

# EDWARD-WAKOOL AERATORS

## A Community Initiated Response to Fish Deaths



A summary of voluntary actions taken by local individuals supported by government agencies



Western Murray  
Land Improvement Group Inc.

February 2017



Local Land  
Services  
Murray



Australian Government

National  
Landcare  
Programme



Version	Author	Date	Reviewed by
1.0	Dan Hutton	February 2017	Roger Knight (WMLIG)
1.1	Dan Hutton	February 2017	Roger Knight (WMLIG)

## Acknowledgement

The Western Murray Land Improvement Group would like to acknowledge all those who contributed to this initiative. In particular Tim Betts, Stephen Coates, Robert Glenn and David Woodland for huge involvement and their openness; Sean & Helen Collins together with Narrandera Fisheries for the loan of the aerators. Roger Knight for his dedication, commitment and hard work in coordinating this venture; Linda Duffy (CEWO) for her support and Jamie Hearn (MLLS) for his continued support of the local community.



Figure 1: Paddlewheel aerator in operation at Edward Park on the Edward River (photo Luke Pearce).

Front cover – Local protest on the approach to Moulamein Township (photo anonymous).

## Contents

Acknowledgement.....	2
Introduction.....	4
Background.....	4
2016 Flooding Event .....	5
Community Response .....	6
Aerators Site Locations and Installation.....	8
Aerator & Site details.....	10
Tueloga .....	10
Cartwheel Bend .....	13
Edward Park.....	14
Moulamein.....	15
Birdswood.....	16
Media Coverage.....	17
Costs, Expenses, Funding & Reimbursement.....	18
Incidental Observations, Experiences and Suggestions .....	18
Observations.....	18
Experiences.....	19
Suggestions.....	19
Conclusions.....	20
Comments and Quotes .....	21
Appendix 1 - ABC Rural News .....	22
Appendix 2 – MLLS Facebook.....	26
Appendix 3 – Koondrook & Barham Bridge Article #1 .....	27
Appendix 3 – Koondrook & Barham Bridge Article #2 .....	28

## Introduction

The fish deaths attributed to the hypoxic Blackwater that closely followed the 2016 flood event, understandably sparked a passionate response from the Edward-Wakool community. At the time much appeared in the press although unfortunately and as is too often the case, some tended to be emotive, inaccurate sensationalism and not representative of community opinions and feeling. This report focuses on one immediate, proactive response initiated by a small group of committed locals and their contribution to temporarily install borrowed and homemade aerators in an attempt to create small, fish refuges by temporarily raising the level of dissolved oxygen.

By documenting their collective endeavours, observations, experiences and suggestions they hope to improve the knowledge and understanding of the impacts fish deaths have on rural communities as well as what practical actions might be taken in the future to counter the impacts of hypoxia.

## Background

The Edward and Wakool Rivers are two of the major components of the Edward-Wakool System, an elaborate matrix of rivers, creeks and channels that flow west of the Cadell Fault which runs on a north south axis from Deniliquin to Echuca, through to Kyalite and the confluence of the Murray and Wakool Rivers. In addition, the numerous rivers, creeks and flood runners the area is crisscrossed by a labyrinth of irrigation channels (see figure 2 below).

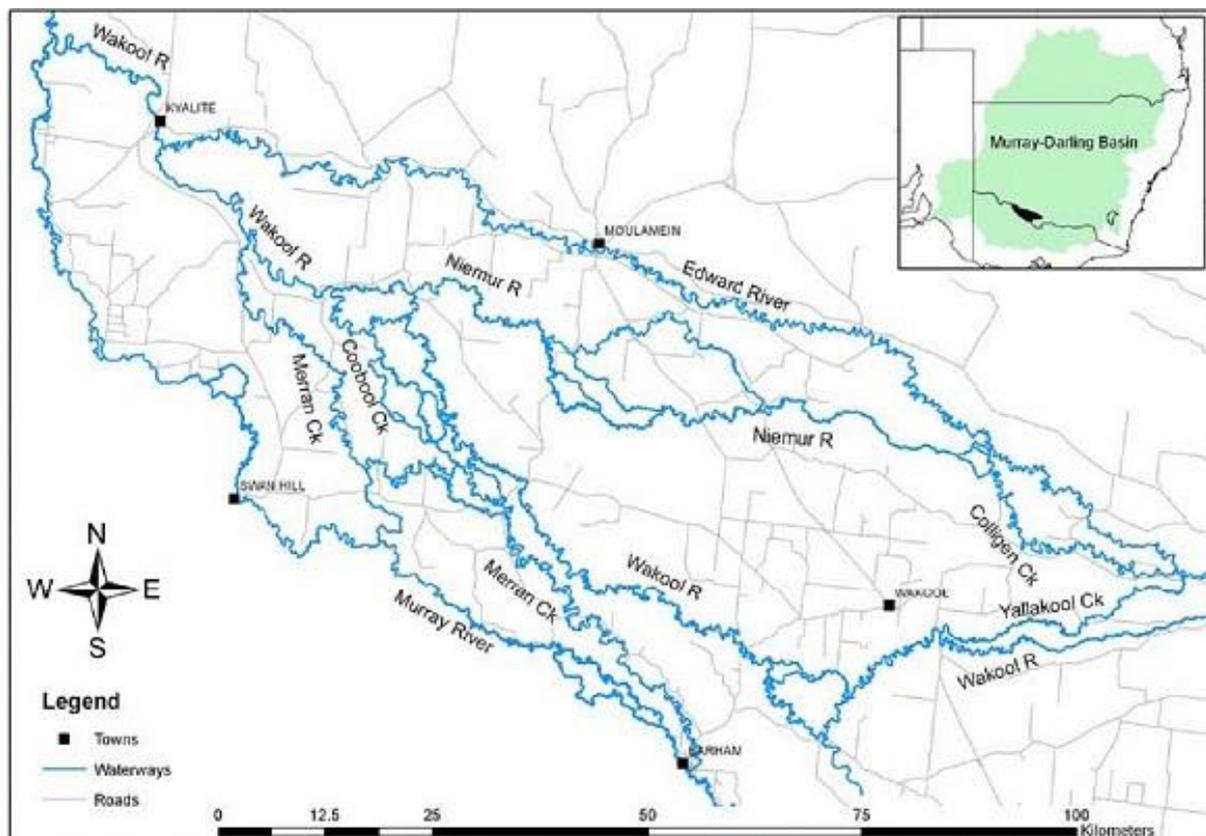


Figure 2: This maps shows the extent and complexity of the Edward Wakool system

In 2010 in response to local concerns of the adverse impact of the millennial drought on local native fish populations the Murray Catchment Management Authority (MCMA) initiated the Fish and Flows

