

WATER CHEMISTRY AND SEDIMENT COMPOSITION IN MCGINNIS LAKE, SOUTHERN ONTARIO: IMPLICATIONS FOR MARL DEPOSITION

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Stable isotopes and physiochemical parameters were determined for water and sediment samples from McGinnis Lake (5.7 ha) to investigate lake productivity and formation of carbonate sediment. Marl currently forms prograding benches along the margins of this shallow lake. Water profiles from 12 localities within the lake basin illustrate important depth-related changes in pH, TDS, temperature, conductivity and dissolved oxygen content. Summer temperatures drop sharply from 22°C at the surface to 12°C near the bottom, with corresponding changes in pH from 8.4 to 3.2. Dissolved oxygen content of the water column increases sharply between 4 and 5 m, then decreases to almost 0 in the center of the western basin (12 m). TDS and conductivity show opposite trends to the temperature, pH and dissolved oxygen. These results suggest that McGinnis Lake may be partly meromictic or rarely oligomictic. Oxygen isotope profiles from water samples show trends consistent with the oxygen isotopic values of surface and ground waters in the area. In contrast, $\delta^{13}\text{C}_{\text{DIC}}$ values show sharp fluctuations with depth in the range of -4 to -14 ‰ (PDB), reflecting variations in productivity of carbon and changes in dissolved oxygen content. Carbonates collected from shallow cores show consistent $\delta^{18}\text{O}$ values (-9 ‰ PDB) but increase in $\delta^{13}\text{C}$ values from -8‰ at 5 cm depth to -2 ‰ at 80 cm depth. These variations reflect decreasing paleoproductivity of the lake over time as the climate became drier and nutrients less available.