SAVE THE MURRAY: RESTORE THE ESTUARY
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SYDNEY INSTITUTE, FEBRUARY 8, 2012

Summary

The Australian Government's $10 billion plan to save the Murray-Darling by reconfiguring upstream irrigation so that more water is sent to the Lower Lakes, Murray's mouth and Coorong is based on a narrative about the Murray's mouth closing-over and Lake Alexandrina drying-up because of greedy upstream irrigators taking too much water. This invented story ignores the impact of 7.6 kilometres of sea dyke[i] that have dammed the estuary and stopped the tide. Before the sea dykes the Lower Lakes never dried-up because each autumn, and for longer periods during drought, the Southern Ocean would push in to the lakes. Furthermore, the Murray's mouth would close over naturally irrespective of upstream water diversions because of high-energy coastal processes and how they impact barrier estuaries.

Telling Lies

At the very bottom of Australia's Murray-Darling Basin is a vast coastal lagoon that was once connected to the Southern Ocean. The region was home for the Ngarrindjeri, who wore possum skin coats and loved to tell stories. One of their stories[ii] is about greed and the environment and also the consequences of telling lies.

Two men set off in their bark canoe for the Ngiakkung, a shallow, reed-filled corner of the lagoon their tribe favoured for fishing. That day *thukeri*, or bream, were so plentiful that the fish all but hopped into the canoe. Having acquired a substantial haul, one said, "Hey brother, we have plenty of *thukeri*. Let's paddle to the shore before we sink." But his friend, for whom plenty was never enough, wanted to keep on fishing. The fish piled up even higher in the canoe, which sank even lower.

Eventually, they paddled towards the shore, where a stranger stood. "Hey brothers, I'm hungry," he called out, "Have you got any fish to share?"

The rapacious one replied, "No, we haven't. Just enough to feed our families."

As the stranger turned to walk away, the men started laughing behind their hands. The stranger heard them and said, "You have plenty of fish, but because you are greedy and don't want to share, you will never enjoy the *thukeri* again." When the men reached the bank, they found the fish they had caught were thin and full of sharp bones.

They told their families what had happened. The old people said that the stranger was the Great Spirit Ngurunderi. From then on, for all time, the Ngarrindjeri people would be punished. Today, whenever Ngarrindjeri catch a bony bream, they are reminded of long ago, when Ngurunderi taught them a lesson.

During the recent drought, the waters of Ngiakkung, a place now called Loveday Bay, dried up. No one could ever remember the lagoon, now called Lake Alexandrina, drying up before.

Some of the people who now live around Lake Alexandrina said it was the fault of upstream irrigators.

But there was little to no water upstream either. There was drought in the Murray Darling, and there had been drought before. But this was the first time the lake waters had receded.

It was an Estuary

The old fishermen say that before irrigation, before the weirs, locks, levees and sea dykes, the Murray River would flog down from September until maybe Christmas, filling the lagoon, then out the mouth. By Christmas flow had usually slowed and water levels dropped right down. Then when the South Westerly wind picked up the sea would pour in through the mouth and work its way across the lake.[iii]

So Lake Alexandrina was fresh in spring and summer, but salty by autumn.

What the old fishermen describe is an estuary: a transition zone. In these type of systems salt water comes in under freshwater, and moves across this type of coastal lagoon as what is known as saltwater 'wedge'.

The Murray River had a barrier estuary with a central lagoon, Lake Alexandrina, and a sand barrier, the Younghusband Peninsula. A single, narrow and shallow inlet that often closes over is also a characteristic of barrier estuaries.[iv]

There are many barrier estuaries along the southern Australian coastline including Lake Illawarra just south of Wollongong. According to the Lake Illawarra Authority's management guide, freshwater flows into the lake from the escarpment and salty water from the ocean tides and therefore it is an estuary. There are 70, of these Intermittently Closed and Open Lakes and Lagoons, known by the acronym ICOLL, from Sydney to the Victorian border.[v] A significant issue is management of the risk of flooding when their 'mouths' close over. NSW State government policy doesn't support the artificial opening of ICOLLs.

