South Australia's Environment Protection Authority

Lower Lakes Monitoring Program

Water Quality, Nutrients and Micro Algae

Presentation World Wetlands Day

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Australian Government

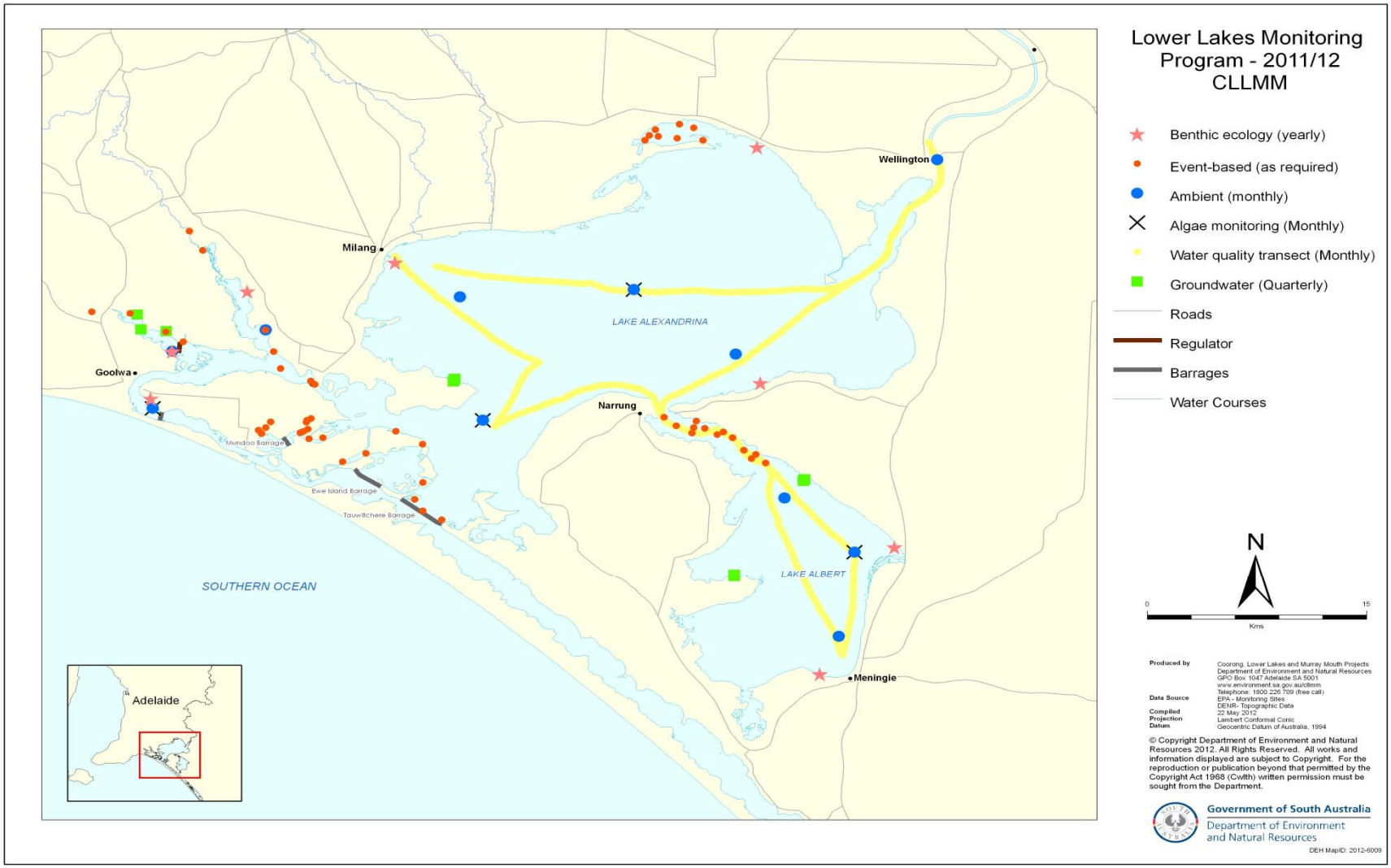
Government of South Australia

EPA South Australia

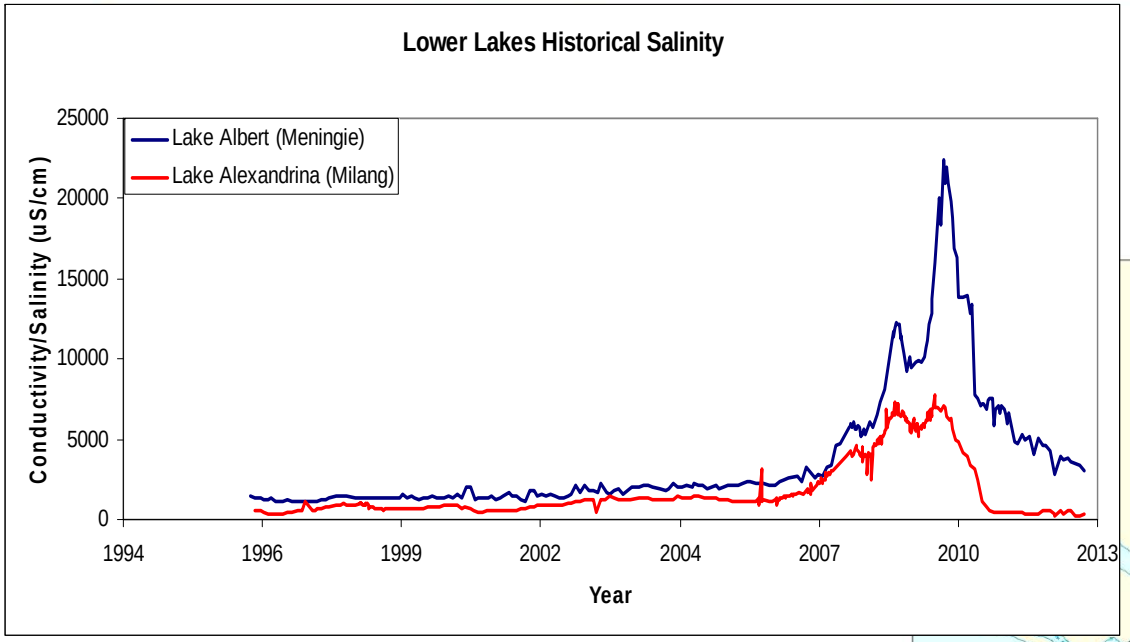
Monitoring Program Outline

- **Surface water (Ambient 11 sites and Receiving Waters various sites)** – sites sampled routinely
  - How is lake water quality changing, particularly in regard to the water quality impacts associated with the previous drying and the rewetting of sediments and to assess presence of acidification hotspots?
- **Groundwater -** 3 sites (10 piezometers) sampled quarterly
  - How is groundwater quality changing at piezometer sites in the Lower Lakes region and are there risks of acidified groundwater flux to the main lake water body?
- **Benthic ecology** – 8-10 sites sampled yearly
  - How are benthic ecology communities recovering from drought impacts (lowered lake levels, increased salinities and soil acidification) following return to normal lake levels and flushing of salt from the system?