project. This project focused on monitoring and regenerating native fish populations through building collaborative partnerships between interested parties. This was well supported by a variety of local interest groups including the Edward-Wakool Anglers Association, the Wakool River Association, the Colligen-Niemur Action Group, the Barham Angling Club and the Deniliquin RSL Angling Club. The program also proved particularly beneficial in contributing to native fish monitoring and population regeneration following the 2010/11 hypoxic Blackwater event.

Through the Fish and Flows project and subsequent Long-term Intervention Monitoring project (LTIM) coordinated by the MLLS, many locals have become actively involved and more knowledgeable of native fish as well as the broader operation and management of the Edward Wakool system, in particular the delivery of environmental flows. These important projects have not only increased public awareness, knowledge and involvement but also galvanised a sense of community responsibility and ownership of the river systems health and through that, community wellbeing.

### 2016 Flooding Event

Following a reasonably wet 2016 autumn rain fall increased and upstream storages quickly began filling through July and August. By mid-September flows throughout the Edward-Wakool system were steadily rising and correspondingly dissolved oxygen levels were falling. The graph in Figure 3 shows the flows of the Edward River (mega litres per day) and corresponding dissolved oxygen levels (milligrams per litre) recorded at Deniliquin. They have been extracted from the NSW Government Department of Primary Industries Office of Water website (<http://realtime.data.water.nsw.gov.au/water.stm>) from August 1<sup>st</sup> to November 21<sup>st</sup> 2016.

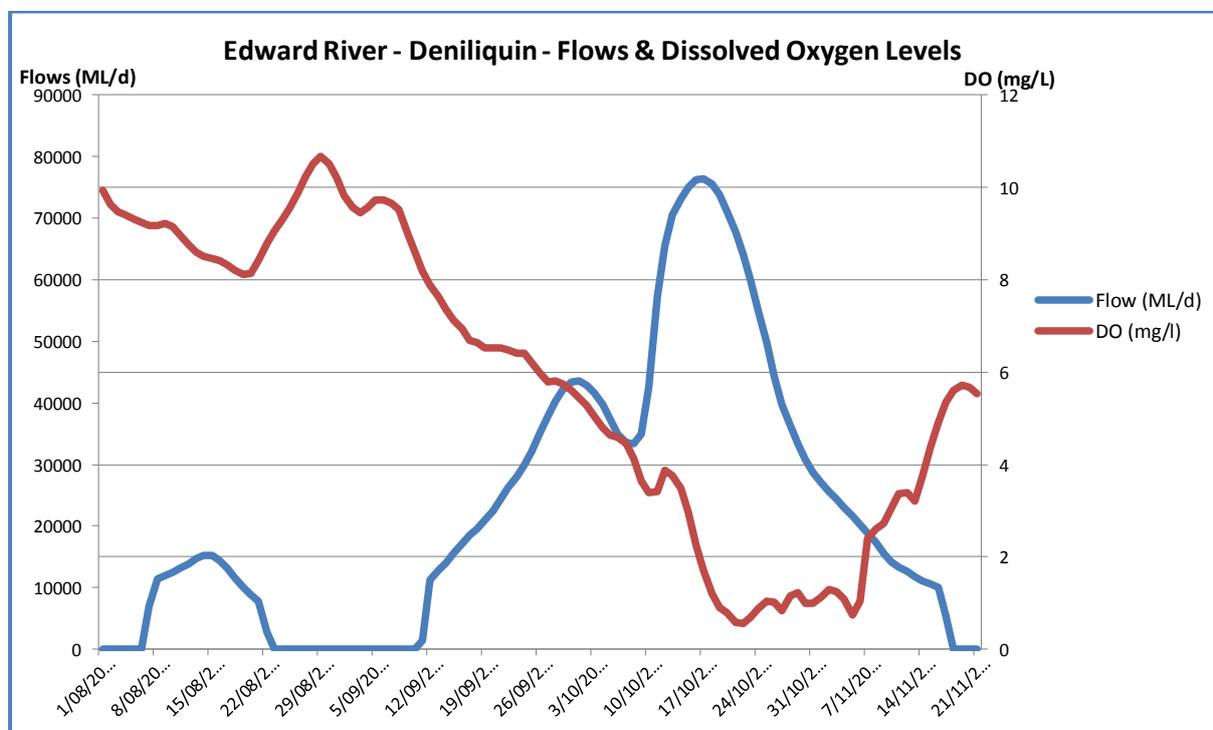


Figure 3: Flows and dissolved oxygen levels recorded in the Edward River at Deniliquin (sourced NSW DPI website)

Through the winter of 2016 the quality of water entering and within the Edward-Wakool system was being regularly recorded and closely monitored by a variety of government agency staff and others. By the end of September dissolved oxygen levels had fallen sufficiently to cause widespread concerns. In response the MLLS who had been collating and dispersing water quality results, convened a meeting of the Murray Dissolved Oxygen Group (MDOG) to discuss concerning dissolved oxygen levels and possible mitigation options. MDOG which includes community representation was specifically formed for this purpose after the impacts of the 2010/11 hypoxic Blackwater event. The outcomes of MDOG efforts are not recorded in this document however; it is understood that MDOG's primary focus was on providing fish refuges by delivering environmental flows directly into the Edward-Wakool system through utilising irrigation channel escapes.

