

Intrinsic tracer signals of groundwater sources to montane meadows of the Sierra Nevada, CA

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Montane meadows of the Sierra Nevada often serve as the interface between up-gradient forested area and down-gradient stream flow. Water samples were collected from monitoring wells in two montane meadows and associated streams. Samples were analyzed for major ions and stable water isotopes. Groundwater flux was calculated from nested piezometers co-located with the monitoring wells. Near the meadow center, groundwater flux indicates discharge for the duration of the snow free season and relatively high major ion concentrations. At the meadow edge, groundwater flux changes from a discharge to a recharge signal during the growing season and major ion concentrations are more dilute than those observed near the meadow center. Analysis of stream water samples show that when groundwater is discharged throughout the meadow, the stream water more closely resembles that of the meadow edge; as the season progressed and groundwater is no longer discharged at the meadow edge, the stream water is reflective of the groundwater sampled from the center of the meadow. Analysis of stable water isotopes indicates that all samples collected resemble the local snow pack signature. Deviation from the local meteoric water line—due to evaporation—is not observed with exception to a handful of late season samples. We conclude that differences in major ion signatures in groundwater vary from the meadow edge to the meadow center as a result of these areas having separate groundwater sources or flow paths of significantly different lengths.