

# Water Quality Management After Bushfires

## General Information

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# Contents

1	Introduction	2
2	Impact on water quality	2
3	Recommended actions	3
3.1	Immediate actions	3
3.2	Short to Medium term actions	4
3.3	Long term actions	4

## 1 Introduction

Following on from the recent and continuing extensive bushfires a number of water authorities are concerned about the impact of the degraded catchments on water quality. CWT have had experience with this issue with previous significant bushfires and have summarised key points from our experience and research in this document for the benefit of the various affected water authorities.

The biggest impacts are likely to be on rivers and dams where catchments have been significantly burnt and are susceptible to contaminants being washed in after significant rainfalls. Following a fire event, huge amounts of ash, burnt material and eroded soil can be washed into waterways. Significant rainfall following bushfires are also likely to increase the mobility of pathogens from septic and sewage systems and animal agriculture into aquatic environments. Without adequate management and treatment these will affect the quality of drinking water.

## 2 Impact on water quality

Fires, particularly in deforested catchments and riparian zones, alter the structure, behaviour and erosion of soil, typically resulting in high volumes of ash, sediment and debris being washed into waterways, leading to:

- **Elevated turbidity and particulates**
- **Elevated colour and organics**
  - May result in increased concentrations of disinfection by-products, e.g. trihalomethanes (THMs) and chloroacetic acids (CAAs)
- **Elevated nutrients** from ash and other contaminants being washed into the source water during the next significant rainfall event
  - Ash is high in both carbon and nutrients. Phosphorus presents a particular concern as elevated concentrations can lead to favourable conditions for blue-green algae (BGA) growth
- **Increased level of pathogens in raw water** from run off impacted by sources of human sewage such as sewage pump stations and sewer overflows and failing septic systems. Run off will also transport pathogens from animal sources including from agricultural activity, animal carcasses within the catchment area and livestock able to enter the catchment area and access waterways due to depleted fencing
- **BGA blooms** and propagation of other algal species and bacteria

- Will likely result in increased concentrations of taste and odour compounds and potential toxins
- **Reduced Dissolved Oxygen (DO) concentrations**
  - Could increase concentrations of soluble iron and manganese in the water body from reducing conditions in bottom sediments
  - Could increase nutrients from bottom sediments
  - May result in fish kills depending on the severity of DO reduction.

## 3 Recommended actions

During the window of time after a bushfire has subsided and before the onset of significant rain, immediate actions to protect water catchments should be taken. While there will be catchment specific issues to consider, the following staged recommendations are suggested as priorities.

### 3.1 Immediate actions

1. Assess the condition of existing water supply infrastructure, including any remote monitoring and telemetry and repair/replace where required.
2. The frequency and scope of catchment/raw water monitoring and inspections should be reviewed to ensure that changes in key indicators of water quality are not being missed.
3. Review water treatment plant capabilities:
  - a. Determine the limits of what raw water quality your WTPs can reliably treat while still achieving ADWG targets.
  - b. Consider the ability to reduce plant flowrates and increase operating times to achieve longer contact times for improved treatment, where necessary.
4. WTPs will need to be optimised to deal with increased solids, organic and pathogen loads as well as potential filter clogging algae, taste, odour and toxicity issues. It is likely that doses for coagulant, polymer, activated carbon and chlorine will go up significantly to cope with the increased loading:
  - a. Check the revised chemical dosing requirements through regular jar testing and adjust as raw water conditions change.
  - b. Enhanced coagulation (lower pH high coagulant dose) may be considered for removal of organics.
  - c. PAC dosing rates and contact time should be reviewed to combat colour, algal toxins and tastes and odours.
  - d. Ensure adequate supply of chemicals is available and maintained considering increased dosing
  - e. Management of the wastewater system (e.g. from clarifier blowdowns and filter backwash streams).
    - i. Wastewater and solids production will increase
    - ii. Recycle streams may require additional monitoring to identify potential concentration of contaminants by recirculation. Recovery targets may need to be reduced if recycling contaminants is likely.
5. Dam destratification systems should be operated as often as possible in conjunction with appropriate DO monitoring to determine effectiveness.
6. Implement extraction point protection strategies, e.g. installation of floating booms to protect from debris and ash.
7. Protect catchments by repairing fences/barriers, especially those to exclude livestock.

