Control Strategies for Harmful Algae Blooms (HABs)

WATER QUALITY IMPROVEMENT


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Summary

Harmful algal blooms (HABs) refer to the rapid growth of algae that can cause harm to animals, people, or the local ecology through toxins. They appear as foam, scum, or mats atop the surface of warm fresh, marine, or brackish waters with abundant nutrients. Prevention is the preferred management method, and this can be accomplished through source tackling strategies. Source tackling is sustainable algae management that aims to reduce nutrient load to our waterways before they can cause a bloom. Examples of strategies include: upgrades to sewage treatment plants, reduction of nutrient inputs through stormwater management practices, regulation of point source pollution, restoration of wetlands and seagrass which serve as natural nutrient filtration systems, and real-time monitoring of key water quality parameters and algae indicators.

Once a bloom occurs, research then focuses on methods to control or suppress blooms. These approaches include strategies that kill HAB organisms (in some cases) or limit further growth, and/or physically remove cells and toxins from the water column. Each strategy has its own limits and levels of effectiveness. Bloom control or suppression activities can be controversial, however, due to unintended ecosystem impacts of these controls.

PHYSICAL	CHEMICAL
Aeration	Algaecides
Hydrologic Manipulation	Barley Straw
Mechanical Mixing	Coagulation
Reservoir Desiccation	Chemical Flocculation
Surface Skimming	Clay Flocculation
Ultrasound	
Bio-manipulation	

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Ultrasound


Aeration

Bloom Control Strategies and Descriptions

Aeration: pumps air through a diffuser to bottom of water column causing plumes to rise and mix the water column, disrupting normal behavior of cyanobacteria to and limiting access to nutrients.

Algaecides: chemical compounds applied to water to kill cyanobacteria. However, these also carry risks for other organisms in the system.

Barley Straw: straw deployed around the perimeter of water; when exposed to sunlight and oxygen, it produces a chemical inhibiting cyanobacteria growth. However, it does not remove existing algae.

Bio-manipulation: the alteration of a food web to remove certain predators and change the balance of zooplankton in the community, as certain larger-bodied zooplankton can control phytoplankton algal blooms.

Clay Flocculation: the removal of HAB cells by dispersing clay over the water surface; clay particles aggregate with HAB cells, removing those cells through sedimentation.

Coagulation & Chemical Flocculation: used to facilitate sedimentation of nutrients to the anoxic bottom layer of a water column, thereby limiting nutrients available in the water column, thus inhibiting algal growth.

Hydrologic Manipulation: the manipulation of water flow in/out to disrupt normal stratification of cyanobacteria and control growth.

Mechanical Mixing: a surface-mounted mixer that disrupts cyanobacteria behavior to migrate vertically up the water column and limiting access to nutrients.

Reservoir Desiccation: drawdown of water levels to where cyanobacteria accumulations are above the waterline; and then scraping sediment to remove the cyanobacterial layer attached, reinjection of water is required.

Surface Skimming: Oil-spill skimmers can be used to remove cyanobacteria from surface scums, this method is coupled with a coagulant or flocculent removal technique.

Ultrasound: a device that emits ultrasonic waves at a frequency where cell structure is destroyed by rupturing internal gas vesicles used for buoyancy control by certain algae.

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