## Community Response

The installation of aerators by landholders across the Edward-Wakool system was initiated by Tim Betts who had experimented with homebuilt, improvised aerators during the 2010/11 hypoxic event. Living right on the water's edge and witnessing the devastation of the 2010/11 event had a profound impact on Tim and his wife Adele as it did too many others who care deeply about preserving the environment in which they value living. It is important to appreciate the extent of the impact suffered by so many who observed first-hand the fish deaths in 2010/11 as it was one of the



**Figure 4: Dead fish photographed on the Wakool River above the Barbers Ck junction 31<sup>st</sup> October 2016 (photo Luke Pearce).**

instrumental motivators behind this year's initiative. Another was the perceived inability of government agencies to initiate effective mitigation measures. The entrenched views government agencies and landholders hold of one another, unfortunately remains a major obstacle in environmental management and appear pivotal in the landholder's decision to act largely autonomously in this situation. Landholders are exceedingly self-reliant and well accustomed to resolving issues themselves; many saw the 2016 hypoxic event this way and acted accordingly. All those involved with the 2016 aerators initiative freely described the beneficial effects they experienced in their wellbeing from actively "doing something to help". Many believe installing the aerators to be worthy exercise for that reason alone.

As the 2016 hypoxic event spread through the Edward-Wakool system and reports of fish deaths, in particular large cod, increased and landholder's anxiety justifiably grew with fears of a repeat of the 2010/11 hypoxic event. Memories of thousands of dead fish of all sizes resurfaced; in some places they had covered the river from bank to bank. Many landholders spoke of feeling obligated by their conscience to "not stand by and do nothing" - they felt compelled to act.

Roger Knight played a critical role in fielding community reports of fish deaths and communicating concerns to local government agency staff and seeking their support. He also played a vital role in sourcing and coordinating the installation of the aerators. The list of those who contributed and volunteered is long and many offers were not taken up due to the limits in available time, resources and logistical support. The full list of volunteers and their contributions appear in Table 1.

Many of those involved in this year's initiative suggested a post-event forum would be beneficial to share experiences and discuss long-term development and expansion of a landholder aerator initiative in preparation for future hypoxic Black-water events.

**Table 1: List of those who contributed and volunteered their services**

<b>Name</b>	<b>Contribution</b>
<b>Tim &amp; Adele Betts (Landholders)</b>	Project instigator, provided site, installation & power
<b>Stephen Coats (Landholders)</b>	Provided site, aerator, installation & power
<b>Sean &amp; Helen Collins (Landholders)</b>	Loaned aerators
<b>Robert &amp; Alison Glen (Landholders)</b>	Provided site, aerator, installation & power
<b>David Woodland (Landholder)</b>	Provided site, aerator, installation, power & electrical skills
<b>Greg Lodge (Landholder)</b>	Provided information and offered onsite power ( <i>not utilised</i> )
<b>John Lolicato (Landholder)</b>	Information & offered site & power (not utilised)
<b>David, Darryl &amp; Drew McDonald (Landholders)</b>	Information support
<b>Andrew Bowring (Kyalite Pistachios)</b>	Offered site & power ( <i>not utilised</i> )
<b>Daniel Monk (Landholder)</b>	Provided information
<b>Luke Pearce &amp; others Narrandera Fisheries</b>	Provided aerator, technical support & advice
<b>Linda Duffy (CEWO)</b>	Lobbied & petitioned for government support
<b>Jamie Hearne (Murray LLS)</b>	Provided funding, contacts & advice
<b>Roger Knight (Barham Angling Club/WMLIG)</b>	Key coordination, setup & logistical support
<b>Moulamein Lake Committee</b>	Onsite power and photos
<b>Kevin Bigmore &amp; China Gibson (Moulamein Lake pump station)</b>	Information, support & supervision assistance
<b>Peter Clarke (Landholder)</b>	Set up assistance
<b>Troy Bright (Edward Wakool Angling Association)</b>	Provided information & project communication e.g. ABC radio
<b>Jason Mathers (Electrician)</b>	Offered aerators electrical assistance ( <i>not utilised</i> )
<b>Many Tourists</b>	Set up assistance
<b>Ken Barnes (Kyalite Hotel)</b>	Knowledge, information on potential Kyalite sites
<b>Boyd's Pumping &amp; Supplies (Barham)</b>	Provided fitting & parts
<b>Andrew Ash (Hunter Marine/Swan Hill)</b>	Provided electrical assistance & information
<b>Colville Engineering (Barham)</b>	Offered pumps & assistance ( <i>not utilised</i> )
<b>Dan Hutton (NRM Consultant)</b>	Assisted with coordination and provided report

## Aerators Site Locations and Installation

A total of seven aerators were installed in late October early November at seven sites, three sites where on the Edward River and two sites on the Wakool River (see location map Figure 3). The units were installed at:

- Tueloga - Wakool River - Tim & Adele Betts (three units)
- Cartwheel Bend - Wakool River - Steven Coates (single unit)
- Edward Park – Edward River - Robert & Alison Glenn (single unit)
- Moulamein Bridge – Edward River – David Woodland (single unit)
- Birdswood – Edward River – David Woodland (single unit)

