



Science and engineering to support societal water-use planning using computational tools and GIScience data

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Potable and irrigation water provide a cornerstone for society. Groundwater has been tapped worldwide through the advent of modern well hydraulics over the past 50 years to provide a water supply that is reliable through seasonal and episodic droughts. While societies and economies have benefited through short-term groundwater withdrawals, these resources are often over-appropriated and may, in the long-term, prove unable to satisfy modern society's thirst. This presentation discusses integrated approaches aimed at providing scientific support for societal planning and decision making in water resources. Economics serves as a driving factor in crop production and water-use. Computational tools have been developed to quantify the impacts of changes of policy and market on the hydrologic cycle. Near surface fluxes are modeled using crop models and models of phreatophytes; groundwater models have been developed to forecast changes in groundwater stores and aquifer depletion over time. GIScience provides a means to organize data used within these models, and to present results in a visual format that is easily accessible to the stakeholders and planning agencies who are wrestling with water-use decisions. Results are presented for case studies in regions of the High Plains Aquifer in the central U.S. where a high density of data exists. Discussion will focus on what has been learned and the implications for data collection and model application in other semi-arid grasslands of the world.