The use of continental saline lake microbialites as indicators of Holocene environmental change

Author: Last, Fawn M; Last, William M; Halden, Norman M; Anonymous.

Abstract: Microbialites that occur in terrestrial settings can be an excellent archive of past environmental conditions and have provided a source of proxy data in many ancient lacustrine systems. However, these organo-sedimentary structures have been used much less frequently in Quaternary sequences due mainly to their paucity in extant lakes. We are examining the genesis, morphology, mineralogy, geochemistry, and postdepositional alteration of laminated and massive carbonate microbialites in selected saline lakes of North America and Australia. The lakes have been selected to represent a spectrum of hydrologic, climatic and limnological characteristics under which microbialites form. The structures in these lakes show variations in internal and external morphology, as well as mineralogy. Manito Lake, a large hypersaline lake located in the Great Plains of Canada, contains microbialites of varying composition and morphology. Isotopic and mineralogical analyses of these structures reveal a complex history of hydrologic and environmental change over the past 2k yr. Because of its hydrologic setting in the arid Great Basin of the United States and as one of only four extant remnants of pluvial Lake Lahonton, Walker Lake has been the focus of much paleolimnological research. Laminated tufas have been known from its exposed basin margin areas for some time. The late Holocene microbialites are less complex than Manito in terms of morphology and mineralogy, and their composition shows surprisingly little variation despite a complex history of lake level changes recorded from the offshore record in the basin. Lake Bullen Merri is the deepest lake in Australia and occupies a closed basin that is fed by meteoric water and groundwater. Shoreline and paleoshoreline microbialite morphologies range from beachrocks to thrombolitic and leiolitic branching cauliflower forms and small tubular tufas. Similar to those of Walker, the Bullen Merri structures show little variation in mineralogy, but their location in the steeply sloping basin indicates complex lake level fluctuations during the past 2k yrs. These examples demonstrate that microanalyses and chronological investigation of Holocene microbialites can provide a remarkably detailed snapshot of past environmental and hydrologic conditions in terrestrial settings.