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ABN 78 458 664 047
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Mildura Wetlands

A guide to the mid-conference field trip

2nd July

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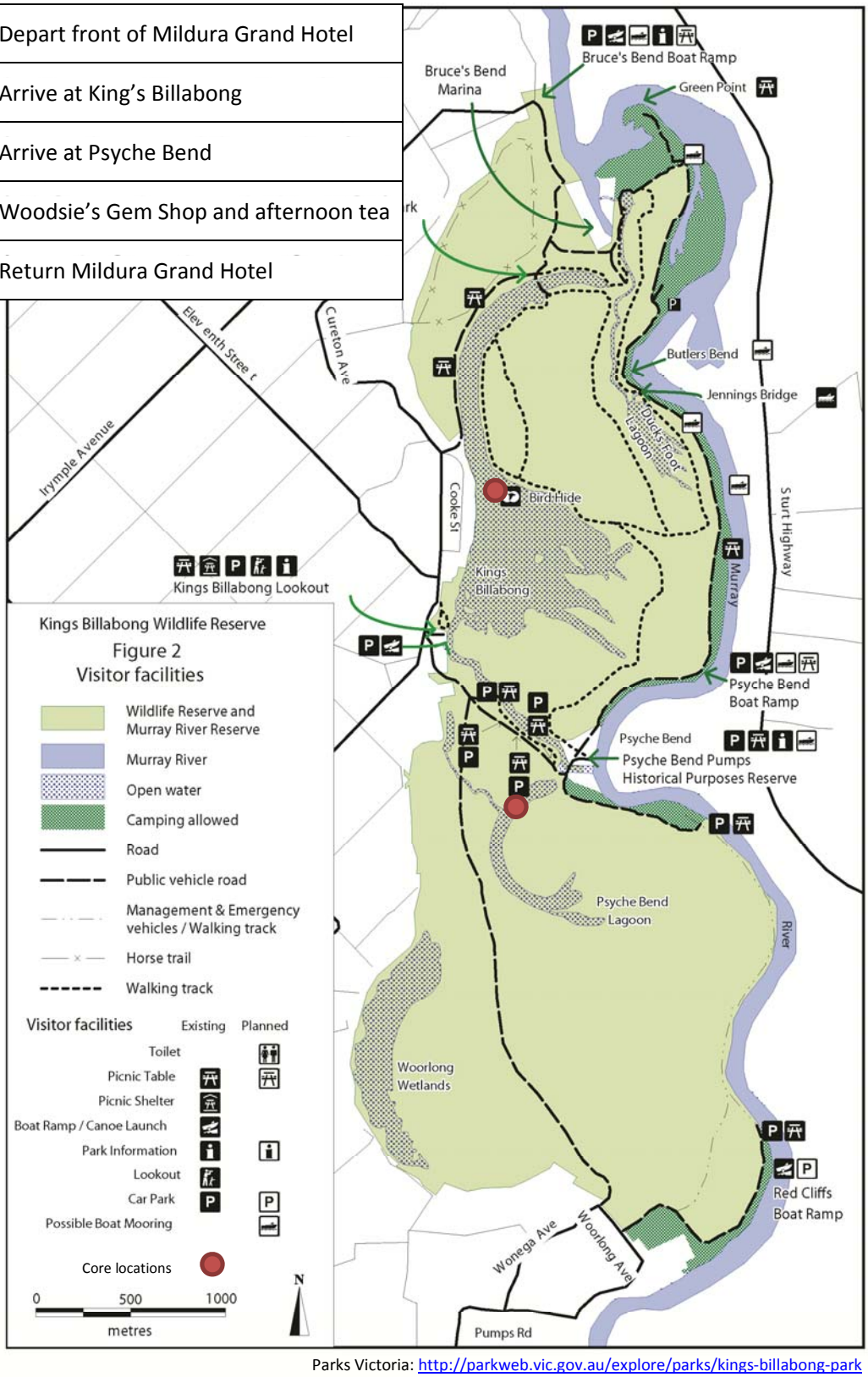
from contributions by Giri Kattel, Paulo Silva, Rosie Grundell
and Peter Gell