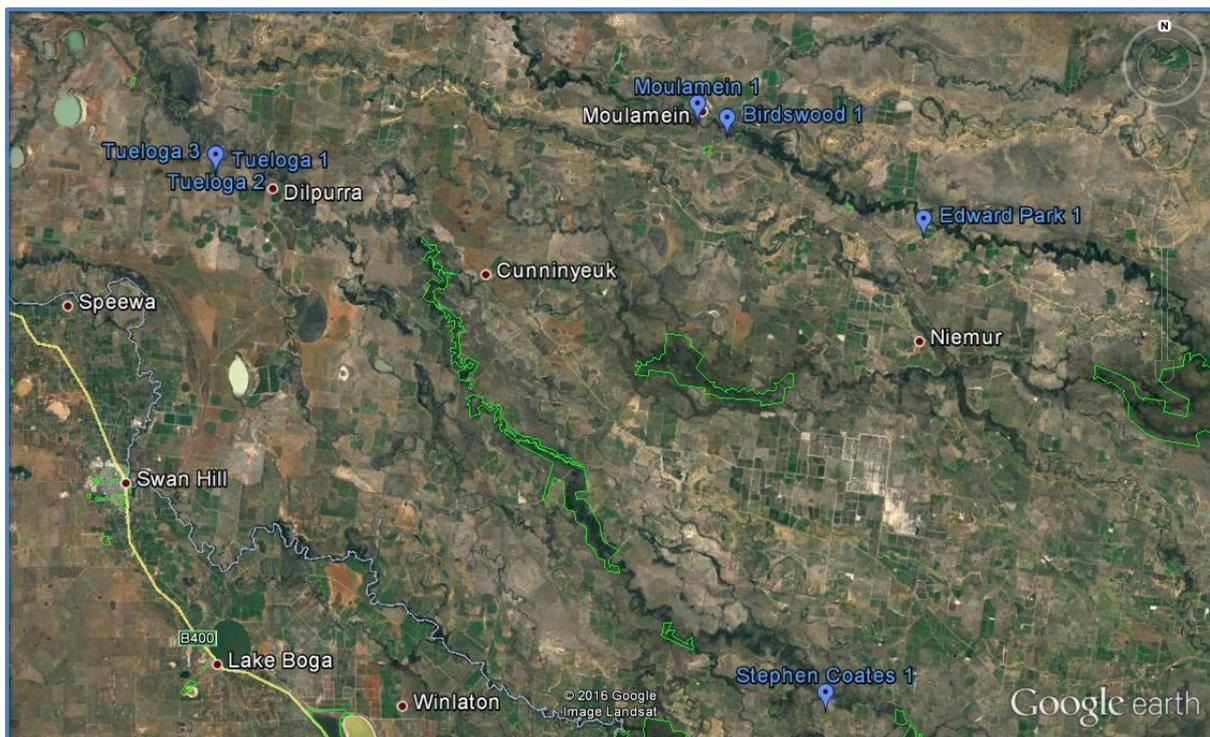


Figure 5: Map indicating the location of the five sites the seven aerators were installed.

The location that the aerators were installed was heavily restricted by the necessity for access to an electrical power source; consequently sites were adjacent to homes and property buildings. This was advantageous for observations and maintenance of the units however; this resulted in the units being located in deeper sections of the main channel with stronger currents. Those involved suggested that having the capability to deploy the units in more suitable sites away from the main channels such as eddying pools, might improve the effectiveness of the aerators. Due to their intimate knowledge of their properties, all the landholders were able to suggest more suitable sites to install the aerators if a remote power source were available.



The loaned paddlewheel units came with the added complication of being driven by 3 phase electric motors which unfortunately further restricted suitable installation sites. This issue was overcome by local electrician David Woodlands volunteering his time and skills to source, purchase and install a variable speed drive to one unit, enabling single phase, 240V power to be utilised. The variable speed drives costing \$200.00 each, are just one example of how the voluntary involvement of such local expertise was vital to the initiative.

**Figure 6: The variable speed drives used on the paddlewheel aerators to convert single phase electricity to 3 phase (photo Dan Hutton).**

Other practical issues overcome by those involved included;

- Aerators were loaned as follows
  - Narrandera Fisheries – 2 paddlewheel units
  - Sean & Helen Collins – 2 paddlewheel units
  - Time Betts – 2 home built units (1 using Roger’s compressor)
  - Roger Knight – 1 air compressor unit (utilised by Tim)
  - Steven Coats – 1 domestic pump unit
- Transporting the aerators to installation sites was undertaken by a number of volunteers
- Electrical connection, cables, vary speed drives and fittings were donated
- Pipe fittings and other material were donated and borrowed
- Electricity costs were estimated at \$100 a quarter and willingly paid by the landholders
- Five \$200 fuel cards were provided by MLLS to reimburse volunteers out-of-pocket expenses
- Four \$100 fuel cards were donated by the WMLIG to reimburse volunteers out-of-pocket expenses

## Aerator & Site details

### Tueloga

Owner:	Mr Tim Betts	River System:	Wakool River
Aerators	Description	Date installed	Supplier
Unit 1	Pump spray system from 2010/11 - 3 phase domestic pump	25 <sup>th</sup> Oct	Tim Betts
Unit 2	Gate aerator - compressed air - 12V battery car compressor - changed to 240V compressor via extension cable	28 <sup>th</sup> Oct	Roger Knight
Unit 3	4 wheel paddle wheel aerator - 3 phase -1.1kw motor	1 <sup>st</sup> Nov	Sean & Helen Collins



Figure 7: Map indicating the location of the Tueloga units on the Wakool River.



Figure 8: Tueloga unit 1 home built by Tim and previously used during the 2010/11 event (photo Roger Knight).