Making Changes

The South Australian government insists the Murray mouth, which is the inlet to Lake Alexandrina, be kept open. In fact since European settlement there have been many schemes devised to change the Murray's mouth to make it deeper and wider, including through basting and dredging and more recently through water reform.

The South Australian government also insists that Lake Alexandrina be a freshwater lake, not an estuary. In the 1930s, 7.6 kilometres of sea dykes were built blocking the five channels from Lake Alexandrina that converge on the Murray's mouth to stop 'salt water intrusions', Map 1.

The sea dykes dammed the estuary making it totally dependent on river flows. Stopped the tide. Limiting natural scouring of the sea mouth in spring by the river flow and in autumn by the Southern Ocean. Not surprisingly the hydrology and geomorphology of the Murray's mouth has changed with sand that used to shoal behind the mouth consolidating into Bird Island that continues to grow and may one day permanently plug the Murray's mouth.[vi]

Shifting Blame

During the Millennium drought, water levels in Lake Alexandrina fell precipitously from 0.85 metres above sea level to -1.10 metres below. There was simply not enough water in

upstream dams to keep both Lake Alexandrina and the adjacent Lake Albert supplied with adequate water notwithstanding the Snowy diversions and strictly limited allocations for irrigation during the drought.

The South Australian government could have opened the 593 gates within the five sea dykes to let the Southern Ocean in, but instead kept the gates shut tight. This was not reported in the national media, instead, during the drought, television cameras focused on either the receding lake waters or the sand dredge working to keep the Murray's mouth open, conveniently avoiding images of the massive sea dykes in between.

As soon as the floodwaters arrived in the spring of 2010, the government opened the gates to let excess water out.

Double Standards

The Parramatta River empties into Port Jackson that includes Sydney Harbour. Melbourne's Yarra River empties into Port Phillip Bay.

We don't expect the Yarra River to keep Port Phillip Bay full of freshwater. But we do expect the Murray River to keep Lakes Alexandria and Albert full of freshwater, even during drought.

Interesting the Yarra River has 57 per cent of its flow available to the environment. The Murray has a similar level of water extraction with 58 per cent remaining for the environment.[vii]

In June 2011, the Yarra was short-listed for a prestigious international environmental award, while the Murray River was being described by activist group, GetUp!, as on the brink of ecological collapse because of inadequate environmental flow.

The Murray Darling is a large catchment and the upper Murray and Murrumbidgee snow fed, so most years it can fill Lakes Alexandrina and Albert with freshwater. On average over the 42 years from 1968 to 2010, 5,920 gigalitres a year of freshwater has flowed over Lock 1. That's about 11 Sydney Harbour's full of freshwater each year into the Lower Lakes.

Stopped the Tide and the Mulloway

Of course the Southern Ocean could guarantee water for Lake Alexandrina during drought; except the gates have been kept shut to the Southern Ocean since February 1940.

Before the sea dykes were built across the five channels that converge on the Murray's mouth, mulloway, a large fish with a golden sheen, would hangout in the underwater canyons beyond the Murray's mouth. As though reluctant to come in, then on a big tide and a full moon large schools would race through the inlet between the sand dunes.

The year the sea dykes were sealed, the mulloway came in and then were trapped, on each ebbing tide, churning in the channels below the sea dykes. There is an old photograph of the Goolwa wharf groaning under 160 ton of dead mulloway.[viii]

Being Deceived

During the 1980s prominent South Australians successfully lobbied for Lake Alexandrina to be listed as a Wetland of International Importance under the United Nation's Ramsar Convention. The listing was never intended to restore the estuary and bring back the mulloway. The intention was to secure more water from upstream; as more than one South Australian has told me over the last year, we can import our rice and cotton from overseas, but there is only place we can get our freshwater and that is from upstream. All the new housing estates and marinas on Hindmarsh Island have fixed, not floating jetties: they have no intensions of ever restoring the tide.

