Johnston, J.W., Koster, D., Wolfe, B.B., Hall, R.I., Edwards, T.W.D., Endres, A.L. & MBD Team, 2005, **Bustard Island Barrier Beach Complex - Insight into Lake Athabasca's water-level history**, *Canadian Geophysical Union - Hydrology Section Conference*, Dec. 9-10, Wilfrid Laurier University, Waterloo, Ontario.

The world's largest inland freshwater delta, located at the termini of the Peace and Athabasca rivers is an invaluable regional, national, and international resource. It was declared a national park in 1922, wetland of international importance under the Ramsar Convention in 1982 and included as a United Nations World Heritage Site in 1983. Managing water resources within this area to maintain its ecological integrity has been a challenge with changing climate, anthropogenic influence and a paucity of long-term data sets. One of the keys to understand water levels in the PAD is Lake Athabasca, as this large lake exerts important effects on the local base level for the PAD. A paleolimological study of a small inland lake (PAD 9) about 15 km northwest of Fort Chipewyan suggests that Lake Athabasca advanced westward into an embayment flooding PAD 9 during the Little Ice Age (LIA, ~AD 1600-1900). Archival maps back to 1827 corroborate the transition from open- to closed-drainage conditions for PAD 9 in response to declining Lake Athabasca water levels. Supporting evidence within Lake Athabasca for a high stand in lake level during the LIA and even longer-term perspectives are being investigated on Bustard Island, in the western end of Lake Athabasca. At least 5,000 years of water-level variations have been recorded in different parts of a beach barrier complex on Bustard Island. Ecological and sedimentological responses to changes in hydrology and climate are being studied in the modern system to help interpret the ancient deposits. Topographic variations and surface samples are being used to interpret the modern system, while cores, a soil pit, and ground penetrating radar data are being used to interpret ancient sediments. Diatom assemblages and textural analyses in lagoonal and washover deposits are the current focus for determining changes in Lake Athabasca water levels. Here we present preliminary findings providing evidence of a dynamic hydrological regime for Lake Athabasca in the past.