

# Big Hawk Lake Benthic Macroinvertebrate Assessment (2023)

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## Purpose

The purpose of this project is to research, analyze, and interpret benthic macroinvertebrate data gathered at Big Hawk Lake, in addition to water chemistry and aquatic vegetation, to assess and understand the water quality of the lake. The results of the water quality analyses and benthic indices aided in developing recommendations which will be provided to the Halls and Hawks Lakes Property Owners Association (HHLPOA). Recommendations will include efforts that can be made to maintain and improve the health of the lake, aligning with the HHLPOA's long-term goal of keeping their lakes healthy and sustainable. In reference to the HHLPOA vision statement, an evaluation of the concerns at Big Hawk Lake will be executed and considered through benthic water quality indices and measures of water chemistry. This summary report will include the study methods, our findings, results, and recommendations for maintaining the water quality at Big Hawk Lake based on its current status.

## Methods

To obtain data from Big Hawk Lake, four sites were selected to be sampled for benthic macroinvertebrates on September 16, 2023. These sites were coded BHWK-01, BHWK-03, BHWK-04, and BHWK-05 (Figure 1).

Ontario Benthic Biomonitoring Network Sampling Sites on Big Hawk Lake, Haliburton County, Ontario (2023)



Figure 1: Map of the location of the sites sampled at Big Hawk Lake, Haliburton County, Ontario

At each site, the OBBN kick-and-sweep method was conducted at 1m depth and/or 10m from the shoreline. Each site had two sample replicates, where they were collected in jars, sieved, labelled, and preserved with 70% ethanol. According to OBBN protocols, the collected invertebrates were identified using a microscope by their taxonomic order within the 27 groups until 100 individuals were recorded from each replicate, or until the sample was completed sorted. Other data obtained from the site including water chemistry such as pH, conductivity, and temperature, as well as observations of vegetation, riparian zones, and dominant substrate type.

## Results and Trends

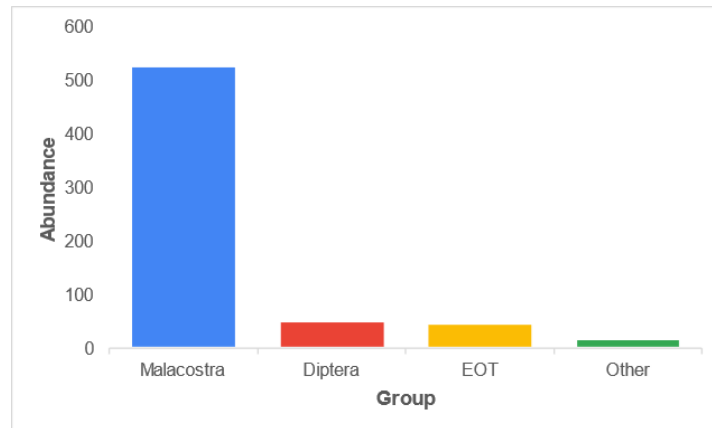


Figure 2: Benthic macroinvertebrate taxa and abundances ( $n = 646$ ) from Big Hawk Lake, Haliburton County, using combined data from sites BHWK-01, BHWK-03, and BHWK-05. Samples were taken on September 16<sup>th</sup>, 2023.

A total of 646 benthic macroinvertebrate specimens were sampled at Big Hawk Lake in 2023, with Amphipoda (scuds) and Isopoda (sowbugs) representing 82% of these specimens. Representatives from 22 out of 27 OBBN groups were sampled, and midges, dragonflies, scuds, and sowbugs were present at all three sampling sites. Some OBBN groups were only sampled at certain sites, including water mites, beetles, craneflies, and unspecified true flies at BHWK-01, biting midges/no-see-ums at BHWK-03, and clams, alderflies, dobsonflies, and fishflies, mosquitoes, and blackflies at BHWK-05. Water chemistry was measured at BHWK-01 and BHWK-05, and parameters including temperature, pH, dissolved oxygen, and conductivity were consistent across the two sites and fall within normal ranges for an Ontario lake.