Monitoring sites

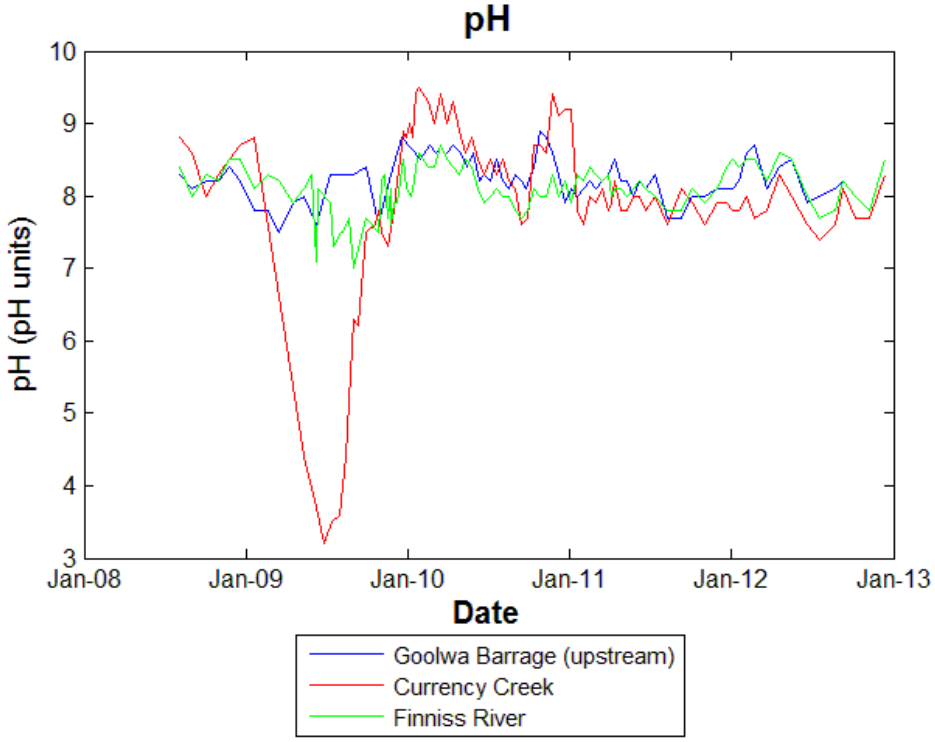


Surface water - salinity

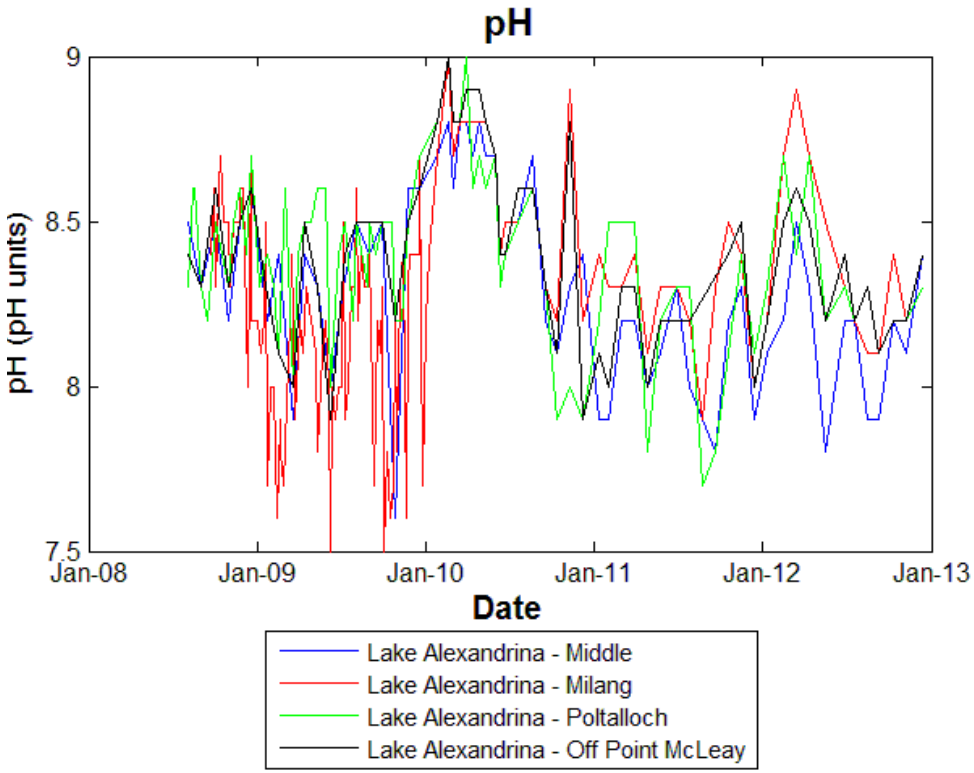


Surface water - pH

Tributaries

