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## Quantifying Water Availability in the South Platte River Basin Using SWAT-MODFLOW

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## Quantifying Water Availability in the South Platte River Basin Using SWAT-MODFLOW

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**Abstract:** The South Platte River Basin (SPRB) in northeastern Colorado is experiencing acute water resources competition between sectors of agricultural, municipalities and industry, with this competition increasing annually due to changes in population, land use, and climate patterns. In the semi-arid river basin, which encompasses an area of 72,000 km<sup>2</sup> area, conjunctive use of surface water and groundwater is required, which often leads to groundwater depletion. Competition between urban and agricultural areas intensifies this exploitation as surface water rights are sold to growing municipalities. In this study, the recently developed SWAT-MODFLOW coupled hydrologic model is modified for application to large managed river basins, with a specific application to the entire area of the SPRB. Specific modifications include the linkage of groundwater pumping to irrigation practices, and a change in the code to handle the large number of SWAT hydrologic response units (HRU) required for a large river basin with numerous land uses and soil types. SWAT handles land surface and soil zone processes, whereas MODFLOW handles groundwater flow and all sources and sinks (pumping, injection, bedrock inflow, canal seepage, recharge areas, groundwater/surface water interaction), with recharge and stream stage provided by SWAT. The model is tested against groundwater levels and stream discharge and is used to quantify available groundwater and surface water throughout SPRB for water resource management projects. Trends in groundwater depletion also will be explored.

**Keywords:** Coupled SWAT-MODFLOW; Hydrologic modelling; Large-scale river basin