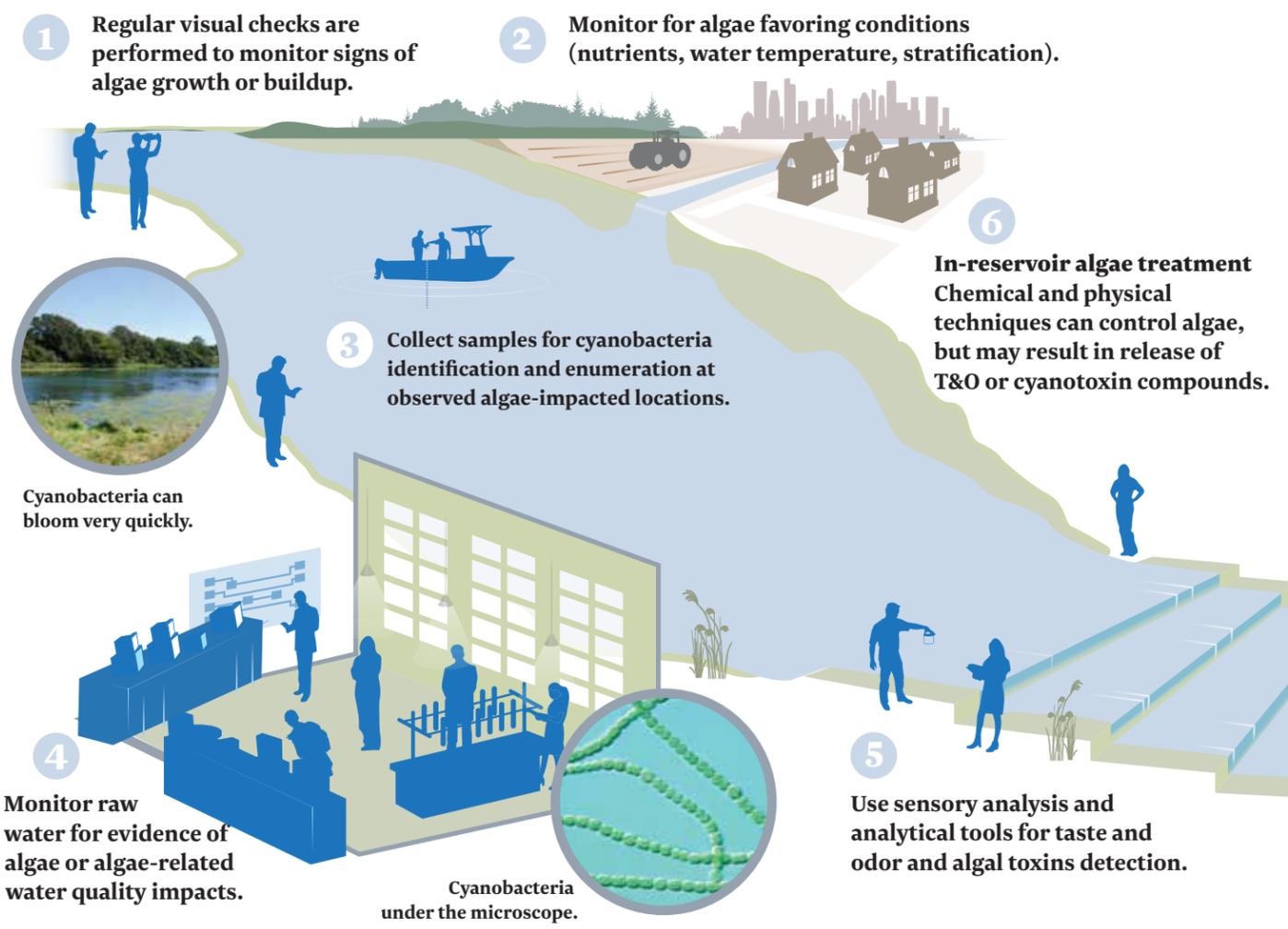


Alert & Action Plan Algae

Each summer, municipalities are faced with algae-related issues in their raw water supplies. This wall poster can be used as a guide to develop preventative algae monitoring and treatment for your facility, as well as minimize the impact of an algae event.



1 Regular visual checks are performed to monitor signs of algae growth or buildup.

2 Monitor for algae favoring conditions (nutrients, water temperature, stratification).

3 Collect samples for cyanobacteria identification and enumeration at observed algae-impacted locations.

Cyanobacteria can bloom very quickly.

