The ups and downs of lake levels in the Northern Great Plains of Western Canada

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Abstract: The northern Great Plains region of Western Canada contains literally millions of lakes and wetlands, which serve a critical role in waterfowl and wildlife habitat, recreation, and an array of economic pursuits. The vast majority of these lakes occupy small closed basins that respond dramatically to changes in climate, groundwater, and drainage basin and landscape modifications. Receding lake levels are a problem, no doubt made more noticeable by the fact that the lakes in this dry region of Canada are heavily used for recreation, agriculture, and industry. Although few historical records extend back more than just a few decades, it is clear that the general trend within the Canadian Great Plains over the past approximately 40 years is toward lower lake levels. These declining lake levels present a multitude of associated socio-economic concerns due to increased salinity and changes in biogeochemical processes dominant in the basins. Although declining levels are noteworthy, it is also evident the entire Great Plains region cannot be characterized by diminishing lake levels. Since the 1990's, many lakes located in broad areas of the northern Great Plains have experienced exceptionally high stands. When high lake levels occur in closed basins the immediate and short term repercussions can be just as devastating to the local communities and economy as low water levels (e.g., significant property damage, road closures, demolition of homes and other structures, loss of agricultural land, controversial large-scale dike and water diversion projects, etc.). Unfortunately, little is known about the long-term natural hydrologic fluctuations in most of these lakes. Lake level changes are often attributed to changes in climate, although anthropogenic causes can be just as significant. Examining the stratigraphic changes preserved in the sediment records of lakes at historic low and extreme high levels in the same region provides the opportunity to better understand the natural hydrologic variability and to decipher climatic versus anthropogenic effects on lacustrine hydrology.