CASE STUDY 03

MANAGEMENT OF LOWER LAKES TORTOISES

Tortoises are one of a number of aquatic species being adversely affected by the recent drought and record low inflows across the Murray-Darling Basin. A response has been led by the Department for Environment and Heritage (DEH), which has been working with the community in the Lower Lakes region to successfully rehabilitate and release hundreds of freshwater tortoises.

Reduced flows into the Lower
Lakes system, which is normally
characterised by freshwater wetlands,
have resulted in an increase in
salinity levels in those waterbodies.
Freshwater wetlands flora and fauna
are mostly intolerant of high salt levels.
One result of the changing ecology
is the invasion of a marine tubeworm
(Ficopomatus enigmaticus) into the
Lower Lakes and Goolwa Channel.

The tortoises prefer freshwater habitats, and their prolonged exposure to high salinity levels causes an undesirable build up of toxins that adversely impacts upon their health and survival. Also, the marine tubeworm can encrust the upper and lower shell of the tortoises. This weighs them down and can block off limb and head cavities, interfering with the tortoises' ability to feed and eliminate, and leaving them more vulnerable to predation and drowning.

Since March 2008, community volunteers have led the rehabilitation of two species of freshwater tortoise rescued from the Lower Lakes region: the Murray Short necked Tortoise (Emydura macquarii) and the Eastern Long necked Tortoise (Chelodina longicollis). Most of the tortoises found have been encrusted with tubeworm and suffering from the effects of an accumulation of toxins.

The rehabilitation process comprises quarantining, detoxing, cleaning, housing and feeding the tortoises, which are likely to recover fully if placed in a freshwater environment and given appropriate rehabilitation over some weeks. DEH has organised several releases of rehabilitated tortoises into suitable upstream (lower salinity) vegetated wetlands, after carrying out a thorough habitat assessment.

Milang School incorporated its tortoise rehabilitation activities into the curriculum, recognising links with biology, water use, sustainability and natural history. Students from Investigator College have been involved in the release of rehabilitated tortoises into their school's artificial wetland. The project has also assisted the College with plans for establishing a back up rehabilitation site and incorporating tortoise rehabilitation activities into the school curriculum. These projects have been assisted by funding from the Save the River Murray Fund.



Key achievements of the Tortoise Project

During the last twelve months, the main achievements are:

- Volunteers in Goolwa and Milang have been provided with practical and technical support for their tortoise rehabilitation activities, and with the set up of their rehabilitation operations.
- The dedication and commitment of local community volunteers has ensured several releases of rehabilitated tortoises.
- A workshop has enabled the synthesis of knowledge about the rehabilitation process, the results of which were used to contribute to the development of the guidelines: 'Rehabilitation and release of fresh water tortoises rescued from the Lower Lakes and Goolwa Channel—guidelines for community volunteers and managers'.

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ENHANCING THE ENVIRONMENT

River Murray ecosystems are in decline due to over allocation of water resources and ongoing drought conditions. The Basin Plan is being developed by the MDBA. It will place enforceable limits on the quantities of surface water and groundwater that can be taken from the Basin water resources. These will be known as sustainable diversion limits and must be environmentally sustainable, providing more water in the River to sustain the riverine environment and associated wetlands.

Modelling of climatic change suggests the frequency of medium and high flows will decrease. Hence more effective water delivery mechanisms for environmental watering will be required. Environmental water delivery is more than delivery via gravity to important sites at pool level. Each environmental site has unique characteristics requiring individual plans and watering considerations.

River Murray Environmental Manager (RMEM)

Chowilla Floodplain

During 2008-09, environmental water was delivered to wetlands, floodrunners, permanent creek and floodplain environments. This environmental water resulted in many positive outcomes for floodplains such as breeding events for amphibian species, including the Environmental Protection & Biodiversity Conservation Act 1999 (EPBC Act) listed Southern bell frog. Thousands of water birds used wetland and floodplain sites for drought refuge, feeding and breeding. In addition, a strong response from vegetation communities was recorded at watering sites, providing relief for many River red gums, Cooba and Black box trees and re-establishing flood dependent wetland understorey species.

