

Environmental Monitoring Report

Murray Futures

Coorong, Lower Lakes and Murray Mouth

July 2012 to June 2013

Objectives

2012-13 ecological and acid sulfate soils monitoring continue to assess the CLLMM ecosystem's response to flow conditions, and continue to improve knowledge on the ecological character of the Coorong, Lakes Alexandrina and Albert Wetland of International Importance.

CLLMM monitoring is undertaken in line with the CLLMM Monitoring Framework (developed in 2011), with objectives including gathering information to:

- detect changes, or likely change in the ecological character of the site, including monitoring significant biological components, and the extent and condition of wetland types, and to
- provide or improve the descriptions of Limits of Acceptable Change, including critical components, processes, and drivers of the site.

Ecological objectives

To assist in achieving the objectives described above, the CLLMM ecological monitoring aims to:

- monitor the response of the biotic components to continued water availability following the recent drought (2006-2010), including:
 - changes in species abundance and distribution,
 - shifts in community composition and structure
 - changes in habitat condition and utilisation, and
 - signs of recruitment and recolonisation.
- enhance synergies/integration within the CLLMM monitoring program and complementarity with existing monitoring programs, including *The Living Murray*, and
- use monitoring information to improve knowledge of the ecological character of the site and better inform current and future management.

CLLMM 2012-13 ecological monitoring includes a range of taxa, including zooplankton, macroinvertebrates, birds, fish, and *Ruppia tuberosa*, and was undertaken at numerous sites within the CLLMM region between September 2012 and June 2013 (Table 1).

Acid sulfate soils objectives

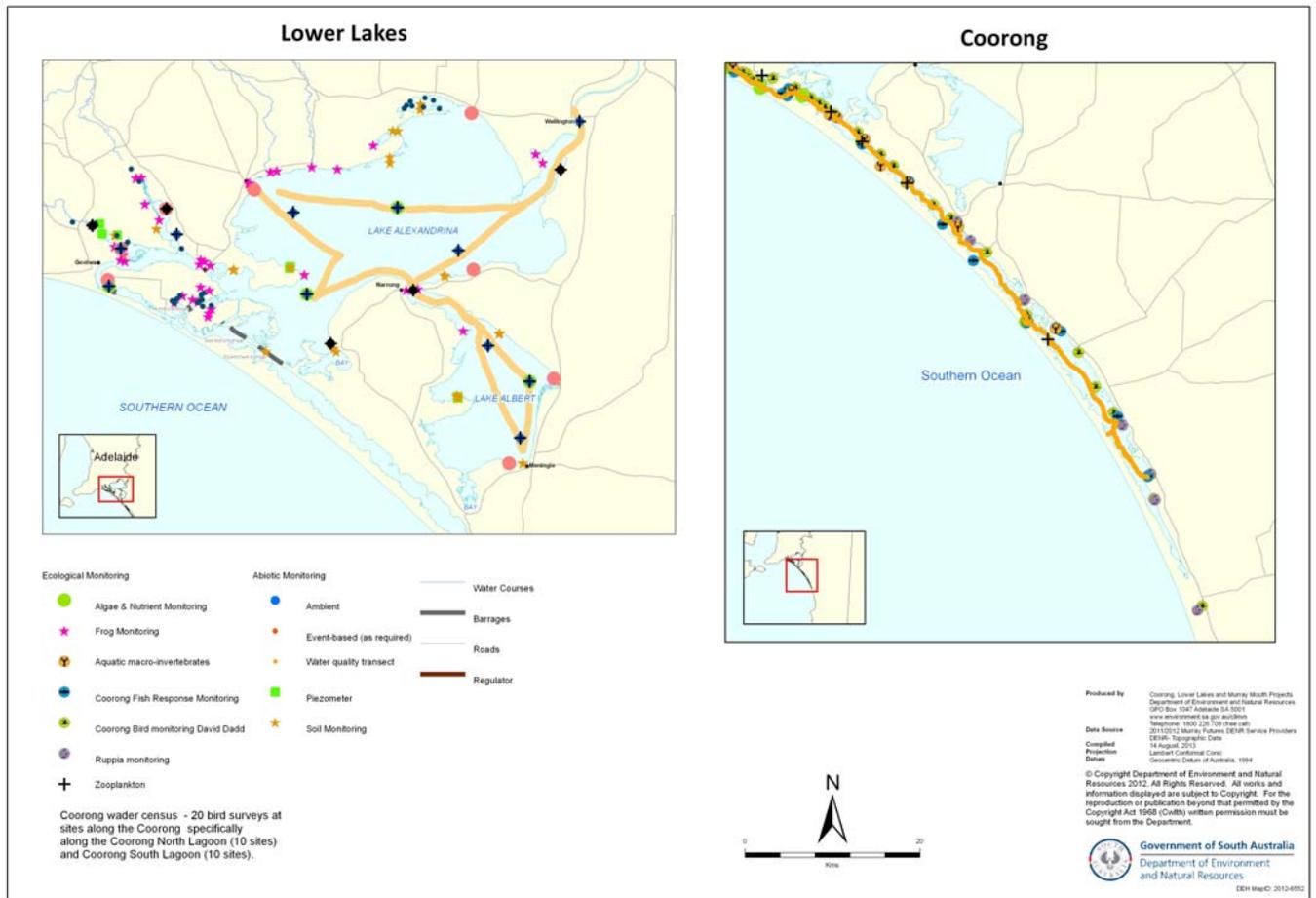
To assist in achieving the objectives described above, the CLLMM abiotic monitoring aims to:

