The Pajaro River, central coastal California, loses 0.2-0.4 m3/s of discharge through streambed seepage along an 11-km reach during the dry half of the water year. This loss could contribute ~20-40% of current sustainable basin yield, 6,000-12,000 ac-ft/year. A similar amount of water leaves the channel of Corralitos Creek, on the other side of the basin, and may also contribute significantly to ground water recharge. Differential gauging and tracer dilution experiments reveal significant storage exchange and dilution fluxes associated with streambed seepage within this strongly-losing reach. A new method for using streambed thermal records to measure seepage rates shows that seepage is highly variable in location and rate. This method is based on an analysis of time series records collected in shallow piezometers installed in the streambed, and offers many advantages in comparison to traditional, forward-modelng approaches. At the same time as the Pajaro River loses discharge, nitrate concentrations decrease along the reach by ~30%; as a result, the Pajaro River loses ~50% of its nitrate along this reach, a removal rate of 200 - 400 kg/day N-NO3. Most nitrate loss occurs where seepage exchange of water occurs. Stable isotopes of nitrate show streambed and downstream enrichment associated with denitrification. When discharge is greater and storage exchange is most vigorous, denitrification is least efficient and isotopic fractionation is greatest. When discharge is lower and storage exchange is more sluggish, denitrification is more efficient, resulting in lower isotopic fractionation. Resource managers can use this information to protect and enhance conditions that allow denitrification, thereby improving water quality.