About blackwater

Water oxygen levels and native fish populations

Blackwater explained

'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.

When flood water moves across the floodplain, organic materials such as leaf litter and woody debris are broken down, resulting 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.

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.

Department of Climate Change, Energy, the Environment and Water

NSW GOVERNMENT

Why hypoxic blackwater occurs

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, which become 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.

Effect this has on water quality and native fish

Dissolved oxygen levels in inland rivers are typically around 6–9 mg/L (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 4 mg/L typically result in physiological stress to fish and crustaceans. Fish may be seen 'gasping' for air near the surface or floating on their sides, and crayfish may leave the water.

At 3 mg/L and below, the risk of fish mortality, or fish kill, increases. Fish kills can be localised around areas where oxygen levels have been reduced.

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 when water quality thresholds trigger concern for native fish survival. The group is convened by the Water for the Environment program regional teams and includes representatives of the Water Group in the NSW Department of Climate Change, Energy, the Environment and Water, NSW Department of Primary Industries Fisheries, WaterNSW, the Commonwealth Environmental Water Holder, and 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.

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 depends 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.

Cover photo: Bullatale Creek from Cornalla West Road Bridge. Photo: Paul Childs/NSW Department of Climate Change Energy, the Environment and Water (DCCEEW)

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