Psyche Bend Lagoon, 2004. *Picture*: Peter Gell

Itinerary

14.30	Depart front of Mildura Grand Hotel
14:45	Arrive at King's Billabong
15:30	Arrive at Psyche Bend
16:15	Woodsie's Gem Shop and afternoon tea
17:30	Return Mildura Grand Hotel



Parks Victoria: http://parkweb.vic.gov.au/explore/parks/kings-billabong-park

Historical Setting

The region of King's Billabong and Psyche Bend is the traditional country of the *Nyeri Nyeri*, but utilised by other groups such as the *Latje Latje* and *Paakantyi* people. The region is rich in cultural heritage, including middens, scar trees, artefact scatters and burial sites.

Charles Sturt was the first European in the area from the 1830s, on his quest for the inland sea. Upon discovering the Murray and Darling Rivers, he was soon followed by opportunistic squatters and drovers, grazing sheep and cattle. The settlement of Wentworth, at the confluence of the rivers, was established in the 1850s and paddlesteamers soon became the main form of transportation for wool and timber through the river systems.

The drought of the 1880s prompted Alfred Deakin to seek a solution to a more reliable water supply to "modernise" Australian agriculture. He famously travelled to the irrigation district of California where he met the Canadian Chaffey Brothers. George Chaffey came to Australia in 1886 and established the first irrigation settlement around Mildura. The Chaffey Brothers with a lease of 250,000 acres and good marketing convinced the public to share their dream.

Drawing water from the Murray involved a lift of some 28 m, which lead George to design the pump and billabong system in this area. The Psyche Bend Pump Station, built in 1891, is a relic of this time. The system supplied an area of approximately 20,000 hectares and was the first stage of a grand scheme to irrigate over 100,000 hectares around Mildura.

The Chaffey steam engine and pumps at Psyche Bend operated successfully until 1959, when electric pumps were installed nearby and the pumping station decommissioned. This was in part due to the decimation of suitable firewood (i.e. River Red Gum) in the region.

Mildura Tourist Information: https://www.visitmildura.com.au/chaffey-trail.html

King's Billabong

The King's Billabong Reserve (2050 ha) was was first placed under Wildlife Reserve in 1979. Part of the reserve was further classified as a Nature Conservation Reserve in February 2001. An area of 1.1 ha in the southern part of the reserve was added to the reserve on 15 August 2006. Kings Billabong Wildlife Reserve is managed by Parks Victoria for the management of wildlife. The reserve forms part of the Robinvale Plains Bioregion and is within the Victorian section of the Mallee Basin managed by the Mallee CMA, and the municipal boundaries of the Mildura Rural City Council (MRCC) (Parks Victoria, 2008).

