

## **Numerical simulation of surface barriers for shrub-steppe ecoregions**

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**Abstract.** Surface barriers, constructed of earthen materials, are being proposed for the long-term management of vadose-zone buried waste and subsurface contamination for sites within the shrub-steppe ecoregion of North America. Field experiments of a prototype barrier on a shrub-steppe site have been ongoing since 1994, providing water balance data, which includes drainage from the sideslopes. Design and licensing of surface barriers will require a demonstrated understanding of the nonisothermal geohydrologic and coupled ground surface to atmosphere water mass and energy transport processes that control water infiltration to the subsurface. As a prelude to inverse numerical modeling to estimate critical parameters for the prototype barrier, this paper describes and demonstrates a numerical simulator for modeling the prototype barrier for shrub-steppe environments. The numerical simulator comprises a nonisothermal multifluid subsurface flow and transport simulator fully coupled to a modified nonlinear sparsely vegetated (bare substrate to closed canopy) evapotranspiration module that mechanistically predicts evaporation.