Based on water chemistry, Big Hawk Lake appears to be in a good state, though a temperature increase of 1.5°C at BHWK-05 compared to its 2020 measurement should be monitored in future sampling years to determine its significance. Annual changes in vegetation were observed at all sites, but it is unclear if these resulted from natural processes or external pressures. Since 2020, algae levels have increased at all sites. This should also be examined in future years, as too much algae at a site can negatively affect aquatic plants and animals or indicate changes to the water quality.

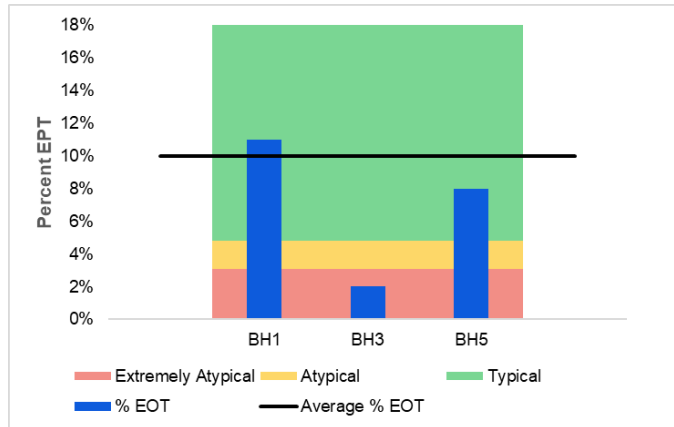


Figure 8: The average % EOT found at each sample site against a color gradient of typical (green), atypical (yellow), and extremely atypical (red) % EOT ranges for the region, as well as the average regional % EOT (black).

Five indices were calculated to relate the occurrence of benthic macroinvertebrates to water quality. The average Modified Hilsenhoff Family Biotic Index was calculated to be 5.96. This value is in the middle range of the scale (0-10) and is indicative of a macroinvertebrate community with a general tolerance of fair water quality, as well as fairly significant organic pollution in the lake overall. The Simpson's diversity index was calculated as 0.66, which is slightly above average diversity, indicating good to fair water quality across the sites. The %EOT average for the sites was calculated to be 7%, which is 3% below the 10% Haliburton average. Hills  $N_0$  was found to be 20, meaning that an average of 20 benthic groups were found. Lastly, the %Amphipoda:%insects average was 2.54, which indicates that for every insect that was sampled 2.54 Amphipoda were sampled.

## Conclusion

Overall, the five benthic indices revealed that the lake is in good health, most ranges of the indices were average. Given that BHWK-03 has seen a steady decline in %EOT every year this site specifically should be monitored for potential pollution sources or disturbance if this decline continues. In future years better planning and more samples would be greatly beneficial to both the results and recommendations. Continued annual data collection will allow for the observation of any changes to the state of the lake and allow for future statistical analysis and trends to be observed. In addition, chemical monitoring should continue at sites. Regular chemistry data collected by property owners and the HHLPOA would be invaluable to the monitoring project. The community is encouraged to continue to stay involved and informed with the HHLPOA to make the best land use decisions possible to maintain the health of Big Hawk Lake for future generations.

## Recommendations

Based on the 2023 data collected and compared to the previous three years at Big Hawk Lake, there have been no major changes in the results over time. We recommend improving knowledge on the health of the lake by taking samples annually at these sites to gain long-term data. This will allow for the observation of any changes to the state of the lake and the determination of trends over time. A second recommendation is to take preventative measures that will reduce the chances of invasive species entering the lake system. This can include draining boat live walls, removing any living organisms

from the bottom of the boat, never dumping bait and using only local bait, and properly sanitizing the boat in between uses in different lakes, and these measures can all be consciously conducted by homeowners/cottage owners on Big Hawk Lake. This will ensure that all local species remain local and keep their place in the ecosystem without disruption from invasive species. Another important measure to ensure the proper monitoring of the lake's health is the regular testing of the water quality and chemistry, as well as conducting benthic sampling, in areas that may experience construction. These measures will provide data on the impact of any human activities, such as development and pollution, and can assess if bacterial levels, water acidification, and overall water quality are being impacted by typical human activities that may increase in volume over time. Lastly, a good recommendation to homeowners is to stay involved in any studies that are conducted on the lake and contribute to citizen science on Big Hawk Lake.

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