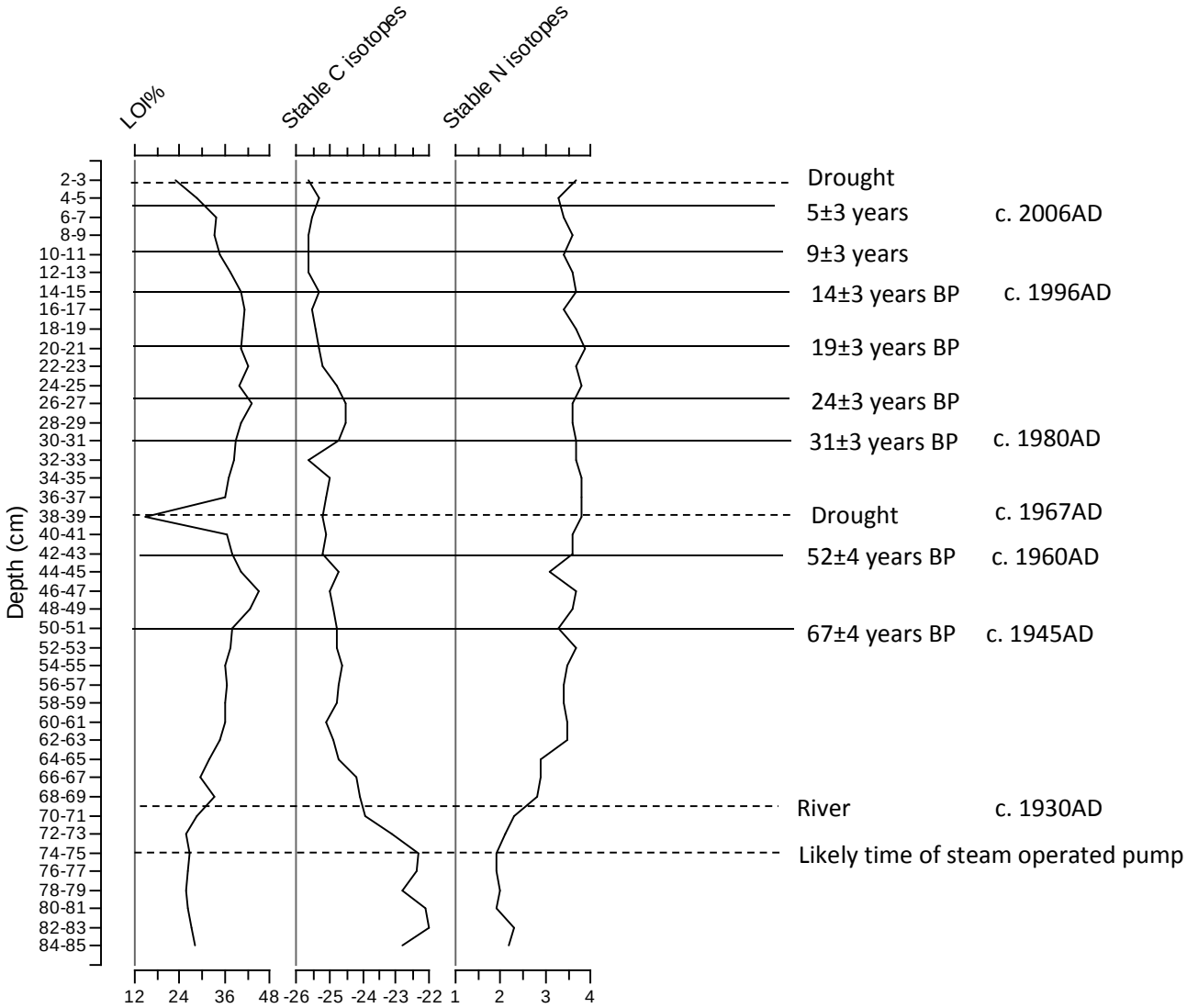
Prior to European settlement the wetlands in the reserve would have been intermittently filled during times of high river flow. River regulation has changed the hydrology, in particular the variability, duration and frequency of flows (Gippel and Blackham, 2002).

Since 1896 Kings Billabong has been managed primarily as a water storage basin and was the site of three pumping stations. Water was distributed to the surrounding area from the billabong via a series of pumps and open channels.

