USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002CO6B

Title: Evaluating Strategies to Mitigate Waterlogging and Salinization in Colorado's Lower Arkansas River Valley, Phase 2

Project Type: Research

Focus Categories: Water Quality, Groundwater, Agriculture

Keywords: Salinity, Saline soils, Drainage, Water quality, Groundwater quality, Groundwater modeling, Surface water modeling, Decisionmaking

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Abstract: If agricultural production is to be sustained, well-designed, economical changes must be made in fields and subregions along the entire Lower Arkansas Valley. Old irrigation habits will have to be altered to become more efficient, aging water-delivery infrastructure will need to be rehabilitated and modernized, subsurface drainage systems must be installed and maintained, new and more salt-tolerant crop varieties will need to be adopted. These site-specific actions, however, cannot be adopted independently. The entire lower valley system is an interlocking web of scale-dependent components, in which local changes ripple upstream and downstream via irrigation-stream-aquifer interactions and water rights issues. Also, basin-scale changes in river operations can either dampen or exacerbate the effects of localized actions. A variety of political and economic issues press for basin-scale changes through conservation, altered operations, and redistribution of water resources in the Valley. For example, in response to a recent court ruling regarding the Kansas-Colorado compact, well pumping in the valley, that also serves to reduce high water table levels, has diminished. Also, cities along Colorado’s front range are looking to acquire water rights historically used for irrigation in the valley to meet increasing

urban demands, and it appears that new federal regulations will alter minimum in-stream flow requirements. Actions taken by farmers at the field scale should be informed by guidelines based upon valley-wide objectives and constraints. Such guidelines must be developed using accurate models calibrated to extensive field data, and with input from farmers and valley agencies. Models must account for interacting processes at the basin (regional)-scale (dimensions on the order of 104-105 m) and subregional-scale (order of 103-104 m) that shape decisions for integrated management of water quantity and water quality. Furthermore, models must be available for evaluation of large-scale planning targets in view of detailed design and management issues that arise at the field scale (order of 102-103 m). Educating and interacting with stakeholders, through use of reliable field observations and proven modeling tools, will be necessary to inspire interest and confidence in tackling difficult problem-solving issues. Specific questions arise: What are the expected outcomes of investing in alternative field-, subregional- and basin-scale measures? How can water be conserved and redistributed in the Lower Arkansas River Basin to meet an array of competing demands at the basin scale while complementing efforts to protect irrigated agriculture from waterlogging and salinity problems at the subregional scale? How are targets developed at these scales translated to actual implementation at the fundamental management unit, the field scale? How can the input of growers and agencies be garnered in developing sound valley-wide solutions that will be effectively implemented?
