



BLACKWATER EVENTS AND WATER QUALITY

Blackwater can be a natural feature of lowland river systems and occurs during flooding when organic material is washed into waterways and consumed by bacteria, leading to a sudden depletion of dissolved oxygen in water. The black appearance of the water is due to the release of dissolved carbon compounds, including tannins, as the organic matter decays – similar to the process of adding water to tea leaves.

Dissolved oxygen is essential for aquatic organisms which need to breathe underwater. Therefore, widespread blackwater events that degrade water quality and deplete dissolved oxygen can result in the death of aquatic organisms such as native fish.

What are the causes of blackwater?

Blackwater forms when flooding occurs after prolonged dry periods when air and water temperatures are high and there has been an extensive build-up of organic material such as leaf litter. Although blackwater occurs naturally, the magnitude and timing of floods have been altered by the collection and delivery of water for agriculture and other consumptive purposes.



Markaranka Floodplain, South Australia. Mark Mohell, DSEWPac.





Wakool River, New South Wales. Kerry Whitworth, MDFRC.

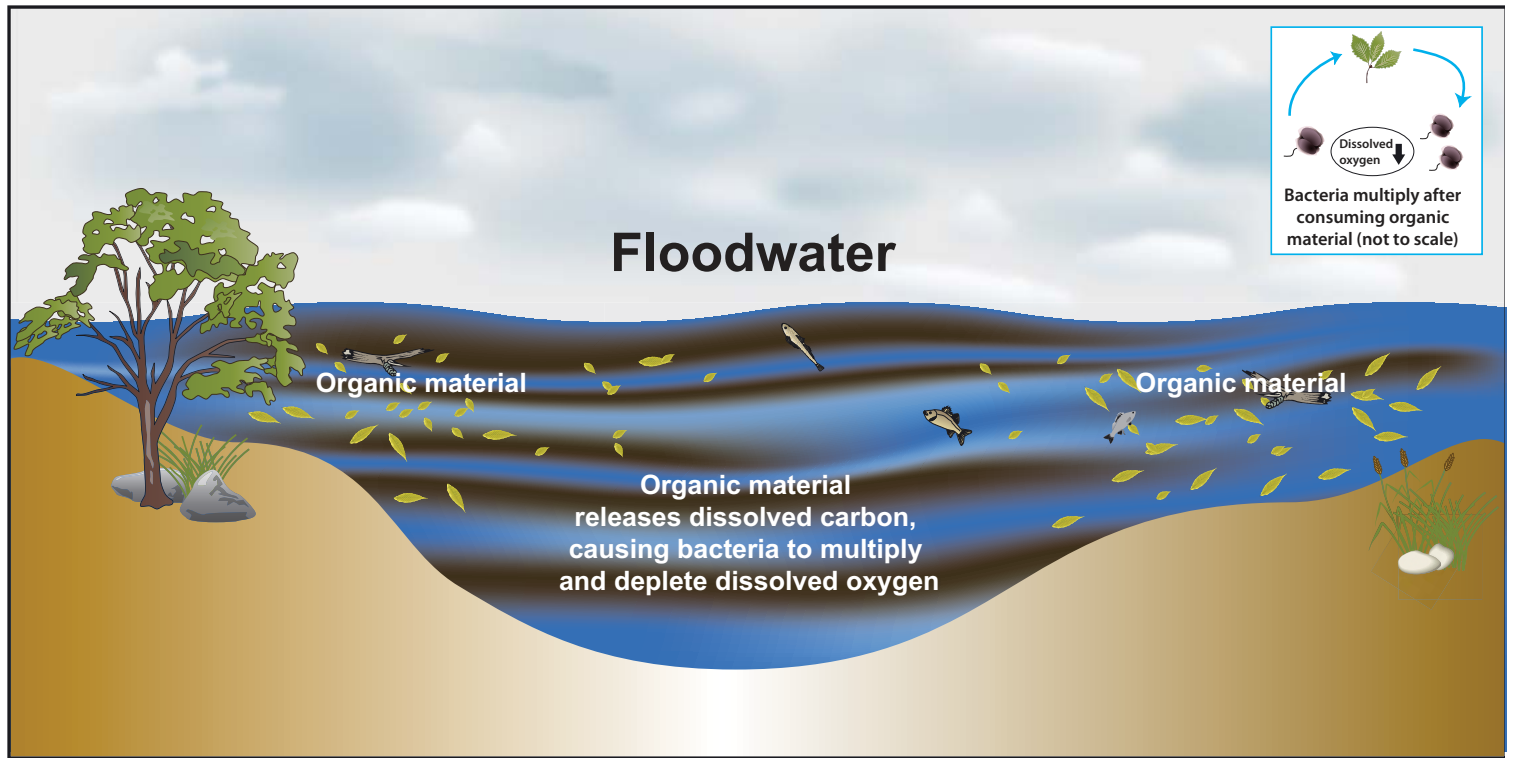
Less frequent flooding allows large quantities of organic material to accumulate on river banks and floodplains. When this material is washed into waterways in times of flood, increased bacterial activity can result in deoxygenation of the floodwater. This process is more pronounced during summer flooding.

