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25 August 2017

Mr Josh Bull MP

Chair, Victorian Parliament's Environment, Natural Resources and Regional Development Committee

Parliament House, Spring St

East Melbourne, VIC, 3002

Dear Mr Bull and committee,

In response to your Inquiry into the Management, Governance and Use of Environmental Water, we would like the following submission to be considered, especially in regard to point 1: the assessment of the role of environmental water management in preventing or causing 'blackwater' events.

Blackwater events occur when very large quantities of organic matter enter the water in a river or wetland system and the dissolved portion of the organic matter colours the water a deep brown. These events may become hypoxic (very low dissolved oxygen) when the circumstances of the event result in the consumption of oxygen by organisms in the water exceeding the rate of production by plants and algae and oxygen dissolving into the water from the atmosphere. These hypoxic events may result in deaths of fish and other aquatic organisms and are more likely to occur when water temperatures are high or very large loads of organic matter have accumulated on the floodplain. Not all dark coloured water results in hypoxia or fish kills and it is important to maintain connection between rivers and their floodplains for the transfer of organic matter and nutrients to support ecosystems. More detail on the causes of blackwater and some preliminary detail regarding the 2016 event can be found in Attachment 1.

Blackwater events do occur naturally and while we can try to reduce their frequency and severity it is not possible to prevent all occurrences. The 2016 event occurred in many rivers within the Southern Murray-Darling Basin and was associated with record spring rainfall and inundation of areas of the floodplain that had been disconnected from the river for many years (decades in some areas). The inundation of forested areas, cropping and grazing lands introduced considerable organic matter and was not caused by the use of environmental water. The impacts of an event of this scale are difficult to mitigate using environmental water but creation of localised refuges and small scale improvements are possible. Historical accounts of fish deaths associated with blackwater have been reported over a considerable period of time and for sites as diverse as the Edward River at Deniliquin (Sydney Mail and New South Wales Advertiser, 23/2/1878), Lismore (Argyle Liberal and District Recorder, 15/12/1903), Campaspe River at Elmore (Weekly Times 15/3/1913 and Riverine Herald 24/2/1915), the Murray River at Murray Bridge and Renmark (Mt Barker Courier and Onkaparinga and Gumeracha Advertiser 15/11/1929) and Kananook Creek, Frankston (Army News, Darwin, Sat 26/2/1944). More recent events have been studied and reported in some detail including by the authors (see Howitt et al (2007), Ecological Modelling, 203 (3-4): 229-242; Watts et al (2017) – confidential pre-publication version attached, and references within).

While our study site (the Edward-Wakool River system) is in New South Wales, the work done here can provide insight into the role of environmental water in responses to hypoxic blackwater and potential strategies to minimise the severity of these events. Blackwater in this system is also of interest to Victorian communities further downstream in along the Murray River. Our work has shown there is a role for the use of environmental water to provide localised refuges (small scale releases) or dilution flows (making up a more substantial portion of the overall water in the channel) where water can be sourced which is unaffected by hypoxia (see Attachment 2 and refer to <http://www.environment.gov.au/water/cewo/publications/monitoring-ecosystem-responses-delivery-environmental-water-edward-wakool-river-system-2011-report-2>). The full version of this report is available on request.

It may also be possible to reduce the duration and severity of hypoxic blackwater events by the use of environmental water to increase the frequency of flushing flows that remove accumulated organic matter from the floodplain, preferably in late winter and early spring when water temperatures are low. Care must be taken with the use of environmental water in summer months to avoid input of new organic matter into aquatic systems in large amounts, as water temperature plays such a critical role in the development of hypoxic blackwater. Where blackwater forms in summer (e.g. as a result of a rain event causing inundation of forests or other areas with considerable organic matter, such as crops) environmental water may be used to dilute this water as it re-enters the channel, or management options may include altering the rate of release back into the channel to restrict the impact of the blackwater on the wider system.

Reports on the 2016 events are in preparation and will be available from NSW State Forests and at the ILWS website when complete. <https://www.csu.edu.au/research/ilws/research/sra-sustainable-water/edward-wakool-research-project#horizontalTab5>

Please do not hesitate to get in touch should the committee require further detail, clarification or copies of reports and journal articles mentioned.

Yours sincerely,

Dr Julia Howitt

Professor Robyn Watts

Dr Nicole McCasker

Attachment 1: Answers to some questions about the 2016 hypoxic blackwater event in the southern Murray-Darling Basin. (also found at: <https://www.csu.edu.au/research/ilws/research/sra-sustainable-water/edward-wakool-research-project/Blackwater-event-in-the-Murray-in-2016.pdf>)

Attachment 2: Adaptive management of environmental flows: Using irrigation infrastructure to deliver environmental benefits during a large hypoxic blackwater event in the southern Murray-Darling Basin, Australia. pre-publication version (provided in confidence prior to publication in Environmental Management, Springer- Not for further distribution.).