# A future for the Coorong and Lower Lakes

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THE Coorong and Lower Lakes are listed as a Wetland of International Significance under the Ramsar Convention. This wetland system was nominated because of the diversity of wetlands that were supported: fresh, estuarine and hypermarine; and because of the importance of the area to vast numbers of water birds: ducks, swans, pelicans, terns, grebes, and migratory sandpipers and endemic shorebirds (stilts, avocets).

But the region has changed and is about to change again: a consequence of failing to allocate the necessary maintenance and environmental flows to the River Murray.

The Coorong has not received upstream flows of freshwater for at least six years and in just the last two years the water levels in the Lakes have dropped to well below sea-level — unprecedented. These changes threaten to eliminate the key features that made this system of international significance.

But all is not lost. We can do things to salvage some of the essential natural elements of this internationally-recognized region.

Salinities in the southern Coorong are so high now that they exceed the maximum levels that key fauna can tolerate. Small hardyhead fish (Atherinidae) and chironomid larvae abounded in the hypermarine salinities of the southern Coorong provided these salinities did not exceed about 115–120 ppt TDS or 3 times the salinity of seawater, as was the case throughout the 20th century. But in the last 5–6 years with no flows of freshwater over the barrages, the salinities have risen to levels of 160–180 ppt TDS during summer, even above 200 ppt TDS at times — far beyond their tolerance. The fish and chironomids have gone and with them the waders and the fish-eaters, the pelicans, terns, and grebes. Worse still, the lack of flows has led to water levels in the South Lagoon dropping in spring instead of late summer, preventing the key annual aquatic plant, *Ruppia tuberosa,* from completing its life cycle. After 5–6 years of negligible reproduction this plant has disappeared from the entire South Lagoon and so has its seed bank. Little wonder that swans and ducks no longer darken the skies.

The once secure and productive drought refuge for Australian waterfowl has all but gone.

The Coorong is unlikely to get an environmental allocation of water for several more years at least.

**Why?**

Current drought conditions have greatly reduced storages of water along the River and these will be replenished before significant volumes will be provided for environmental purposes. Substantial flows of freshwater in excess of 1,000 GL are then needed to lift the water levels in the Lakes before any water can be released to the Coorong. Even if water was available and it was put directly into the South Lagoon of the Coorong, it would fail to dilute the salt levels to levels below the critical thresholds that would allow the fish and chironomids to return. Pumping seawater in just exacerbates the already accumulated salt load. A major flood (10,000 GL flowing over the barrages) would be needed to back flush the accumulated salt out of the southern Coorong and return salinities to moderately hypermarine conditions — such volumes of water are not available and are extremely unlikely to be available in the foreseeable future.

Given that there is no likelihood that environmental flows will reach the Murray Mouth and northern Coorong in the next two years, then the southern Coorong is likely to continue to deteriorate. With the lack of freshwater input, evaporative water losses in the Coorong will continue to be offset by influxes of marine water. This will result in further salt accumulating in the Coorong lagoons. As a consequence, excessive salinities will rapidly shift northwards into the southern reaches of the North Lagoon further restricting the areas where fish and chironomids can exist in the Coorong. In January 2008, the salinities at Noonameena about 20km into the North Lagoon had reached 115 ppt TDS. In the previous year they were around 80 ppt TDS and prior to that lower again. By this January 2009 the salinities are likely to exceed the threshold for the bottom 20 km of the North Lagoon, restricting fish, chironomids and other aquatic invertebrates to an even smaller portion of the Coorong By January 2010 salinities above critical thresholds may be expressed a further 10km north. To continue to do nothing about this deterioration contravenes the EPBC Act.