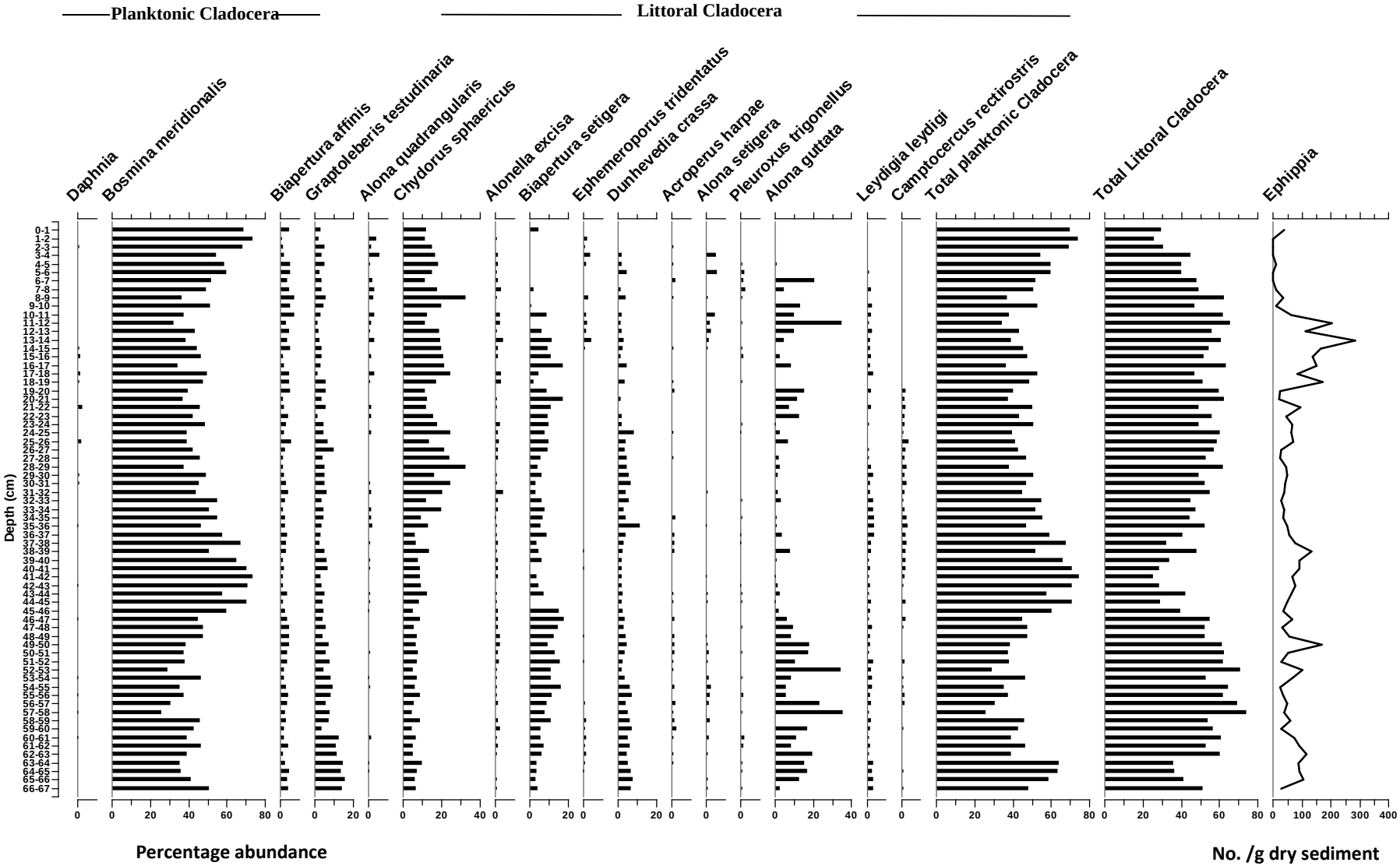
Permanent inundation of the billabong has caused the waterlogging and subsequent death of many remnant River Red Gums within the reserve and the establishment of extensive areas of Cumbungi, which currently dominates the fringing vegetation. The impact of infrastructure development, deforestation of RRG, and water logging followed by intensive irrigation of saline dune system has all led to secondary salinization around the southern section of the billabong.

Parks Victoria, 2008. *Kings Billabong Wildlife Reserve Management Plan*.