It was clever politics, the Ramsar listing: the need for freshwater for the Lower Lakes is now always framed as being about the environment. Never mind that the Lower Lakes are managed as a freshwater storage and that the water allocation comes from upstream dams.

And over the last decade, the Wentworth Group of Concerned Scientists has successfully lobbied for the environmental needs of Australia's river systems to have a guaranteed first priority call on water. This became reality with the Water Act in 2007 that also gave precedence to particular environments: Ramsar-listed environments.

The Wilderness Society is campaigning for the $10 billion allocated for implementation of the Water Act to be spent on water buy back ostensibly to restore natural environments in the Murray Darling. But given the legislation most of the water that is bought back will be to maintain the Lower Lakes with a regular allocation from the dams in the Murrumbidgee and upper Murray.

A water license doesn't guarantee irrigators water, the actual allocation depends on how much water is in the dams. The upper limit for all water extractions by NSW irrigators from the Murrumbidgee and Murray in any year is just over 4,000 Gl. Coincidentally this is the same volume of freshwater the South Australian government is demanding as additional flow for the Ramsar listed Lower Lakes.

So, all that campaigning for environmental flow is on the basis of a false premise. You are being deceived. Meeting the objectives of the Water Act 2007 may result in the closing down of irrigated agriculture in the NSW Riverina, but most of the 'water saved' will not benefit a natural environment.

Being Greedy

Remember back in 2004 when Mark Latham, was campaigning to win the federal election? He promised to add 450 gigalitres of environmental flows to the Murray River in his first term of government and an extra 1,500 within ten years. At that time Australian Greens leader, Bob Brown, said he would return 1,500 gigalitres within five years – in half the time. Back then 1,500 gigalitres seemed like a lot of water.

The late Peter Cullen also mentioned 1,500 gigalitres and indicated that volume was "scientifically derived." The Wentworth Group proposed the water be returned through an annual incremental increase of 100 gigalitres for environmental flows. So, by last year 800 gigalitres should have been returned.

In fact, campaigning during the 2010 federal election Julia Gillard said over 900 gigalitres had already been recovered.

But no one is happy. The Australian Greens, who once demanded 1,500 Gl, are also now claiming that a minimum of 4,000 Gl must be returned to ensure the Murray River's survival and 7,600 Gl if it is to be healthy.

In 2004, the campaign for more water was ostensibly because of declining water quality and rising river salinity. This was shown to be a fiction: river salinity levels had been falling for twenty years as a result of the implementation of on-farm drainage and salinity management plans in the 1980s. So theoretically less, not more, water should now be needed, particularly given the drought has broken.

It was junk science that suggested an additional 2.7 Sydney Harbours of freshwater would restore the system back then, and more junk science by way of different computer modelling that now claims the need for 13.6 Sydney Harbours of freshwater.

In Denial

In July 2011, I visited the Federal Parliament in Canberra and met with about a dozen Labor, Liberal, National and Greens Senators and MPs representing voters from across the Murray Darling. I emphasized that: the health of a river system is more than the quantity of water flowing downstream; current management of Lake Alexandrina as an artificial freshwater oasis is unsustainable; and restoring the Murray River's estuary must be a priority in any Murray Darling Basin Plan.

They all knew about the sea dykes, the false premises on which much of the current water reform agenda is based, but they said restoring the estuary would be too hard, too political, it was potentially a vote loser in South Australia.

So, there is no discussion or opposition to the detail in the planning documents relating to the distribution of the $10 billion for implementation of the Water Act. The argument is only about how much water will be bought back, in particular how much water will be guaranteed for the Lower Lakes as an annual freshwater allocation at the expense of upstream food production.

The supporting policies of the federal government, South Australian government and even the Australian Greens, is based on the assumption Lake Alexandrina has always been a freshwater lake.

The Evidence

This claim, that the lake has always been fresh, is never juxtaposed, for example, against the observations in the diary of Charles Sturt that the waters of Lake Alexandrina were salty in February 1830, or the history of the mulloway fishery in Lake Alexandrina, until construction of the sea dykes.