It is now urgent that the excessive salt loads in the South Lagoon are reduced; this is the key to recovering the Coorong. A logical solution is to pump some of the salt out of the South Lagoon and into the Southern Ocean as was suggested in mid-2008, after assessing other alternatives. Delays even of one year in reducing these excessive salt loads may be critical for the recovery of the system. Modelling suggests that if pumping commenced in early 2009 then by 2011–2 (depending on rates of pumping) salinities across the South Lagoon would be lowered to levels where the fish and chironomids could

recolonize. If the pumping was delayed by a year further salt would accumulate in the South Lagoon, increasing the pumping time needed to drop salinities and potentially preventing recovery until 2013–4. Some key components of this system cannot wait this long. For example, Fairy Terns *Sterna nereis* are now listed as vulnerable on the IUCN Red List because their abundances have plummeted, particularly in the Coorong. Their ability to breed successfully in the Coorong has been curtailed because of the absence of hardyhead fish near secure breeding locations in the South Lagoon. The global population for this species is now less than 4,000. In the 1980s in excess of 1350 Fairy Terns used the Coorong — making the Coorong a stronghold for the species. In 2000, nearly 700 Fairy Terns were counted in the Coorong and this has now dropped to around 300. These birds do not live indefinitely and if they continue to fail to breed successfully (as is likely under the current conditions) they will face extinction.

Ironically, the problems of high salt levels in the southern Coorong need to be addressed before environmental flows over the Barrages are returned to the northern Coorong. The migratory waders for which the Coorong is globally important need productive mudflats covered by no more than a few centimetres of water. At present the only productive mudflats are in the northern Coorong. Dredging of the Murray Mouth since 2002 has maintained the productivity of these northern mudflats to some extent. The northern most of these are tidally-influenced and as the tide retreats the birds can access invertebrates from the mudflats. However, if an environmental flow was provided, water levels in the northern sections of the Coorong would rise and deprive the birds of access to the productive mudflats. Historically birds displaced from these mudflats during freshwater flows shifted southwards and joined birds foraging on the productive mudflats of the southern Coorong. These productive southern mudflats do not exist at present, so providing an environmental flow before the southern Coorong is recovered might have significant adverse effects on these migratory birds, with which Australia has international agreements with China, Japan and Korea to protect.

Like the Coorong, the modern ecological changes to the Lakes commenced with the installation of the Barrages in the late 1930s. These Barrages prevented marine water entering the lakes during periods of low River flow but also allowed water levels to be elevated within the Lakes. We have become accustomed to having freshwater lakes. Historically they were not fresh all the time. There were periods when the lakes would have been extensively estuarine having salinities between those of freshwater and marine water. The duration and frequency of estuarine conditions on most occasions would have been short-lived except in severe droughts, and estimates suggest that the lakes were fresh 95% of the time.

With the lack of flows over the last 2 years, the water levels in the Lakes have dropped to unprecedented levels and those levels may continue to drop exposing mudflats with acid sulphate soils. Following exposure to the air and then re-inundation, there is a high risk that the water bodies of the lakes will become acidic with various heavy metals (pollutants) being released into the water column. One solution to this impending disaster is to keep these acid sulphate soils covered with water. At present water is being pumped from Lake Alexandrina into Lake Albert to keep water over the most affected soils, but come summer when evaporative rates are higher this pumping may be inadequate to prevent water levels dropping and exposing acid sulphate soils. The suggestion is to return marine water to the system, but there are risks in doing this. Although marine waters historically entered the Lakes, these waters mixed with fresh water and after short periods of incursion were flushed out of the lakes. In the 1930s, something like 80% of the water entering the River Murray went out to sea. By the 1990s, it was around 25%, and now **NO** water reaches the sea. So, if the barrages are opened and the sea let in, the lakes will rapidly become marine or hypermarine, without the prospect of a freshwater influx. We do not know what this will do to the ecology of a system that has been effectively fresh for over 65 years. Importantly, we now know that any marine water that enters the lakes is likely to travel upstream and contaminate freshwater *in the river*, and so reduce the quality of the water extracted for human use from Tailem Bend upwards. Even at present, with the Barrages closed, some marine water has seeped under the Barrages and a slug of saline water is detectable at Wellington, where the River channel meets the Lakes. Because salty water is denser than freshwater and because the channel floor of Lake Alexandrina and the River are below sea level this upstream incursion can be gravity driven. So before any marine water could be released the incursion of salty water upstream into the River channel needs to be prevented. One of the potential functions of the proposed Wellington Weir at Pomona might be to provide a barrier to prevent incursions of marine water further upstream.

Fortuitously recent local rains have added a significant volume of water to Lake Alexandrina and so the decision to proceed with the Wellington Weir has been postponed, with work unlikely before June 2009. While there is no environmental flow in the River and no weir at Wellington any releases of marine water into the Lakes will need to be limited to very small volumes aimed only at keeping water over acid sulphate soils in the vicinity of the Barrages.

