# Mobilization and reactive transport of selenium in a stream-aquifer system: From field monitoring toward remediation modeling

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**Abstract.** Predicting the fate and transport of redox-sensitive species in groundwater systems requires an accurate characterization of the distribution and concentrations of all related (or interdependent) chemical constituents and the reaction rates at which these constituents interact. Ground and surface water sampling of chemical and physical properties in the stream-aquifer system of Colorado's Arkansas River is providing an emerging picture of the nature and extent of selenium (Se) contamination as well as the strengths of correlations between Se and other constituents. Results from almost six years of field measurements, along with a detailed review of the literature, have led to a conceptual model of a redox-sensitive aquifer system wherein oxidants such as DO and nitrate, driven by extensive recharge from irrigation and canal seepage, mobilize sulfide and selenide species from shale bedrock and shale-derived soils. These species, dependent on the redox environment, are either reduced to immobile forms or transported through the shallow aquifer to surface water bodies. This conceptual model will be further refined through sampling along a transect of multi-level piezometers, thus enabling chemical characterization in the vertical dimension of the aquifer. This sampling, coupled with laboratory analyses of soil samples to quantify reaction kinetics, will allow the calibration of a vertical-profile reactive-transport groundwater model wherein the fate and transport of DO, nitrate, and Se species are modeled. Insights from this modeling exercise will assist in developing a regional-scale, three-dimensional, reactive transport model of the Arkansas River system, providing a tool for exploring best management practices and remediation schemes.