Addressing Blue Green Algae Problems

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In light of concerns over blue-green algae (BGA) blooms, the Mona Lake Watershed Council put together the following information to educate the public regarding BGA issues.

Blue-green algae are cyanobacteria, microscopic organisms that can photosynthesize. They are found in the summer plankton of many lakes. When conditions are favorable, the number of blue-green algae can increase dramatically, or "bloom." These blooms may be visible as a floating scum that resembles paint on the surface of the water. Warm, calm water with elevated nutrients (primarily phosphorus) make algae grow faster than normal, contributing to algae blooms. As long as nutrients are in excess, algae can grow until some other factor, often light or temperature, limits their growth. Some of the sources of phosphorus that promote BGA blooms are from fertilizer runoff, decomposing vegetation, soil erosion, and septic tank leaching. In addition to potential toxins (which have no known antidotes) BGA can have many other negative affects including:[1]

- Spoiling water quality when present in large numbers by producing odors or thick scum.
- Making recreational areas unpleasant or unusable.
- Dense blooms blocking sunlight can kill other aquatic plants & animals.
- When respiring they use oxygen in the water that can alter the balance of the ecosystem, to the point of causing fish kills. Decomposition of the bloom also will consume oxygen.

Of the more than 1,500 known species of BGA, some are useful as food, while others can cause stomach and intestinal inflammation and hepatitis (inflammation of the liver).[1] A few types of blue-green algae are known to produce toxins called microcystins. If these toxins are swallowed in sufficient quantity, they can cause diarrhea, nausea, cramps, fainting, numbness, dizziness, tingling and paralysis. Skin contact can cause rashes or irritation. Children and pets are at greatest risk. Wild animals and pets have died from ingesting BGA toxins. Eating fish during a bloom can also pose a health risk.[2] Toxins usually occur within the BGA cells but substantial amounts are released to the surrounding water when algae cells rupture.[3] For example, causing turbulence with boat traffic increases the potential of BGA cell rupture. Toxins are also released when the algae die and disintegrate.

Since it is impossible to determine if a bloom is toxic by visual appearance, it is best to avoid or limit contact until the water has been tested and declared safe. Blue Green Algae health advisories are posted on line by the County Health Department at www.muskegonhealth.net (click on Blue Green Algae).

What can be done about unsightly, smelly and potentially toxic blooms?

Lakes and their associated watersheds are complicated ecological systems. There is no "silver bullet" to conquer unwanted algae blooms or aquatic plants. Significant benefits can be derived, however, from individual actions which collectively impact the problem. Following are some basic principles of water quality management that can help reduce the chances of unwanted algae blooms (*and* an over abundance of aquatic plants).

#1 Please don't feed the algae!

☺ Adhere to the Muskegon county-wide ban on phosphorus fertilizers (although exemptions are made for the establishment of a new lawn). What helps make your lawn green also makes the water green. In fact, most lawns and gardens in west Michigan *do not* lack phosphorus but rather other nutrients. In the three numbers you see on the fertilizer bag, the middle one should be a "0" (e.g. 12-0-12).
See also: log.mlive.com/grpress/2008/05/phosphorus_ban_looms_your_lawn.html

☺ Help get phosphorus laden products off the shelves. Check local suppliers and speak up if you see they are selling fertilizers that contain phosphorus. Small amounts of phosphorus fertilizers can be kept on hand for new lawns, but it need not be on open display. Customers asking suppliers to help the situation can carry a lot of weight.

☺ Properly maintain septic tanks and fields. Faulty systems leach nutrients from fecal matter and other wastes right through the soil into lakes and streams (i.e., that's more algal nutrients). See also: deq.state.or.us/WQ/pubs/factsheets/onsite/septictankmaint.pdf

☺ Clean up pet waste and isolate livestock from streams and lakes—their waste is raw sewage. See also: www.state.nj.us/dep/watershedmgt/pet_waste_fredk.htm