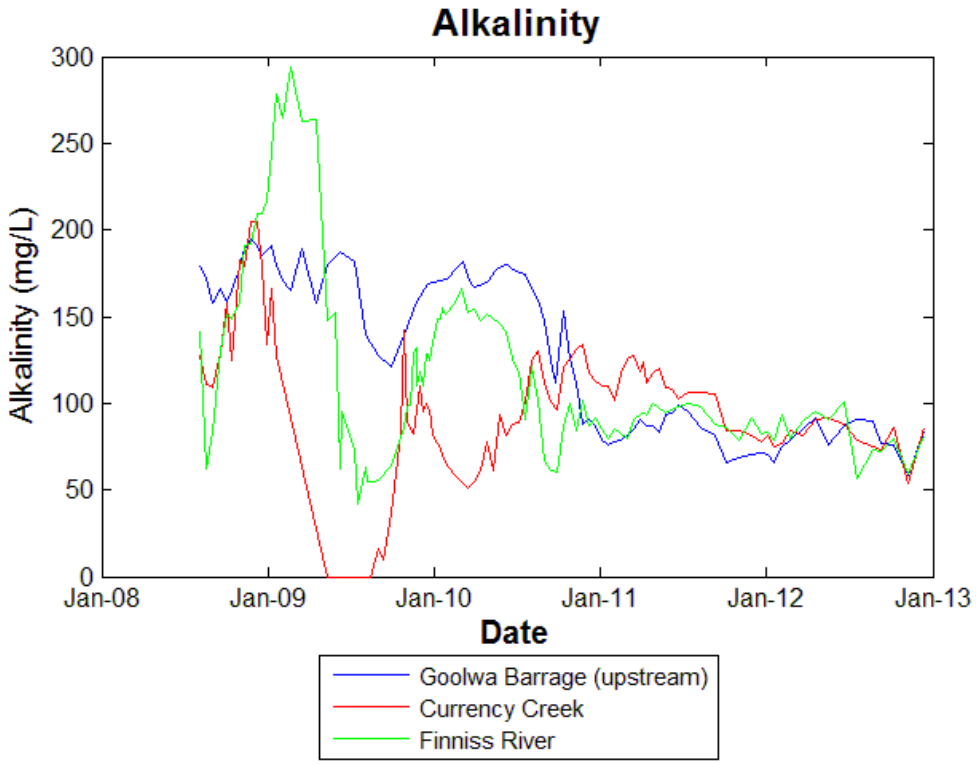


Lake Alexandrina

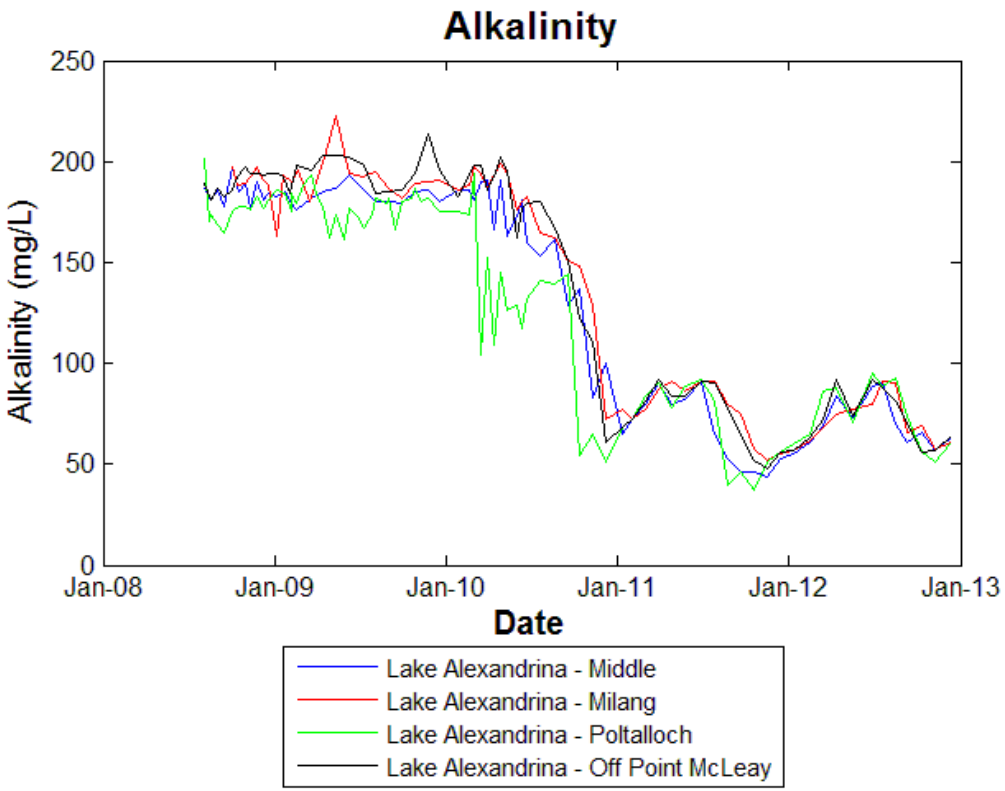


Surface water – alkalinity

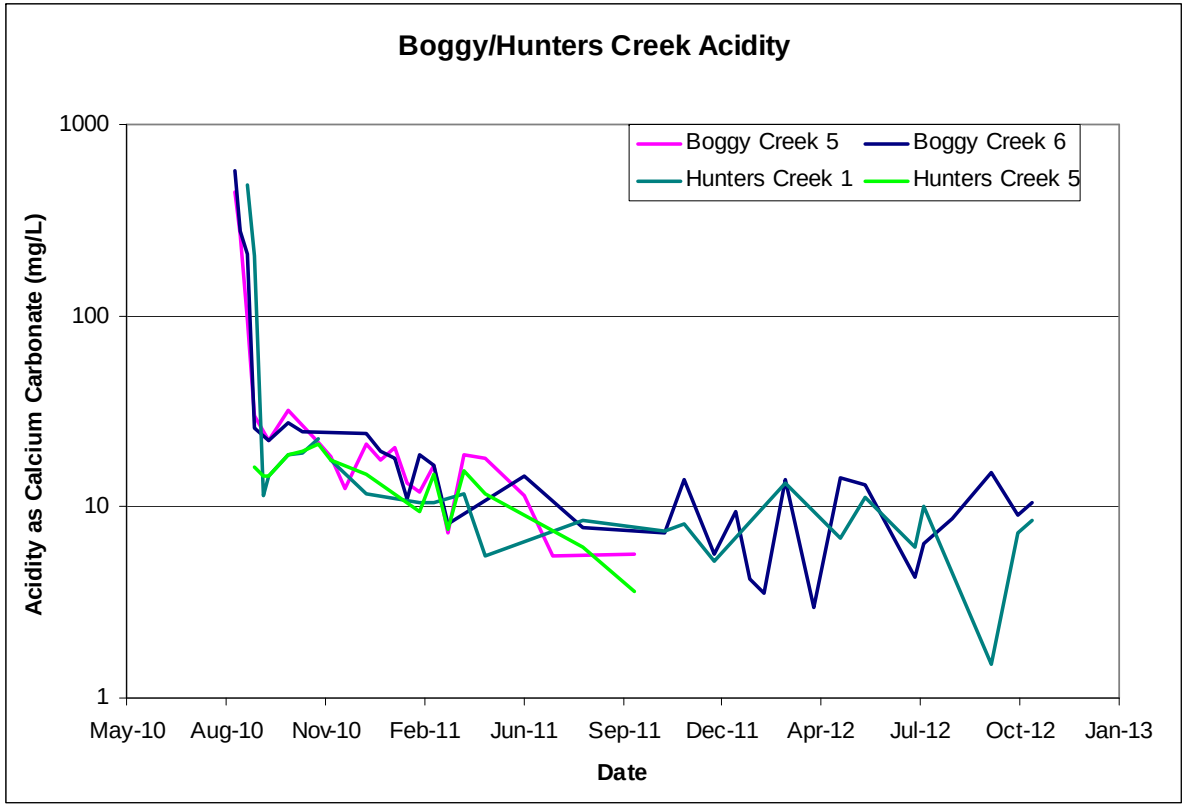
Tributaries



Lake Alexandrina