- assess the water quality impacts associated with the previous drying and the rewetting of sediments,
- provide an early warning of any adverse water quality changes,
- provide data for water quality scenario reporting,
- assess long term changes in benthic ecology and,
- provide information for long term planning
- assess how the Lake's sediments are recovering following the drought



CLLMM 2012-13 abiotic monitoring includes:

- Water quality monitoring (including nutrients, algae and benthic ecology)
- Groundwater monitoring
- Soil monitoring



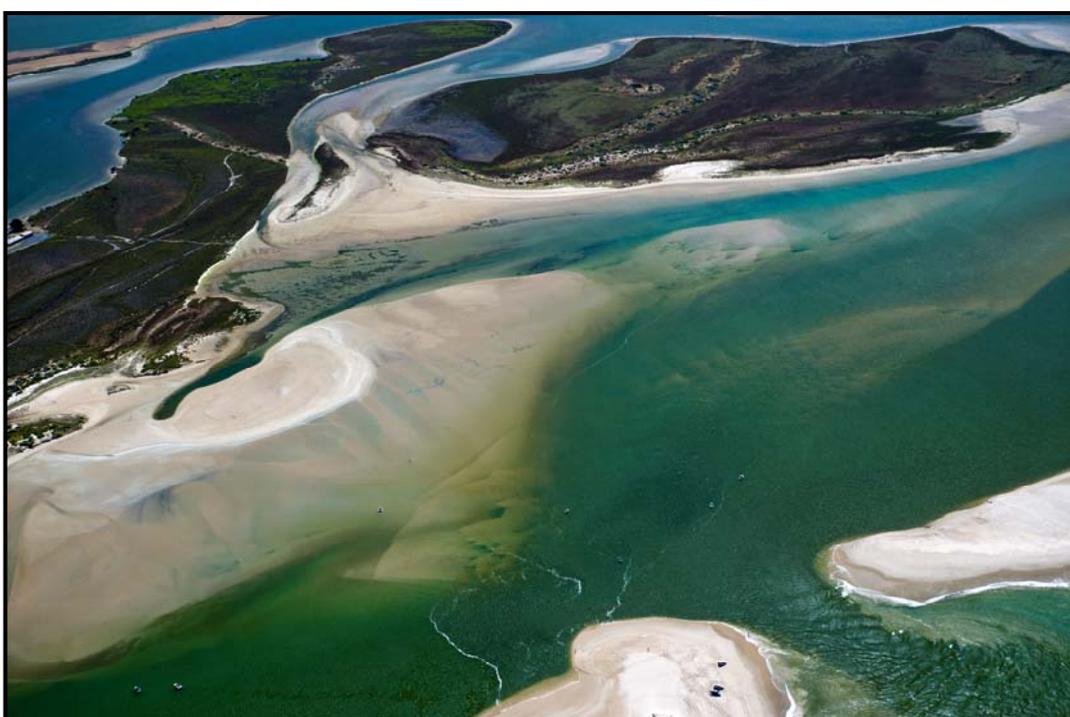
2012-13 Murray Futures Coorong, Lower Lakes and Murray Mouth ecological and abiotic monitoring locations



2012-13 Overall Findings

Overall the findings indicate that:

1. the CLLMM site is continuing to improve, however the legacy of the 2006-2010 drought still remains
2. appropriate water delivery regimes and continued environmental flows to the Lakes and Coorong are key to ensure:
 - that life cycles of the flora and fauna could be completed
 - water quality is kept within acceptable ANZECC guideline levels
 - acid sulfate soils management trigger levels are not exceeded
 - continued recovery of the system following the drought.
3. to facilitate the recovery of higher order species the recovery of water quality parameters and lower trophic order species is likely required, however further monitoring in 2013-14 is required to assess this.



