

## Executive Summary

### 2019 Kahshe and Bass Lake Steward Report

A comprehensive review and analysis of all historical environmental monitoring on Kahshe and Bass Lakes has now been completed and presented in annual Lake Steward Reports from 2012 through 2019. These documents as well as Executive Summaries are posted on the new **Lake Health** tab of the KLRA web-site: <https://kahshelake.ca/Water-Quality>. This report summarizes the findings from sampling and analysis of both Kahshe and Bass Lakes in 2019. The sampling programs include those of two agencies: The District Municipality of Muskoka (DMM) and the Ontario Ministry of Environment, Conservation and Parks (MOECP). In the latter, the Lake Stewards of Ontario carry out the water sampling and clarity measurements and the MOEC analyzes the samples and coordinates the data reporting.

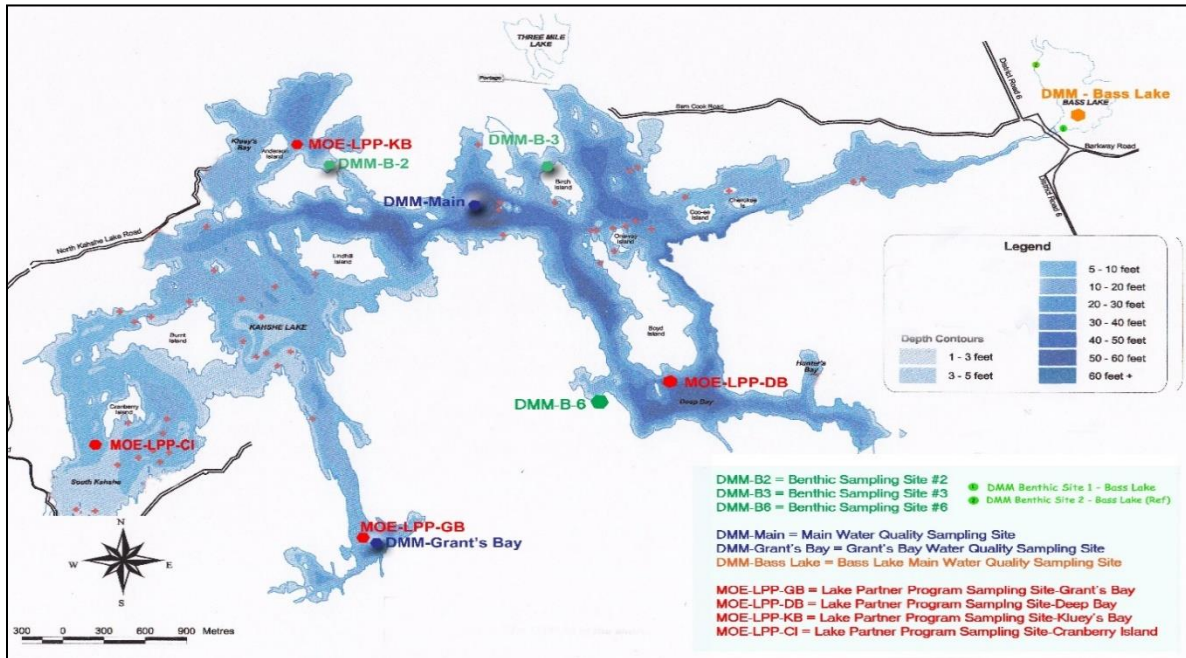
As in 2018, this report has been structured to address the following issues/areas of potential concern for both lakes with emphasis on the development of harmful algal blooms.

- Nutrients, Water Clarity, Temperature and Algal Growth
- Calcium Depletion
- Lake Acidification
- Metals and Other Chemicals
- Dissolved Oxygen
- Benthic Health (not undertaken in 2019)


Before any discussion of the above main areas of interest, it's important to understand how climatic factors in 2019 compared with other years, as it is now well documented that we live in a time of changing climate conditions and these atmospheric changes can impact several water quality findings.

