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Lower Lakes Water Quality & Benthic Ecology Monitoring

Presentation to CLLMM Monitoring Showcase
Luke Mosley, Ben Zammit & Peter Goonan



Talk outline

- Outline of monitoring program
- Hydrological context
- Longer term trends
- Extreme low flow => present water quality and benthic ecology results
- Summary



Monitoring Program Outline



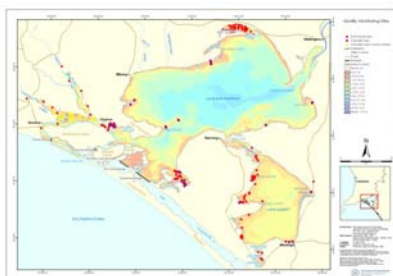
- Ambient – 15-25 sites, fortnightly-monthly, lake wide condition, risks and use in geochemical modelling
- Event-based
- Groundwater
- Benthic ecology



Monitoring Program Outline



- Ambient
- Event-based – adaptive & responsive, acidification and issue focussed
- Groundwater
- Benthic ecology



Monitoring Program Outline



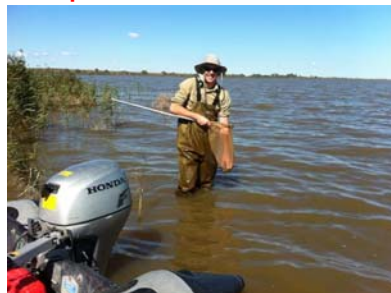
- Ambient
- Event-based
- Groundwater – 4 sites, 23 piezos, transport of acidity



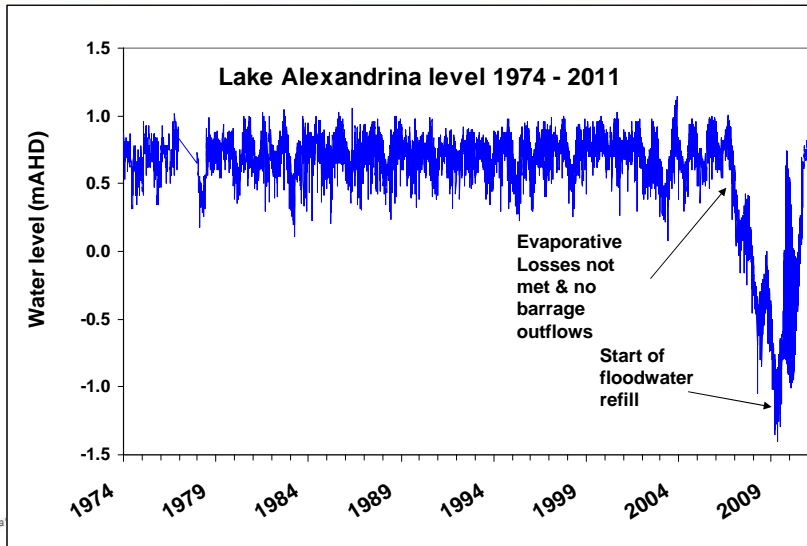
Monitoring Program Outline



- Ambient
- Event-based
- Groundwater
- Benthic ecology – benthic invertebrate assessments, aquatic vegetation and zooplankton observations



