

## **Hydrologic interactions between an alluvial fan and a slope wetland in the central Rocky Mountains**

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**Abstract.** Slope wetlands generally occur at breaks in slope where discharging groundwater maintains moist soil conditions. Slope wetlands often are found on the perimeter of highly permeable alluvial fans, where they may receive both surface water and groundwater inflows. However, there have been no detailed studies on the hydrology of these wetlands, or their potential sensitivity to upstream surface water diversions. We used the rapid changes in streamflow caused by an upstream water diversion to investigate the hydrology of a 1.6 ha slope wetland located at the base of a 5.2 ha alluvial fan in the central Rocky Mountains of Colorado. Seepage losses of up to  $0.14 \text{ L s}^{-1} \text{ m}^{-1}$  were observed along a 90 m stream reach on the alluvial fan, and seepage losses were highly correlated with streamflow ( $r^2 = 0.78$ ,  $p < 0.0001$ ). Discharge from two springs at the toe of the alluvial fan was eliminated within 1-2 days after the stream began to be diverted, and the piezometric head in the toe of the fan decreased by more than 80 cm; these responses indicate that stream seepage is a primary source of groundwater recharge for the alluvial fan. Because streamflow was the primary source of wetland inflows, wetland water levels declined by up to 75 cm after the diversion began operating. The largest water level declines were in the lower part of the wetland where surface sheet flow was the main water source. Due to the close connection with streamflow, groundwater discharge into the wetland also declined when the diversion was operating, but water level declines in the upper part of the wetland were generally less than 40 cm. The importance of streamflow as a water source indicates that slope wetlands adjacent to alluvial fans are hydrologically distinct from slope wetlands previously described. Their dependence on streamflow makes them particularly vulnerable to upstream water diversions.