



Australian Government



MURRAY-DARLING  
BASIN AUTHORITY

# Acid sulfate soils

Acid sulfate soils can pose a significant risk to the environment, water supplies, human health and man-made infrastructure. Key hazards include acidification of soil, loss of oxygen from water and the mobilisation of metals.

A number of sites across the southern Murray-Darling Basin including the Lower Lakes in South Australia, are susceptible to the impact of acid sulfate soils.

The build-up of acid sulfate soils in inland wetlands, lakes, creeks and rivers is an important and ongoing issue for the management of waterways in the Murray-Darling Basin. A range of measures can help to manage the problem, including restoring natural wetting, drying and flushing regimes, revegetation in affected areas, and treating acidic water.

Acid sulfate soils is the name given to soils or sediments that contain sulfide minerals. They either contain, or have the potential to form, sulfuric acid.

Acid sulfate soils occur naturally in inland waterways in Australia. Changes to the way water moves through the landscape and an increase in sulfur in the landscape has increased the prevalence of acid sulfate soils.

## Why acidification occurs

Acid sulfate soils do not present any risk if left undisturbed. However, when acid sulfate soils are exposed to oxygen, such as when water levels fall and expose the river or lakebed, a complex series of reactions occur that can produce sulfuric acid. If the amount of acid produced is greater than the environment's ability to absorb the acid (its acid neutralising capacity), the pH level in the soil and remaining water falls (it becomes more acidic).

In extreme cases, oxidation can remove all the oxygen from the water, resulting in the death of fish and other aquatic organisms.

The oxidation of acid sulfate soils can lead to the release of toxic metals (such as cadmium and lead) and other substances such as arsenic, into the environment.

Acid sulfate soils require a source of sulfate to form. In inland Australia, the largest source of sulfate is saline groundwater. Therefore, acid sulfate soils in inland waterways can result from rising groundwater that brings underground salt to the surface.

## Key facts

**Acid sulfate soils occur naturally. Problems from acidification are more likely in the southern Murray-Darling Basin than in the north.**



The Murray and Darling rivers and their tributaries provide **drinking water for more than three million Australians.**



Acidification is caused when acid sulfate soils are exposed to oxygen (oxidation occurs) – however, **left undisturbed there is minimal risk.**



Acid sulfate soils and affected waterways **can harm or kill plants, fish and other aquatic organisms.**



Long-term **mitigation of salinity can help** to reduce the likelihood of acid sulfate soils developing.



Poor water quality can **adversely affect water-based recreational tourism** as well as the communities that depend on it.

## Managing the problem

Acid sulfate soils occur throughout the Basin. During the Millennium Drought they were more prevalent in the southern Basin. A number of areas were impacted, in particular the Lower Lakes in South Australia as a result of the unprecedented low water levels at that time.

This resulted in soil acidification (soil with a pH less than 4) over large areas around the exposed lake margins, in the Finnis River and Currency Creek tributaries, and in the Goolwa Channel.

An *Emergency Framework for the Lower Lakes* was introduced in 2014. The framework guides decision making during droughts and aims to avoid irreversible damage through acidification. It also considers the impacts of salinity, not just acidity.



On-the-ground treatment of acid sulfate soils and impacts include:

- temporary barriers (called bunds) at key locations in the Lower Lakes to keep acid sulfate soils under water
- the application of limestone to treat acidic water in drainage channels - this aims to neutralise the water's pH
- revegetation of exposed lake beds and fringes to help reduce sulfate levels
- maintaining water levels above sea level behind the Lower Lakes barrages.

The Basin Plan aims to keep the Lower Lakes water levels above sea level (0 metres Australian Height Datum - AHD) 100% of the time and above 0.4 metres AHD 95% of the time.

It is important to note that actions to dilute and remove acid from the Basin will only have a small affect - droughts and low flows caused by human intervention mean that the risk of acidification increases despite efforts to mitigate the impacts.

## Effects of acid sulfate soils

The acid and metals released from soil can have many damaging effects.

- Rainfall can wash acid and toxic metals into waterways and kill aquatic life
- Plants and animals survival and growth rates can be reduced and it can promote outbreaks of disease (especially in fish)
- Very acidic soil can kill all plants growing in it
- Sulfuric acid can corrode concrete, iron, steel and some aluminium alloys
- Acid sulfate soils and acidic water can irritate skin and eyes
- Drinking acidic water may make animals ill.

For more information about managing the Lower Lakes and Coorong, visit [mdba.gov.au](http://mdba.gov.au) or South Australia's Department for Environment and Water website ([environment.sa.gov.au](http://environment.sa.gov.au)).



### Connect with us.

The MDBA has offices in Adelaide, Albury-Wodonga, Canberra, Goondiwindi, Griffith, Mildura, Murray-Bridge, Toowoomba, and regional engagement officers around the Basin.

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