

## 2018 Executive Summary

### Kahshe and Bass Lake Steward Report

In accordance with the goals and objectives for the Kahshe Lake Steward, 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 2018. These documents as well as Executive Summaries are posted on the KLRA web-site. <https://www.kahshelake.ca/ne/ls>

This report summarizes the findings from sampling and analysis of both Kahshe and Bass Lakes in 2018. 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 sampling and measurement and the MOEC analyzes the samples and coordinates the data reporting.

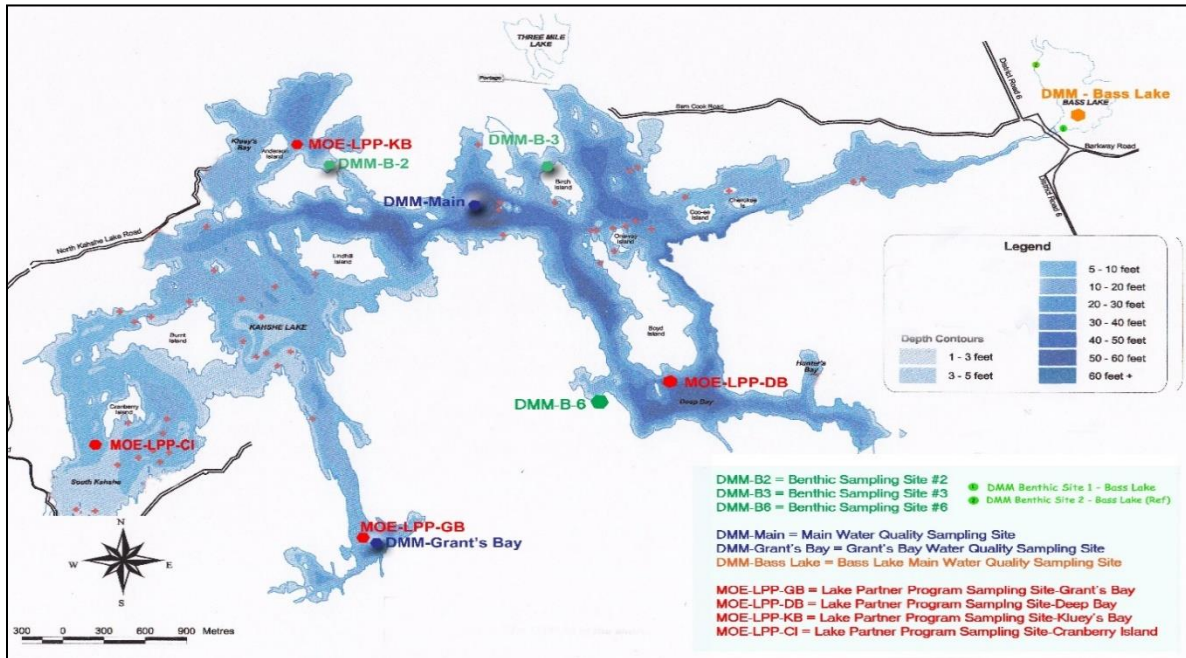
As in 2017, this report has been structured to address the following issues/areas of potential concern for both lakes. However, this year's report has been re-organized to focus more on factors associated with the development of harmful algal blooms.

- Nutrients, Water Clarity, Temperature and Algal Growth
- Calcium Depletion
- Lake Acidification
- Metals and Other Chemicals
- Dissolved Oxygen
- Benthic Health

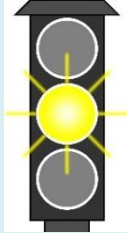
Before any discussion of the above six main areas of interest, it's also important to understand how climatic factors in 2018 compared with other years, as it is now well documented that we live in a time of changing climate conditions.