The severity of blackwater events is determined by the amount, age and type of leaf litter and whether it has been previously submerged in water. Debris from river red gums is particularly problematic as it contains large amounts of dissolved organic carbon. High air and water temperatures also contribute to increased bacterial activity and subsequent lower concentrations of dissolved oxygen in water.

What are the effects of blackwater?

Blackwater usually has short-term harmful impacts on the environment. Low levels of dissolved oxygen, combined with the toxic components of some organic matter, can lead to the death of aquatic organisms. Native fish and crustaceans are especially vulnerable to oxygen deprivation, although fish are sometimes able to escape the most badly affected areas by swimming upstream or downstream. The chemicals released from organic material can also make water bodies more alkaline or acidic, potentially disrupting normal pH balances and resulting in toxic effects on some aquatic organisms.



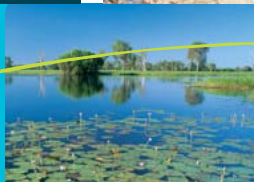


Primary drivers of blackwater events

Despite short-term effects on aquatic organisms, the floods which lead to blackwater are an essential and valuable requirement for the long-term health of river, floodplain and wetland ecosystems, particularly after prolonged drought. These events help break down organic material which supply additional carbon and nutrients to drive the overall production of river and wetland systems. In the long-term, native fish, waterbirds and other organisms benefit from the increased production that boosts food supplies and supports breeding cycles.

Even during blackwater events, downstream systems benefit from the organic inputs once the water has re-aerated.

Risks to human health are low if direct contact with blackwater is avoided. Thorough cleansing is advised after any contact with affected water and discoloured or dead fish should not be eaten because of possible health risks. Blackwater may have social and economic impacts related to the higher costs of treating water for consumption and short-term loss of amenity and recreation opportunities.





Conditions which can lead to blackwater – Chowilla Floodplain in drought near Renmark, South Australia. Arthur Mostead, MDBA.

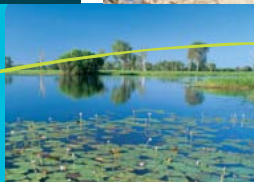
How can blackwater be managed?

The flooding that leads to blackwater events is a natural feature of Australian river systems and the capacity to prevent and manage the impacts of blackwater is limited. The frequency or severity of such events can be reduced by managing water systems to maintain or reinstate natural wetting and drying cycles and ensuring flows are adequate to reoxygenate water. In temperate areas, regular flooding in winter and spring washes away organic material from floodplains when there are more moderate temperatures and bacterial activity is low. This watering also helps reduce the amount of leaf litter falling by alleviating stress on trees.

After floods have receded, releasing more water into the system may help flush out blackwater and improve water quality.

What is the Australian Government doing about blackwater?

In the Murray-Darling river system, the Murray-Darling Basin Authority is working closely with the relevant states and territory to develop a Basin Plan which will return more natural flow regimes to the system. The Authority also collects and publishes data to manage the effects of blackwater. State and territory agencies have various provisions for managing floods and water quality. Contact details for the relevant agencies can be found at: www.environment.gov.au/about/library/govtdepts.html.



As part of Murray-Darling Basin reforms, the Australian Government is acquiring water entitlements with the objective of returning more water to the environment. These entitlements become part of the Commonwealth environmental water holdings and are managed so that increased flows are provided to rivers and wetlands. Environmental watering also helps to achieve more natural wetting and drying cycles, flushing out toxicants, improving water quality, and minimising exposure of soil to oxygen.

Further information about Commonwealth environmental water is available at: www.environment.gov.au/ewater.

Glossary

Carbon: an element in all living beings and consumed by plant matter as carbon dioxide to produce energy, new organic matter and release oxygen.

Dissolved oxygen: a form of oxygen in water which aquatic organisms are able to breathe through specialised respiratory systems.

Ecosystem: a specific composition of animals, plants and micro-organisms which interact with one another and their environment.

Environmental water: water released from a reservoir to maintain downstream water levels, or water retained in a system to satisfy ecological requirements.

Floodplain: the portion of a valley next to a river channel which is periodically covered with water during flooding.

pH: a measurement of acidity and alkalinity, denoting the concentration of hydrogen ions in a solution. A pH of 7 is neutral.

References and further information

Arthur Rylah Institute for Environmental Research.
www.dse.vic.gov.au/arthur-rylah-institute.

Murray-Darling Basin Authority Draft Basin Plan, Water Quality Bulletins, Dissolved Oxygen Maps and Fact Sheet: Blackwater.
www.mdba.gov.au/.

The Murray-Darling Freshwater Research Centre. Understanding Blackwater Events and Managed Flows in the Edward-Wakool River System.
www.mdfrc.org.au/publications/index.htm.

National Water Quality Management Strategy.
www.environment.gov.au/water/policy-programs/nwqms/index.html.

