



Blue-green algae—general information

This fact sheet provides answers to common questions about blue-green algae in waterways and water storages. Further enquires should be directed to Natural Resources and Water (NRW) at one of their offices listed on page 4.

NRW is well prepared to advise on ways to deal with the problems blue-green algae can present to our water resources. Templates for management and contingency plans have been developed and distributed to the relevant agencies to assist them in providing for the security of public water supplies. Much has been learnt about the causes, effects and prevention of algal blooms and research is continuing. Joint initiatives are also under way nationally with other agencies to develop and implement long-term measures to reduce the incidence of algal blooms.

Algae – what are they?

Algae are simple aquatic plants that occur naturally in habitats such as rivers, lakes, damp soil, tree trunks, hot springs and snow. They can vary considerably in shape, colour and size.

Blue-green algae are very small organisms and can be seen under the microscope as a single cell or large accumulation of cells (colonies) or strings of cells (trichomes). Some accumulations may be so large that they are easily seen with the naked eye.

Blue-green algae are also known as cyanophytes, cyanobacteria and most recently cyanoprokaryotes. They have a similar external appearance to algae and their requirements for light, nutrients and carbon dioxide are also similar. In the absence of light, some blue-green algae can survive and grow using chemicals from its surroundings.

Certain types of blue-green algae have tiny gas vesicles in their cells, allowing them to float to the surface or sink to the bottom in response to changing light and nutrient availability.

Some species have the potential to produce toxins. This cannot be determined by 'naked eye' inspection; only a laboratory analysis can verify the potential for toxicity.

What is an algal bloom?

Algal bloom is a common term used to describe an increase in the number of algal cells to a point where they can seriously reduce the water quality.

Blooms can discolour water, form surface scums, produce unpleasant tastes and odours, and create

problems for aquatic life. They may vary in colour from green to blue, red, brown, dark green or black. Some will be easily seen as a scum while others may be evenly spread throughout the water or concentrated at depth.

Many blooms are composed of non-harmful species, however it is best if a sample can be analysed in a laboratory to determine if blue-green algae are present, and whether they are producing toxins.

Species of blue-green algae may dominate and increase excessively in water when:

- nutrient levels, particularly phosphorus and nitrogen are sufficient to support growth
- water is still or turbulence is minimal
- weather pattern is stable for a long time
- weather is warm (although blooms can occur in cooler weather too).

The longer the period of calm weather conditions, the greater the "bloom-forming potential". Such potential exists mostly in slow flowing rivers or in lakes, dams, weirs and reservoirs.

Blooms can persist for several weeks or sometimes months. Cooler, windy weather or increased flow may reduce or stop them fairly quickly.

As a bloom ages or begins to die, concentrations of toxins may increase. Some toxins may persist for more than three months before they are degraded by sunlight and microbial activity. However, the time taken to degrade may increase if a chemical agent such as copper sulfate is added to reduce the number of microorganisms.

Note: Not all blue-green algal blooms are toxic. Those that are may change their toxicity slowly over a period of weeks to months.

How can blue-green algae affect humans?

Water contaminated by blue-green algae constitutes a health risk to water users in the following ways:

Drinking water

Due to the toxins they may produce, blue-green algae can affect water consumers in a number of ways. They have been associated with nausea, headache, vomiting, abdominal pain, diarrhoea, gastroenteritis, muscle weakness, pneumonia and paralysis.



The occurrence and severity of symptoms is strongly related to the type of toxin, the toxin's concentration in water and to the amount of water consumed.

Note: Boiling the water will not destroy toxins. Boiling will kill algae but in doing so will release toxins into the water. In fact some toxins become more dangerous as a result of boiling the water.

Also, laboratory studies with experimental animals indicate that blue-green algae may promote skin, liver and gut tumours. Further research is needed to establish whether they have similar affects on humans.

Skin contact with blue-green algae

Contact with blue-green algae (toxic and non-toxic forms) through water-based activities can cause problems such as skin rashes, swollen lips, eye irritation and redness, ear ache and itchiness, sore throat, hayfever symptoms, asthma and possibly promotion of skin tumours. The risk of problems is likely to grow as contact time increases.

The risk from various activities ranges from zero where there is no contact, to high depending on the likelihood of an activity bringing an individual into contact with the algae. The table below indicates of the level of risk for some water activities.