8. Rehabilitate riparian zones to limit soil erosion and protect further contamination of catchments. This could be through the following potential regeneration practices:
  - a. Spray on vegetation and grasses in strategic areas
  - b. Pinning down protective fabrics on exposed areas
  - c. Planting native shrubs and trees
9. Identify areas within the catchment where flows into the waterbody are more likely and implement strategies to control flow direction and volume, such as:
  - a. Constructing physical buffers/barriers (e.g. silt fences, swales, gabion walls, sandbags, repurposing fallen trees).

It should be noted too that these holdback strategies can conserve water by limiting run off and deepening water channels.

10. Assess/audit potential sources of chemical, or pathogen contamination from fire affected properties/assets:
  - a. Stores of fuel, fertilisers and pesticides (personal and industrial volumes) may have been spilled during fires
  - b. Septic, sewer or stormwater systems may have been compromised.
  - c. Confirm details of any firefighting chemicals or salt water used in the area and assess risk. Most firefighting foams are now biodegradable and are low toxicity.

### 3.2 Short to Medium term actions

1. Investigation of *in situ* water treatment in the reservoir or modifications that could be made to improve selective withdrawal of water from the reservoirs. This would help avoid extracting from areas of poor quality. If this is not possible, consider installing fixed or floating barriers around extraction points.
2. Establish trigger levels for the management of water supply sources e.g. algal count, turbidity. These trigger levels would inform actions and protocols to be taken under various water quality scenarios.
3. Undertake seasonal hydrodynamic and DO modelling of the storages to monitor for changes in profile.
4. Implement community awareness/engagement programs, such as:
  - a. Advise landowners on potential benefits that could be realised through protecting the catchment that lies adjacent to or through their property, e.g. water retention and erosion prevention.
  - b. Provide assistance in implementing catchment protection measures, e.g. constructing swales or sediment containment structures.
  - c. Advise consumers using tank water to clean ash and contaminants off catchment sites and provide a first flush system. Clean and flush tanks and pipes as necessary. Refer also to <https://www.health.nsw.gov.au/environment/water/Pages/rainwater-bushfires.aspx>

### 3.3 Long term actions

1. Continue Rehabilitation of the natural environment and maintaining control lines and access tracks.

2. Complete studies to gain a better understanding of the potential for algal blooms, factors influencing chlorine demands and decay and the potential for the formation of THMs and CAAs.
3. Consideration of increased water storage and reuse opportunities.
4. Undertake scoping assessments to review the robustness of the current plant's performance in terms of changing climatic variables and its associated water quality issues.

According to Water Quality Australia (<https://www.waterquality.gov.au/issues/bushfires>), *"Depending on the severity of the fire, freshwater catchments are usually naturally regenerated to pre-fire conditions within five to twenty years. Aquatic ecosystems are remarkably resilient and often recover quickly if there is connectivity between affected and unaffected habitats."*

Assistance for the funding of works may be available via state and federal government grants and programs.

You can also contact your local Public Health Unit (1300 066 055) with any questions about the safety of drinking water, including communicating risks with the public. NSW Health Public Health Units can advise on water quality testing and, where necessary, arrange free of charge testing for local council supplies. NSW Health can assist with specialist water quality and engineering contractors to help manage fire impacts on drinking water quality. This could include investigation of catchment impacts and treatment optimisation.

City Water Technology (02 9498 1444) are also available to provide further assistance and more detailed advice. Contact us for a checklist of actions and additional information.

Additional sources of information:

<https://www.waterquality.gov.au/issues/bushfires>

[https://ewater.org.au/bushfire/background\\_impactquality.shtml](https://ewater.org.au/bushfire/background_impactquality.shtml)

[https://www.environment.act.gov.au/cpr/conservation\\_and\\_ecological\\_communities/aquatic\\_species\\_and\\_riparian\\_zone\\_conservation\\_strategy](https://www.environment.act.gov.au/cpr/conservation_and_ecological_communities/aquatic_species_and_riparian_zone_conservation_strategy)