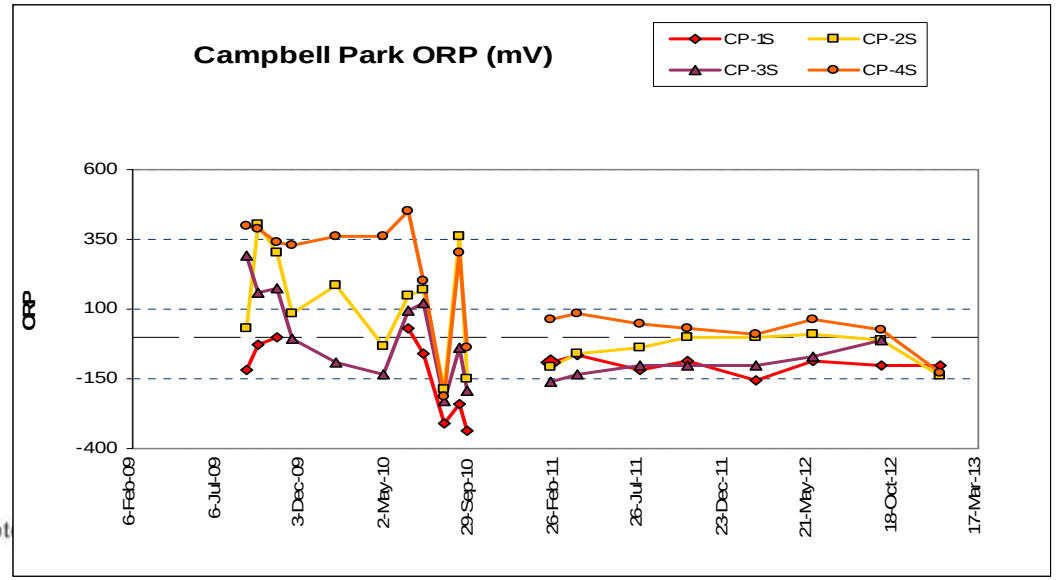


Surface water - acidity

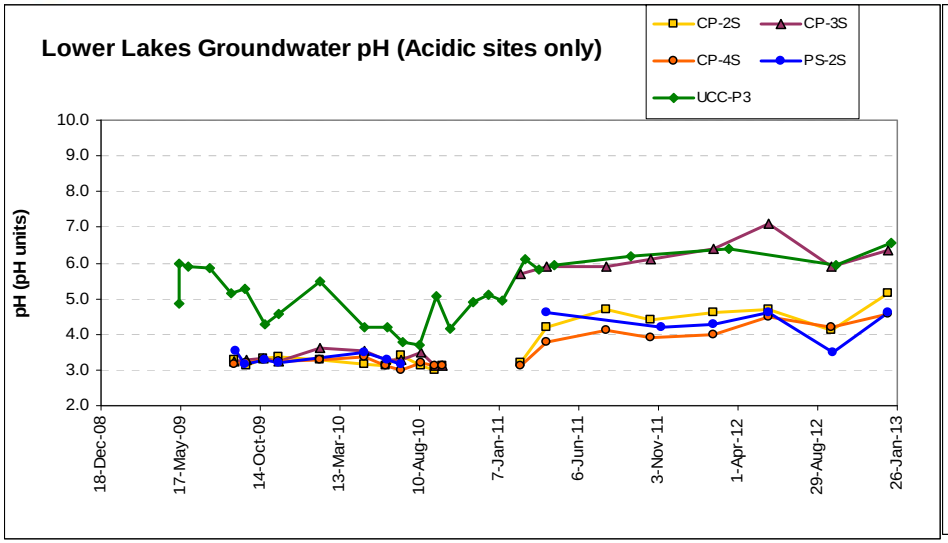


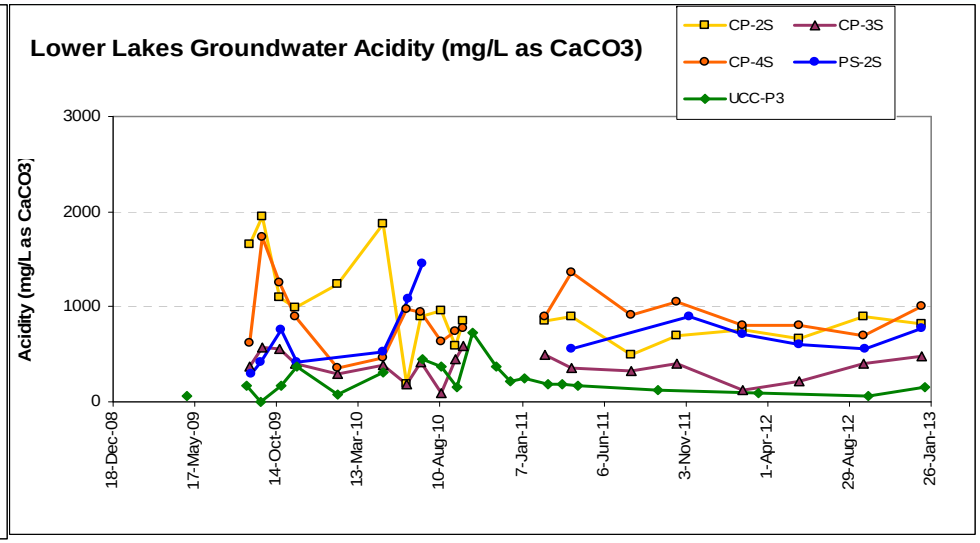
Groundwater