Given that there is unlikely to be an immediate allocation of upstream river water to the Lakes, the exposure of acid sulphate soils to the air remains imminent. If the drought continues, the Lakes will be faced with the same dilemma of acid sulphate soils being exposed in the near future. That leaves little alternative but to find some other solutions to minimize the impact of these soils and we should be focusing some attention on implementing these actions now — whether that is spreading lime, planting these areas with plants and or adding mulch may still need to be determined — but we should be trying to mitigate the potential damage that could be caused by acid sulphate soils by whatever means available. Once solved then the risks of these issues

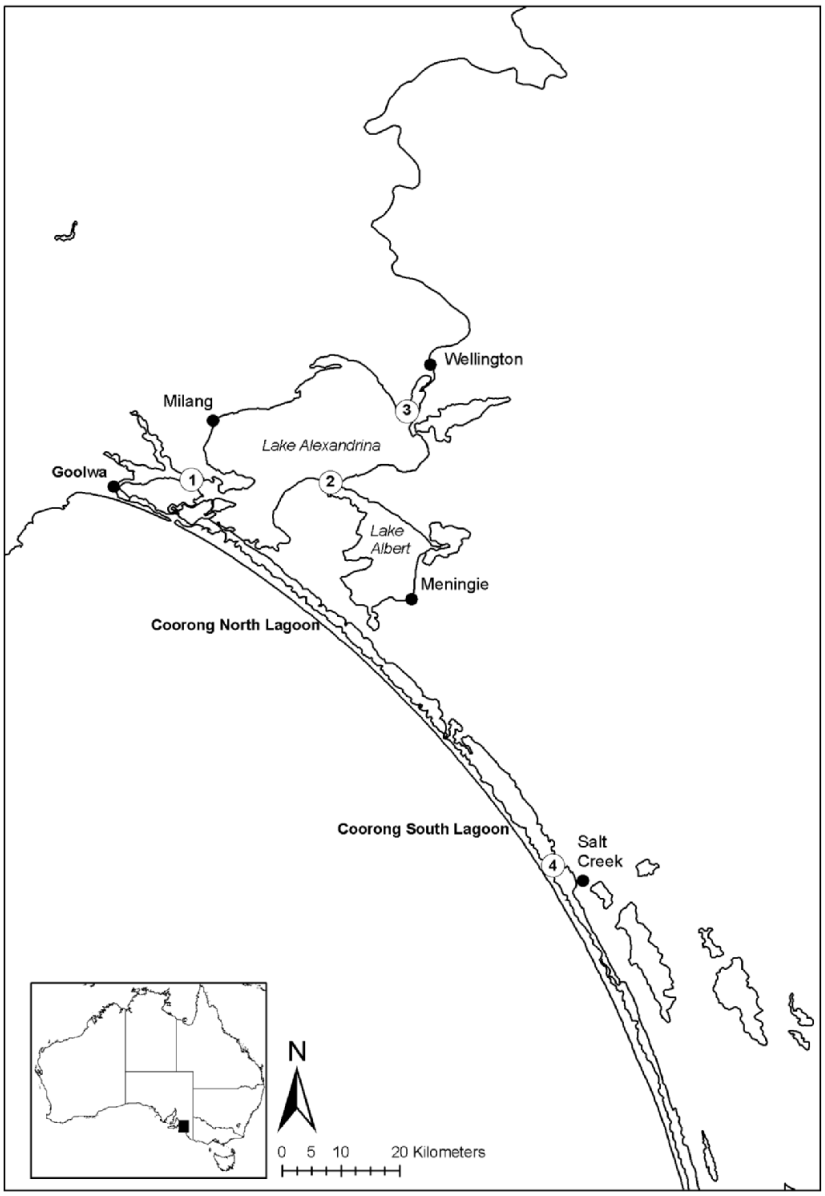


*Fig. 1.* Coorong and Lower Lakes region showing location of engineering works that could be used to secure the biodiversity assets of this Internationally Significant wetland in the short-term under limited environmental flows and in the long-term with a re-configured river system. (1) Weir near Clayton to secure a freshwater system between Goolwa and Clayton; (2) Weir at the junction of Lake Alexandrina and Lake Albert to allow Lake Albert to become an ephemeral lake; (3) Wellington Weir; and (4) pumping highly saline water out of the South Lagoon into the Southern Ocean to lower salinities and allow ecological recovery of the southern Coorong.

recurring and doing ecological damage during the next dry period are diminished.