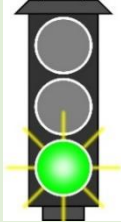
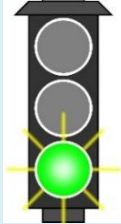
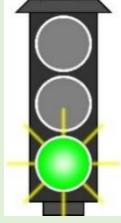
The information on weather and water/ice conditions confirmed that 2019 was generally similar to the 30 year climatic normals, with the only pronounced variation being a much wetter April and warmer and dryer July. As the noticeably lower levels of precipitation in July coincided with slightly above normal temperatures, this likely contributed to the warmer lake water experienced towards the end of July and early August. Ice-out on Kahshe occurred around April 26, which was a few days earlier than in 2018. Ice-out records for Deep Bay also have been recorded dating back to 1987, and this record shows no clear trend towards an earlier or later ice-out.

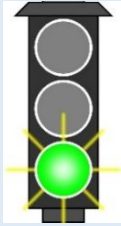


The map below shows the locations of all sampling sites for both DMM and MOECP (abbreviated to MOE) sampling programs, while the summary table that follows provides brief information on each of the six issues.



### Summary of 2019 Findings for Kahshe and Bass Lakes

Issue	Why It's Important	Level of Concern*	Comments
<b>Nutrients, Water Clarity, Temperature and Algal Growth</b>	<ul style="list-style-type: none"> <li>Total P and Nitrogen are indicators of water quality degradation and increase the potential for algal blooms.</li> <li>The other factor associated with algal blooms is increasing water temperature</li> <li>The DMM's total P benchmark is set to preserve water quality via a background approach.</li> <li>Natural tea colour of water complicates the relationship between water clarity and water quality findings.</li> </ul>	 <p>Kahshe &amp; Bass</p>	<ul style="list-style-type: none"> <li>2019 results for Kahshe Lake show total P levels below Threshold and Background.</li> <li>In Bass Lake, the 2019 sampling results also were well below the existing Threshold level and marginally below the Background level.</li> <li>No upward or downward trend in total phosphorus in either lake has been detected in almost 40 years of monitoring.</li> <li>In the case of nitrogen, the levels are in a normal range and no trend has been detected in either lake.</li> <li>As in 2018, water temperature in the upper layers of both lakes was higher than in previous years and reflected a warmer air temperature that was documented.</li> <li>To date, there has been no confirmed evidence of a harmful blue-green algal bloom in either Kahshe or Bass Lakes. However, because of the documented presence of this type of algal bloom in several nearby Muskoka lakes in both</li> </ul>

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			<p>2018 and 2019, and the fact that in several cases, their total phosphorus levels were lower than those in Kahshe and Bass Lakes, we must remain vigilant about maintaining or reducing nutrient loading. This may help us avoid an algal bloom as we experience warmer water associated with climate change.</p>
<p><b>Calcium Depletion</b></p>	<ul style="list-style-type: none"> <li>❑ Calcium is naturally occurring in soils and rocks and is essential component of aquatic food chain.</li> <li>❑ There was enhanced leaching from soil to lakes due to acid rain impacts in 1970s &amp; 80s.</li> <li>❑ Many Muskoka lakes show a decline in calcium and are now at lower end of the growth limiting threshold for some aquatic species.</li> </ul>	 <p>Kahshe &amp; Bass</p>	<ul style="list-style-type: none"> <li>❑ Not a shoreline development or concern regarding algal blooms.</li> <li>❑ No upward or downward trend over almost 15 years has been detected.</li> <li>❑ Calcium in Kahshe and Bass Lake is currently above the growth limiting threshold for some sensitive zooplankton species (which is good), but the margin of safety is small, so we need to keep monitoring.</li> </ul>
<p><b>Lake Acidification (pH)</b></p>	<ul style="list-style-type: none"> <li>❑ In mid to late 1900s, sulphur and other acid gasses from the Sudbury basin plus transboundary air flows from the U.S. acidified many lakes.</li> <li>❑ Most lakes in Muskoka have recovered following emission controls.</li> </ul>	 <p>Kahshe &amp; Bass</p>	<ul style="list-style-type: none"> <li>❑ The Ontario objective is to keep pH of lake water between 6.5 and 8.5.</li> <li>❑ Kahshe and Bass Lakes are currently at the lower end of the optimum pH range (6.5) and generally above the level of 6.0 where impacts to sensitive aquatic species might be encountered.</li> <li>❑ No upward or downward trend over almost 15 years has been detected.</li> <li>❑ However, both lakes have a low buffering capacity - are less able to neutralize acid inputs than lakes with a higher buffering capacity - so we need to continue monitoring.</li> </ul>
<p><b>All Other Chemicals</b></p>	<ul style="list-style-type: none"> <li>❑ DMM samples and analyzes Kahshe and Bass Lake for over 30 different metals, nutrients and other chemicals.</li> <li>❑ This report analyzes them relative to chronic toxicity benchmarks and charts them all since monitoring began in early 2000s.</li> </ul>	 <p>Kahshe &amp; Bass</p>	<ul style="list-style-type: none"> <li>❑ All 30 metals and other parameters have been compared to chronic toxicity benchmarks from Ontario, Canada and the U.S. EPA.</li> <li>❑ Sampling of both lakes in 2019 confirmed that most are well below aquatic thresholds for survival.</li> <li>❑ A few historical exceedances are likely due to analytical problems early in the program.</li> </ul>