Hydrology – water levels



Source:
DFW

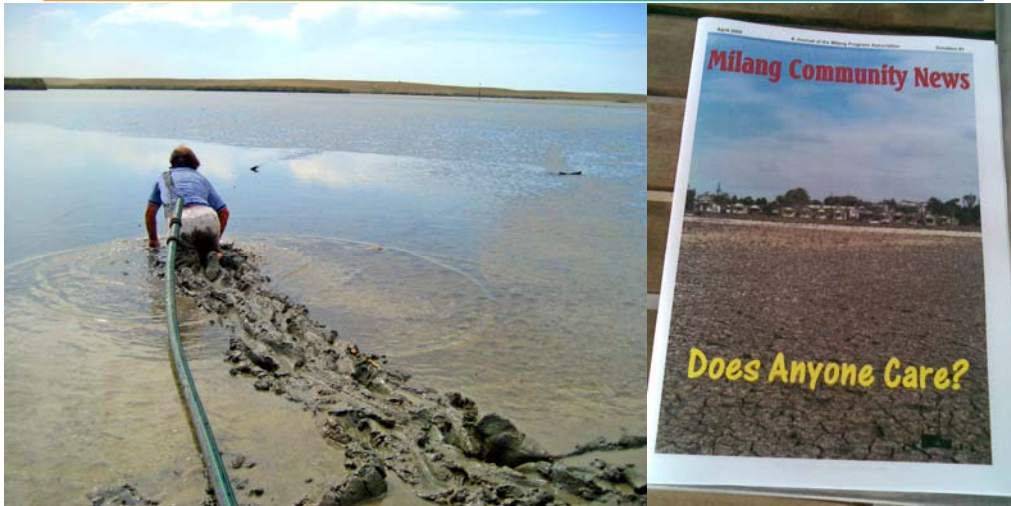
Drying of lake margins



Acid sulfate soils exposed

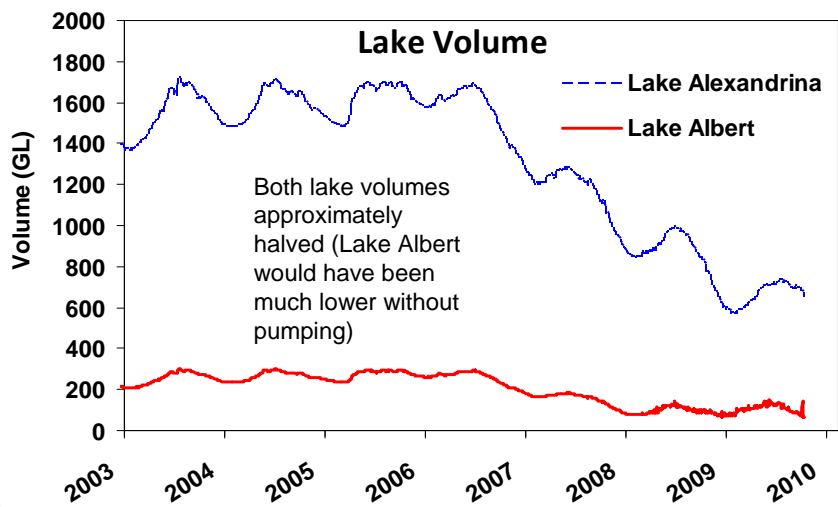
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Drying of lake margins