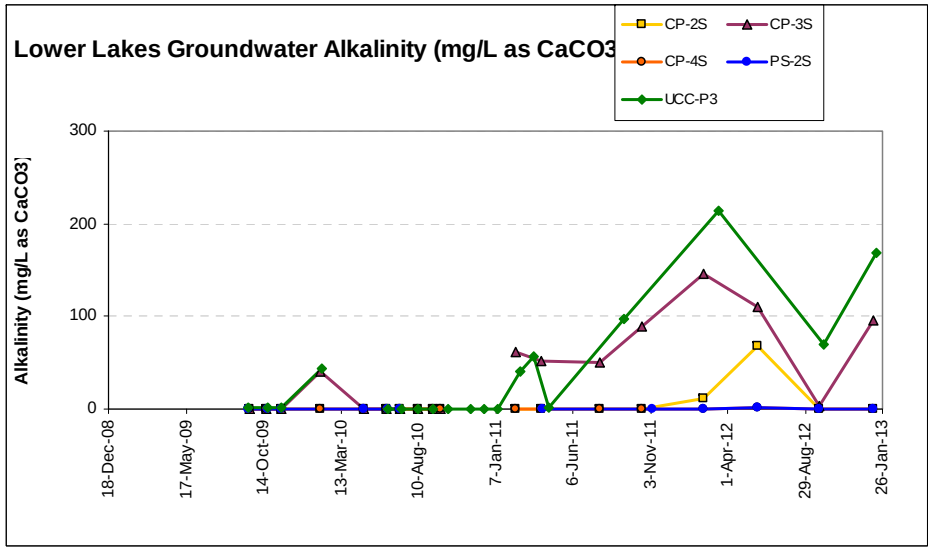
- Several sites still recording acidity in shallow groundwater despite 24> months of inundation
  - Campbell Park (3 sites)
  - Point Sturt (1 site)
  - Currency Creek (2 sites)
- Results show some improvement with increasing pH, a change to reducing conditions (-ve ORP) and the introduction of alkalinity at some sites since 2011



