Antelope Lake, Saskatchewan; a multidisciplinary archive of late Holocene hydrologic and environmental change in the Northern Great Plains of Western Canada

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**Abstract:** The large number of closed-basin saline lakes in the northern Great Plains of western Canada offers an exceptional opportunity to study regional paleoenvironmental change. Over the past decade there have been significant advances in our understanding of the Holocene history of this region. Despite this increased interest, however, paleolimnological research in the Canadian Plains still lags behind other areas of North America due largely to a paucity of well-dated, uninterrupted Holocene sequences and the high salinity and alkalinity of many of the most attractive lakes, which limits the routine application of most biological proxies such as siliceous microfossils and ostracodes. Antelope Lake is a relatively large, perennial, Na-SO\(_4\) saline lake occupying a topographically closed basin in southwestern Saskatchewan. High lake levels during the 1950's-1970's allowed Antelope to develop into a popular recreation area. However, a steady decline in lake levels beginning in the mid-1970's has resulted in deteriorating water quality and significant ecosystem modification. Today, the lake is about 50% of its mid-20th century volume and area; salinity has increased from less than 10 ppt to about 40 ppt TDS. The simple basin morphology and straightforward hydrologic budget suggests that the lacustrine sequence of Antelope holds considerable promise for interpreting past lake level variations. In addition, its close proximity to the Great Sand Hills, the most arid part of the northern Great Plains, makes Antelope a key site in linking prairie landscape processes with climate change. We used mineralogy, sediment geochemistry, texture, sedimentary structures, stable isotope geochemistry, and organic matter geochemistry to examine 4000 years of environmental and hydrologic changes in Antelope Lake cores. These data emphasize the complex interrelationships that exist between water level, salinity, endogenic mineral saturation and precipitation, biological productivity, and watershed erosion.