Planning for the proposed Chowilla Environmental Regulator continues, with ecological and risk assessments recently being finalised for frogs, vegetation and birds. An investigation into risk management for large bodied fish is under way. The construction proposal for the Chowilla Creek environmental regulator will be forwarded to the MDBA for approval in late 2009.

Floodplain Planning - Pike Integrated Management Plan

The SA MDB NRM Board has placed a high priority upon floodplain protection and rehabilitation in combination with attempts to attract increased environmental flows. The Pike floodplain has been identified as one of the high priority sites requiring urgent action to enhance and where possible restore its significant environmental values.

The Pike River Environmental Management Plan has been finalised with a series of investigations being completed or initiated. These include fish, tree, understorey and habitat mapping and monitoring, and hydraulic and groundwater modelling. Mapping of soil salinity using an airborne electromagnetic survey technique has also been undertaken. Concept designs are being developed for the upgrade of the inlet structures into the Pike River system and an investment proposal is being prepared for the project. This aims to secure funding for implementation of the environmental management plan.

A Memorandum of Understanding for the Pike River has been developed between the South Australian Government and the community.

Coorong, Lower Lakes and Murray Mouth (CLLMM) – Summary of Icon Site Activities

The SA MDB NRM Board is responsible for the management of the Coorong, Lower Lakes and Murray Mouth (CLLMM) Icon Site.

Ecological Monitoring

The CLLMM Icon Site Condition Monitoring Plan has been completed. It outlines monitoring methodologies, sites and data analysis techniques for condition monitoring funded through *The Living Murray*.

A comprehensive monitoring program involving aquatic vegetation, small bodied threatened freshwater fish, large bodied commercial marine fish, waterbirds, benthic invertebrates and mudflat monitoring was implemented, using techniques outlined in the plan.

Long-term condition monitoring at the site will inform management decisions and allow managers to track changes in condition. An example of the monitoring program informing management options is the discovery of two remnant small bodied threatened fish populations in Lake Alexandrina (Murray hardyheads and Southern pygmy perch) and the subsequent delivery of environmental water, sourced from *The Living Murray*, to protect and enhance their habitat. Plans to deliver environmental water to these sites are in place for 2009-10.

Environmental Works and Measures Program

A report which prioritises the Lower Lakes wetlands for future management, based on their ecological components, was developed for the SA MDB NRM Board in 2008. As a result, management plans for Tolderol and Milang wetlands were completed, together with detailed digital elevation models from which volumes of environmental water required and areas of wetland to be inundated can be calculated.

Several studies into methods for reducing salinity levels in the Coorong have been initiated by the SA MDB NRM Board. The South Lagoon Flows Restoration Project aims to divert flows from the Upper and Lower South East drainage schemes into the South Lagoon of the Coorong.

In conjunction with the Flows Restoration Project, studies into the feasibility of pumping hypersaline water from the South Lagoon into the Southern Ocean to reduce net salinity in the South Lagoon are under way. Modelling has determined that this is the most effective way to reduce salinities and 're-set' the system before natural inflows return. Detailed modelling of the extent of the potential 'salt plume' in the Southern Ocean has been undertaken, as well as an assessment of the potential impacts on any sensitive marine life.

Other investigations undertaken include an assessment of the ecological benefits of dredging the Murray Mouth which reported on current dredging effort and the incremental benefits possible with enhanced effort. Another study assessed the possible engineering alternatives for maintaining an open Mouth, including the hydrological consequences for the Coorong.

Environmental Watering

Along the River Murray in South Australia, 47 wetlands were watered from July 2008 to June 2009. The SA MDB NRM Board coordinated the watering and monitoring program in partnership with landowners, the Commonwealth Government, South Australian Department for Environment and Heritage (DEH), DWLBC, South Australian Research and Development Institute (SARDI) and local community groups.

A total of 34 228 ML of water was applied to these sites. The water was obtained from several different sources including: The Living Murray, The Living Murray Increased Flow Account, the Commonwealth Environmental Water Holder, Healthy Rivers Australia, Nature Foundation SA, private donations and evaporative savings from closed wetlands.

Each wetland was monitored to understand the effects of adding water. Fish, birds, frogs, vegetation within and around the wetlands, and groundwater and surface water levels and quality were measured. Wetlands that are watered create drought refuges for a range of species.