Wearing wet suits may result in greater risk of skin irritation because algal material trapped inside the wet suit may be in close contact with the skin for long periods.

Risk	Activity
High	Swimming, diving, sail-boarding, water-skiing, paddling
Medium	Canoeing, sailing, rowing (assumes avoidance of algal material when launching and landing and no rollovers or capsize)
Low	Fishing, pleasure cruising, passive shoreline recreation (picnicking, walking, etc.)

Eating fish from algae-affected waters

The identification of "Paralytic Shellfish Poisoning" (PSP) toxins in one of the species of blue-green algae in Australia has highlighted concerns about possible neurotoxin bioaccumulation in edible mussels and other shellfish. In marine waters consumption of shellfish contaminated by PSP has caused many human deaths. Cylindrospermopsin, another blue-green algal toxin common in Queensland freshwaters has been identified in the edible flesh of crayfish. Therefore, mussels, yabbies and other shellfish caught in algae infested waters should not be consumed.

The liver and gastro-intestinal tract of fish caught in algae infested waters are likely to be poisonous and should not be consumed. Limited information is currently available on the likelihood of toxin concentration in fish, and common sense dictates not to consume any fish caught in water where the presence of these toxins is confirmed.

Irrigating with algae-affected water

Research is currently being undertaken in relation to the uptake and accumulation of toxins in various plants. Toxins such as microcystin can be detrimental to both plants and animals. Based on the current knowledge, an affected water source should not be used for watering edible plants if there is an alternate supply.

If there is no alternative supply, direct spray on the edible part of the plants should be avoided. This is particularly important with plants such as cabbages, lettuces, tomatoes, and strawberries.

Prior to use, the vegetables and fruit should always be thoroughly washed and rinsed with non-toxic water. Research has shown that dried blue-green algal cells can remain toxic for several months.

Irrigated pastures may cause problems with stock because of the potential for long-term poisoning over many months or years. The effects of sunlight may reduce the level of some toxins, however other toxins can be persistent and remain active for many months.

Where an irrigation system produces a spray all efforts should be made to avoid contact or inhalation of the spray. Contact with the outer layer of blue-green algal cells may cause allergic reactions. Spray irrigation systems are often used on golf courses and agricultural fields.

The presence of algae and blue-green algae in water can cause clogging of filters, meters, valves and sprinklers.

Household usage – washing clothes and dishes

Contaminated water should not be used for washing clothes or dishes where a safe source of water is available. Should such a source not be available, the following precautions are recommended:

- use rubber gloves to avoid contact with the water
- rinse dishes with non-toxic water or remove surplus water with a tea towel
- give clothes a final rinse with non-toxic water and dry them in open air exposed to the sun.



Other areas of concern

Aesthetic effects

Blooms may discolour the water and form unsightly and sometimes smelly scums on the surface and along the shore. A number of blue-green algae and other organisms can also produce substances that may impart a pungent earthy taste and odour to the water. While these may not be a health risk they may make the water unpalatable.

Animal health

Stock deaths have occurred after drinking contaminated water. As not all toxic algae produce blooms that are readily recognisable, it is important that all stock deaths and illness are reported to the Department of Primary Industries and Fisheries (DPI&F). Early intervention methods, that may save the lives of affected stock, are available so it is important to contact the DPI&F when problems are first detected.

Pets can also be affected; dogs are particularly susceptible as they tend to lick their coats after swimming.

Sometimes blooms wash onto the shore of a water body where a crust of dead algae can form and dry. In the dry crust, toxins may be active for months. Consumption of such material by animals may cause illness or even death.

If an algal bloom is suspected, farmers should prevent animal access to the affected water and provide alternate supplies where possible. It is most important that animals are not fenced into small areas where the only source of water has a covering of algal scum. Advice should then be obtained from your local veterinary adviser.

Ecological effects

Blue-green algae have been implicated in the poisoning of wild animals including rodents, amphibians, fish, pelicans, waterfowl, bats, and zooplankton. However, nitrogen-fixing blooms provide a valuable source of nitrogen in tropical and semi-arid zone water bodies. In some areas, a large diversity of microscopic animals (including rare forms) only exists during the blooms.

