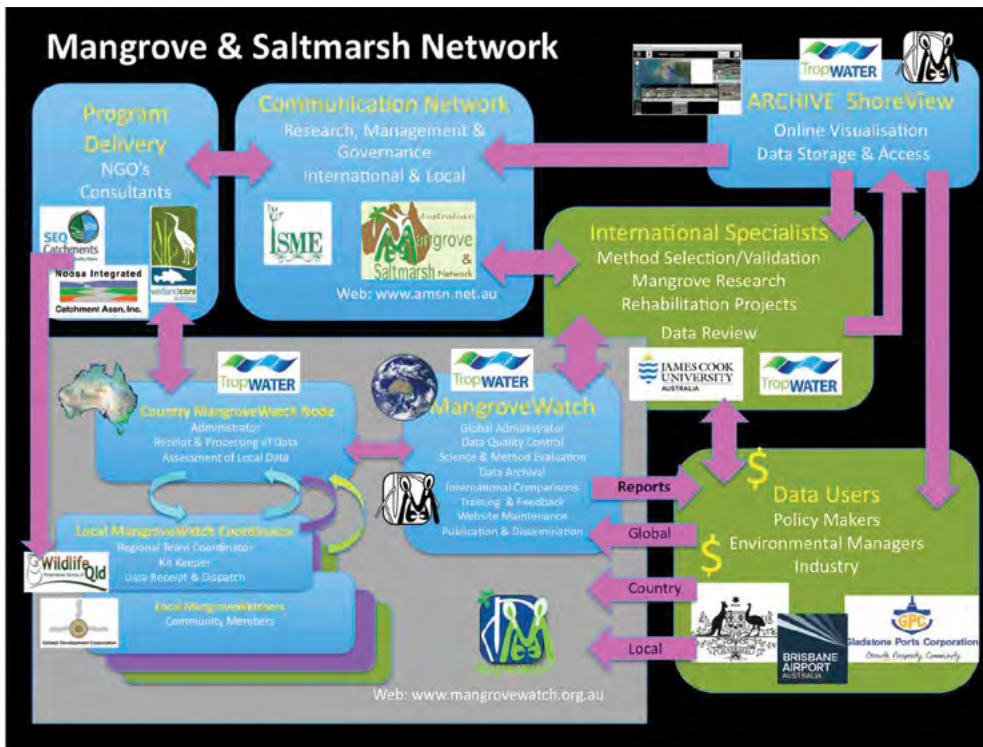
Introduced in earlier editions of *Wetlands Australia* (Duke, Mackenzie 2010; Mackenzie et al. 2011), the plan with MangroveWatch has been to link communities interested in applying scientific rigour to monitoring and assessment, as well as sharing knowledge and skills amongst all stakeholders. Groups are active in nine Natural Resource Management areas, involving more than 15 communities and approximately 500 citizen scientists. To date, these people have filmed and monitored more than 2000 kilometres of the Australian shoreline, providing a significant contribution to more informed and effective shoreline management and restoration.

The recent launch of the Australian Mangrove and Saltmarsh Network further supports this growing interest in tidal wetlands, facilitating greater communication between stakeholders.

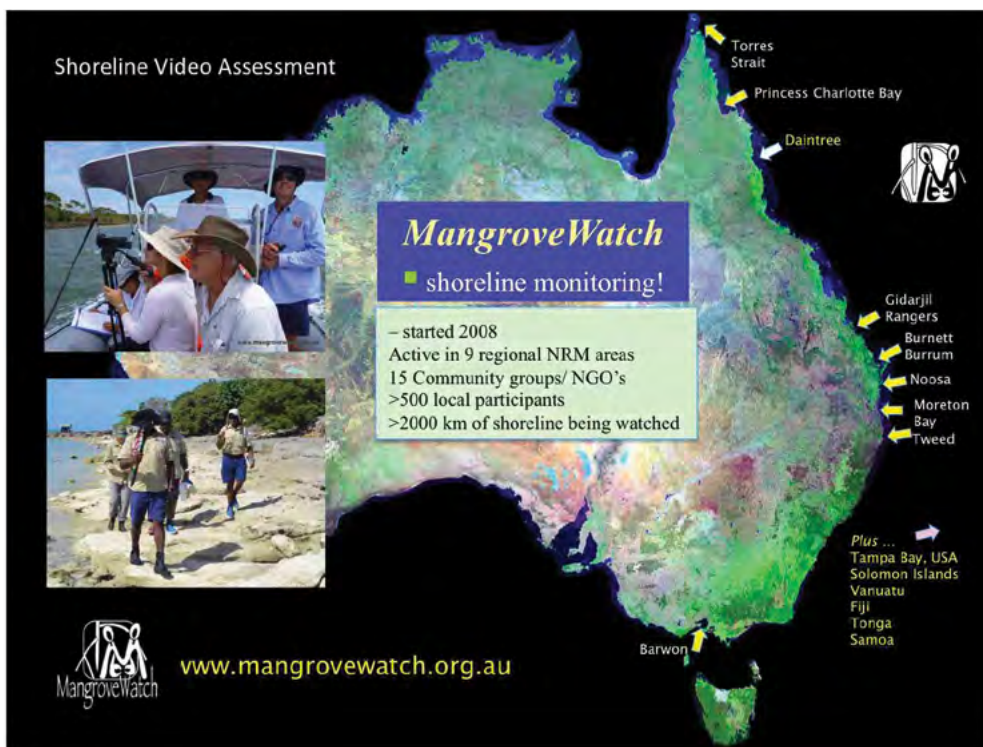
To discover who-is-who amongst participants please visit the Australian Mangrove and Saltmarsh Network website www.amsn.net.au. And, to learn more about MangroveWatch see the website www.mangrovewatch.org.au. Also, follow us on Twitter: @MangroveWatch, like us on Facebook: MangroveWatch or email: mangrovewatch@gmail.com.