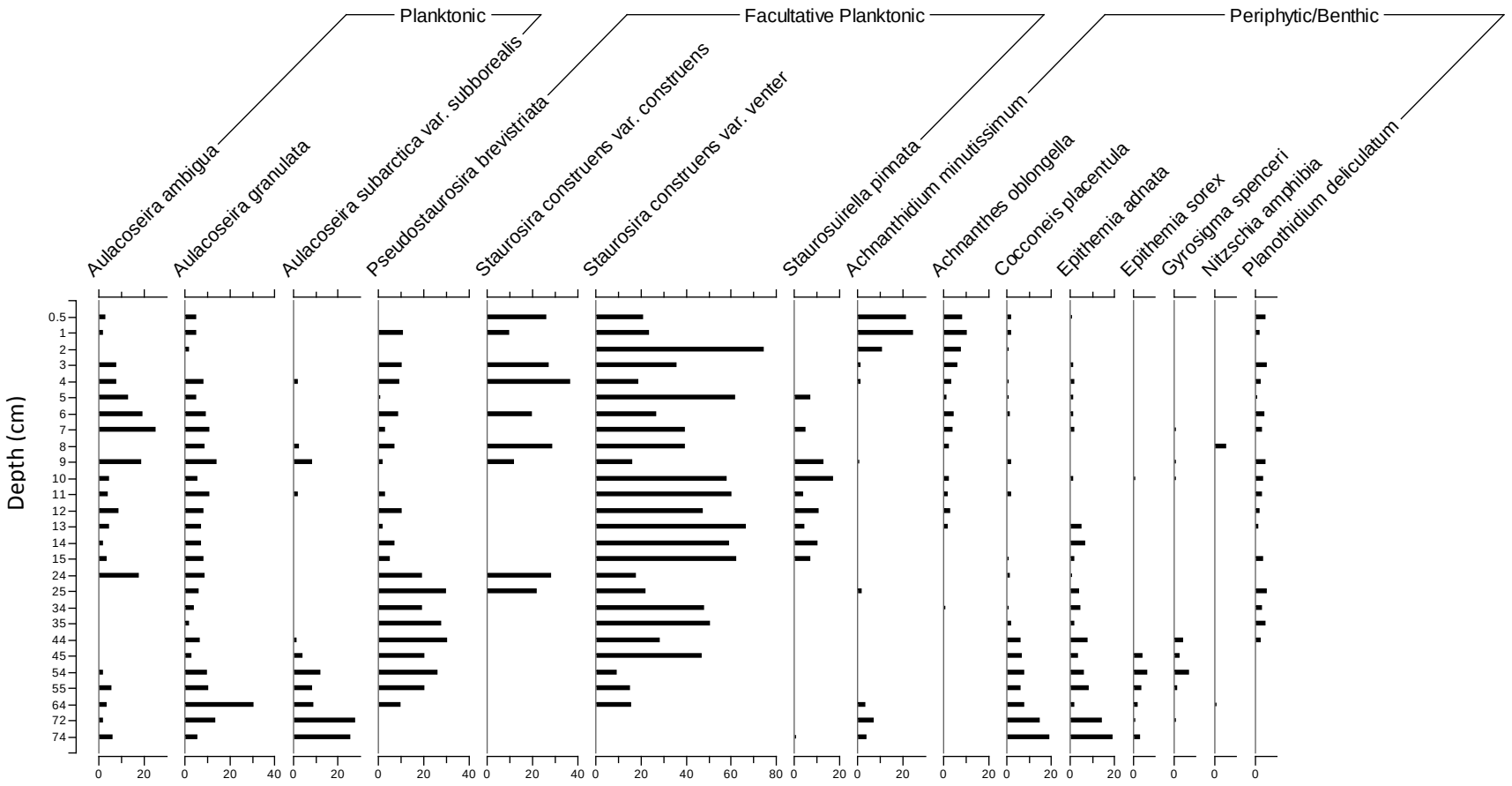
A continuous, long term sediment record with good preservation of biological and chemical proxies retrieved from Kings Billabong was used to reconstruct any possible transition of the ecosystem of Kings Billabong from a natural flood pulse environment to a human-induced, permanent water regime. The subfossil assemblages of cladocerans, diatoms and stable isotope ratios of carbon and nitrogen derived from the bulk sediment samples reflected a gradual deviation of the historic natural cycle-based submerged macrophyte-rich clear water ecosystem to a phytoplankton dominant, less resilient ecosystem following river regulation.