Groundwater



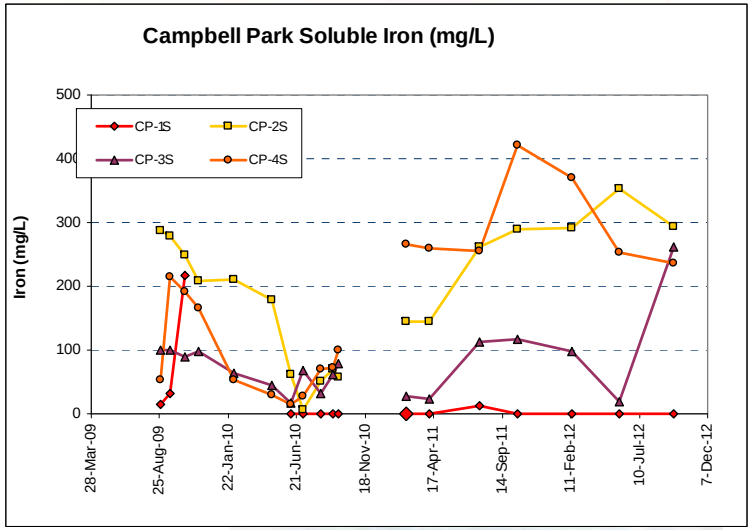


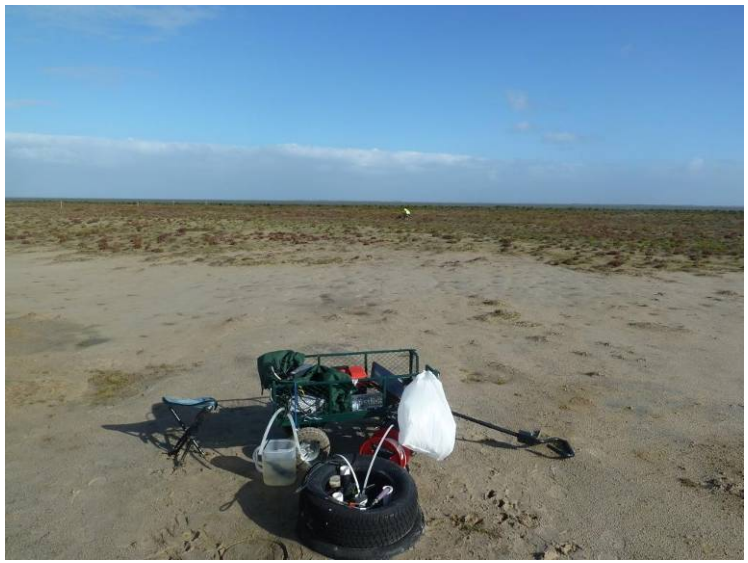


Groundwater

But…….

- Soluble metals (Fe, Mn) increasing which may indicate reductive dissolution of metal oxides and secondary acidic minerals formed post-sediment acidification
- This sediment acidity/metal hazard could be diffusing into surface water - effect on benthic communities ?
- Continued monitoring is required





Benthic Ecology patterns February 2012

- Lake Alexandrina, Currency, Finniss and Goolwa dominated hydrozoans, amphipods and worms and include crustaceans + molluscs (sensitive to salt and acid)
- Lake Albert continues to have low diversity and very low abundances…only presence of flatworms and 2 caddisflies indicate some improvement occurring but no shrimps or molluscs
- Most sites show comparable or higher richness and abundances than 2011 indicating recovery
- Unknown but assume most of lake dominated by zooplankton, phytoplankton and fish whilst macro invertebrates largely restricted to vegetated littoral zone
- Despite this expect wider range species and higher densities of macro invertebrates among reeds and other aquatic plants than is being recorded

Benthic taxa richness and composition

Salt tolerant and typical of heavily impacted macroinverte brate communities. Only extremely tolerant species present.