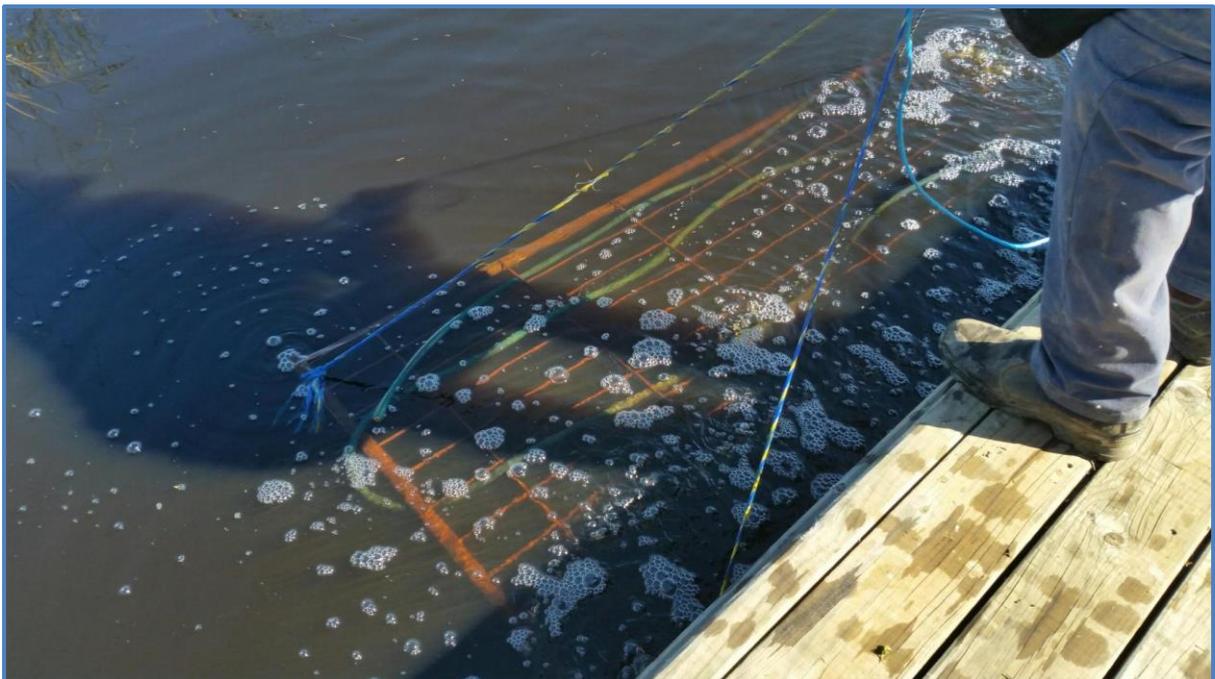


Figure 9: Photograph of the Tueloga unit 2 using an old air compressor (photo Roger Knight).



Figure 10: Photograph of the Tueloga unit 3 a four paddlewheel unit in operation (Photo Dan Hutton).



Figure 11: Tim Betts fervently resisting Roger Knight's attempts to donate fuel cards as reimbursement for out-of-pocket expenses (photo Dan Hutton).

## Cartwheel Bend

Owner:	Stephen Coats	River System:	Wakool River
Aerators	Description	Date installed	Supplier
Unit 1	Onga domestic pump 1 inch - water spray	28 <sup>th</sup> Oct	Stephen Coates



Figure 12: Map indicating the location of Cartwheel Bend unit on the Wakool River.

## Edward Park

Owner:	Robert & Alison Glenn	River System:	Edward River
Aerators	Description	Date installed	Supplier
<b>Unit 1</b>	4 wheel paddle wheel aerator - 3 phase -1.1kw motor + vary speed drive	31 <sup>st</sup> Oct	Sean & Helen Collins



Figure 13: Map indicating the location of the Edward Park unit on the Edward River.



Figure 14: Four paddlewheel aerator in operation at Edward Park (photo Dan Hutton).

## Moulamein

<b>Owner:</b>	<b>David Woodland</b>	<b>River System:</b>	<b>Edward River</b>
<b>Aerators</b>	<b>Description</b>	<b>Date installed</b>	<b>Supplier</b>
<b>Unit 1</b>	2 wheel paddle aerator (3 phase)	2 <sup>nd</sup> Nov	Narrandera Fisheries

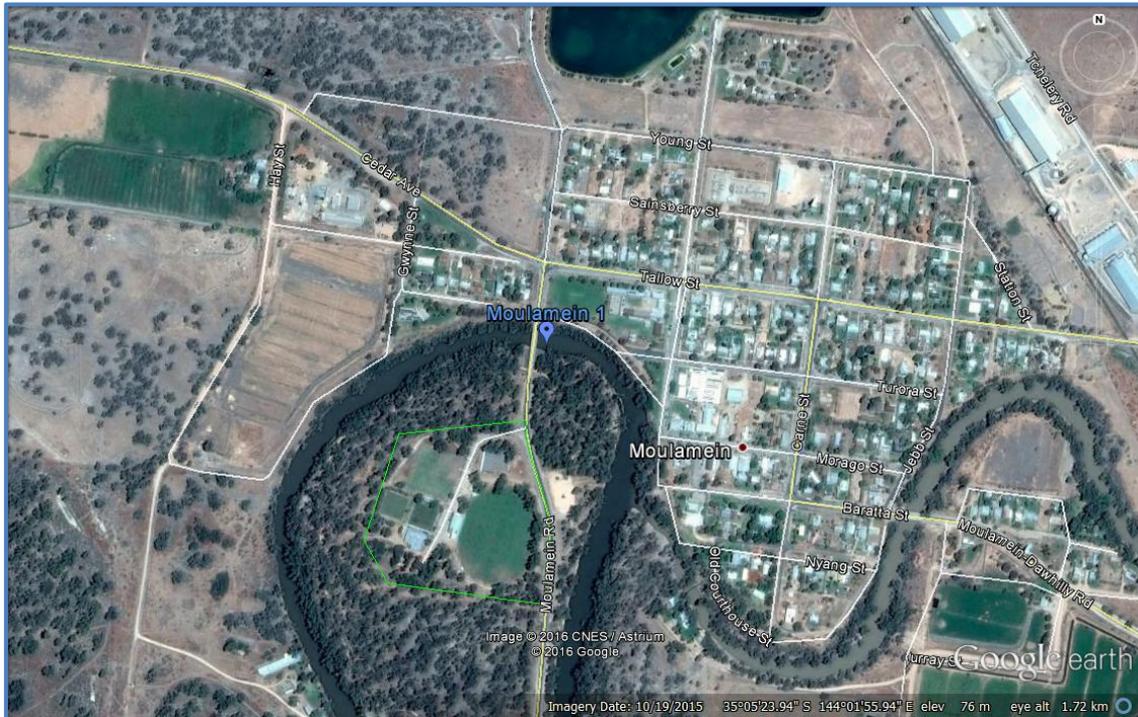


Figure 15: Map indicating the location of the Moulamein unit on the Edward River.