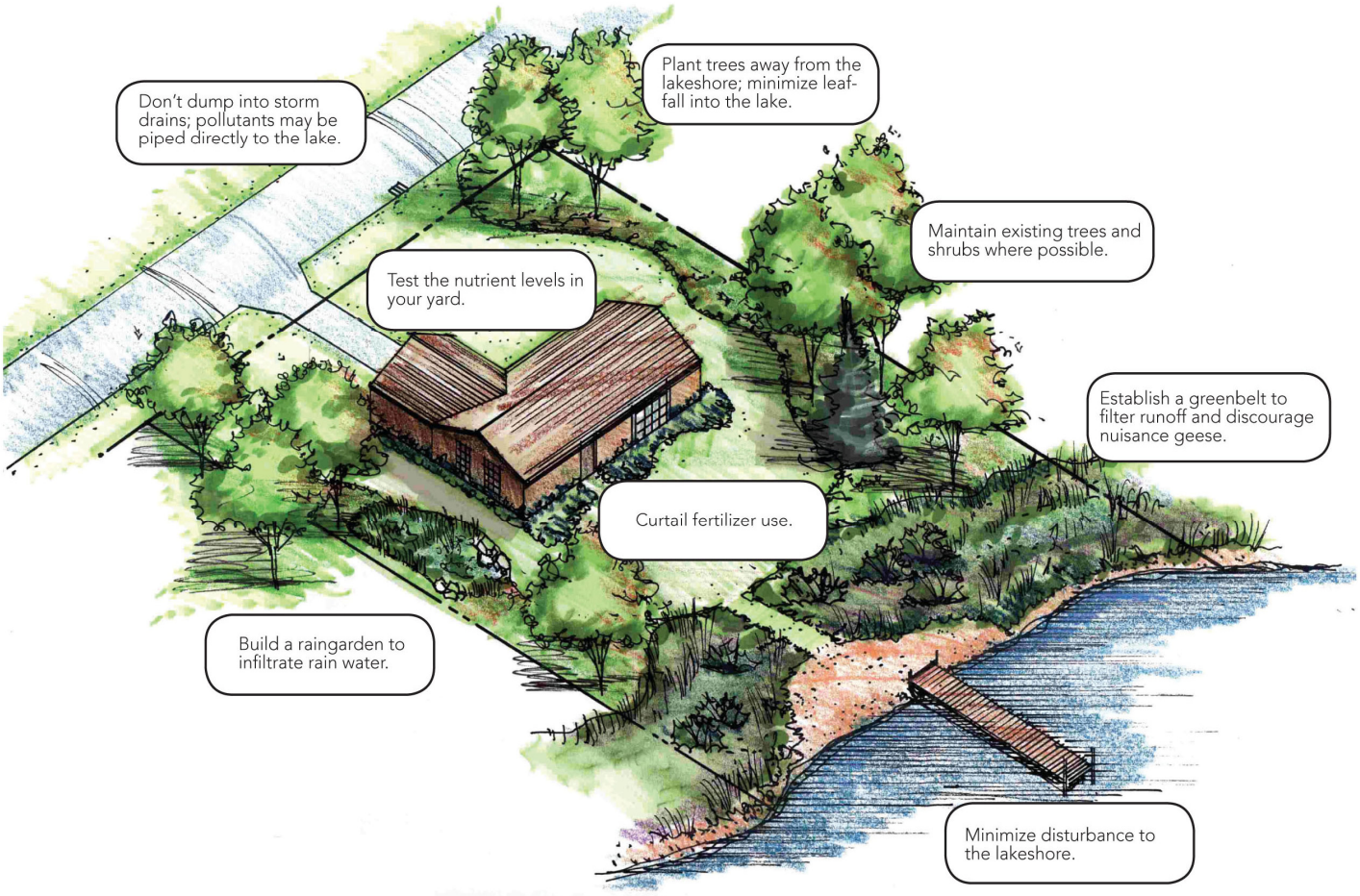
☺ Establish natural planting buffers adjacent to water (drains, streams and lakes) rather than mowing up to the water's edge. A thick, unmown strip of groundcover or wildflowers will filter out nutrients that algae and other aquatic plants thrive on. Additionally, these thick buffers can deter unwanted geese from wandering into your yard. See also: www.oakgov.com/drain/assets/docs/environmental_unit/Waterfront_Wisdom_4_net.pdf
www.ewashtenaw.org/.../environmental_portal/lawn_care/rethinking_yard_care.pdf –

☺ Don't dump or stockpile yard waste (clippings and leaves) near drainage areas or the water's edge. As yard waste rots it releases nutrients that can wash into lakes and streams further feeding algae. Consider composting, but away from the water.
See also: www.sustainability.uconn.edu/sustain/goodecol/twelve.html

☺ Keep yard debris away from stormwater grates and don't dump anything in them—they are often a direct shot to lakes and streams.