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MangroveWatch works as an environmental monitoring program implemented by local community groups (bottom left), supported by partners ranging from the scientist trainers and assessors of data collected by community members, to educators, government managers, and industry; the latter assist with funding and support of community programs. Communication between stakeholders is facilitated by the Australian Mangrove and Saltmarsh Network (© Copyright, MangroveWatch)



In 2015, a number of MangroveWatch groups are active in eastern Australia, including a small number overseas. Inset images: top left, Wildlife Queensland Citizen Scientists aboard Moreton Bay Environmental Education Centre's 'Janjari' for Moreton Bay MangroveWatch (© Copyright, Peter Wear); and lower left, Torres Strait Rangers surveying on foot the shoreline of Warraber Island (© Copyright, Norman C Duke) (© Copyright, MangroveWatch)

Bird surveys on the Barratta Creek: A research initiative with BirdLife Australia

Hanna Kogelman, WetlandCare Australia

A new monitoring partnership will help to inform research and restoration efforts in Barratta Creek, near the Bowling Green Bay Ramsar site in Queensland.

Diverse assemblages of birds have been recorded within the Barratta Creek remnant wetlands. With Barratta Creek at its heart, Bowling Green Bay's listing as a Ramsar wetland is largely based upon its outstanding values as habitat for migratory waterbirds. The Barratta Creek remnant wetlands provide habitat for nationally endangered and locally threatened wildlife, including the northern quoll (*Dasyurus hallucatus*), squirrel glider (*Petaurus norfolcensis*) and the rufous owl (*Ninox rufa*). Since the commencement of our project we have been undertaking flora and fauna surveys of high value remnant wetlands and these findings are reported to the Australian Government as part of the Atlas of Living Australia, a federal government initiative to enhance and make available biodiversity data from multiple sources, and reported back to our local community through biannual Advisory Group Meetings and Committee meetings.

At the start of 2014, we signed an agreement with BirdLife Australia who will be conducting bird surveys at key regeneration sites across the Barratta Creek. Townsville members of the BirdLife Australia team have chosen four sites in the Barratta Creek to conduct bird counts, species identification and photographic surveys to set a benchmark for future comparisons. These surveys will occur twice annually until June 2017.

This project provides the opportunity to support monitoring efforts which seek to demonstrate positive environmental outcomes for threatened species resulting from changes in co-management of wetlands and waterways in the Barratta Creek conservation area currently managed by Sunwater.

WetlandCare Australia is unable to carry out sound, repeatable bird monitoring efforts itself, and BirdLife Townsville has kindly offered to assist in monitoring bird use of target wetlands over the life of the project. WetlandCare Australia welcomes the support of BirdLife Australia and looks forward to working in partnership with the club's expert amateur birdwatchers.

The survey findings will continue to be reported to the Atlas of Living Australia, and allow us to prioritise wetlands for surveying and indicate where our research efforts are better targeted to benefit and support threatened species.

A wedge-tailed eagle (Aquila audax)
perched above a nest in the Barratta
Creek catchment, Queensland
(© Copyright, Merv Pyott)



An iconic species is being used to drive behaviour change in Western Australia

South West Catchments Council

The blue swimmer crab (*Portunus pelagicus*) is again being used as the hero and emotive driver for the new autumn *Save the Crabs, Then Eat Them* campaign in south-west Western Australia.



HOME RIVER OCEAN

Fertiliser. Hold off when there's rain around.

The local's love of eating seafood is being used in a campaign that aims to reduce nutrient runoff from urban areas in south-west Western Australia (© Copyright, South West Catchments Council)

Following the success of the winter campaign, which uses crabbing and enjoying seafood as the drivers for change in fertiliser practices, the South West Catchments Council (SWCC) has increased the prominence of the species in its new campaign.

“The new suite of commercials features our unlikely crab heroes, Crusty and Chrisso, who give us their perspective on how fertiliser use impacts local waterways,” said SWCC CEO Damien Postma.

“The two endearing characters bring the crabs to life which we hope will achieve greater cut through with the community and build on the success of the previous winter campaign.”

In 2014, a winter campaign tracking survey was undertaken with 209 local residents to determine if the campaign’s approach was successful in reaching its target audience. The survey indicates that the winter *Save the Crabs, Then eat Them* adverts had performed above expectations, with 97 per cent of residents finding them believable and 79 per cent finding them relevant. Furthermore, 64 per cent of residents surveyed said that the campaign increased the way they value the blue swimmer crab and its habitat.