Figure 16: Photograph of the two paddlewheel aerator working Moulamein (photo Roger Knight).

## Birdswood

Owner:	David Woodland	River System:	Edward River
Aerators	Description	Date installed	Supplier
Unit 1	2 wheel paddle aerator (variable speed drive - single to 3 phase power)	9 <sup>th</sup> Nov	Narrandera Fisheries



Figure 17: Map indicating the location of the Birdswood unit on the Edward River.



Figure 18: Two paddlewheel aerator operating at Birdswood on the Edward River (photo Roger Knight).

## Media Coverage

As so often occurs in cases of such local resourcefulness little media coverage was given to the aerator initiative. The ABC in Mildura covered the story well with a short, recorded interview with Roger Knight, Tim Betts and Troy Bright broadcast on local ABC and also an article on the ABC Rural News website. Some were disappointed that much of the acknowledgement of agency assistance was omitted from the broadcast. A copy appears in Appendix 1, or follow the link: [http://www.abc.net.au/news/2016-12-06/farmer-tries-to-save-fish-affected-murray-black-water/8096576#.Wl\\_gtJo1I5Q.mailto](http://www.abc.net.au/news/2016-12-06/farmer-tries-to-save-fish-affected-murray-black-water/8096576#.Wl_gtJo1I5Q.mailto)

The MLLS posted a brief, supportive report on their Facebook page. A copy of the post appears in Appendix 2, or follow the link below: <https://www.facebook.com/Murray.LLS/photos/ms.c.ejyzNLUONrIwMzAxNDe2MDDUs4TwTUF8c0szKN~;cAMI3BADOzwmu.bps.a.959328437507151.1073741896.245036172269718/959328604173801/?type=3>

The Koondrook & Barham Bridge newspaper prints two supportive articles of the aerator initiative, copies appear in Appendix 3 and 4.



**Figure 19: David Woodland and Robert Glenn receiving fuels cards on behalf of the Moulamein Lake Committee from Roger Knight which they intend to include in their raffle (photos Dan Hutton).**

## Costs, Expenses, Funding & Reimbursement

There is no attempt to accurately account for the costs or expenses incurred during this initiative and they were willingly born by the volunteers who donated varying quantities of time and resources however: a list of donations and some noteworthy and non-attributable costs appear below together with funding received from the MLLS.

- Time spent
  - Researching and sourcing equipment
  - Traveling/transporting equipment
  - Installing equipment, monitoring and maintaining equipment
- Resources used
  - Transporting equipment
  - Installing equipment
  - Running the aerators
- Cost of the vary speed drive = \$200.00
- Average running cost for the paddlewheel aerators = \$100/quarter
- Five \$200 fuel cards were provided by MLLS to reimburse volunteers out-of-pocket expenses
- Four \$100 fuel cards were donated by the WMLIG to reimburse volunteers out-of-pocket expenses
- Some of the volunteers chose to donate their fuel cards to local community groups involved in the initiative for them to raffle
- A Small Community Grant of \$10,000 was successfully obtained from MLLS to support this initiative. This funding contributed toward the administrative and coordination costs incurred by WMLIG; coordination, logistical support and report writing by Dan Hutton. However; the funds have not been exhausted and it is hoped they can contribute towards preparations for future hypoxic events.

## Incidental Observations, Experiences and Suggestions

### Observations

- Seen in close proximity to the aerators and not elsewhere were:
  - Lots of crustaceans attracted to aerators upon initial installation
  - Large numbers of shrimp, yabbies and small fish caught near the aerator. None caught away from the aerator
  - Lots of small carp
  - Lots of small bait fish
  - Some individual large Cod seen and detected on a FishFinder
  - 2 large Yellowbelly
  - 1 turtle
- Cod seen accumulating in large numbers at Brehaut MIL escape
- A lot of public interest and enquiries at Moulamein aerator site

## Experiences

- Those involved all felt better for proactively doing something
- Access to power source limited location of aerators
- Remote power would enable improved site selection
- Ideal location
  - Out of main current
  - In shade
- Running cost = \$80-90/quarter
- Doubts of effectiveness in such a large volumes of water
- Many involved felt the media were being unhelpful in reporting the Blackwater event
- Differing and conflicting views of effectiveness from government agencies were confusing and unhelpful.

## Suggestions

- Coordinated preparation
  - A coordinated, larger scale approach
  - Organise for next year now
  - Advance selection of suitable aerator/refuge sites (now)
  - Early warning
  - Controlled inclusion and use of private infrastructure
  - Set up power recovery costs
  - Purchase a number of variable speed drives now (\$200) = single phase 240V input – 3 phase 240V 3KW output
  - Possible purchase of aerators
  - Use of the Brehaut MIL escape for environmental water delivery .
- Aerator design
  - Instigate Uni/Tech colleges/schools competition with prizes for best design
  - Various categories: 240V power/remote power/renewable power/cheap/recycled materials
  - Men's Shed could manufacture winning designs
  - Made on a trailer frame.
- Breeding stock of primary importance
- Dilution flows to be incorporated into environmental allocation and plans
- Brehaut MIL escape not used despite suggestion
- Flows from the Murray could have provided refuge/dilution flow to Waddi
- Education of Landholders in the benefits and operation of MIL escapes
- Positive, pre-arranged media campaign
- Post-event forum to share experiences and discuss any future developments.