Murray Mouth. Source DEWNR

Ecological – Summary

Ecological monitoring in 2012/2013 generally indicated positive results for taxa monitored since the return of the flows in 2010. Fish assemblages and macroinvertebrate communities continued to expand their distributions and recruitment. Waterbird species numbers have continued to increase or stabilize since the return of the flows, and monitoring suggests that the CLLMM site supports a number of important cryptic bird species. Colonial-nesting waterbirds respond strongly to hydrological conditions and their breeding activity can be used as a key indicator of wetland status. Frogs were one taxa that didn't display positive outcomes in 2012/13 with no evidence of breeding events for the threatened southern bell frog.



Acid sulfate soils - Summary

Overall the Lower Lakes water quality remained stable within ANZECC guidelines (pH 6.5), above limestone dosing triggers. and is now similar to pre-drought conditions compared to microalgae which is slower to recover (still similar to drought conditions) and to immediate post-drought conditions in the Coorong. Salinity in Lake Albert is still higher than average pre-drought, although continuing to slowly improve.

pH and alkalinity levels continue to be above trigger levels at previous acid sulfate soils hotspots, however there continues to be low levels of persistent acidity in the surface water despite the presence of neutral pH and alkalinity at Boggy and Hunters Creeks. The Lower Lakes groundwater is slowly recovering although acidity remains in the groundwater monitoring sites at Point Sturt and Currency Creek, Lake Alexandrina and Campbell Park, Lake Albert.

Acid sulfate soils acidification hazards remain mostly unchanged (i.e. the soil acidification hazard after re-flooding still remains high). Soil material at many of the study sites continue to pose a high acidification hazard on drying therefore is likely to further acidify or rapidly re-acidify and may impact surface waters and ecosystem health.

2012-13 Findings Per Monitoring Program

Water quality – ambient

General lake parameters remained stable and above (ph, alkalinity & acidity) trigger levels for all ambient sites in the Lower Lakes and tributaries

Monthly Lower Lakes surface water quality monitoring (including pH, alkalinity/acidity, salinity, dissolved oxygen, temperature, oxygen saturation, chlorophyll a and b, and turbidity) was undertaken in 2012-13. The data indicated that the overall water quality in Lake Alexandrina remains stable following lake refill in late 2010 (end of the drought). The pH and alkalinity levels continue to be within ANZECC guidelines (6.5 pH) and above trigger levels in both Lakes Alexandrina and Albert. The data also indicated that salinity in Lake Albert was approximately 3100 to 2900 EC, still higher than average pre-drought levels, although continuing to slowly improve.

Water quality – event-based

Event-based monitoring (around lake margins hot spots) undertaken in 2012-13 indicated pH and alkalinity levels continue to be above trigger levels. However, the monitoring at Boggy and Hunters Creeks indicates that the localised acid sulfate soils hotspots continue to show low levels of persistent acidity in the surface water despite the presence of neutral pH and alkalinity.

Groundwater

Regional (unsaturated zone) groundwater monitoring results in 2012-13 indicated that the Coorong, Lower Lakes and Murray Mouth site is recovering from drought, although acidity remains in the groundwater monitoring sites at Point Sturt and Currency Creek, Lake Alexandrina and Campbell Park, Lake Albert. In particular, groundwater acidity has fallen across sites at Campbell Park and Currency Creek but has remained elevated and variable at one site at Point Sturt. There has been a consistent trend of increasing pH across all sites indicating a trend closer to conditions suitable for further sulfate reduction.



The groundwater salinity remains variable and significantly higher than the overlying lake water, which is likely due to stable and isolated regional groundwater and seasonal influences. Generally, surface water and groundwater quality for the lakes has stabilised since lake refill and continues to show improvements. However the process is slow and requires water levels be maintained for a thorough recovery and resilience to be built into the system.