The survey results informed the development of the autumn campaign, and the final decision to make the crab the central figure of the advertisements. This approach integrated with the previous campaign to build on the messaging and marketing achieved during the first campaign.

The campaign is part of the Home River Ocean program, which aims to reduce nutrient runoff from urban areas entering waterways through a series of targeted behaviour change campaigns.

The winter campaign was adapted from the successful Chesapeake Bay ‘Save the Crabs, Then eat Em’ campaign in the United States, and was featured in the February 2015 edition of *Wetlands Australia*: <http://www.environment.gov.au/water/wetlands/publications/wetlands-australia/national-wetlands-update-february-2015>

Home River Ocean is supported by the South West Catchments Council through funding from the Australian Government. The project partners include the South West Catchments Council, Peel-Harvey Catchment Council, Perth Region NRM, Water Corporation, GeoCatch, Department of Water, Swan River Trust, SERCUL and Murdoch University.

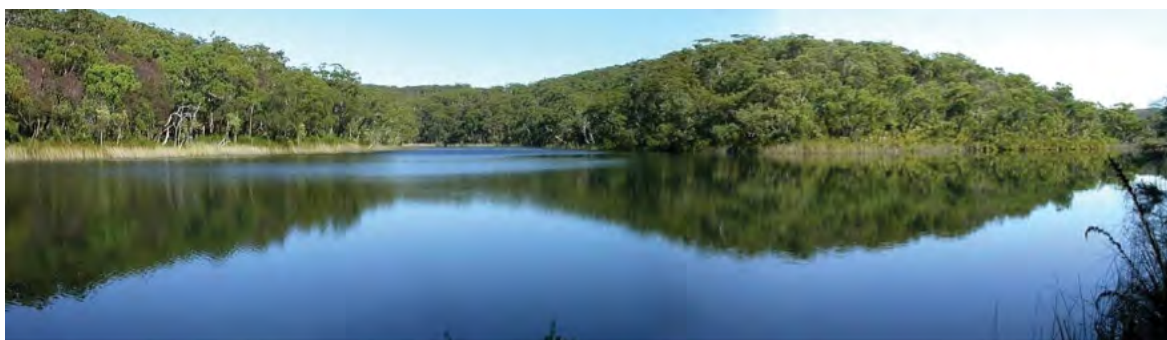
For more information and to view the adverts, visit the Home River Ocean website and social media sites: www.savethecrabs.com, www.facebook.com/homeriverocean

Wetlands research

Wetland palaeo-insights: revealing the past to manage the future

Cameron Barr and John Tibby (University of Adelaide), and Jonathan Marshall and Glenn McGregor (Queensland Department of Science, Information Technology and Innovation)

Understanding how wetlands have reacted to past climate fluctuations provides insights for appropriate management to lessen future impacts and conserve habitat for endangered species.



However, management decisions are often undertaken without such knowledge because even long-term ecosystem monitoring does not fully encapsulate the range of natural climatic variability. Palaeoenvironmental reconstructions provide windows into wetland responses to past climate perturbations using sequential information preserved in sediments over millennia.

North Stradbroke Island, in south-east Queensland, lies just offshore from one of the largest and fastest growing population centres in Australia. The island has over 75 wetlands including lakes, swamps and creeks, most of which are dependent on groundwater. These wetlands, some of which are included in the Moreton Bay Ramsar site, are significant in terms of their impressive biodiversity (Marshall *et al.*, 2011), as community and cultural assets and as recorders of past environmental change.

Blue Lake (Figure 1), part of the Moreton Bay Ramsar site, supports significant biodiversity including the endemic water plant *Eleocharis difformis*, which grows at depths of over 8 metres due to the lake's clear water, and a genetically unique population of the endangered pygmy perch (*Nanoperca oxleyana*). Our recent study (Barr *et al.*, 2013) examined the response of Blue Lake to climate variability over the last 7500 years using several indicators preserved in the lake sediments, including fossil algae and pollen. There was clear evidence of catchment change in response to continental drying from around 4000 years ago (Donders *et al.*, 2007). In stark contrast, the lake ecosystem remained stable, indicating a remarkable degree of resistance to large climatic changes. This may be unique in Australia.

This disconnect between climate and the lake ecosystem is explained by the lake's location in the landscape in relation to the large regional aquifer contained within the sand mass of North Stradbroke Island (Leach, 2011) (Figure 2). Blue Lake is a 'window' into this aquifer and, as such, receives constant inflow of chemically stable groundwater. The lake discharges through an overflow swamp, which acts as a natural weir that regulates lake depth (Figure 3). The entire lake volume is replenished approximately every 30 days. This combination of factors maintains a constant lake environment on seasonal to millennial timescales.

Resistance to the full range of climate variability over millennia, including significant continental aridification, highlights the importance of Blue Lake as a freshwater refuge from future climate change. However, this stability depends on continual connectivity with groundwater. Increased extraction of groundwater would risk breaking this connection with unprecedented impacts on lake ecology, biodiversity and dependent threatened species.