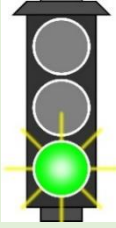
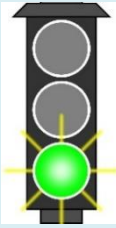
The information on weather and water/ice conditions confirmed that 2018 was significantly warmer and dryer during the summer months, with high water levels in the early spring and lower levels towards the end of summer. However, in contrast to the 125 year trend of earlier ice-out dates for the larger Muskoka Lakes, ice-out on records for these lakes in 2018 was much later than normal. In fact, the May 4<sup>th</sup> date was tied with 1956 as the second latest ice-out date since 1886. The ice-out date for Kahshe Lake (April 28) also was late compared to other years and in line with the reported ice-out date for the larger Muskoka lakes.

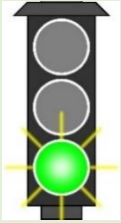
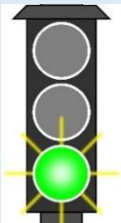
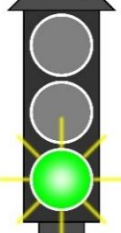
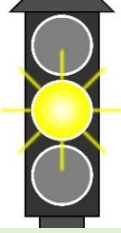
The map below shows the locations of all sampling sites for both DMM and MOECP (abbreviated to MOE) sampling programs, while the summary table that follows provides brief information on each of the six issues.





### Summary of 2018 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>2018 results for Kahshe Lake show total P levels below Threshold and Background.</li> <li>In Bass Lake, the 2018 sampling results also were well below the existing Threshold level and marginally below the Background level.</li> <li>No upward or downward trend over almost 40 years has been detected.</li> <li>In the case of nitrogen, the levels are in a normal range and no trend has been detected.</li> <li>However, because of a late season algal bloom that was reported in Kahshe Lake in 2017, and the confirmed presence of a blue-green algal outbreak in nearby Leonard Lake and five other Muskoka water bodies in 2018 continued monitoring is essential.</li> <li>This is of even greater concern given the fact that the nutrient</li> </ul>

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			<p>levels in Bass and to a lesser extent in Kahshe, are <u>higher</u> than in the algae impacted neighbouring lakes.</p> <ul style="list-style-type: none"> <li>❑ Given the warmer than normal air and water temperature in 2018, climate change is now a factor that will require even greater effort to keep nutrient loading as low as possible.</li> </ul>
<b>Calcium Depletion</b>	<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 (good), but the margin of safety is small, so we need to keep monitoring.</li> </ul>
<b>Lake Acidification (pH)</b>	<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>

Issue	Why It's Important	Level of Concern*	Comments
<b>All Other Chemicals</b>	<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 have been compared to chronic toxicity benchmarks from Ontario, Canada and the U.S. EPA.</li> <li>❑ Sampling of Bass Lake in 2018 confirmed that most are well below aquatic benchmarks.</li> <li>❑ A few historical exceedances are likely due to analytical problems early in the program.</li> <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>	 <p>Kahshe</p>  <p>Bass</p>	<ul style="list-style-type: none"> <li>❑ There are 3 locations on Kahshe Lake, but they have not been monitored since 2015.</li> <li>❑ The DMM considers all 3 to be Reference Locations, and adds the findings to a database of Reference Levels across Muskoka.</li> <li>❑ DMM has conducted benthic assessment at one Reference Site and one Potentially Impacted site on Bass L as part of the Transitional Lake study in 2016, 2017 and 2018.</li> <li>❑ While there is some indication of potential impacts at one of the sampling locations compared to Muskoka Reference levels, there is insufficient data and significant</li> </ul>

Issue	Why It's Important	Level of Concern*	Comments
			variability to determine if any negative trend is taking place. <input type="checkbox"/> DMM plans to continue the benthic program in 2019.
<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <div>Green = Normal and Not a Concern</div> </div> <div style="margin-top: 10px;"> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <div>Amber = Flagged for continued monitoring and caution as margin of safety is low</div> </div> </div>			

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 the finding that their nutrient (phosphorus) levels were 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.