EPA field staff undertaking groundwater monitoring at Currency Creek. Source EPA

Soils

The acid sulfate soils monitoring indicated the acidification hazards remain mostly unchanged (ie the soil acidification hazard after re-flooding still remains high). Minor increases in soil pH were observed at Point Sturt and Campbell Park. However, soil material at many of the study sites continue to pose a high acidification hazard on drying therefore is likely to further acidify or rapidly re-acidify and may impact surface waters and ecosystem health.

Microalgae

Analysis of the water quality in 2013 indicates it is now similar to pre-drought conditions compared to the microalgae which is similar to drought conditions in the lakes and to immediate post-drought conditions in the Coorong. This likely infers that water quality recovery is first required to support the recovery of microalgae communities. Also Microalgae monitoring showed differences in community patterns between drought and non-drought periods; and post-drought communities have started to become similar to those in the pre-drought periods.

Ruppia

The distribution and abundance of *Ruppia tuberosa* in July 2012 was similar to previous years, with the percentage of samples with *Ruppia* shoots significantly declining to the point of being essentially absent in the Coorong South Lagoon from 2008 - 2010. Some *Ruppia tuberosa* did re-appear at the northernmost monitoring point in the Coorong South Lagoon at Villa dei Yumpa (present in 32% of samples in 2011 and 38% in 2012), but not further south despite similar salinities. This reappearance indicates the ability of the plant to grow in the current salinities if there is available seed bank in the sediment. Another key factor limiting recovery of *Ruppia tuberosa* are inappropriate water levels in spring that prevent remaining plants within the Coorong from completing their



reproductive cycle. This monitoring work is informing a project translocating *Ruppia tuberosa* seed from a suitable donor site at Lake Cantara.

Zooplankton

Results of the zooplankton monitoring indicated that there was generally a lower diversity of species in the Lower Lakes and Coorong, and moderate diversity in the tributaries compared with results from 2011/12. There was also a shift to a freshwater zooplankton composition above the barrages (in Lakes Alexandrina and Albert) and a salt-tolerant/estuarine dominant composition below the barrages. The decline in diversity/density is thought to be caused by the reduced sampling frequency and the change from shore-based (littoral) sampling to boat based (open water) sampling. The 2012/13 samples are generally more indicative of a true lake assemblage.



River Murray Zooplankton – *Platyias* (Rotifera).
Source Russell Shiel

Macroinvertebrate

Results from the macroinvertebrate monitoring indicated continued recovery of macroinvertebrate communities, with diversity and abundances increasing throughout the Murray mouth and North Lagoon (Coorong) in comparison to the previous monitoring periods for the water release (2010-12), and further expansion of distribution ranges towards the South Lagoon (Coorong). Recruitment occurred for most of the polychaete species in the Murray Mouth and Coorong, as well as for several bivalve species. Several species rarely seen in recent years (*Arthritica helomsi*, *Spisula trigonella*) are becoming established, however, overall abundances remain dominated by amphipods and chironomid larvae. The macroinvertebrate communities monitored in 2012/13 were distinct from those communities occurring during the drought, with the differences based on flow scenarios.

Frogs

Lower Lakes frog monitoring only detected the southern bell frog *Litoria raniformis* at two sites in Lake Alexandrina (Pomanda Point and Clayton Bay) in late spring. No bell frogs were detected in Finniss River, unlike previous years. Adults were observed calling in November and December 2012 when lake levels were maintained just above 0.80 m AHD. Preferred habitat was inundated terrestrial, emergent and submerged vegetation. Successful recruitment (presence of tadpoles) was not recorded at any sites. A total of seven different frog species were recorded in the Lower Lakes.



Southern Bell frog. Source Regina Durbridge

Cryptic and colonial nesting birds

The cryptic and breeding water bird monitoring confirmed the Lower Lakes wetlands provide significant habitat for cryptic bird species, with over 2000 observations of 13 cryptic species recorded. The Coorong and Lower Lakes habitats also



provide a significant and regular nesting habitat for thousands of colonial-nesting waterbirds. Over 4000 active nests of 8 water bird species were detected in the aerial surveys.



SARDI scientists undertaking fish monitoring in the Coorong. Source DEWNR

Further information –

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Fish monitoring

Monitoring results indicate that recruitment for most species seen to recruit in 2011/12 continued in 2012/13. Yelloweye mullet showed a noticeable increase in its recruitment compared to 2011/12, diadromous species recruitment increased in 2012/13, and most key species were able to at least maintain their distribution ranges, with some expanding into the Coorong South Lagoon. Overall fish assemblages observed in 2012/13 were generally similar to those observed in 2011/12, although they were vastly different to those present in the drought years.