Environmental Water for the Lower Lakes

From 2 May 2008 to 30 June 2009, pumping of water from Lake Alexandrina to Lake Albert at a rate equal to 170 GL per annum was undertaken to mitigate the risk of acidification of the Lake Albert water body (Lake Albert Water Level Management Project). By May 2009, it was apparent that River Murray flows to South Australia during the 2009-10 water year would not be sufficient to continue pumping to Lake Albert at that rate.

As part of developing a 'Freshwater Solution' for the Lower Lakes, the Lower Murray Action Group (convened under the auspices of the Department of the Premier and Cabinet) identified that the purchase of 50 GL for delivery to Lake Alexandrina, in conjunction with cessation of pumping to Lake Albert on 30 June 2009, would effectively assure the lake's acidification trigger water level of minus 1.5 m AHD would not be reached until December 2010.

On this basis, Government approved the purchase of 50 GL of temporary water during the 2008-09 water year.

Subsequent to the purchase being completed, approval for the Goolwa Channel Water Level Management Project under the *EPBC Act* was made conditional on the delivery of 50 GL to Lake Alexandrina as an offset to the 27.5 GL required during the 2009-10 water year to implement the project.

Negotiations with the Ngarrindjeri community over implementation of the Goolwa Channel Water Level Management Project confirmed that delivery of the 50 GL would be consistent with 'cultural flow' aspirations of the community.

Wetland Management

Wetland Monitoring

The SA MDB NRM Board wetland community monitoring staff continued to support wetland groups and undertake monitoring programs at managed wetlands. The data collected by the SA MDB NRM Board and community groups has been used to prioritise wetlands for re-wetting. Following the approval of water for ten managed wetlands, comprehensive monitoring programs were developed and implemented as part of the wetland refills undertaken throughout 2008-09.

The table below outlines the scope of monitoring works undertaken within the Wetland Program:

WETLAND PROGRAM	TOTAL
Number of wetlands assist with monitoring and management	33 wetlands
Total wetland area monitored under Wetland Program	3348 ha
Number of wetland groups supported by Wetland Program	25 groups
Number of people associated with groups	305 people
Number of data updates produced for groups	20 data updates
Total number of monitoring sites	808 sites
Days spent in the field undertaking monitoring	179 days/yr
Community volunteer hours per year	2000 hr/yr

Wetland Management Plans

The Wetland Program supported community groups in the development of wetland plans, and provided recommendations on the management of wetlands for ecological purposes. A Wetland Management Plan update was developed for the Paiwalla wetland, located upstream of Murray Bridge. The Wetland Planning Officer developed new wetland plans in conjunction with the Mid Murray Local Action Planning Association and landholders for Noonawirra and Wongulla wetlands.

Wetland Prioritisation

A new initiative of the Wetland Program was the development and trial of a Prioritisation Framework for rehabilitation and conservation of wetlands along the River Murray in South Australia. This project is developing a transparent and flexible means of identifying wetland sites for future investment, management or watering events, based on ecological values and potential for rehabilitation.

Wetland On-ground Works

Wetland on-ground works were undertaken by Local Action Planning Associations as part of the SA MDB NRM Board's Community Grants. The aim of the work was to undertake onground activities and installation of structures that would enable community groups to better manage their wetlands for ecological purposes.

The following works were undertaken:

- Installation of box culvert structures between the Devon Downs south and north lagoons to improve hydrological management and improve flows between the wetlands;
- Design of inlet structure at Martins Bend to enable hydrological management of the wetland at normal pool level; and
- Installation of box culverts in Boggy
 Creek wetland on Hindmarsh Island to
 improve flows.

Fishway Program

The continuation of the drought and the fall in water levels in Lake Alexandrina have resulted in another year with no releases of freshwater through the barrages, and therefore no operation of the barrage fishways. Drought conditions provide an opportunity for construction of a new vertical slot fishway, designed to enhance passage for small-bodied species, to be installed in the Goolwa Barrage in 2010.

Katfish Reach Native Fish Demonstration Reach

A draft project monitoring framework for the Katfish Reach project has been developed. The Framework deals with intervention and condition and compliance monitoring, supporting the Katfish Reach Implementation Plan.

