

Assessing and Modeling Irrigation-Induced Selenium in the Stream-Aquifer System of the Lower Arkansas River Valley, Colorado

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Abstract. Water quality data on dissolved selenium (Se) have been collected since April 2003 in a study area of the irrigated lower Arkansas River Valley, Colorado. Data have been obtained from 22 surface water locations and from 59 ground-water monitoring wells using low-flow sampling techniques. GIS mapping and statistical analysis were used to characterize the occurrence, severity, and spatial-temporal distribution of Se in the study area. Results indicate dissolved Se concentrations ranging from about 0 to 3760 $\mu\text{g/L}$ with a median of 16.4 $\mu\text{g/L}$ in the ground water, including three significant hot spots. River concentrations range from 1.62 to 46.20 $\mu\text{g/L}$, often exceeding stream standards for aquatic habitat. Relationships were explored between Se concentrations and more-easily-monitored indicators such as electrical conductivity, sulfate concentration, and nitrate concentration. Statistically significant non-linear relationships exist between Se, sulfate, and nitrate concentration, in which the predictive capability of Se is significant if concentrations of sulfate and nitrate are known. Uranium (U) concentrations also have been found to have a significant relationship with Se. Since high U concentrations have earlier been linked to marine shale and shale-derived soils in the Valley, the significant relationship between U and Se concentrations suggests a similar linkage between Se and the presence of shale formations. This relationship will be explored further with additional sampling events to test its validity. Modeling of the selenium transport process in the unconfined aquifer, as affected by irrigation practices, is currently being conducted. Additional information will be available when the model has been calibrated and running properly.

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