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			<ul style="list-style-type: none"> <li>For cadmium and silver, the laboratory detection limits need to be improved, as the non-detect (MDL) levels are close to or higher than the aquatic benchmarks.</li> </ul>
<b>Dissolved Oxygen (DO)</b>	<ul style="list-style-type: none"> <li>Oxygen is essential for all aquatic organisms.</li> <li>It enters surface water from the air and is transferred down to lower depth waters via spring and fall water turnover.</li> <li>Levels in the bottom waters deplete during the summer and can become anoxic and impact aquatic survival and also release P from sediments.</li> </ul>	<p>Kahshe &amp; Bass</p> 	<ul style="list-style-type: none"> <li>The PWQO for DO in warm water lakes is 5 mg/L.</li> <li>The DO levels in mid and lower layers of water in both lakes often drop below the desirable PWQO benchmark.</li> <li>However, neither Kahshe nor Bass Lake is considered anoxic, and the lower DO levels are limited to late summer and fall and are unlikely to impact aquatic organisms.</li> </ul>
<b>Benthic Monitoring</b>	<ul style="list-style-type: none"> <li>The study of benthic organisms living in the bottom sediment is undertaken as an early warning activity for water quality impairment.</li> <li>The population of benthic organisms can detect very subtle changes due to alteration in species richness and in the survival or decline of groups of species that respond differently to impaired water quality.</li> </ul>		<ul style="list-style-type: none"> <li>Not evaluated in 2019.</li> </ul>
 Green = Normal and Not a Concern  Amber = Flagged for continued monitoring and caution as margin of safety is low			

In conclusion, based on the foregoing summary of the environmental monitoring of Kahshe and Bass Lakes, no major environmental water quality issues have been identified. However, given the documented occurrence of harmful blue-green algae blooms at several lakes in the Muskoka area in 2018 and 2019 and the finding that half of these lakes had nutrient (phosphorus) levels similar to or even lower than those in Kahshe and Bass Lakes, continued vigilance in terms of nutrient loading is

imperative as we face the reality of warmer water associated with a changing climate. Each of us can do our part by:

- managing our septic systems properly and having tanks pumped out and inspected regularly;
- avoiding the use of any chemical fertilizers or pesticides for lawns, flowers or cultivated vegetation in areas close to the shore;
- minimizing near-shore removal or management of native species and ensuring that any shoreline disturbance does not result in soil runoff to the lake; and,
- avoiding the use of any cleaners containing phosphorus/phosphates at the cottage and in particular on boats or docks near the water.

While not related to water quality *per se*, desirable lake stewardship also involves:

- taking precautions if moving boats to or from other lakes to avoid introducing invasive aquatic species; and,
- avoiding the planting or re-location of non-native invasive plant species to your lake property.



Ron Pearson

Kahshe Lake Steward