A business plan has been developed for the Katfish Reach project and identifies the following outcomes:

- Improve spring-summer inundation of Eckert Island at low river flows;
- Achieve fish passage and increased in-stream flow for Eckert Creek anabranch system and Katarapko Creek;
- Improve hydrological management through temporary partial drying and variation of the pool level of Eckert Creek anabranch system;
- Improve opportunities for wetland inundation frequency and duration of a number of temporary wetlands;
- Secure present Murray Hardyhead habitat site and create an additional site of secure habitat; and
- Manage pest, soil erosion and visitor impacts at selected locations across the site.

Key Achievements

- Trial of Wetland Prioritisation for rehabilitation and conservation of wetlands along the River Murray in South Australia.
- Support for community managed wetlands.
- Development of the detailed design and construction proposal for the Chowilla Creek Environmental Regulator.
- Completion of the Pike River Environmental Management Plan.



CASE STUDY 04 PREVENTING ACIDIFICATION IN THE LOWER LAKES

The Murray-Darling Basin is experiencing the worst drought since records began in 1891. Record low inflows to the River Murray through drought and over-allocation of water across the Murray-Darling Basin are having a serious social, cultural, economic and environmental impact on River Murray communities.

Nowhere are the devastating effects so evident as in the Lower Lakes, at the end of the River Murray system. In Lakes Alexandrina and Albert, and surrounding wetlands and backwaters, water levels are dropping, salinity levels are increasing and exposed soils are acidifying. The situation is unprecedented.

Falling water levels in the Lower Lakes and tributary rivers such as Currency Creek and Finniss River have exposed previously submerged sulphidic soils to the air. Based on water levels at March 2009, more than 20,000 hectares of acid sulphate soils were exposed in Lake Alexandrina and Lake Albert, resulting in acidic salts forming over much of the dried lakebed. These soils can react with oxygen to form acid sulphate soils, which contain sulphuric acid (the

same acid as in a car battery) and can release heavy metals from the soil. If the low flows continue, the risk of the Lower Lakes becoming acidic will increase, posing a threat to the environment, South Australia's drinking water supplies, agriculture, the local economy and, in extreme cases, animal and human health.

Urgent action is being taken to increase the amount of freshwater flowing into the lakes to improve their health and minimise or prevent the exposure of potentially devastating acid sulphate soils.

The Lower Lakes cover a large area and more than 1,000 gigalitres (GL) of water would be required to return them to pre-drought levels of 0.75 metres above sea level. This amount of water is simply not available under the current conditions. However, smaller amounts of water can provide important benefits to targeted areas and the wider lakes system.

During 2009-10, a positive step was taken for the region with the purchase of 50 GL of water for the Lower Lakes, funded by the Save the River Murray Levy. While this water is well below the amount needed to return the Lower Lakes to pre-drought levels, it is providing important benefits for the region.



This water was purchased and used as an offset to the pumping of 27.5 GL to raise water levels in the Goolwa Channel, as part of the Goolwa Channel Water Level Management Project. This important project includes building temporary flow regulators at Clayton and Currency Creek, together with pumping the 27.5 GL from Lake Alexandrina into the Channel and localised in natural inflows, submerging a considerable area of exposed soil and protecting the Finniss River, Currency Creek and Goolwa Channel from potential acid sulphate soils. Without this project, these waterways would continue to be severely affected through drying out, rising salinity and acidification.

The increased water levels in the Goolwa Channel and its tributaries provide a fresh water refuge for several important species of plants and animals which would otherwise be heavily impacted, and give them a greater chance to re-establish in the area when conditions improve.

05

BUILDING CAPACITY

The South Australia Strategic Plan places a strong emphasis on building strong community networks and enhancing information transfer. Capacity building generates knowledge and skills that will better equip South Australians to responsibly manage our natural resources. This knowledge will allow South Australians to actively participate in making decisions for their individual and collective social, cultural, economic and environmental futures.

Adopting a strategic knowledge management approach will provide the framework for the long-term management of the River Murray, which will be enhanced by informed decision-making backed up by the most up-to-date science. Integrating this scientific knowledge increases the ability to achieve positive ecosystem outcomes throughout the South Australia Murray-Darling Basin, in particular informing the development of the new Basin Plan by the MDBA.