Stratigraphic records of LOI and stable isotope ratios of carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) of bulk sediment samples collected from Kings Billabong (*Kattel*).



Stratigraphic records of subfossil assemblage of cladocerans and concentration of their ephiipia in Kings Billabong (*Kattel*).



Stratigraphic records of subfossil assemblage of diatoms in Kings Billabong (*Grundell*).

Psyche Bend

Psyche Bend was an ephemeral freshwater billabong until it became part of the Mildura irrigation system as a water holding basin. It remained permanently filled until the pumping station was decommissioned in 1959.

The site was kept as a fresh (EC 2000) permanent-water wetland from 1959 until 1996. The local water management authority started to divert fresh water derived from the Red Cliffs District towards the Murray River to mitigate increasing salinity in the river. Between 1996 and 2001, Psyche Bend Lagoon was monitored to establish how the local ecosystems were adapting to increasing salinity levels (Gell, 2002).

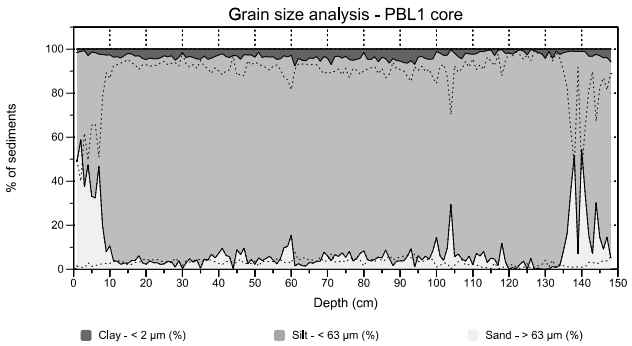
The water diversion scheme is established in 2001, and over a period of only six months the lagoon shifted from 2000 EC to 60,000 EC consequently exterminating populations of the native Murray Hardyhead and Carp Gudgeon. Monitoring ceased in 2001, and in 2004 the lagoon became acidified, displaying red waters and pH of 5.1 (pers. comm. Gell).

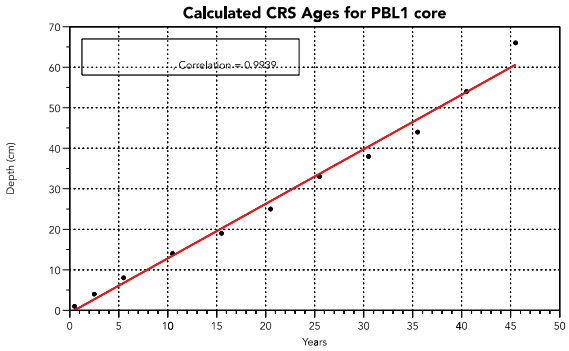
Iron stained waters at Psyche Bend Lagoon. Source: Steph Tout.

Gell, P.A, Sluiter, I.R., Fluin, J., 2002. Seasonal and interannual variations in diatom assemblages in Murray River connected wetlands in north-west Victoria, Australia. *Marine and Freshwater Research* 53: 981-992.