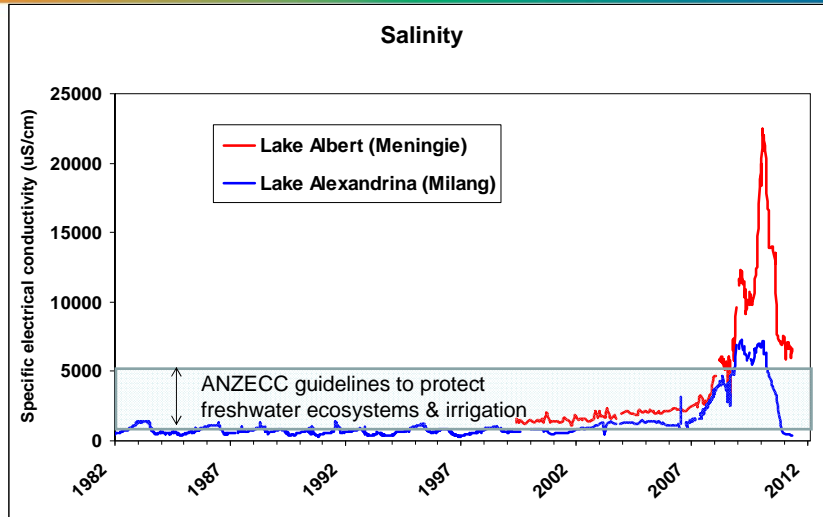


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Hydrology – Lake volume



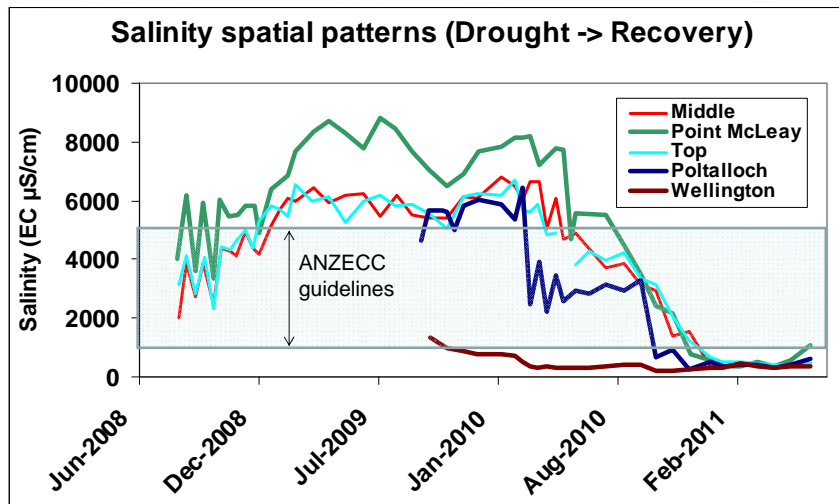
Long term salinity trends



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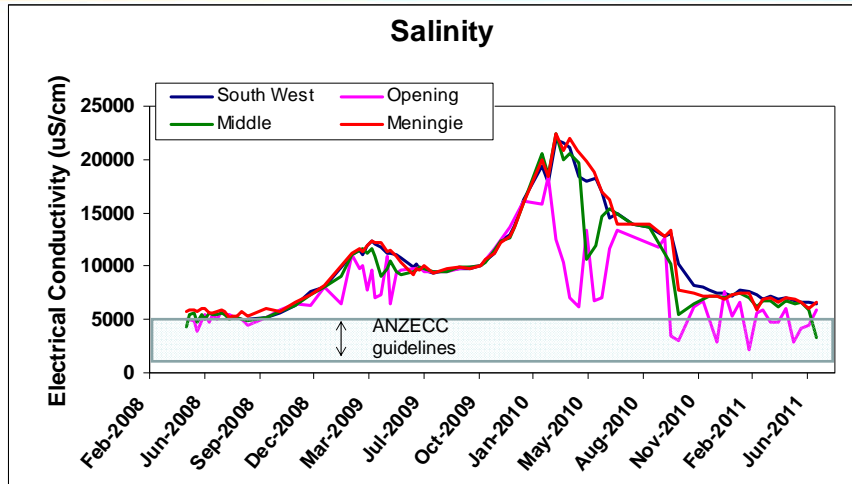
Source: EPA data

Lake Alexandrina salinity 2008-2011



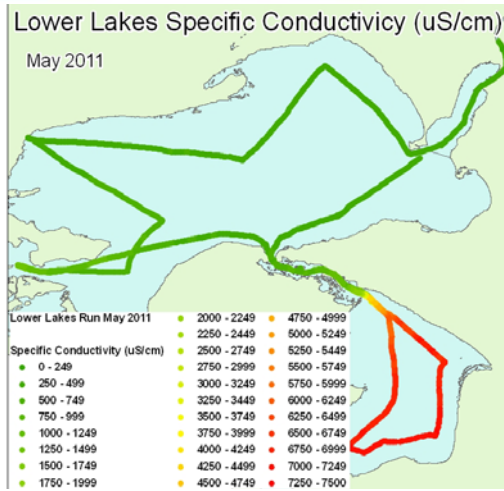
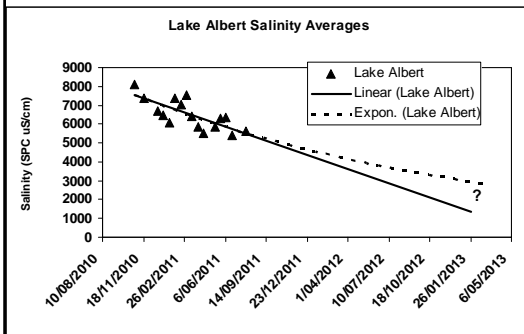
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Lake Albert salinity 2008-2011



