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A Paleoenvironmental Study Tracking Eutrophication, Mining Pollution, and Climate Change in Niven Lake, the First Sewage Lagoon of Yellowknife (Northwest Territories)

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APPENDIX 1: SEDIMENT CHRONOLOGY

The Niven Lake sediment core was dated using the radioactivities of ^{210}Pb, as well as ^{214}Bi and ^{214}Pb (averaged to give supported ^{210}Pb activity), and the circa-1963 peak in ^{137}Cs was used as an independent dating marker (Fig. S1). Total ^{210}Pb activity was low as is common for sediments from northern regions (Wolfe et al., 2004); however, good exponential decay was observed over the core, and the Constant Rate of Supply (CRS) model (Appleby, 2001) was applied to determine the core chronology (Fig. S1). The peak in ^{137}Cs activity was difficult to determine, as is common in highly organic sediments (Blais et al., 1995). However, the modeled ^{137}Cs dates had good agreement with CRS ^{210}Pb-derived dates, giving a date of 1979 ± 12 years for 6.25 cm, corresponding to a CRS-date of 1971 ± 9 years. The CRS-derived sedimentation rate sharply increased from 8.25 to 6.25 cm (1939 to 1971) and then stayed approximately stable for the upper 6.25 cm of the core (Fig. S1). The increase in sedimentation rate had good agreement (within error) with the period of known sewage inputs to Niven (1948 to 1981). Therefore, our chronology places the sediment intervals that represent the duration of Niven Lake's use as a sewage lagoon from approximately 7.5 cm (~1950) to 5 cm (1981).

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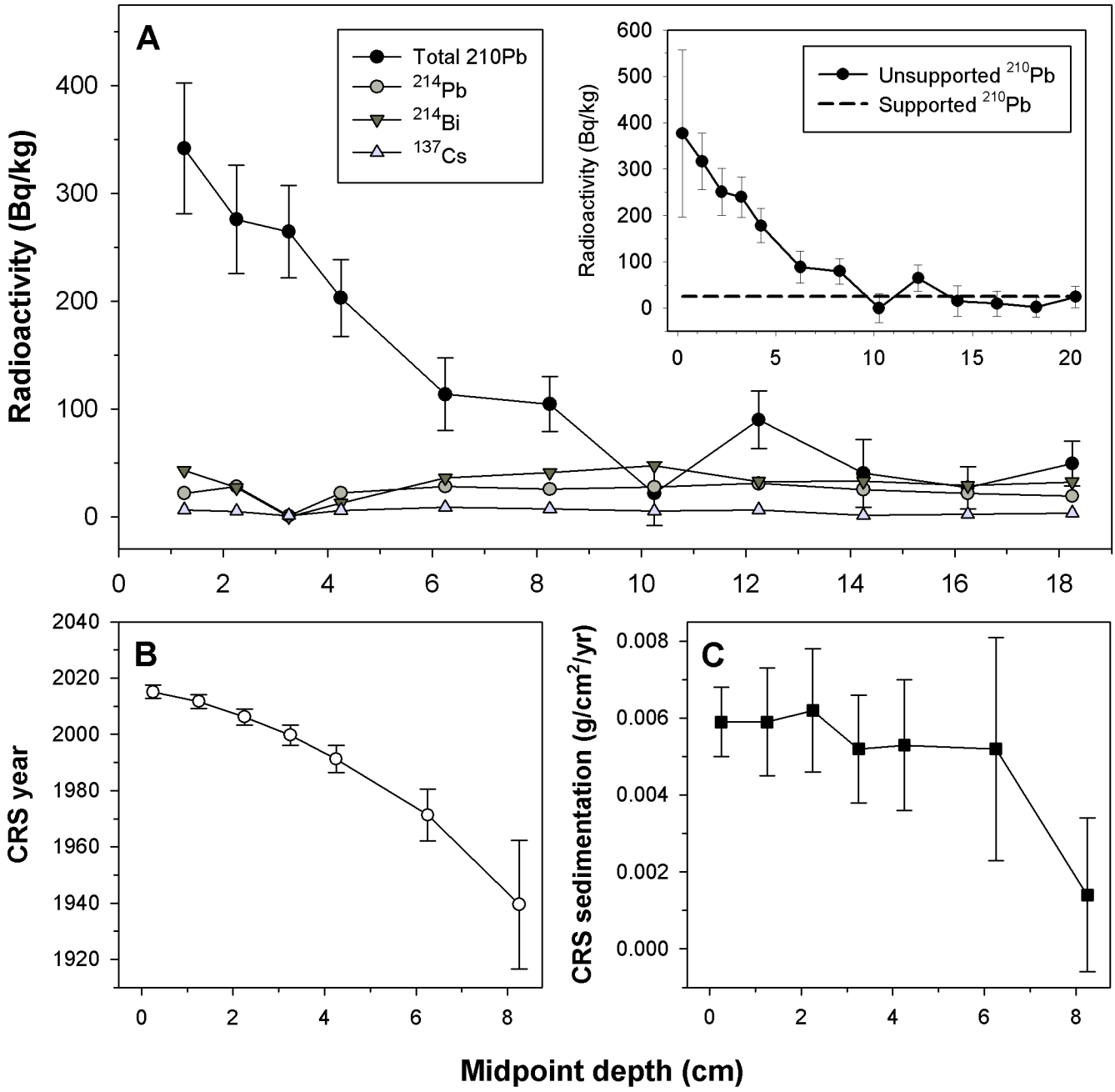

FIG. S1. ^{210}Pb gamma spectrometry dating was used to develop a chronology for the Niven Lake (Northwest Territories) sediment core. A) The radioactivity in becquerels per kilogram (Bq/kg) for total ^{210}Pb (with error), ^{214}Pb, ^{214}Bi, and ^{137}Cs, with an inset showing the radioactivity of unsupported ^{210}Pb and supported ^{210}Pb (estimated using an average of ^{214}Pb and ^{214}Bi). B) The chronology (years AD) and associated error derived using the CRS model. C) The CRS-derived sedimentation rate (g/cm^2/year). All x-axes are plotted as the midpoint of the 0.5 cm interval used for analysis.