

# About blackwater

## Water oxygen levels and native fish populations



Photo, Peter Morton

'Blackwater' occurs naturally in rivers and wetlands when decaying organic matter increases the level of dissolved tannin in the water, resulting in tea-coloured water.

### What is 'blackwater'?

When flood water moves across the floodplain, organic materials such as leaf litter and woody debris are broken down, which results in a higher concentration of dissolved organic carbon in the water. This is one of the main fuels for the aquatic food web, providing food for microbes and aquatic insects that, in turn, feed fish, frogs, birds and other wetland animals.

Blackwater in inland rivers and creeks is common, especially after flooding, and normally plays an important part in maintaining a healthy ecosystem.

### What is 'hypoxic blackwater'?

When there is a lot of organic material available, its rapid decay can consume dissolved oxygen from the water. This can result in dissolved oxygen

levels falling faster than they can be restored. If the concentration of dissolved oxygen falls to very low levels, this may cause 'hypoxic' water which can be distressing to aquatic organisms.

Low dissolved oxygen levels can occur over a range of temperatures; however, it is more common during warmer seasons as warmer water carries lower concentrations of dissolved oxygen compared with cooler water.

### Why does it occur?

Inland rivers and wetlands need wetting and drying cycles to survive and thrive. Over time, leaf litter and woody debris accumulates on the floodplain.

When flooding occurs regularly, a low-level of dissolved organic carbon is released into the river system. This is important for the wetland food web. Carbon is taken up by the smallest of wetland organisms and becomes food for fish and other wetland animals.



However, river regulation typically results in fewer small to moderate floods, as water is captured by dams and released in a controlled way. This means there are longer periods of dry conditions between floods, allowing leaf litter levels to increase.

When water arrives, the impact of the decaying process is amplified, especially during warmer months.

### **What affect does this have on water quality and native fish?**

Dissolved oxygen levels in inland rivers are typically around six to nine milligrams per litre, which maintains healthy habitat and a diverse mix of animals.

Low dissolved oxygen levels in inland rivers and creeks can lead to stress and death in native fish and other aquatic animals.

Prolonged periods at or below four milligrams per litre typically result in physiological stress to fish and crustaceans. Fish may be seen 'gasp' for air near the surface or floating on their sides, and crayfish may leave the water.

At three milligrams per litre and below, the risk of fish mortality, or fish kill, increases. Fish kills can be quite localised around areas where oxygen levels have been reduced.

### **Who is monitoring dissolved oxygen levels in our rivers?**

A number of partner agencies are involved in monitoring dissolved oxygen levels.

For example, in the Murrumbidgee valley, a Technical Advisory Group is established as needed to address such issues. The group is convened by Department of Planning, Industry and Environment - EES Group and includes representatives of Department of DPIE Water, DPI Fisheries, Water NSW, the Commonwealth Environmental Water Office and the Riverina Local Land Services.

Members work together to collect information, identify any available solutions to decrease hypoxic blackwater, and coordinate movements of water to improve oxygen levels.

### **What is the role of water for the environment in reducing the effects of hypoxic blackwater?**

Water held for environmental purposes is just one tool available to help mitigate large-scale hypoxic blackwater events.

On the advice of scientists and water managers, water for the environment can sometimes be made available locally to help reduce the effects of hypoxic blackwater, particularly for native fish populations. The effectiveness of these water releases will depend on other operational decisions and river constraints, including what other flows are currently in the river system and whether there is scope to release fresher water in a pattern that provides refuge areas for fish.

Photos top: from left to right, R Webster; P Morton; R Watts/CSU

Published by

Environment, Energy and Science  
Department of Planning, Industry and Environment  
4 Parramatta Square, 12 Darcy Street, Parramatta NSW 2150

ISBN 978-1-76039-941-2

EES 2020/0209 October 2017; updated October 2019