We are still left with managing the Lakes in some sustainable manner that keeps some of the core values of this wetland, such as freshwater habitats for threatened fauna such as the Yarra Pygmy Perch *Nannoperca obscura*, and Murray Hardyhead *Craterocephalus fluviatilis*. There is an obligation under the Ramsar Convention to maintain at least some freshwater habitat, but it is unlikely that the Lakes as a whole can be maintained as a permanent freshwater system. This is particularly so as inflows to the river diminish due to climate change as predicted, and given the sentiment from interstate that South Australia needs to significantly reduce the 800GL of water that evaporate off the lakes each year.

**What compromises and changes can we make?**

Here are some suggestions. First if we were to conserve and manage a representative freshwater system with limited River flow then the section between Goolwa Barrage and Clayton should be selected and a regulator or weir built from just east of Clayton across to Hindmarsh Island. Inflows of freshwater from Currency Creek and the Finniss River would flow into this section and be contained. Those flows on their own would be more than sufficient to sustain this section as a freshwater system given current median flows from these catchments. In years of drought or very low water levels, some consideration could be

given to piping freshwater sourced upstream from the Murray into this wetland. A pipeline from above Wellington to Clayton is likely to be built to service the water needs of this community and so the added infrastructure costs are not great to do this. The wetland areas between Goolwa to just east of Clayton have the best habitat for the small and highly threatened freshwater fish. Sectioning off this section also reduces the risks of salt-water incursions into the Finniss and Currency systems. Water levels might need to fluctuate a little and be maintained at levels slightly lower than in the recent historical past, but the majority of people living in and around Goolwa will still be able to boat and recreate.

Second, if the flows down the River are inadequate to sustain water levels across both lakes then decommissioning Lake Albert as a permanent lake and converting this to an ephemeral wetland or swamp, with areas of paperbark ti-tree (*Melaleuca halmaturorum*), reeds and/or samphires established within the lake's footprint is an option. This can be done by simply raising a barrier at the junction of the two lakes near Narrung. These ti-tree swamp systems have largely disappeared from the region, many potentially disappearing because the elevated lake levels permanently inundated them and they drowned. Each winter and spring, rainfall and local runoff would accumulate in the disconnected "lake" as it does now and then the system would dry out during summer. This new system once vegetated provides an environmental benefit, but importantly if significant flows return to the river then the area could be inundated for longer and under those conditions it is likely to be a significant breeding area for waterbirds and possibly fish.

The freshwater saved from Lake Albert (perhaps as much as 200GL) can then be used for environmental purposes elsewhere within the river or in maintaining or raising water levels in Lake Alexandrina to increase the likelihood of releasing water into the Coorong and to the Murray Mouth. Ironically under the current sharing rules, the water saved in this way would need to be shared with the other states. At times it may be necessary to let some marine water into Lake Alexandrina and to provide an estuarine component to the system. No estuarine conditions currently exist within the region because there is no flow of freshwater to the Murray Mouth; there have been no estuarine conditions for six years. Prior to the barrages, estuarine areas were extensive particularly across the northern Coorong and out into the Southern Ocean, and back into the Lakes when the flows diminished or ceased.

The above suggestions are engineering solutions to symptoms: dredging the mouth; pumping out the South Lagoon; plus weirs and regulators strategically placed within the Lakes and Coorong. No engineering solution diminishes the need to address the underlying causes that will prevent these systems from collapsing, due to the over allocation and extraction of water for human uses across the Murray-Darling Basin. However, these solutions do provide a safety net — an ability to manage and keep essential elements of a truly fantastic international wetland system for short periods during malevolent times, while still allowing the system to return and recover if ever we return to providing the River with a sustainable environmental flow. Return the environmental flows and the dredging and pumping can cease, and the weirs and regulators are no longer required. Bear in mind that these suggested emergency engineering works will not sustain these aquatic systems in the long-term — this requires the provision of essential environmental flows.