It would be difficult for a rational person, familiar with the available evidence, to come to the conclusion that Lake Alexandrina has been a predominately freshwater lake for 7,000 years. Yet this is the advice in reports from CSIRO and the Australian Wetlands and Rivers Centre. And this popular claim is backed up by a prominent statement in the executive summary of a report commissioned by the South Australian Department of Environment and Heritage prepared by Jennie Fluin, Deborah Haynes and John Tibby.[ix] These scientists are recognised experts at reconstructing the past history of lakes and wetlands based on the presence or

absence of particular species of diatom in sediment cores. Diatoms are unicellular algae with shells that preserve as microfossils.

The scientists incorrectly state in the report that:

"There is no evidence in the 7,000 year record of substantial marine incursions into Lake Alexandrina."

This claim, while consistent with government policy, is at odds with not only what we know about how Southern Australian estuaries evolved and now function, but also many studies published in reputable scientific journals including research papers authored by the same scientist.[x] Indeed the claim is inconsistent with the specific diatom assemblage described in their published papers and also in their report to the South Australian government.[xi]

There is substantial evidence for three distinct phases in the evolution of the Murray River's estuary: a period of maximum marine influence when the estuary was starting to form following a period of rapid sea-level rise 7,000 years ago, then a period of maximum freshwater influence after a sand barrier formed across the estuary, followed by a third phase with conflicting evidence as to whether Lake Alexandrina was becoming generally fresher or saltier at the time the sea dykes were built. That there have been three distinct phases in the evolution of the Murray River estuary is consistent with what is generally known about the evolution of barrier estuaries in Southern Australia[xii] including, for example, the Illawarra Lakes in NSW.[xiii]

Secrets and Stories

What we don't know, we can learn. But it can be hard to unlearn lies, especially those that have been pounded into our brains like the story of the Murray's mouth closing over and Lake Alexandrina drying-up all because of greedy upstream irrigators.

Those who know about estuaries could be correcting the misinformation. But a majority of Australian scientists with expertise in such issues are dependent on government for their funding.

Like the Thukeri Story of the Ngarrindjeri, the real story of water reform in the Murray Darling is about greed, deception and telling lies but on a much grander scale.

Increasingly my tribe, middle-class white Australia, has many compelling stories that purport to teach us how to live in harmony with the natural environment and the Murray River. Some of the stories are made-up by those with a vested interest, while many more are from people who simply want to save the environment, but who don't understand it. Although their hearts are in the right place, they may not know that the natural history of Lake Alexandrina once included mulloway, or that Matthew Flinders did not draw a river mouth on his map of Encounter Bay, or that some scientists make claims that accord with government policy, but not the available evidence.

