A Streamflow and Salinity Modeling System for the Evaluation of Additional Water Resource Projects on the South Platte River

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Abstract. Increased water demand and changing water uses in the South Platte River Basin of northeastern Colorado are spurring the proposal and development of new water diversion, exchange, and reuse projects such as Denver Water's Reuse Project, the City of Aurora's Prairie Waters Project, and the Northern Integrated Supply Project (NISP). These and other projects have the potential for reducing instream flows through increased diversions or reduced return flows. Due to the evapoconcentration of salts contributed upstream, the lower reaches of the South Platte River currently exhibit elevated concentrations of total dissolved solids (TDS) that have the potential for deleterious effects on some crop species. The possible downstream water quality impacts resulting from upstream flow reductions are currently not well understood and the combined impacts from multiple projects are not always considered. To aid in the investigation of potential downstream impacts, a user-friendly water and salt flux modeling system was developed. Based on mass balance concepts, this dynamic modeling system allows for the evaluation of possible changes in streamflow, dissolved solids load, and dissolved solids concentration along the middle and lower portions of the South Platte River resulting from a combination of user-configurable upstream diversion and reuse projects. Details of the model development and operation are presented along with model-predicted impacts of several simulated upstream water project scenarios.

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