Innovative management systems and technologies in areas such as environmental flows, water trade and water use efficiency continue to be pursued to enable irrigators, water and environmental managers to respond to challenges presented by ongoing drought conditions, longer term climate change, salinity and water allocation policy.

eWater CRC

During 2008-09, the 'Investing in the River Murray Ecology Project' was progressed through the eWater Cooperative Research Centre (eWater CRC).

The eWater CRC continued the development of a suite of decision tools to assist the improved management of freshwater resources and the environment. The decision tools were progressed to prototype stage for testing in the various Murray-Darling Basin jurisdictions. They include models for forecasting and visualising scenarios, databases and decision support software, management guidelines and training courses for industry professionals and post-graduates.

Irrigation Research, Technology Diffusion and Education

The prolonged drought in South Australia has demonstrated the vulnerability of riverdependent industry under climate change; in particular the combined pressure of reduced water availability, increased salinity and heat stress. The next generation of irrigation technology will need to integrate and balance recent research findings to enable not just increased water use efficiency but also improved root zone salinity management, a new approach to heat stress management, and more efficient delivery of nutrients.

This next generation of irrigation technology will provide additional crop protection during extreme and lengthy heatwaves. Even many well watered crops may not withstand predicted high ambient temperatures, combined with excessive radiation. This indicates the need for temporarily modifying the micro-environment of field crops by cooling sprays, row orientation, shading or canopy structure modifications to adequately protect the seed and fruits during extreme events.

Living Murray Icon Site Indigenous Facilitators

Two Indigenous Facilitators supported the implementation of *The Living Murray* Program for the Chowilla and Coorong, Lower Lakes and Murray Mouth Icon Sites. The program aims to involve and engage the indigenous community in Icon Site on-ground works and monitoring programs, and to provide strong communication links between government and the indigenous community.

The work at the Coorong, Lower Lakes and Murray Mouth site is focused on facilitating aboriginal heritage approvals for The Living Murray infrastructure. During 2008-09, the SA MDB NRM Board (through the RMEM Unit) committed funding to the Ngarrindjeri Education Research and Training Centre through Flinders University to develop culturally appropriate higher education courses with a focus on Ngarrindjeri culture.

Key Achievements

- Documentation of culturally significant plants and animals of the Chowilla floodplain.
- Provision of support for the development of culturally appropriate higher education courses.
- Continued research to address the issues faced by the irrigation industry from reduced water allocations.
- New techniques introduced in realistic field conditions relating to varying drought and heat conditions.
- A number of workshops held for growers, irrigators, and other key stakeholders in measuring, monitoring and managing real time salinity risks under precision irrigation.

CASE STUDY 05

CHOWILLA LIVING MURRAY ICON SITE INDIGENOUS FACILITATOR

The Chowilla Living Murray Icon Site Indigenous Facilitator is one of six indigenous facilitators in the Murray-Darling Basin and was appointed in January 2007. The position was created to support the involvement of Indigenous people in ensuring that Aboriginal knowledge and cultural values and perspectives are incorporated into planning and management of the Icon Site.

The position ensures regular information about Tjowila (Chowilla) flows to the Indigenous community and relevant organisations of the Riverland. The position also provides support to help build capacity for the Indigenous community to contribute to the future management of the Chowilla Floodplains Icon Site.

Several significant projects have been undertaken over the last twelve months including the compilation of a book, *Plants and Animals of Cultural Significance at Chowilla*. This is the first book to document culturally significant species on the Chowilla floodplain. It is also the first Aboriginal species book for the Riverland in general.





The aim of the book is to document animal and plant species of cultural significance and to educate the wider community on their usage and preparation. It also aims to preserve knowledge, and to ensure that Indigenous knowledge, cultural values, perspectives and the aspirations of elders are recorded to preserve Aboriginal heritage. The book explains how Aboriginal people use the flora and fauna of the area and how each species is connected to The Dreaming. Many of these species are Ngatji (totemic) to the Aboriginal people, giving them their identity and setting their life path according to the laws of the land. The book also reveals how contemporary Aboriginal people in the Riverland live in this modern-day society while still identifying and practising an ancient culture.