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Recovery time of Lake Albert

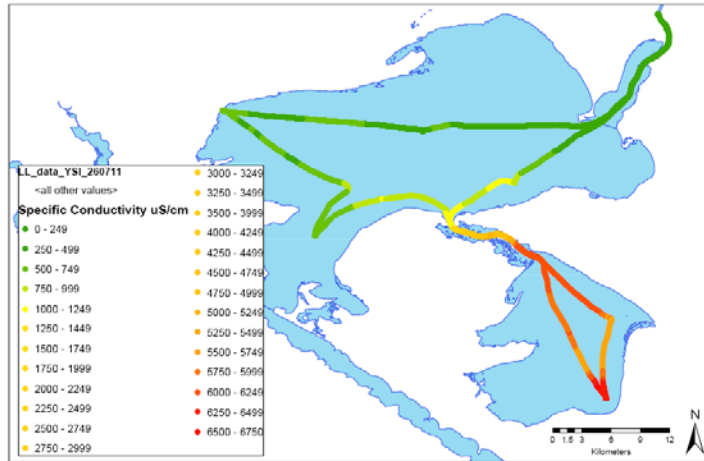


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Recovery – Narrung bottleneck



Lower Lakes Monitoring Run July 26 2011

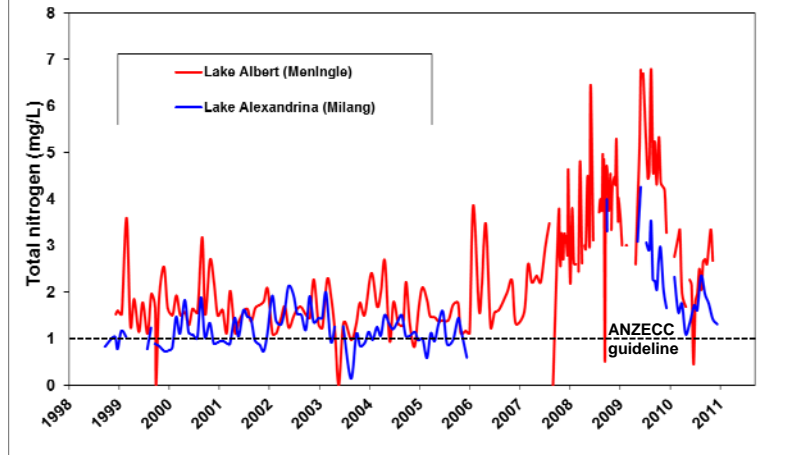


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Nutrient and algal enrichment



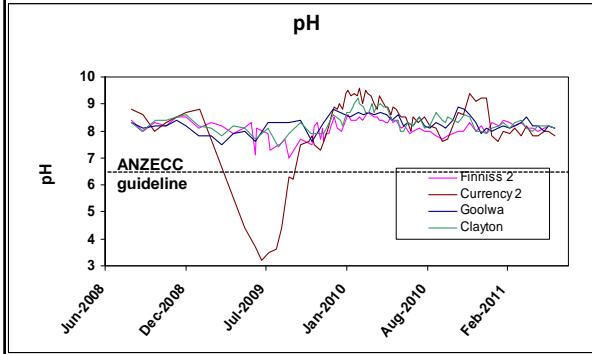
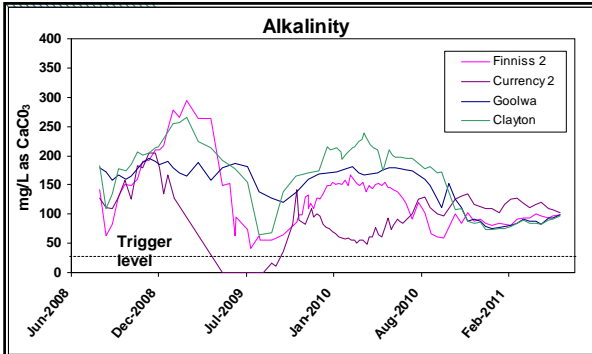
Total Nitrogen