☺ Protect/enhance/create wetlands. They help clean the water before it gets to lakes or streams (i.e., they help use up the food so there isn't much left for algae).
See also: www.epa.gov/wetlands

What You Can Do



Rendering courtesy: ProgressiveAE

#2 Keep it cool!

Thermal pollution can elevate water temperatures which enhances conditions for algae blooms. When rainwater hits hot pavement it heats up as it rinses off the land. Without proper management it flushes (as runoff) into a lake or stream warming up the water body. Blue-green algae like warm water. See also: epa.gov/weatherchannel/stormwater.html

- ☺ Keep trees (or establish new trees) along the water's edge to help shade and cool surface water. Trees are also generally more effective at taking up nutrients in the waterfront buffer than grasses or groundcover.
- ☺ Reduce the amount of area you have in pavement or patios and establish thick vegetated areas to control runoff. Landscaping like shrubs and perennial flower beds

are better stormwater catchers than a mown lawn. Grass works best if it is maintained at no less than 3 inches high.

☺ Support changes in city and township regulations that require developers to consider water quality including:

1. Managing stormwater within developments using rain gardens rather than letting warm, polluted water rush of site, stagnate in a detention pond, or flush into stormwater pipes that directly discharge into lakes or streams.
2. Limiting the amount of paving permitted on a site (e.g., do large department stores *really* need acres of parking?).
3. Providing *maximum* parking thresholds in addition to *minimum* thresholds.
4. Having strong landscaping requirements to create more green than gray (pavement) space. Encourage native species because they are more apt to survive adverse conditions like drought.
5. Protecting existing trees and significant vegetation, they hold soil and use nutrients so they don't get into surface water.
6. Providing protective setbacks and buffer strips from developments adjacent to streams and lakes to filter out pollutants.
7. Requiring some amount of common open space for all developments to increase natural green areas.

Communities should also seek professional site plan review assistance to evaluate the important but subtle nuances of good site design to protect environmental quality, especially for large developments.

#3 Watch soil erosion control measures in your community because sediment is our #1 pollutant.

Unchecked rainwater and snowmelt washes soil away. Pollutants such as phosphorus, salt, oil, and pesticides cling to soil and ride it into our waterways. Soil then settles out in the water as sediment--choking wetlands, fish spawning beds and other water habitat. It also depletes oxygen levels. State law requires soil erosion and sedimentation control measures for every construction site within 500 feet of a lake or stream and for all disrupted sites of over 1 acre. If you see soil erosion control problems contact Muskegon County DPW at 231-724-6411.

#4 Learn from and support scientific and advocacy groups that collaborate to improve water quality, including:

GVSU, Annis Water Resource Institute (AWRI), 728-3601, www.gvsu.edu/wri
Mona Lake Watershed Council, 740-7521, www.monalakewatershed.org
Muskegon Conservation District, 773-0008, www.muskegoncd.org
Muskegon Lake Watershed Partnership (includes Bear Lake) 722-7878; www.muskegonlake.org
Muskegon River Watershed Assembly, 591-2324, www.mrwa.org

#5 Think globally-act locally. Pollution troubles flow down-stream and, ultimately into our Great Lake.

As an example, lands in parts of 13 units of government ultimately drain into Mona Lake, including Moorland Township, Egelston Township, City of Norton Shores, City of Muskegon

Heights, Muskegon Township, Fruitport Township, City of Muskegon, Roosevelt Park, Sullivan Township, Casnovia Township, Ashland Township, Bridgeton Township and Ravenna Township. All land uses in these municipalities are potentially contributing phosphorus to Mona Lake, so it is important that everyone works together to reduce nutrient inputs to their local drains, storm drains, tributaries, and lakes. Residential, commercial/industrial, and agricultural land use are potential sources of phosphorus loading in the Mona Lake watershed.

