The effects of large-scale artificial lake level fluctuations on sediment redistribution, Aylesford Lake, Nova Scotia.

D. Matthew MacLeod and Ian S. Spooner
Department of Geology, Acadia University, Wolfville, Nova Scotia B0P 1X0, Canada

Lake level fluctuations were found to have a significant effect on lacustrine sedimentation in Aylesford Lake, Kings County, Nova Scotia. Aylesford Lake has been subject to yearly hydroelectric draw-down of approximately 4 m since the 1940s. Hardwood Lake, also located in Kings County, was chosen as a control lake for the study, as its morphology approximates that of Aylesford Lake and its waters are not artificially drawn-down. Both lakes can be classified as polymictic and remain wind mixed throughout the summer months.

Initial sonar profiling showed that the transition from littoral to profundal sediment varies from 7 m below the highwater mark at Aylesford Lake to 3.5 m at Hardwood Lake and can not be attributed to variations in the storm wave base (< 3 m) between the two lakes. The profundal sediments in each lake were cored using a Glew gravity corer. Similarities between loss on ignition, grain size and bulk density values from the sediment cores collected suggest that the same processes are influencing profundal sedimentation in basin deeps in each lake. However, analyses of cores collected in the profundal-littoral transition zone at each lake indicate that the processes controlling transition zone sedimentation vary. The transition zone at Aylesford Lake is characterised by a coarse clastic horizon (3 cm thick, max. 0.7 g/cm^3 wt. sand) not observed in Hardwood Lake cores. This horizon has gradational boundaries and the overlying gyttja (8 cm) is also characterised by increased clastic content. The clastic horizon was most likely the result of basinward transfer of littoral zone sediment by wave and/or ice-influenced processes. These data indicate that profundal sedimentation can be strongly influenced by the lake level fluctuations.

A laboratory study of the interaction between free-falling fine gravel-sized clastic sediment and organic gyttja indicated that introduced clastic sediment can settle through the gyttja. These experiments indicated that clastic layers have the potential to be significantly younger than the bounding gyttja, an important observation in the interpretation of the age of clastic horizons in lacustrine sediments.