



December 21, 2020.

Haliburton County is home to hundreds of beautiful lakes, and through each passing season, these waters are the heart and soul of the residents who live here. In recent months there have been concerns raised about the presence of algae in these lakes we so deeply love and enjoy. With environmental care informing each meeting, the Haliburton County Home Builders' Association wants to learn more about the relationship between human habitation and algae growth. Under the guidance of the HCHBA, a study was commissioned procuring a scientific report of algal blooms in Haliburton County. With this report, the HCHBA aims to reinforce the importance of proper scientific research when exploring new bylaws and policies which will affect the development of our communities.

The following report was written by Dr. Melodie Lindsay. Dr. Lindsay is a Kiwi-Canadian, born in Huntsville, ON and raised in New Zealand with a research background in biological sciences and microbiology. She is currently working on bio stimulants to decrease the use and environmental impact of conventional fertilizer as well as seaweed cultivation as a strategy to reduce diffuse nutrient runoffs.

Algal Blooms in Haliburton County

Blue-Green Algae: Cyanobacteria Facts and Fixes

Blue-green algae, or more specifically, *Cyanobacteria* date back 3.5 billion years¹. They photosynthesize like plants and produce oxygen. In fact, they are responsible for producing around 30% of all oxygen on earth². There are over 2000 different types of blue-green algae and you will recognize some of the beneficial applications that are being developed using them³. For example, natural colourants in cosmetics, natural sunscreens, protein and vitamin supplements, as well as biofuels³. You may have even consumed some blue-green algae or *Spirulina* in your morning smoothie⁴.

Cyanobacterial blooms: A multitude of causes

Lately, cyanobacteria have gotten a bad reputation for their role in lake water quality – especially for their potential to form harmful algal blooms and toxins. However, despite their long-lasting history and benefit to earth, the phenomenon of harmful blooms is still not well understood by scientists^{3,5}.



Here's what we do know. Triggers of algal blooms include³:

- 1) Stagnant water
- 2) High water temperatures – above 25°C
- 3) Nutrient availability, especially the ratio of nitrogen and phosphorus in water
- 4) High levels of dissolved carbon dioxide in water
- 5) Long sunlight hours
- 6) Sedimentation of other microscopic organisms
- 7) Light winds

Cyanobacteria blooms: What is the solution for Haliburton County?

But what can we do about it? Control of algal blooms is both difficult and controversial. It is safe to say there is no silver bullet and no one-size-fits-all approach. A recent study found that one of the most important factors in successfully mitigating algal bloom is relying on *local knowledge*⁶. Do we have leaky or aging septic systems? Are we nutrient loading our waters through intensive farming? Do we have storm runoff entering our lakes? Is our municipal sewage and stormwater system up to scratch?

Informed decisions for effective action

It's easy to point fingers and shift blame but it is impossible to make informed decisions without doing our homework. That's why, alongside our local knowledge, our next most important tool is monitoring. Water quality monitoring will take us leaps and bounds closer to understanding the risk and true causes of algal bloom in Haliburton County. We should be testing water quality regularly, and specifically after storms, high boating traffic weekends, just after the lakes thaw, after leaf fall in autumn... Only then can we make effective changes for the better. Informed, evidenced action will always trump clumsy reactions.

One example of the most common causes of algal bloom is stagnant water; that is why some prevention strategies employ large propellers or artificial oxygenation to combat it and keep water moving⁷. Light winds can expand existing blooms, pushing them to the shoreline while stronger winds can dissipate them. Agitated water makes it very difficult for a network of algae to form a bloom. However, implementing propellers where the true problem is nutrient runoff would be futile⁷.

In the same way, addressing nutrient release from lake sediment stirred by high boat traffic, or leaf decay in autumn with vast tree planting onshore will not fix the problem. We need to assess our situation with an open mind and take pragmatic steps towards properly studying and understanding our true environmental impact while keeping our local economy in mind.



Closing remarks

Toxic algal bloom is a global problem brought on by a multitude of factors. There is no simple fix, and we are fortunate to not have experienced any noteworthy events thus far. Prevention is a key strategic goal, both environmentally and economically, but this will only be achieved through proper water quality monitoring and using all the tools and local knowledge available to us to take rational and evidenced action.

References

1. Introduction to the cyanobacteria University of California, Museum of Paleontology. <https://ucmp.berkeley.edu/bacteria/cyanointro.html>. Accessed 07/12/ 2020
2. DeRuyter, Y.S., 2008. Molecular structure of the photosynthetic apparatus. *The Cyanobacteria, Molecular Biology, Genomics and Evolution*, pp.217-269.
3. Vu, H.P., Nguyen, L.N., Zdarta, J., Nga, T.T. and Nghiem, L.D., 2020. Blue-Green Algae in Surface Water: Problems and Opportunities. *Current Pollution Reports*, 6(2), pp.105-122.
4. Karkos, P.D., Leong, S.C., Karkos, C.D., Sivaji, N. and Assimakopoulos, D.A., 2011. Spirulina in clinical practice: evidence-based human applications. *Evidence-based complementary and alternative medicine, 2011*.
5. Hess, P., Villacorte, L.O., Dixon, M.B., Boerlage, S.F., Anderson, D.M., Kennedy, M.D. and Schippers, J.C., 2017. Harmful algal blooms (HABs) and desalination: a guide to impacts, monitoring and management
6. Ibelings, B.W., Bormans, M., Fastner, J. and Visser, P.M., 2016. CYANOCOST special issue on cyanobacterial blooms: synopsis—a critical review of the management options for their prevention, control and mitigation. *Aquatic ecology*, 50(3), pp.595-605.
7. Stroom, J.M. and Kardinaal, W.E.A., 2016. How to combat cyanobacterial blooms: strategy toward preventive lake restoration and reactive control measures. *Aquatic Ecology*, 50(3), pp.541-576.