The following is an extract from the page on Ponde or Po: n'mo: nka (Murray Cod).

In the Dreaming, Ngurunderi (our Dreaming hero and creator) travelled down the River Murray in a bark canoe in search of his two wives, who had run away from him. At that time, the river was only a small stream, below the junction of the Murray and Darling rivers. A giant Ponde swam ahead of Ngurunderi, widening the river with sweeps of its tail. Ngurunderi chased the fish, trying to spear it from his canoe. At last, with the help of Nepelle (the brother of Ngurunderi's wives), Ponde was speared after it left the River Murray and swam into Lake Alexandrina. Naurunderi divided the fish with his stone knife and created a new species of fish from each piece. With the last piece, he said, 'You stay Ponde!'

PROGRAM STATEMENT FOR THE PERIOD ENDED 30 JUNE 2009

		Note	2009 \$'000	2008
Funds held at 1 July			14,473	12,483
RECEIPTS	Recurrent Appropriation	1	25,300	22,000
Total Receipts			25,300	22,000
EXPENDITURE				
	Implementation of Water Allocation Plan		1,751	1,678
	Investment in Salinity Accountability		222	208
	River Murray Act		635	543
	MDBC State Contribution		3,971	3,823
	Environmental Flows and Wetland Management		356	482
	River Murray Environmental Manager		235	235
	Surface and Groundwater Modelling		250	181
	Prescription of Eastern Mount Lofty Ranges		859	895
	Investing in River Murray Ecology		152	156
	Drainage Disposal Basins Management		19	23
	Upgrade of River Murray Waste Disposal Stations		613	512
	River Murray Select Committee – Drought Management and Other Recommendations		0	217
	Improved Information Management		320	299
	Water Acquisition for Environmental Flows	2	26,407	9,478
	MDBC Independent Commissioner		36	61
	Lower Murray Levee Banks		145	109
	International Salinity Conference		0	48
	Murray-Darling Basin Reform		167	0
	Water Systems Reform		59	0
	Riverbank Slumping		172	0
	WAP Angus Bremer/Mallee/Marne Saunders		350	0
	Lake Bonney Refill		120	0
	E-Flows and Wetland Management		147	0
	Irrigation Research, Technology Diffusion and Education		800	800
	Water Quality Improvement		199	262
TOTAL PAYMENTS			37,985	20,010
Net Increase in Funds			12,685	1,990
Funds held at 30 June			1,788	14,473

NOTES TO AND FORMING PART OF THE PROGRAM STATEMENT

1. Fund Purpose and Funding

The "Save the River Murray Fund" (The Fund) is established under Section 100 of the Waterworks Act, 1932. The major purpose of The Fund is to provide funds for programs and measures to improve and promote the environmental health of the River Murray or ensure the adequacy, security and quality of the State's water supply from the River Murray. The Fund contributes to the excess of the State's contribution to the Murray-Darling Basin Commission and may be used to provide rebates (including administration costs) in particular cases.

Revenue collected from the Save the River Murray Levy is paid into the Fund through the provision of appropriation from the Consolidated Account. The Fund is not interest bearing.

(a) Goods and Services Tax (GST)

Generally transactions through The Fund are included under the grouping provisions of the GST Legislation. Under grouping provisions, the Department of Water, Land and Biodiversity Conservation (DWLBC) is responsible for the collection of GST on sales and payment of GST on purchases. The DWLBC received and paid these monies to the Australia Tax Office.

2. Water Acquisition

Funds transferred to The Living Murray for water acquisition during the year totalled \$26.407 million. Water entitlements of 19,935,861 KL were purchased from irrigators at a cost of \$47.096 million. This is partly funded by investment from Other Interstate Jurisdictions.

3. Save the River Murray Contributions Fund

A separate fund, Save the River Murray Contributions Fund, has been established to receive contributions where there is no obligation to pay the Save the River Murray Levy. The separate fund was created because the legislation that established the Save the River Murray Fund only provided for revenue to be received from the Save the River Murray Levy.

The funds received in the Save the River Murray Contributions Fund will be applied for the same purpose as the Save the River Murray Fund. The balance of funds held in the Save the River Murray Contributions Fund at 30 June 2009 was \$4,415.



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