## Conclusions

- The venture was derived and driven by local individuals' determination to avoid reliving their experiences of the 2010-11 Blackwater event and resulting fish deaths.
- The venture brought people together from many walks of life for a common cause. At their own cost they shared equipment, knowledge, skills and provided all kinds of assistance
- All those involved said they would take part in any similar, future venture
- All those involved said actively "doing something" improved their wellbeing by alleviating the sadness and upset caused from seeing the dead fish and feeling helpless
- Though the effectiveness of the aerators in raising DO levels and providing fish refuge was not established, large Cod, Yellowbelly, small fish, turtles and crustaceans were all seen spending time in close proximity to the aerators
- Improvements could be made to any future deployment of aerators; these include
  - An advanced, coordinated, larger scale approach
  - Advance selection of refuge site
  - Early warning
  - Advanced deployment and installation of aerators
  - Controlled inclusion and use of private infrastructure
  - Set up power cost recovery process
  - Purchase a number of variable speed drives now (\$200) = single phase 240V input – 3 phase 240V 3KW output
  - Purchase of aerators
  - Improved aerator design.
- The response and stance of some media in reporting the 2016 Blackwater event was at best unhelpful and at worst deliberately accusatory, divisive and sensationalistic. The local community would have benefited greatly from *pre-arranged and positive information provided through a planned media campaign.*



Figure 20: Robert Glenn showing Roger Knight and David Woodland where he observed a large number of cod congregating at the leaking Brehaut MIL escape during the Blackwater event (photo Dan Hutton).

## Comments and Quotes

***“Maybe I'm clutching at straws, but I've got to do something. My conscience doesn't allow me to just sit here and do nothing”.***

Tim Betts Landholder and project instigator, ABC Mildura Radio 6/12/16

***“Whilst it may feel good to be trying to do something it is simply just that, a feel good exercise. I would also strongly suspect that the home made aerators that I have seen photos of would be even less effective than the commercial aerators.....”***

Luke Pearce Fisheries NSW Fisheries 1/11/16

***“These pics everyone is sending through of aerators are absolutely fantastic. Just shows how ingenious and resourceful people can be in face of an emergency”.***

Robyn Watts Charles Sturt University 1/11/16

***“Great farming ingenuity”..... “I'm wondering whether designing a simple, cheap, robust, effective aerator for use in these situations would be a good Honours project for an environmental engineering student”.***

Kerry Greenwood MDBA 26/10/16

***“I agree; this is a good honours project. I will be at the ANU Fenner School this afternoon and would discuss this with Prof Albert Van Dyke”.***

Tapas Biswas MDBA 26/10/16

## Appendix 1 - ABC Rural News

### Farmer desperately tries to save native fish from deadly Blackwater event in southern Murray-Darling system

Vic Country Hour; By [Emma Brown](#): Posted 6 Dec 2016, 6:24pm



**PHOTO:** [These dead fish have been pulled out of the Wakool River.](#) (ABC Rural: Emma Brown)

**RELATED STORY:** [Murray River flooding draws tourists to Mildura](#)

**With widespread flooding occurring along the Murray, Murrumbidgee, Edward and Wakool Rivers, it may be hard to believe there is not enough healthy water in the southern Murray-Darling Basin system for native fish.**

But as the water has spread along flood plains and forests, carbon matter has been swept up and is breaking down, [causing a blackwater event](#).

Oxygen levels are dropping, leading to [hypoxic events and fish kills](#).

But along the Wakool River, farmers and anglers are desperately working to save as many fish as they can by pumping oxygen into the dark, flooded river.

Farmer Tim Betts, who lives near Moulamein in southern New South Wales, said it may be a hopeless cause, but he felt he must try to protect native fish from suffocating in the Blackwater.



**PHOTO:** [Water that has inundated trees near the Wakool River quickly turns dark.](#) (ABC Rural: Emma Brown)

"It looks like one great big bottle of Cola going past. In reality it is black and horrible," he said

"I've designed a series of pretty rough aerators to try and put some oxygen back into the water, just to make a micro environment or a small area where the fish can take refuge.

"I don't know if it's going to work or not, but I just figure that if one female fish lays hundreds of thousands of eggs and I can save one, I've saved basically maybe 5,000 or 10,000 future fish.

"So if I save one fish I'll be happy. Maybe I'm clutching at straws, but I've got to do something. My conscience doesn't allow me to just sit here and do nothing."



**PHOTO:** [Tim Betts moves an improvised aerator in an effort to put more oxygen in the river.](#) (ABC Rural: Emma Brown)

It is not the first time Mr Betts has seen a hypoxic event in his stretch of the Wakool River.

He said the current flood in his area was not doing as much damage as previous events, but he had concerns that would change as more floodwater filled with decomposing leaf matter and tannins returned to the main river.

"The first time that I was faced with a Blackwater event, we had probably total sterilisation of the river where we lost all the fish in the river," he said.

"It sounds like I'm exaggerating, but you could literally walk across the surface of the water on dead fish.

"So there were tens and tens of thousands of dead fish.

"This time it's not as bad as that, but I think this is only the start of it, because when the river gets back in its banks and the water starts running in off the country that's been flooded, then the oxygen levels will decrease even more.

"Then god knows what we might see."

**YOUTUBE:** [Tim Betts uses an aerator to put more oxygen into the river](#)

## Causes must be examined

Mr Betts said he was worried about the future of the fish population and what was behind the widespread fish kills.

He said Blackwater was an important part of the river's functions, but the extent of the deoxygenation was a concern.

**YOUTUBE:** [The fish aerator in action at Moulamein](#)

"It's terribly challenging because we see this once every 20 years or once every 50 years, so we don't really know how to deal with it," he said.