Source: EPA data

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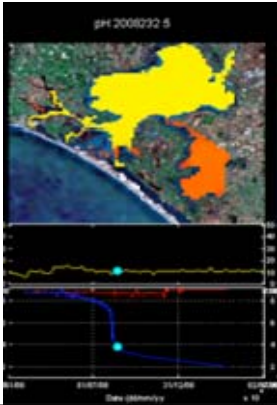
TN, TP, Chlorophyll a, and Turbidity all show similar



Acidification risk



- Alkalinity and pH assessed against specific "trigger levels" and for lake geochemical model development



From Hipsey & Salmon (2008).

Event-based Acidification

Currency Creek

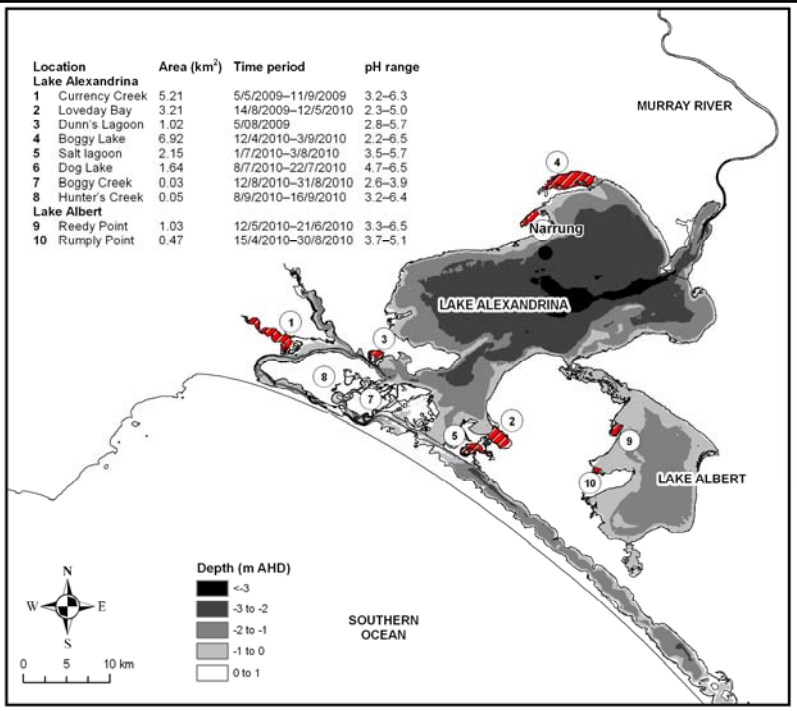
Boggy Lake

Loveday Bay mussels dissolving

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Acidified areas

21.7km² water area acidified on lake margins



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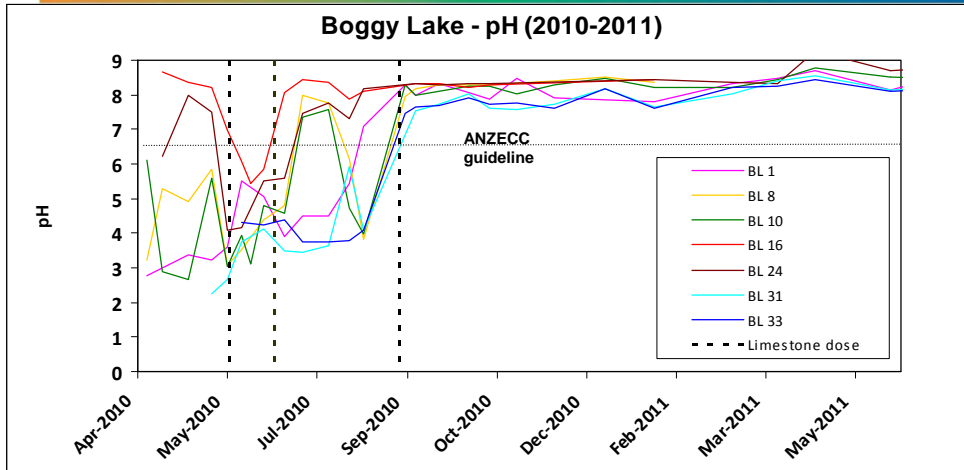
Informing management of acidification