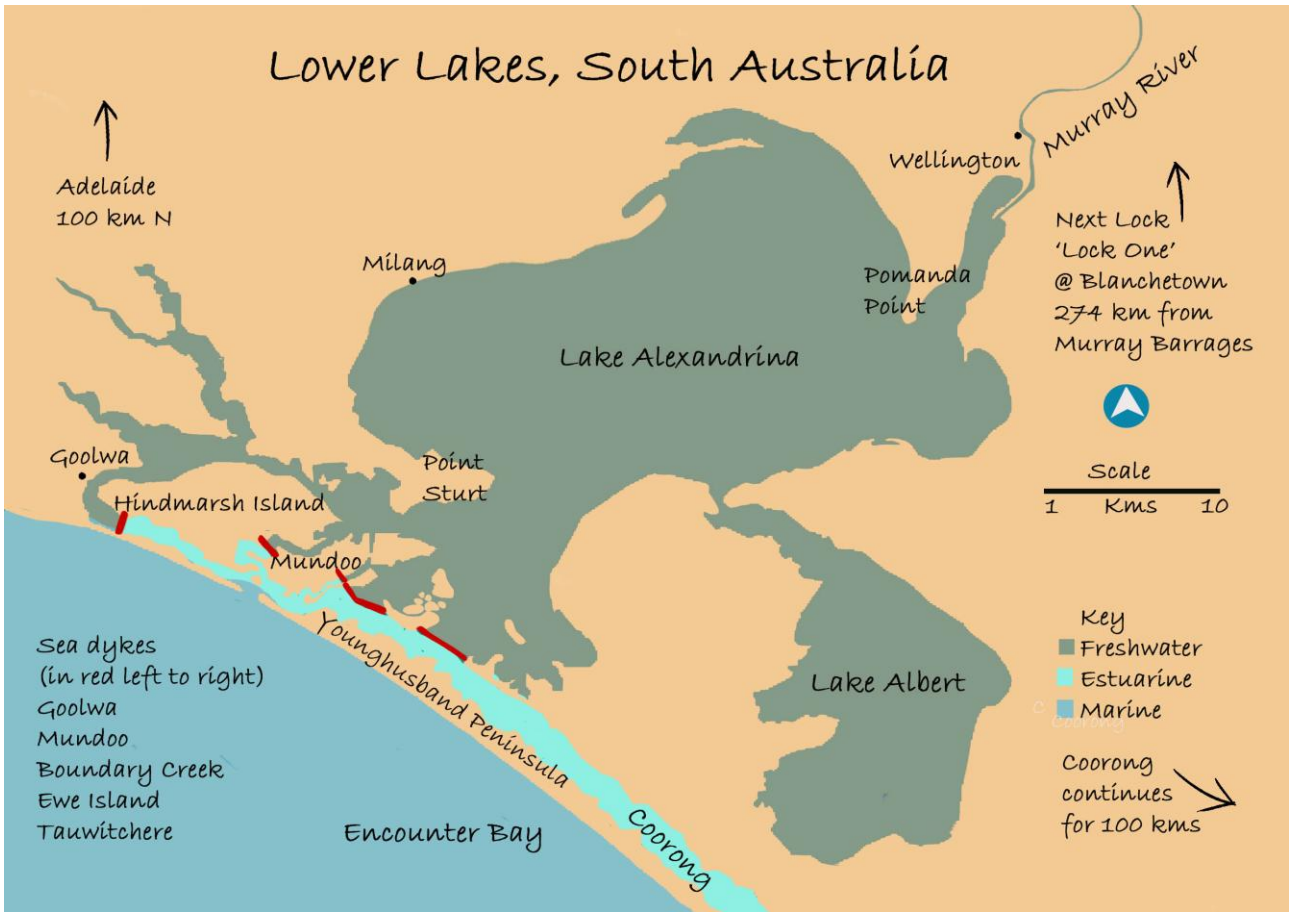
Some think that sea water will kill the river red gums around the estuary. But river red gums don't grow around the Lower Lakes. It is coastal country. Mangroves should be growing there. Mangroves grow in Sydney Harbour, Port Phillip Bay and along South Australia's coastline where there are tides. But there are no mangroves at the bottom of the Murray River. The

Murray River doesn't have an estuary: the sea dykes dammed the estuary and stopped the tides.

It is wrong that politicians, environmental groups and scientists are all silent about the sea dykes. It is wrong that the whole of the Murray-Darling Basin, all one million square kilometres of it, should be held hostage to a fiction, to a specious claim about a freshwater lake.

What our tribe needs is a story about the Murray grounded in reality. Otherwise we risk a thin future filled with sharp bones.

Map 1. Lower Lakes, South Australia



Acknowledgements

Susan Myers drew the map. Kate Jennings helped with the text. John Abbot and I are drafting a technical paper on the diatoms of Lake Alexandrina.

The Australian Environment Foundation is supporting my current research and writing on Murray Darling issues as part of its Rivers Need Estuaries Campaign.

End Notes

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[i] The dykes are known locally, and within Murray Darling Basin Authority publications, as the barrages, however, the correct term for an embankment restraining the waters of a river or the sea is a dyke (Macquarie Australian encyclopedic dictionary 2006). The dykes hold back the Southern Ocean and created a freshwater reservoir with a storage capacity of 1,974 GL. The dykes are variously built of earthen embankment, concrete sluices, concrete piers and stop-logs. The Goolwa and Tauwitchere dykes include a lock.

