

Channel Incision of Proglacial Mendenhall River and Implications to Mendenhall Valley Hydrology

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Channel incision in the recently formed proglacial Mendenhall River channel in southeast Alaska has been linked to water-table decline in the adjacent outwash aquifer. Channel incision of the Mendenhall River was measured through comparison of channel geometry surveys conducted in 1969 and 1998. Cross-section comparisons indicate channel incision over this 29-year period ranged from 0.4 to 1.5 m and averaged about 1 m over a 5.3 km reach. Channel incision in the Mendenhall River is believed to be the result of a combination of factors resulting from localized and region-wide glacial retreat. Recession of the Mendenhall Glacier has enlarged Mendenhall Lake reducing the supply of coarse sediment to the Mendenhall River. Rates of isostatic rebound in this region of southeast Alaska are among the highest in the world and may be a contributing factor to channel incision as it results in a gradual lowering of base level for both surface-water and ground-water discharge.

A declining trend in water-table elevations of about 0.6 m from 1984 to 2001 is identified in a recording well located within 250 m of the incising stream channel. Ground-water levels in three additional recording wells respond in phase to changes in river stage at distances of at least 800 m from the incising channel indicating declining water-table elevations may be a response to river channel incision. The results of this study may have important implications for the streamflow of Duck Creek, which flows in a parallel course ranging from about 500 to 1000 m to the east of the Mendenhall River. Flows in Duck Creek are sustained primarily by ground-water discharge. The trend in declining water-table elevation is consistent with accounts of an increasing frequency of channel dewatering events in Duck Creek. Numerous habitat restoration projects over the last two decades have failed to halt the decline of anadromous fishes in Duck Creek. While it was previously assumed that reduced streamflow in Duck Creek had been induced by a variety of development activities, these results indicate channel incision may be reducing the valley water-table elevations and reducing ground-water contributions to Duck Creek.

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