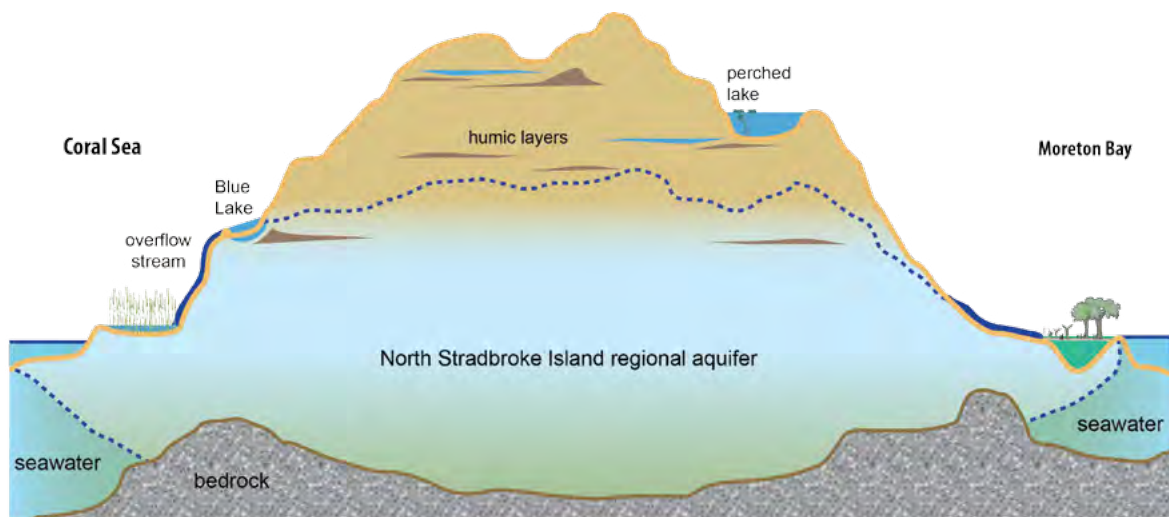


Figure 2: Schematic cross section of North Stradbroke Island, showing the location of Blue Lake as a surface expression of the regional aquifer (© Copyright, Glenn McGregor)

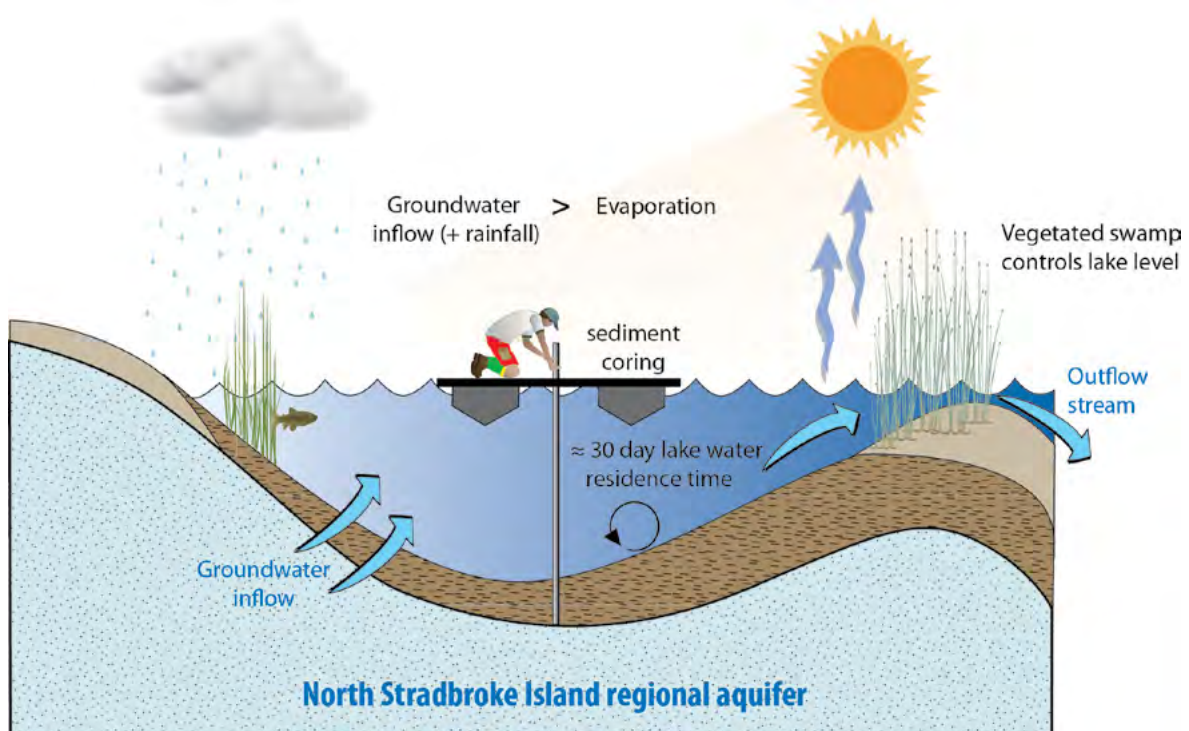


Figure 3: Conceptual model of Blue Lake. High water clarity and short lake residence time are dependent upon a constant throughflow of groundwater. Lake depth is determined by the height of the outflow swamp and can only fall below this height if net water loss is greater than inputs. Our data indicate this is unlikely to have occurred in the last 7500 years (© Copyright, Glenn McGregor)

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Mapping intertidal habitats and their protection in Australia

Kiran Dhanjal-Adams (University of Queensland), Nicholas Murray (University of New South Wales) and Richard Fuller (University of Queensland)

Around Australia, intertidal habitats such as mudflats and sandflats provide a wide range of ecosystem services including protection from storm and sea level rise.