[ii] This story has been adapted from the Dreamtime story Thukeri available on Youtube at http://www.youtube.com/watch?v=Jcl2inXgFzA

[iii] Wood, A. 2007. Poor Man River: Memoirs from the River Murray Estuary, Digital Print, Adelaide

[iv] Digby, M.J., P. Saenger, M.B. Whelan, D. McConchie, B. Eyre, N. Homes, D. Butcher, 2004. A Physical Classification of Australian Estuaries, The National River Health Program, LWRRDC Ocassional Paper 16/99

[v] See Management of coastal lakes and lagoons in NSW. Department of Primary Industries. http://www.dpi.nsw.gov.au/fisheries/habitat/aquatic-habitats/wetland/coastal-wetlands/management-of-coastal-lakes-and-lagoons-in-nsw

[vi] Bourman, R.P. 2000. Geomorphology of the Lower Murray, Lakes and Coorong. In *River Murray Barrages*. Eds. Jensen, A. , M. Good, P. Tucker, M. Long. Pages 23-29

[vii] See MDBA, Guide to the Proposed Basin Plan, Volume 1, page XXIII and Victorian Department of Sustainability and Environment, Central Region Sustainable Water Strategy, page 22

[viii] See Interview with Jim Marsh, Barrage Superintendent at Goolwa, September 27, 1999. Available online at the Alexandrina local history archive http://alexhistory.pbworks.com/w/page/1724620/Jim%20and%20Maria%20MARSH

[ix] Fluin, J.D., J. Haynes, J. Tibby. 2009. An Environmental History of the Lower Lakes and Coorong. Report Commissioned by the South Australian Department of Environment and Heritage.

[x] Compare for example the findings in
1. Fluin, J., P. Gell, D. Haynes, J. Tibby, G. Hancock, 2007. Palaeolimnological evidence for the independent evolution of neighbouring terminal lakes, the Murray Darling Basin, Australia. Hydrobiologia 591:117-134;
2. Fluin, J., D. Haynes, J. Tibby. 2009. An Environmental History of the Lower Lakes and Coorong. Report Commissioned by the South Australian Department of Environment and Heritage;
3. Gell, P., J. Tibby, J. Fluin, P. Leahy, M. Reid, K. Adamson, S. Bulpin, A. MacGregor, P. Wallbrink, G. Hancock, B. Walsh. 2005. Accessing Limnological changes and variability using fossil diatom assemblages, south-east Australia. River Research and Applications 21:257-269;
4. Haynes, D., R. Skinner, J. Tibby, J. Cann, J. Fluin, 2011. Diatom and foraminifera relationships to water quality in The Coorong, South Australia, and the development of a diatom-based salinity transfer function. Journal of Paleolimnology 46:543-560

[xi] For example, in their report to government, Drs Fluin, Haynes and Tibby list the species *Staurosirella pinnata* as a dominant species from the bottom of a Lake Alexandrina sediment core taken near where the river enters the lake and therefore indicative of the lake being "fresh to brackish" for 7,000 years. But in a more recent paper also published by Drs Fluin, Haynes and Tibby, this same diatom species is listed as common in the very salty Coorong with mention that it has a broad salinity tolerance (see Hayne et al. 2011. Diatom and foraminifera relationships to water quality in The Coorong, South Australia, and the development of a diatom-based salinity transfer function. Journal of Paleolimnology 46:543-560).

[xii] Marohasy, J. 2012. Plugging the Murray River's Mouth: The Interrupted Evolution of a Barrier Estuary, Australian Environment Foundation, Report No. 001/12. February 2012.
[xiii] Sloss, C. R., B. G. Jones, C. V. Murray-Wallace, 2003. Litho- and Chronostratigraphy of Holocene Sedimentary Successions Preserved in Lake Illawara, NSW, Australia. Wetlands (Australia) 21: 62- 73.