"We've got to work in with the environment. We can't work against it.

"All I know is that we must be doing something wrong because we haven't had dead fish in the past every time we have a high water event.

"I've spoken to older guys that were professional fishermen in their day, and they've fished through these events in the past.

"They've never seen dead fish and Blackwater like this. We have to go back to the start, find out what we are doing wrong and fix it."



**PHOTO:** [The flooded Wakool River from Tim Betts's backyard, with the fish aerator bubbles in the front left.](#) (ABC Rural: Emma Brown)

## Appendix 2 – MLLS Facebook



[Murray Local Land Services](#) added 3 new photos to the album [Community rally to assist stressed fish](#).

3 November 2016 · 🌐

Landholders and community members continue to build and borrow aerators to assist the survival of native fish during the current natural hypoxic blackwater event in the Edward-Wakool system.

These aerators may only provide very localized benefits but the local landholders are banding together to do what they can to assist the survival of their beloved native fish. These efforts when coupled with the continuing release of environmental flows into the system via Murray Irrigation escapes are giving the native fish every possible chance of survival.

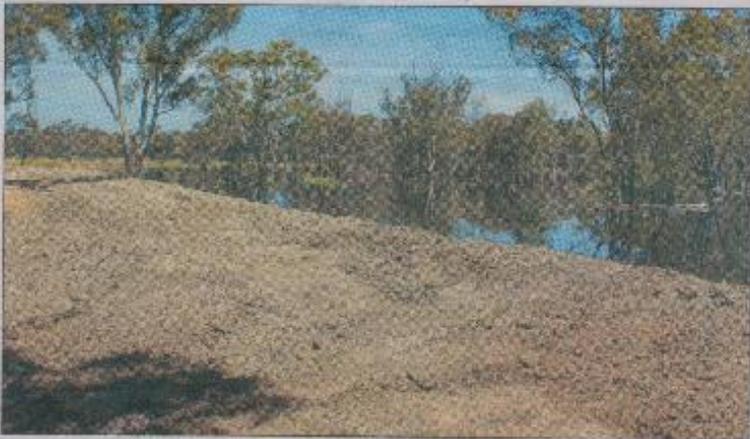


11 Likes 2 Shares

## Appendix 3 – Koondrook & Barham Bridge Article #1

News

---



The Edward River level is now starting to drop, bringing blackwater with it.

# Blackwater toll a heart-breaker



**MOULAMEIN  
NOTES**  
With China Gibson

OPINION

WHAT a bummer. With every good season there is always a sting in the tail. This year it is all of the water coming down our rivers. The reports of fish dying is breaking every fisherman's heart. There seems to be reports of fish dying along the lengths of every river and creek in our district. This is a bloody disaster for our region. We have just got the end population beyond what we would ever expect to do then along comes this. I am not happy; this angers me almost as much as the SES evacuating our town.

### Aerators a welcome sign

SO FAR there have been a couple of aerators set up in our district. There is one at our lake pump in town and another out at Edward Park on the River Road. We do not know if these machines are going to do any good but it is a quick decision that may help. Normally, these decisions are made after everything is dead. It is great to see those in charge on the front foot for a change.

### Wonderful SES volunteers

I MAY have had my differences with the top end of the SES. But the crew on the ground have been great for our town. They have given up their own livelihood to come out here and help us out. Thank you to all those volunteers as well as the paid ground staff that were in our district. You have done a wonderful job. It is those idiots in charge that evacuated our town for no reason that I am angry at. I have not finished with them yet.

### Mighty Swans AGM

THE Mighty Swans AGM will be held on the

November 13. All positions will be made vacant. Our Mighty Swans have been recruiting well and with the new salary cap efforts by most other clubs. We will be very strong this year. Get on board before the band wagon is full. Everyone is welcome to attend our meeting.

# Are they being killed kindness or IGNORANCE

Fish kills have been reported around the area due to hypoxic black water. Hypoxic (blackwater) occurs when a high concentration of dissolved organic carbon is present in the water. The transfer of organic carbon from floodplains to the river channel results in microbial respiration of this carbon consuming oxygen. If oxygen consumption exceeds re-aeration, dissolved oxygen concentrations may fall to levels insufficient to support aquatic biota.

This is what is present in areas around the Wakool, Niemur, Edward rivers and the Billabong Creek. Sadly, this event has seen fish of all sizes perish, even cod of 120cm have been reported in the mix.

I travelled out to an area near the Gee Gee Bridge, over the Wakool River, on the Nourong Road and witnessed firsthand the devastation. An area of approximately 30ac, where water had flowed out into a treed area, was littered with decaying fish.

floodway – in that section, hopefully the damage is contained to a small area.

Continuing on to Mountainein, I was pleased to find the water colour was a bit healthier than the pure blackwater I had been seeing in the morning. Local volunteers have been busy distributing and setting up aerators to try and assist the fish population.

The local community members have supplied a number of aerators from restored, borrowed and supplied equipment in the hopes they may improve dissolved oxygen levels in small localised areas, thus providing limited fish refuges.

From what I am told from community members, NSW fisheries have provided some of the aerators but were not actively promoting them, as it would do little good. This is not a view I share and one, I think, many community members would not agree with. If we have the ability to save any fish, we should give it a go.

At the ripe age of 32, I'm sick of governments' top-down approach of dealing with resource management and totally ignoring local knowledge that has been crafted over the years from real life experience. Not some lecturer's green agenda, fed to eager students ready to go and solve the world's problems without any consideration for the practical application.

If resource management was a trade, you would learn it from those who had years of experience implementing it and working in the environment they are trying to protect. The current approach of taking people from other environments and force feeding them information (yes information, not knowledge) presented by someone who knows the theory, would be similar to a first year apprentice mechanic being given information on how the theory of compression ignition and