In addition, they are valuable habitats for marine species such as clams and fish, and are a critical habitat for Australia's five million internationally migrating shorebirds. However, we know very little about how much intertidal habitat there is in Australia, let alone where most of it is.

The reason for this is simple. Intertidal habitats are remarkably difficult to map, particularly at continental scales. Only now, with the advent of novel satellite remote sensing techniques, has it become possible. By using freely available satellite images across all of Australia's 35 876 kilometres of coastline, a team of researchers from the University of Queensland have produced the first map of Australia's intertidal habitats. They discovered large swathes in Western Australia, Queensland and South Australia, particularly along embayed coastlines and river mouths. Surprisingly, the amount of intertidal habitat within protected areas was quite different between states, ranging from 80 per cent

in Victoria to 6 per cent in the Northern Territory. Even more interesting, some states mainly protect intertidal habitats as part of marine protected areas, and others as part of terrestrial protected areas. In fact, in some cases, intertidal habitats were protected by both!

It is undeniable that marine and terrestrial protected area managers need to continue coordinating their efforts to ensure intertidal habitats are managed properly. What is more, protected areas boundaries need to align more sensibly with intertidal habitats if we are to benefit from their ecosystem services for years to come, and protect the threatened species such as shorebirds which rely on them.

Want to find out more? Visit the Fuller Lab website at www.fullerlab.org



Between land and sea – Internationally migrating bar-tailed godwits (Limosa lapponica) roosting on valuable intertidal habitat in Moreton Bay, Queensland

(© Copyright, Kiran Dhanjal-Adams)

Coastal wetlands in south-east Queensland are home to the mighty water mouse

Nina J. Kaluza, University of Queensland

Surveys of the vulnerable water mouse (*Xeromys myoides*) along the Maroochy River in Queensland will help to improve our understanding of their ecological role within coastal wetlands.

Between 2011 and 2014, coastal wetlands along the Maroochy River system of south-east Queensland were surveyed for the nocturnal water mouse (Figure 1). Water mice are small carnivorous rodents (weighing approximately 40 grams) that occupy and build elaborate mud nests along intertidal zones dominated by mangrove (*Avicennia marina* var.) and saltmarsh (*Sporobolus virginicus*) communities (Figure 2). Within these sites this tiny mouse will cover vast distances to forage for food upon the receding tide. As water mice are not known to interact with human activity, their only home is within wetland habitat. They are rare, protected and listed as vulnerable under the federal *Environment Protection and Biodiversity Conservation Act (1999)*, and are supported by a National Recovery Plan.

The survey covered 765.34 hectares and located 180 nests with the aim of understanding the ecological role of this native mammal. As one of the few native terrestrial mammals occupying these wetlands, they are likely to be important predators of crustaceans, mollusc and flatworms. They are prey for nocturnal raptors and reptiles whilst potentially providing ecosystem services for other interacting species within these tidal areas.

The project provided an opportunity to collect baseline data on nest characteristics (0.22 active nests per hectare), water mouse behavior (more than 10 000 photos were collected), species interaction and potential risk factors for water mice along the Maroochy River. This significant milestone was only achieved through the collaborative efforts of

WetlandCare Australia, Queensland Parks & Wildlife Service (QPWS), Environment Heritage Protection and Queensland Museum based on funding provided by the Australian Government.

To promote awareness, data was distributed to community groups such as Bunya Bunya Aboriginal Corporation, Landcare Australia, non-government organisations, regional councils, state government schools and HQForestry Plantation. Educational packages of these findings were delivered within community forums using digital representation and field workshops to enhance society stewardship of wetlands.

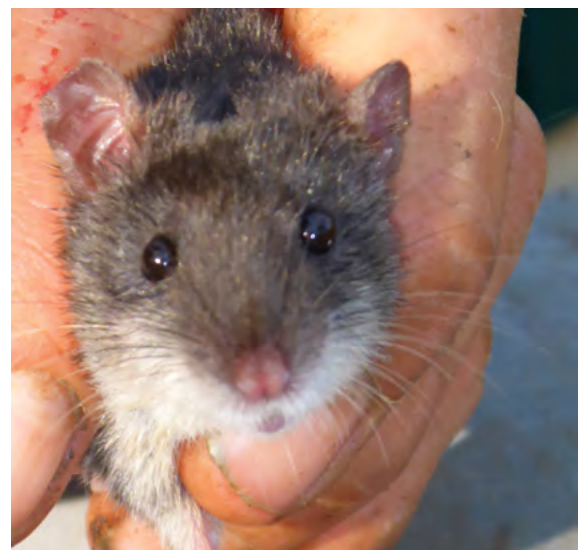


Figure 1: Water mouse (*Xeromys myoides*) captured along the Maroochy River using a size A Elliot Trap in June 2014

(© Copyright, Nina Kaluza)

Currently, I am completing a Research Higher Degree at the University of Queensland and working with the Burnett Mary Regional Group, linking regional and local knowledge of nest distribution for the Great Sandy Strait-15 years after Mark Burnham of QPWS completed the last survey. By connecting research areas for this mighty mouse we may be able to determine

critical points in the relationship between terrestrial and marine ecosystems. The presence of this one mammal may be useful as an indicator of the health of coastal wetlands.

