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# Integrating surface-groundwater systems with economic demands to optimize water management - Application to California's Sacramento Valley

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This paper describes the design and preliminary results of a hydro-economic monthly planning model of a water resource system. The model uses deterministic optimization to suggest efficient water management operations in California's Sacramento Valley. The tool uses a network structure to represent storage and conveyance of surface water and a simplified multi-cell groundwater model to track regional groundwater levels by sub-basin. System operation is driven by minimizing costs due to water scarcity and operating costs. Scarcity costs are estimated from urban and agricultural water demand curves derived from external economic models. Inclusion of pumping costs introduces a non-linearity since extraction is influenced by pumping cost, itself depending on groundwater head which varies with extraction. In an effort to limit model size and hydrologic foresight the optimization model operates using sequential annual runs. Optimal time series of reservoir releases and groundwater pumping are provided and potential lessons for improved integrated management discussed. Model limitations and possible extensions are addressed.