Water supply operation

Blue-green algae affected water and will require additional water treatment. Modern water treatment processes are capable of dealing effectively with blue-green algae. Chlorination and activated carbon are two methods of treatment.

What can be done?

It is extremely unlikely that blue-green algal blooms can ever be prevented from occurring in aquatic systems in Australia. They are a widely occurring group of

organisms that are opportunistic and will develop high populations rapidly under favourable conditions. To exclude only the blue-green algae without eliminating a wide range of other organisms is almost impossible. The objectives of control and treatment are therefore to:

- minimise nutrient concentrations in streams and storages
- encourage water conservation measures
- develop or improve techniques to treat or detoxify contaminated water.

Research as part of the National Eutrophication Management Program has identified phosphorus (that initially enters water bound to sediment) as the key nutrient source for many of the blooms.

Immediate action

If you suspect that blue-green algae have infested a water source you use for drinking, stock watering or domestic purposes, you should refrain from using water from that source until a suitably trained person has identified the algae.

Please note: Boiling the water will not solve the problem.

Short term action

If the presence of blue-green algae is suspected, alternative water sources should be used. These might include bottled, carted or tank water, or good quality groundwater. Treatment of the water with herbicides, copper or other algacides should not be carried out, as such treatments break open algal cells and release toxins into the water. Recent studies have demonstrated that some blue-green algal toxins when released to water form more toxic products that may persist for many months.

If there is no alternative source available, filtration of the water through activated carbon may be used for domestic applications. The activated carbon filtration system will remove some or all of the toxins, but the results in particular applications cannot be guaranteed. They depend upon the adsorption qualities of the carbon and efficient maintenance of the system. Carbon filtration systems can be obtained from manufacturers of water treatment equipment.

Officers from the NRW can provide advice on specific simple carbon filters for emergency use. Advice on the emergency treatment of water supply for stock watering can be obtained by contacting NRW offices listed on this page.

Long term action

There are a number of strategies currently being used to control blue-green algae. These include:



- Integrated Catchment Management aimed at reducing and managing nutrient flows into waterways from natural and artificial sources
- promoting natural algal grazers through selective fish stocking, aquatic plant restoration, and reduction in the contamination of waterways with pesticides
- supporting the maintenance and restoration of riparian vegetation (i.e. the plants near or at the edges of waterbodies)
- community involvement in tackling catchment management issues
- research programs focused on toxin identification, rapid testing procedures for field use, toxin stability and degradation under different environmental conditions.

Prevention of blooms is the primary aim but as they form part of the natural ecosystem, this may not always be possible. It is important, therefore, to be aware of the potential dangers associated with blooms. By adhering to the procedures as outlined above, dangers and risks can be minimised.

For further information or for clarification of the current status of blue-green algae in your area, contact the nearest NRW office from the list below:

Ayr	(07) 4783 2099
Brisbane	(07) 3848 8196
Bundaberg	(07) 4131 5501
Charleville	(07) 4654 4276
Longreach	(07) 4652 7100
Mareeba	(07) 4048 4600
Mt Isa	(07) 4743 6728
Rockhampton	(07) 4938 4600
Toowoomba	(07) 4688 1000

Please note

While every care has been exercised in the preparation of the information contained in this fact sheet, the user should understand that with current research into blue-green algae our knowledge of this issue is progressing at a rapid rate and that accordingly this fact sheet may not be correct at the time of reading.

If a water user has any enquiries relating to blue-green algae, the nearest NRW office should be contacted for further information. NRW hereby expressly excludes any liability and cannot be held responsible for any injuries, deaths, loss or damage sustained as a result of, or arising out of, reliance upon the information contained herein.

No representation is made as to the suitability for any purpose of the information contained herein.

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The cooperation and advice received from Prof. Gary Jones (Cooperative Research Centre, Freshwater Ecology) is gratefully acknowledged.

Useful web sites:

The National Eutrophication Management Program:
<www.rivers.gov.au>.

The NHMRC/ARMCANZ Australian Drinking Water Guidelines (ADWG): <www.health.gov.au>.

These guidelines have an appendix with fact sheets on the most common species of toxic algae in Australian waters.

Australian Research Network for Algal Toxins (ARNAT):
<www.aims.gov.au>

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For further information phone 13 13 04