For information on this research, please email Nina Kaluza: Imightywatermouse@gmail.com



*Figure 2: Camera observations as part of a four-year study on water mouse (*Xeromys myoides*) behaviour and tidal inundation* (© Copyright, Nina Kaluza acknowledgements Les Donald QPWS)

Protecting wetland connectivity for endangered freshwater fish in northern Australia

Dr Nathan Waltham, TropWATER, Centre for Tropical Water and Aquatic Ecosystem Research, James Cook University

River systems of northern Australia are extremely seasonal, with most of the total annual flow occurring during the wet season between November and April.

This wet season flow is important in the longitudinal, lateral and vertical connection of rivers, especially wetland floodplains, which provide critical spawning and feeding areas for fish and wildlife.

An assessment of the feasibility of agricultural development in the Flinders and Gilbert River catchments in northern Queensland was completed in 2013 (www.csiro.au/Organisation-Structure/Flagships/Water-for-a-Healthy-Country-Flagship/Sustainable-Yields-Projects/Flinders-and-Gilbert-Agricultural-Resource-Assessment-overview.aspx).

In the assessment, a range of environmental factors were considered in determining suitable locations for dams to service the agricultural operations proposed. Published literature, museum records and expert local knowledge revealed that 50 freshwater fish species exist in the Flinders catchment, with 42 species in the Gilbert catchment, with most species wide spread across both catchments.

Undoubtedly, the most impressive fish species present in both catchments are freshwater sawfish (*Pristis pristis*; listed as vulnerable under Commonwealth legislation and endangered on the 2000 IUCN Red List of Threatened Species), and the giant freshwater whiplay (*Himantura dalyensis*; listed as probably vulnerable on the IUCN Red List, though data is

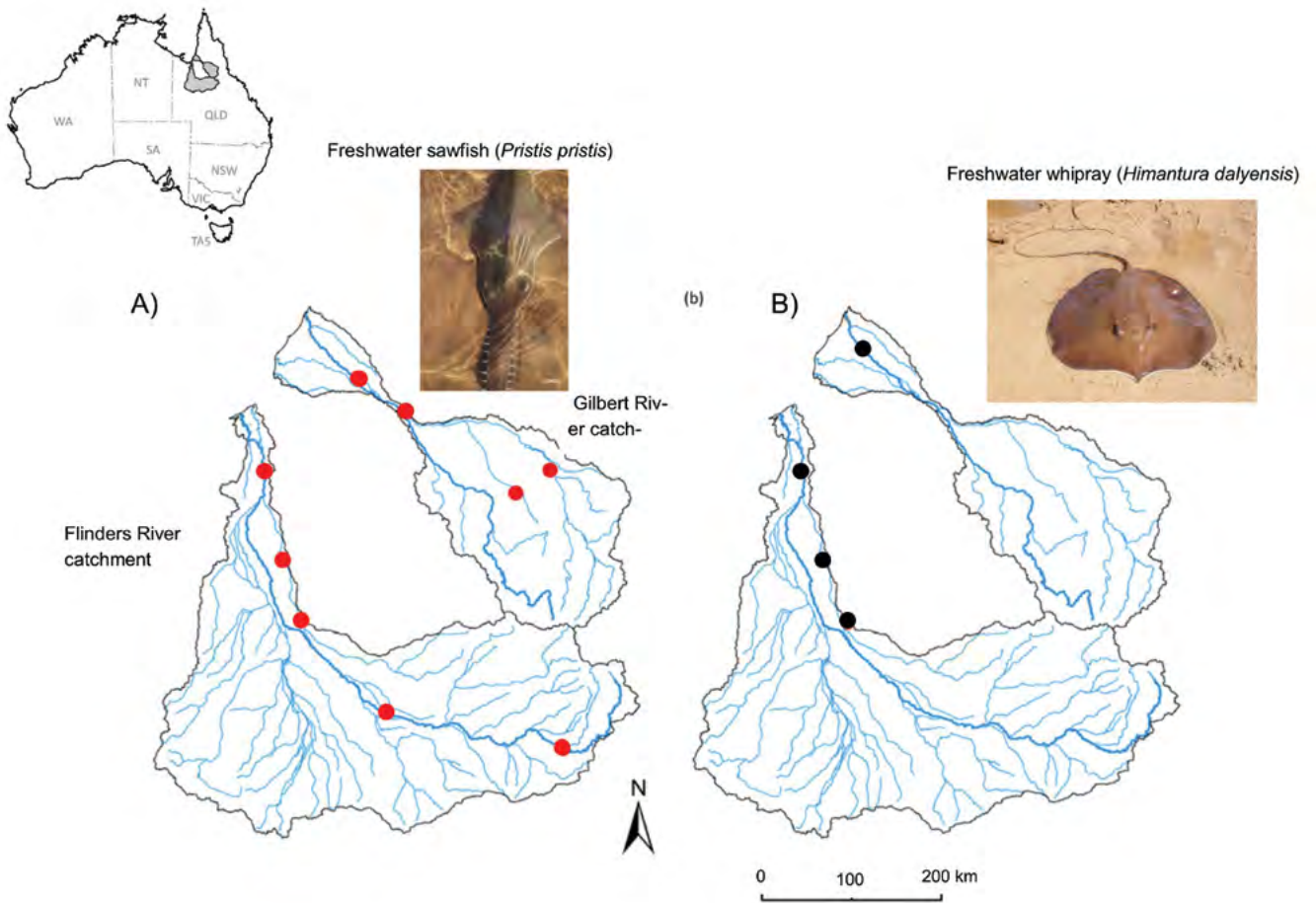
limited). Both species are large (freshwater sawfish grow up to two metres and the giant freshwater whiplay can grow up to one metre in disc width and weigh up to 120 kilograms) and travel long distances across river wetlands to access upstream areas for feeding and breeding. This large scale movement highlights the importance of maintaining river and wetland system connection, which is particularly important when considering water resource development and flow alterations in seasonal rivers of northern Australia.