WARNING
HAZARD TO PEOPLE AND LIVESTOCK
 Avoid contact with water and soil
 A naturally occurring acidification event at this location poses a hazard. Please avoid contact with soil and water from this and surrounding localities.

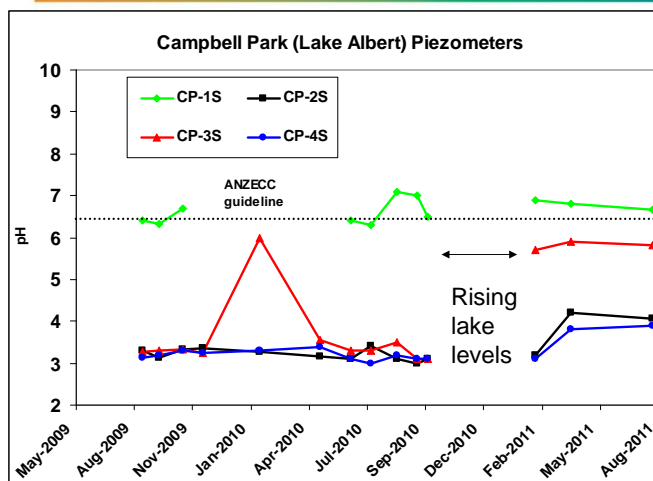
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Boggy Lake 2010 (drought) – 2011 (recovery)



Persistence of low level (soluble metal) acidity in several areas – attributed to diffusion from underlying acidic sediments

Groundwater



Acidic pH 3-4 groundwater and sediments in many locations, slow recovery despite complete inundation for over 12 months

Benthic ecology drought & recovery



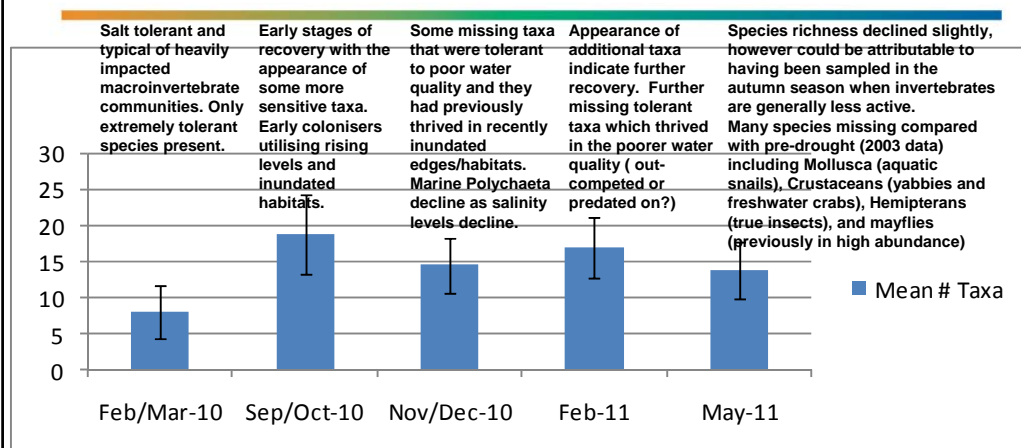
Milang in 2009 (no aquatic invertebrates found)



Milang in 2011

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Benthic taxa richness and composition



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 in prep.)

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Summary



- Extreme low flows resulted in very large water quality changes that severely compromised the aquatic ecosystem and other environmental values of lakes
- Complex water quality and benthic ecology patterns 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 benthic communities recorded before the drought depends on the lake remaining fresh and reasonably full, and the aquatic plants creating habitats for a more diverse benthic community to be able to utilise.

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Thank you



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