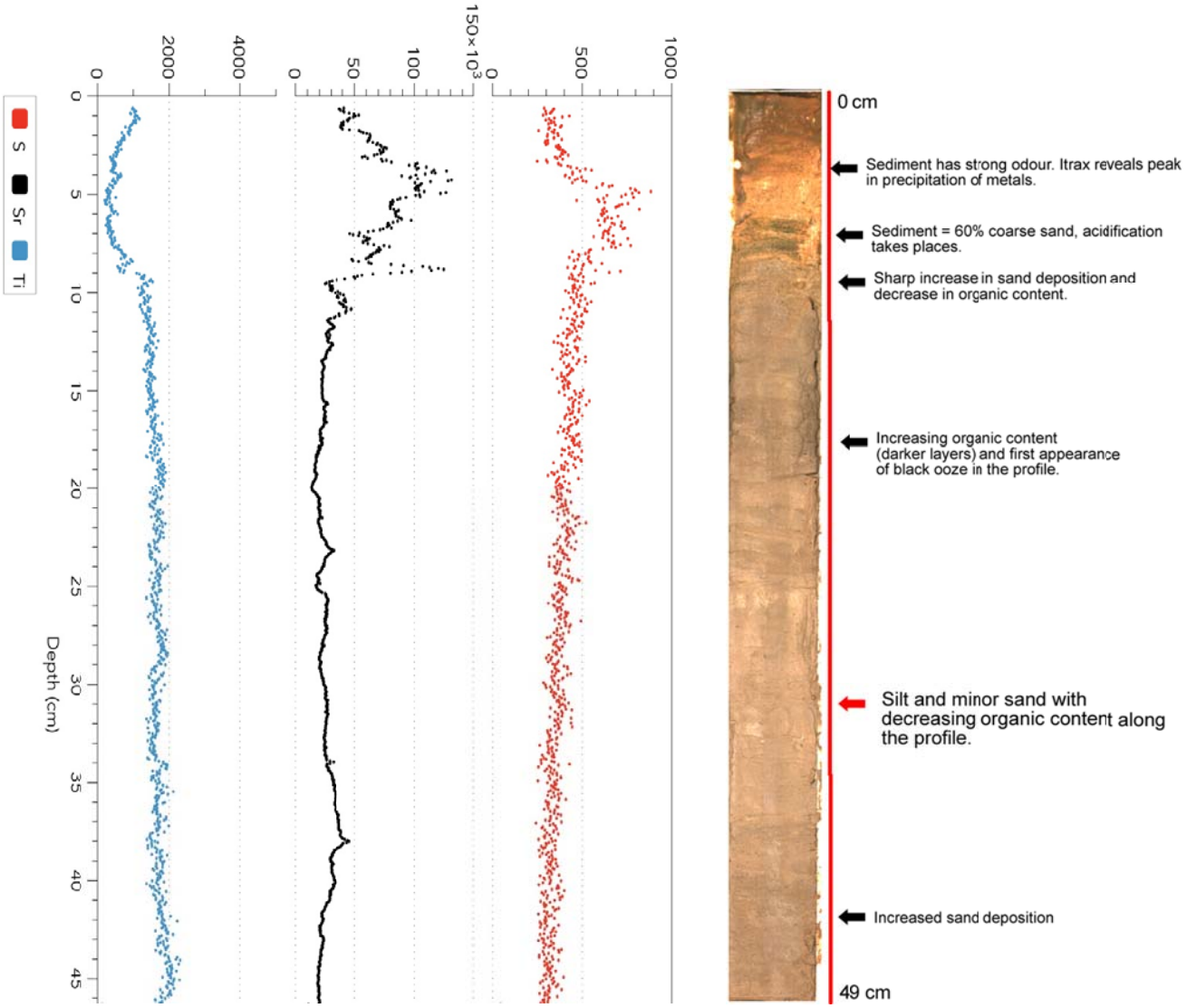
Gippel and Blackham, 2002. Gippel, C.J. and Blackham, D. 2002. Review of environmental impacts of flow regulation and other water resource developments in the River Murray and Lower Darling River system. Report by Fluvial Systems Pty Ltd to Murray-Darling Basin Commission, Canberra. URL: http://www.mdbc.gov.au/TLM/pdf/Final_Review_reg_impacts_eflow.pdf