Footnotes and references:

[1]Great Lakes Sea Grant Extension, www.glerl.noaa.gov/seagrant/GLWL/Algae/HAB/HABFAQ.html

[2] Blue-Green Algae Health Concerns in Oregon- www.oregon.gov/DHS/ph/envtox/docs/bgahealthconcernsfaq.pdf

[3]World Health Organization, who.int/water_sanitation_health/dwq/chemicals/microcystin.pdf

[4] Wisconsin Division of Public Health,: http://dhs.wisconsin.gov/eh/water/fs/Cyanobacteria.pdf. www.cdc.gov/hab/cyanobacteria/default.htm

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TREATING BLUE GREEN ALGEA ON MONA LAKE

There are several methods of controlling unwanted algae in surface water, including chemical treatments, shading with chemical additives, harvesting, and aeration—all of which have limitations. The Mona Lake Improvement Association works with a licensed applicator to treat target areas for Eurasian Milfoil (EWM) and blue-green algae. All chemical applications are regulated by the Michigan Department of Environmental Quality.

Milfoil is treated with "Reward" which is a non-selective contact herbicide. 2,4-D and Triclopyr can also be used as a selective control option for EWM. The Association also conducts water treatments for algae using copper sulfate. The DEQ no longer permits the application of copper sulfate over an entire water body because of concerns with it's impact on the ecology of the lake (e.g. it also kills the "good" algae that fish eat, it can kill untargeted organisms like some fish and snails, and it can reduce dissolved oxygen in the water as mass blooms decompose--sometimes causing fish kills). Residual copper can also collect in the sediments eliminating life on the bottom of the lake. Currently, the copper levels permitted in treatment applications are at or below those permitted in drinking water (per MDEQ requirements). The Lake Improvement Association has used Cutrine-plus (which contains copper sulfate) and Cygnet-plus (a non-ionic surfactant) which assists with herbicide absorption into plants. The Improvement Association is only permitted to treat algae in areas of less than 5-feet in depth. A new product under investigation that presumably only targets blue green algae and not the "good" algae is Phycomycin. However, it is likely that concerns regarding the impact on dissolved oxygen levels will remain because of large amounts of decomposing plant material as well as decomposing algae.

Aluminum Sulfate bonds with Phosphorus, taking it out of the nutrient cycle, which can inhibit but not prevent algal blooms. However, the greater the watershed phosphorus contribution (i.e., coming in from the creeks and adjacent properties), the less effective this treatment can be. If pollutants continue to wash into the water, this tactic is of limited utility. This application is not currently used in Mona Lake and would likely not be effective because of the current nutrient loading into the lake.

"Shading" chemicals are added to restrict light from getting into the water column, which retards algae growth. The MDEQ does not permit the addition of shading chemicals in waters where people swim because of safety issues. Emergency services personal may have difficulty in finding and retrieving victims in shaded water. Additionally, people may and have suffered spinal cord injuries when diving in shallow waters that appeared deep because of shading agents. Entities using shading products may have liability in these cases.

Physical Controls

Skimmers and harvesting take algae and noxious (injurious or harmful to health) or nuisance weeds from the water, but this does little to impact the problem. In fact, some harvesting, like pruning, can actually stimulate additional growth with some aquatic plants.

Aeration

Dissolved oxygen in the water is a major contributor to good water quality. In addition to aquatic life needing it, aerobic bacteria use it when they decompose organic matter (plants, algae, etc.). Aeration is the process of increasing the oxygen content of the water by infusing air into a water body. Natural bacteria are stimulated by aeration and circulation and they feed on muck, organics and the food that normally feeds algae blooms or aquatic plant growth. Out of curiosity we asked a company that makes lake and pond aerators what it would take to aerate a 656 acre lake that averages 14 feet deep. The reply: "*To aerate that much water would cost probably over one million dollars. It is possible, but you would have to purchase 60 of our 10 acre solar pond aerators."* Aerators should only be used after a thorough assessment of the waterbody as they may only be needed in certain problem areas of the lake.

Conclusion

The best treatment for excessive blue green algae blooms is still one of prevention. Limit an infusion of phosphorus into the lake to help prevent severe algal blooms. Note: one pound of phosphorus makes a staggering 300 to 500 pounds of algae.