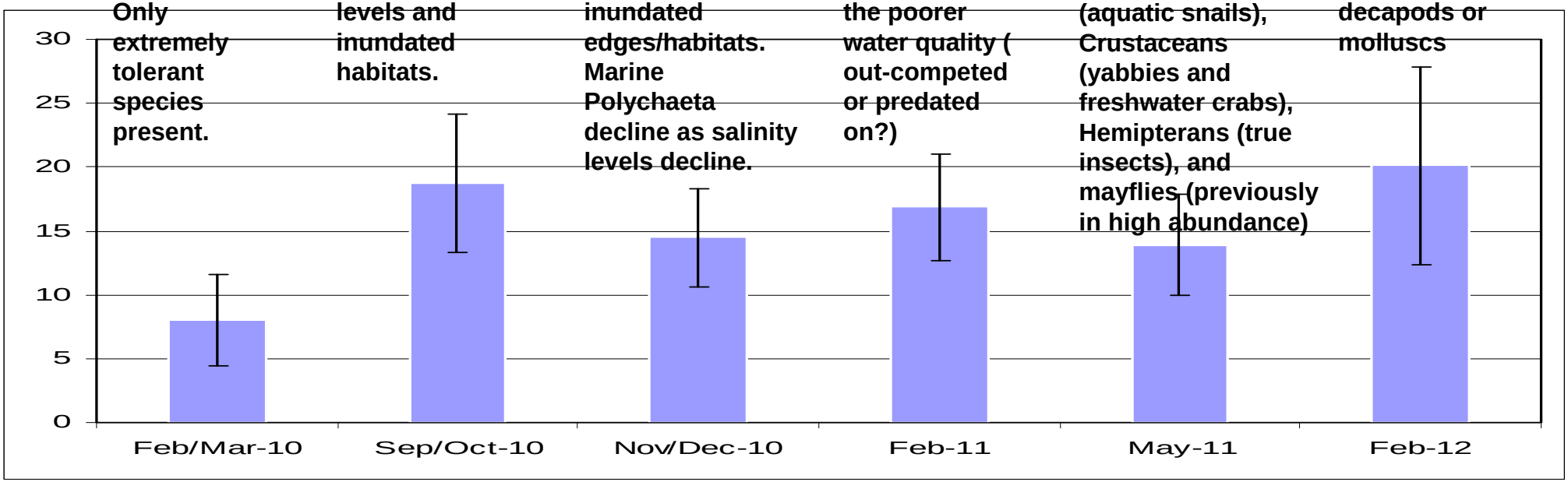
Early stages of recovery with the appearance of some more sensitive taxa. Early colonisers utilising rising levels and inundated habitats.

Some missing taxa that were tolerant to poor water quality and they had previously thrived in recently inundated edges/habitats. Marine Polychaeta decline as salinity levels decline.

Appearance of additional taxa indicate further recovery. Further missing tolerant taxa which thrived in the poorer water quality (out-competed or predated on?)

Species richness declined slightly,. Many species missing compared with pre-drought (2003 data) including Mollusca (aquatic snails), Crustaceans (yabbies and freshwater crabs), Hemipterans (true insects), and mayflies (previously in high abundance)

Taxa richness increased all sites except Lake Albert that also has low abundances and no decapods or molluscs



Mean taxon richness values recorded in samples collected over all eight Lower Lakes ambient sites in each of the five ambient monitoring sampling periods (Giglio & Howell 2011-12)

Summary

- Complex water quality and benthic ecology recovery now occurring across the Lower Lakes
- Ongoing issues - Lake Albert salinity dilution, presence of soluble metal acidity, slow ecological recovery and lack of many sensitive invertebrate species previously present
- Recovery towards the water quality and sorts of communities recorded before the drought depends on the lakes remaining fresh and reasonably full and the ability of species to recolonise

Summary

- Complex pore/surface water interactions continue to take place under high and prolonged flow events
- Continued monitoring required as we transition into more stable lower flow conditions
- Questions remain around whether sediment toxicity is inhibiting recovery of benthic ecosystem
- Recovery and resilience requires more than just **water**

Thank you

- **Email: benjamin.zammit@epa.sa.gov.au**
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