4 Monitor raw water for evidence of algae or algae-related water quality impacts.

Cyanobacteria under the microscope.

6 In-reservoir algae treatment
Chemical and physical techniques can control algae, but may result in release of T&O or cyanotoxin compounds.

5 Use sensory analysis and analytical tools for taste and odor and algal toxins detection.

Conventional treatment options
Powdered activated carbon (PAC), potassium permanganate, and chlorine have been shown effective under certain conditions to oxidize and remove algal toxins.

Advanced treatment options
Ozone, granular activated carbon (GAC) filtration, and UV advanced oxidation provide effective barriers to algal toxins. These high energy and cost technologies represent significant investments for addressing intermittent water quality issues.

Water Regulations
The EPA has released draft "10-day Health Advisory Levels" for total microcystin and cylindrospermopsin as low as 0.3ppb and 0.7ppb for children younger than school age.

10 Proactively prepare a public notification plan in case it is ever needed.

ALERT LEVEL	LOW	MEDIUM	HIGH	VERY HIGH
Conditions	<ul style="list-style-type: none"> Non-favorable algae growth conditions 	<ul style="list-style-type: none"> Favorable growth conditions Potential presence of cyanobacteria Potential for algae-related treatment challenges such as pH, DO swings, low level taste and odor (T&O) or toxins in raw 	<ul style="list-style-type: none"> Confirmed cyanobacteria growth Likely algae-related treatment challenges Potential for algae-related toxins and T&O 	<ul style="list-style-type: none"> Confirmed cyanobacteria blooms Confirmed presence of T&O or toxins in raw water
Monitoring Actions	<ul style="list-style-type: none"> Regular visual inspection for algae Monitoring of conditions Weekly algae Intake sample during growth season 	<ul style="list-style-type: none"> Bi-weekly to weekly visual inspections with cyanobacteria identification at observed impacted locations Weekly review of raw water quality Weekly odor sensory analysis of raw water Daily algae intake sample 	<ul style="list-style-type: none"> Vigilant visual inspections and sampling at confirmed bloom location(s) Daily review of raw water quality Daily odor sensory analysis of raw and treated water Weekly testing for T&O compounds and/or cyanotoxins in raw and treated water 	<ul style="list-style-type: none"> Continue daily visual inspection until algae eliminated Daily review of raw water quality 2 daily odor sensory analyses of raw and treated water Daily testing for T&O compounds and/or cyanotoxins in raw and treated water
Response Actions	<ul style="list-style-type: none"> Evidence of algae in reservoir or raw water = move to Medium Alert Level 	<ul style="list-style-type: none"> Evidence of cyanobacteria observed = move to High Alert Level Prepare for control of observed algae/cyanobacteria via targeted control methods Prepare for in-plant treatment of T&O or cyanotoxins 	<ul style="list-style-type: none"> Evidence of odor or T&O/cyanotoxins in raw or treated water = move to Very High Alert level Treat confirmed bloom location and consider whole-reservoir treatment Prepare for in-plant treatment for T&O or cyanotoxins on standby or precautionary implementation 	<ul style="list-style-type: none"> Alert public as appropriate and advise about treatment strategies in place If not already done, treat bloom or whole reservoir Implement in-plant treatment of T&O or cyanotoxins
Step-up Triggers	<ul style="list-style-type: none"> Favorable algae growth conditions Evidence of cyanobacteria in sampling 	<ul style="list-style-type: none"> Confirmed cyanobacteria growth (2000 - 5000 cells/mL) Evidence of algae raw water quality impacts Detection of algae-related odors in raw water 	<ul style="list-style-type: none"> Cyanobacteria bloom conditions (>10,000 - >50,000 cells/mL) Detection of algae related T&O and/or toxins in raw and/or treated water 	<ul style="list-style-type: none"> Chemical algae control in-reservoir often results in T&O or cyanotoxin release into water column, so analysis of compounds should continue even after bloom controlled

SOURCES:
International Guidance Manual for the Management of Toxic Cyanobacteria, Global Water Research Coalition Water Quality Research Australia, 2009; "EPA Health Advisories for Cyanotoxins" Presented at the May 11, 2015 Cyanotoxins in Drinking Water Stakeholder Meeting