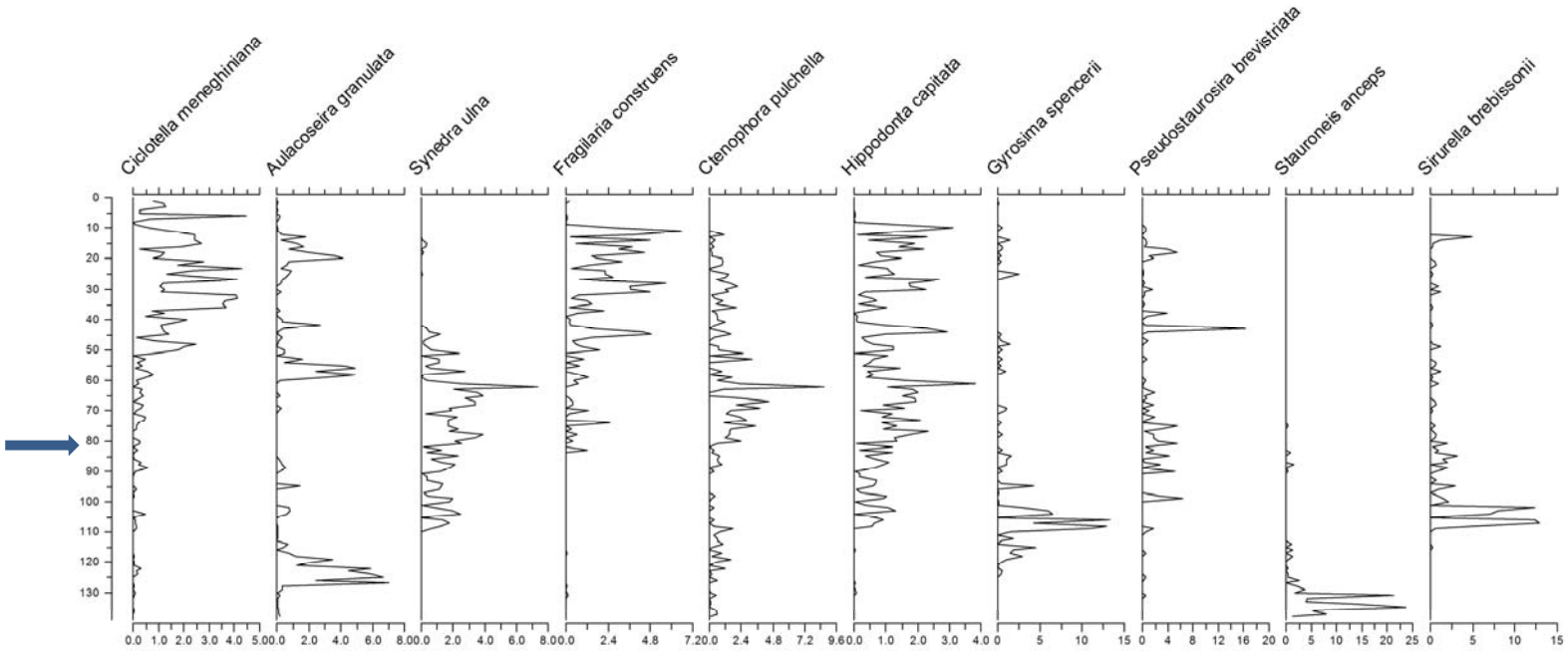
Core sediment





Core sediment and iTRAX results (*Silva*)





Psyche Bend diatom record (Silva and Gell)

Stauroneis anceps is known to be a benthic species of freshwater so this lagoon was original clear freshwater. A peak in *Aulacoseira granulata* may be an increase in river contact, maybe the 1870 flood; or 1917. Then there are peaks in two salinity indicators; *Gyrosigma spenceri* and *Surirella brebissonii*. Is this a consequence of early irrigation or the Federation drought? *Synedra ulna* shows increasing productivity and *Cyclotella meneghiniana* shows nitrogen enrichment and probably increased salinity. *Fragilaria construens* is partly planktonic and it, or its kin, seem to emerge in all Murray floodplain wetlands after river regulation; including Kings Billabong and Lake Cullulleraine. This suggests widespread increase in turbidity; and possibly the increased load of fine sediments in the source waters. Alternatively, the combination of dry conditions, sodic soils, irrigation return waters and sheep has increased the flux of fine sediments from the flood plain to wetlands.

AQUA 2014 Biennial Meeting, Mildura, Australia, June-July 2014 mid-conference field trip guide