# Floodplain GRAZING PROJECT

# BLACK WATER

## WHAT IS 'BLACK' WATER?

'Black' water is water with little or no oxygen in it. 'Black' water is usually dark in colour due to the breakdown of plants and other organic matter. It has high dissolved organic carbon from the rotting vegetation. It develops higher iron levels the longer it pools on the land. It also often has a very unpleasant smell.

## WHAT ARE THE IMPACTS OF 'BLACK' WATER?

Fish, crabs and other aquatic animals need oxygen in the water, so deoxygenated 'black' water is harmful to aquatic ecosystems.

Severe 'black' water events cause fish kills. Less severe events can cause fish to be more susceptible to disease, kill smaller, more sensitive animals that some fish feed on and interrupt breeding cycles.

Large volumes of blackwater can form across the flood-plain about a week after major summer floods. When the black floodwaters enter the river there can be major fish kills.

## WHAT CAUSES 'BLACK' WATER?

'Black' water is due mainly to rapid biological breaking down of organic matter in the water after there has been a summer flood.
Organic matter breakdown after flooding in floodplain wetlands is part of the natural carbon cycling process.
'Black' water entering the Clarence River from South Arm. Photo: Scott Johnson.

*However, drainage has affected the development of 'black' water in several ways.*

- Drainage hastens and prolongs the transport of 'black' water to the estuary, particularly when the flood is receding and river's capacity to dilute this water is reduced.
- Drainage has encouraged the establishment of flood-intolerant pasture species in backswamps. These species are more prone to die and decompose after flooding.
- Drainage has increased surface concentrations of iron and sulphur from acid sulfate soils. During flooding this can lead to the formation of new pyrite in soils close to the surface. Importantly, the extra iron and sulphur present in the drainage sediments enhance the formation of 'black' water because they affect the chemical processes occurring in the backswamp floodwaters and surface sediments. Also known as "Mono-sulfidic Black Ooze" (MBO), these sediments can strip all oxygen from the water in minutes

Research on the Clarence following severe flooding in 2001 showed the deoxygenation that occurred in the estuary was related to over-drainage of acid sulfate soil backswamps (see Figure 1 on the reverse page).

## CAN THE FORMATION OF 'BLACK' WATER BE MINIMISED?

Yes! As noted above, the formation of 'black' water is a normal process in coastal floodplains. However, it can by minimised.

*'Black' water entering the Clarence River from South Arm. Photo: Scott Johnson.*

- Slow the drainage rate and retain about 0.3m of surface floodwaters in backswamps. This is likely to greatly reduce the impact of 'black' water. Retention structures could be used to achieve this in some areas, however, they will not be suitable in some areas or for some management systems.
- Encourage wet-tolerant native pas-ture species. These plants are more resistant to decomposition following flooding. All areas and management systems can use native wet pasture species to their advantage.

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## WHAT ROLE CAN A WET PASTURE SYSTEM PLAY

Wet pasture systems have an important role to play in the long-term management of 'black' water in coastal floodplains. However, using these species will not eliminate 'black' water: even wet pasture will rot if covered with water for long enough.

There are several advantages of integrating the use of wet pasture species into the grazing management of backswamp areas.

- The formation of 'black' water in times of flood is reduced.
- There is less need to invest in retention structures in those areas where they may be suitable.
- The productive capacity of floodplain grazing systems that utilise backswamps is maintained.
- The impact of floods both on the farm itself and in the river and downstream to the estuary is reduced.

*A wet pasture. Photo: G Wilkinson.*

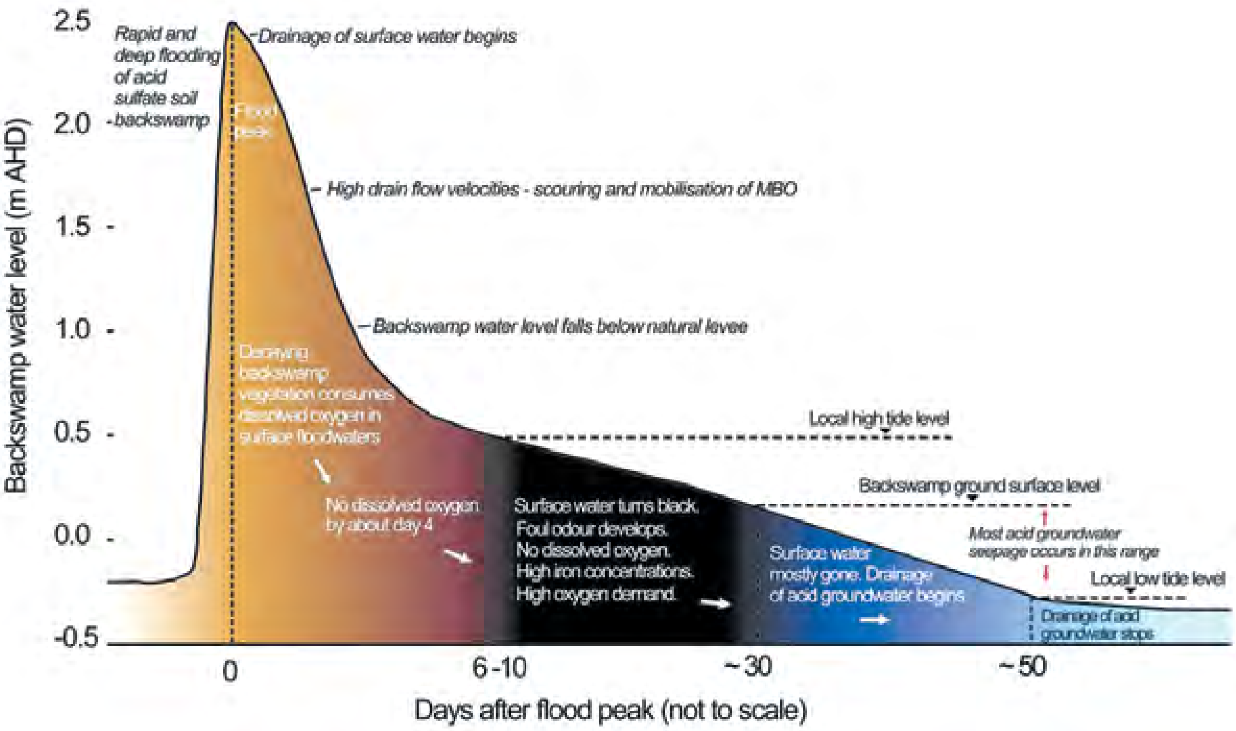


**Figure 1:** This diagram summarises the general sequence of changes that can occur in drainage water quality from a drained acid sulphate soil backswamp after deep flooding. It is based on observations made in flooded acid sulphate soil backswamps on the Clarence River floodplain. The precise timing of changes and the actual elevation (ie backswamp surface level and local low tide) will vary between sites, but the general processes still apply. The duration of the acid groundwater seepage phase will be strongly influenced by follow up rainfall.

*(Source: Restoring the Balance: guidelines for managing floodgates and drainage systems in coastal floodplains, 2003.)*

*The material in this Information Sheet has been adapted from:* Johnston, S., Kroon, F., Slavich, P., Ciblic, A., and Bruce A. (2003) Restoring the Balance: guidelines for managing floodgates and drainage systems in coastal floodplains, NSW Agriculture, Wollongbar.


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