Given their size (and the saw-shaped rostrum on the sawfish) upstream migration for both species would be hindered by migration barriers. While fish passage engineering is available to assist migration of fish, it is unlikely that these two species would be able to negotiate current designs.

The spatial distribution maps generated in this assessment revealed the recorded locations of both species. While the freshwater sawfish has migrated to more locations in both catchments, the full distribution of both species is probably much broader than represented here as both species are caught only with specialised survey techniques (such as gill nets).

The prospects of agricultural development in the Flinders and Gilbert River benefited greatly from these spatial maps, as a starting point for assessing water resource development options. This mapping approach could help other water development investigations and lead to more effective protection of these high conservation, charismatic species that need connection to wetlands and river channel catchments.

To find out more, contact Dr Nathan Waltham on nathan.waltham@jcu.edu.au or 07 4781 4191, TropWATER, Centre for Tropical Water and Aquatic Ecosystem Research, James Cook University.



Captures or sightings in the Flinders and Gilbert catchments: (a) freshwater sawfish (Pristis pristis)

(© Copyright, Dr Brendan Ebner) *and b) freshwater whipray (Himantura dalyensis)* (© Copyright, Prof Bradley Pusey)



Seasonally flowing Einasleigh River, Gilbert River catchment, Queensland (© Copyright, Dr Nathan Waltham)



Drying waterhole in Flinders River, Queensland (© Copyright, Dr Nathan Waltham)

The unusual saltmarsh of Lake Wollumboola

Joy M Pegler

Coastal saltmarsh at Lake Wollumboola on the Shoalhaven Coast of New South Wales provides habitat for a number of threatened species.

Lake Wollumboola is known for supporting a number of waterbirds (Pegler, 2016) and the saltmarsh community plays an important role. At low water levels, approximately 16 hectares of saltmarsh emerges at the southwest end of the lake. Coastal saltmarsh is listed as an Endangered Ecological Community in NSW and supports a variety of threatened species,

including the white-fronted chat (*Epthianura albifrons*), the round-leaved wilsonia (*Wilsonia rotundifolia*) and potentially the green and gold bell frog (*Litoria aurea*) (NSW Office of Environment and Heritage, 2015).



Sarcocornia quinqueflora and *Wilsonia rotundifolia* at Lake Wollumboola in April 2007, seven months after the lake opened and two months after it closed (© Copyright, Joy Pegler)



White-fronted chat (Epthianura albifrons) foraging area amid Sarcocornia quinqueflora and Atriplex australasica. Coonemia Creek is to the right (© Copyright, Joy Pegler)

The saltmarsh at Lake Wollumboola operates in a system of irregular inundation. A high saltmarsh species, the sea rush (*Juncus kraussii*) grows above 1.1 metres AHD which is the mean water height of the Lake. When the entrance to the Lake closes, the water fluctuates above and below this level depending upon the competing influences of surface and groundwater inflows versus evaporation. When the entrance breaches and the water level drops to 0.4 metres AHD, extensive substrate is exposed and within two months low saltmarsh vegetation, primarily beaded glasswort (*Sarcocornia quinqueflora*), but also the *Wilsonia*, sprouts through stranded algae and macrophytes. This low saltmarsh emerges even after periods of up to five years of submersion.

Most of the saltmarsh substrate is mud of clay and silt, with some sand at the Coonemia Creek delta. Here native orache (*Atriplex australasica*) overlays *Sarcocornia*. The white-fronted chats specifically forage at this delta and only retreat to feed on the shoreline under dead *Atriplex* when *Sarcocornia* completely covers the substrate.

The use of the saltmarsh and the Lake by threatened species demonstrates how important it is to protect such a diverse ecosystem.

