

In-lake Intervention Strategy

Substantial Supporting Field Data

Substantial field evidence indicates that applying a crystalized peroxide compound or a liquid peroxide mixture to a non-flowing water body can rapidly reduce HCBs and cyanotoxins ([Mattheiss, Sellner, and Ferrier 2017](#), [Matthijs et al. 2012](#)). The crystal can be deployed in several hours to a day. Two crystal types are now available: (1) one that sinks to the bottom for control of planktonic cyanobacteria in the water column, as well as near-bottom or bottom populations, and (2) one that is a floating, slowly dissolving particle that moves with surface blooms, responding to wind or other concentrating mechanisms. Field evidence from the Netherlands indicates that a lake-water-diluted peroxide solution can be effective in HCB control via dispersal at multiple depths ([Matthijs et al. 2012](#)). Effective peroxide concentrations appear to be 2.3 mg/L for *Planktothrix agardhii*, 3–4 mg/L for *Aphanizomenon* and *Anabaena/Dolichospermum*, and >5 mg/L for *Microcystis aeruginosa*. *M. aeruginosa* may require more than 5 mg/L, but zooplankton mortalities can occur much beyond 5 mg/L ([Matthijs et al. 2016](#), [Zhou et al. 2018](#)).

EFFECTIVENESS

- Water body types: Pond, lake/reservoir, any non-flowing freshwater system
- Surface area: Small
- Depth: Shallow
- Any trophic state
- Any mixing regime
- Any water body use

NATURE OF HCB

- All HCB types; planktonic, near-bottom, and bottom cyanobacteria
- Singular or repeating blooms
- Toxic or nontoxic HCBs
- Effective for most cyanobacteria
- Intervention strategy

ADVANTAGES

- Rapidly decomposes to O₂ and H₂O
- Oxidizes cyanobacterial cells and cyanotoxins
- Effective at <5 mg/L
- Modest cost per acre, with dose dependent on cyanobacterial biomass
- Field use common

LIMITATIONS

- Requires access to surface area (for example, a boat)
- Peroxide compounds need special handling and possible state-required training and application permit
- Can release toxins from cells (but peroxides can quickly oxidize these compounds)
- At H₂O₂ >5 mg/L, may impact zooplankton and fish
- May be less effective in highly turbid systems



Figure C-11. Granular and liquid peroxide application.

Source: J. Mattheiss, Hood CCWS, and [Matthijs et al. \(2012\)](#). Used with permission.

COST ANALYSIS

Costs for granule application are modest to moderate. Granules are used most often on ponds and small lakes, depending on the amount of the HCB and water body size. Liquid dosing is more expensive. Dosing and cost per acre are listed on each product, but seeking <5 mg/L in-lake H₂O₂ should be the goal. Granular peroxide compounds are not inexpensive, but cost is modest relative to mechanical strategies. However, one or two treatments per year or over several years may be required. Small boats with two people can disperse granular compounds, but special liquid-dispensing equipment (an additional cost) may be needed for multiple depth injections. Other cost estimates are presented in Appendix C.2.

Relative cost per growing season: Peroxide application

ITEM	RELATIVE COST PER GROWING SEASON
Material	\$-\$\$
Personal Protective Equipment	\$
Equipment	\$-\$\$\$
Labor	\$-\$\$

CASE STUDY EXAMPLES

Lake Anita Louise, Frederick County, Maryland, United States: Mattheiss, Sellner, and Ferrier (2017) reported that 350 pounds of peroxide crystals were dispersed over ~4.5 acres in a 10–12-foot-deep system from a small boat in approximately 3 hours. Peroxide concentrations approximated 3 mg/L and rapidly declined to background levels in 3 days. Densities of a *P. agardhii* surface bloom were dramatically reduced and remain low 4 years after treatment.

Various locations: Liquid application with peroxide levels at ~3 mg/L have also proved effective in Lake Koetshuis (Matthijs et al. 2012); Ouwerkerkse Kreek, Netherlands (Burson et al. 2014); and an Alabama aquaculture pond (Yang et al. 2018).

OVERALL	\$\$
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REGULATORY AND POLICY CONSIDERATIONS

Applicator training and permits for application may be required in many states. Check individual state regulations.

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