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Australia attends the 12th Ramsar Conference of Contracting Parties in Uruguay, June 2015

Outcomes of the 12th Ramsar Conference of the Parties

Australian Government Department of the Environment

The twelfth meeting of the Conference of the Parties (COP12) to the Ramsar Convention on Wetlands was held from 2-9 June 2015 in Punta del Este, Uruguay, with the theme “Wetlands for our Future”.



The Conference adopted 16 resolutions by consensus, including a new Ramsar Strategic Plan for 2016-2024 with its vision that “wetlands are conserved, wisely used, restored and their benefits are recognised and valued by all”. It also adopted resolutions on a new framework for the delivery of scientific and technical advice and guidance on the Convention; a programme of communication, education and capacity-building; the role of wetlands in disaster risk reduction; effective management of Ramsar sites; peatlands; and the development of a system for accreditation of “World Wetland Cities” .

In the face of the continued loss and degradation of wetlands globally, COP12 sought to heighten the visibility and broaden the leverage of the Ramsar Convention. The COP strengthened its ties with the Convention on Biological Diversity, the Sustainable Development Goals and disaster risk reduction. It also considered ways of improving implementation of the Convention on the ground.

Australia, as a member of the Oceania Region, made a significant contribution to regional consideration of the draft resolutions, and also participated in two successful side events, presenting on Australia’s experience in wetland restoration and a case study on environmental watering in the Murray-Darling Basin.

Australia has stepped up to take on further regional responsibilities during the 2016-2018 triennium as the Oceania Region’s representative to the Ramsar Steering Committee. In addition the Head of Australia’s Ramsar Administrative Authority, Mr David Papps, was elected as Vice-Chair of the Ramsar Standing Committee for the next triennium.

For further information on the outcomes of the Ramsar COP, see: <http://www.ramsar.org/about/cop12-punta-del-este-uruguay-1-9-june-2015>

Copies of the final resolutions can be found at: <http://www.ramsar.org>

Local NGO leads community engagement at Ramsar Conference of the Parties

Louise Duff, Secretary Australian Wetland Network

Uruguay hosted the 12th Ramsar Conference of Parties (COP12), from 1-9 June 2015. The COP brought together 800 government representatives from 168 contracting parties to debate and adopt resolutions. These drive global policy for wetland conservation and wise use going forward. I was fortunate to attend Ramsar COP12 as a facilitator for the World Wetland Network (WWN).

WWN is an international alliance of non-government organisations (NGOs). These organisations reflect their local cultures and communities and are a considerable force for Ramsar wetland conservation. I was also representing the Australian Wetland Network's 39 members, and my employer WetlandCare Australia, who funded my time at the conference.

While at COP12, I supported local delegates and NGO representatives to have an effective voice in the proceedings. First we hosted a pre-COP meeting for NGO delegates. Fifty-five people attended from 14 countries. It was a great chance to meet each other and discuss our aims for the COP. The Pre-COP meeting was sponsored by the Japan Fund for Global Environment.

Our WWN Opening Statement was presented to the COP in Spanish by Virginia Juele from local NGO Aguará Popé. The key message was that NGOs support Ramsar and want to do more to conserve wetlands and promote wise use. We made the point that supporting and enabling volunteers and NGO

staff to be engaged in wetland conservation requires resources, but small inputs create big outcomes, leading to better programs for Ramsar sites. A copy of the statement can be found at http://www.worldwetnet.org/docs/NGO-OpeningStatement_RamsarCOP12_FINALeng.pdf.

Next day I hosted a side event to bring together government and non-government delegates. Twenty-three delegates attended from 19 countries. The side event commenced with a presentation of the results of WWN's global survey of NGOs on their relationship with Ramsar. NGOs often have longer term association with wetlands than their government counterparts. Successfully mobilizing their commitment is a key to wetland conservation success. A copy of the survey report can be found at http://www.worldwetnet.org/docs/RamsarNGOs_Final.pdf. Delegates then participated in a series of activities to create dialogue about working more effectively across sectors.



WWN representatives (L-R) Minoru Kashiwagi (Japan), Louise Duff (Australia), and Rafaela Nicola (Brazil) at Ramsar COP 12 (© Copyright, Virginia Juele)

I was very fortunate to be invited into the working group for the Ramsar Strategic Plan 2016-2024. Engagement with the non-government and community sectors and indigenous people was a serious omission from the draft Strategic Plan. Successfully advocating to have these groups included, and establishing performance indicators for contracting parties to include NGO representation on National Wetland Committees, was a highlight of my participation at the COP.

Finally, we worked together to draft a Closing Statement which was presented by Rafaela Nicola, WWN's Latin American representative. The Closing Statement can be found at http://www.worldwetnet.org/docs/WWNClosingStatementRamsarCOP12_Eng.pdf

Thanks to WetlandCare Australia for funding my participation at the COP, as well as all the local donors including Australasian Wader Study Group, Hunter Wetlands Centre, and Murray Darling Wetlands Working Group.

For more information on the outcomes of Ramsar COP 12 visit the Ramsar Convention's web site, or contact me on 02 4951 1425 or at louiseduff@wetlandcare.com.au

