Applying knowledge to improve water quality
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Ditch and field seepage effects on floodplain water budgets and river flow

Changing land use and water use patterns in northern New Mexico raise the possibility of reduced irrigation diversions from the Rio Grande into traditional acequia irrigation systems. Quantity and quality of groundwater and river flow may be importantly affected by reductions in irrigation water applications. To identify the effects of acequia system seepage on groundwater and river flow, this study is measuring components of the Rio Grande floodplain water budget and integrating hydrologic fluxes with computer modeling. Over the 9-km length of the Alcalde Acequia, 12-16% of canal flow seeps from the earthen canal. In flood irrigated fields, 25-60% of applied irrigation water percolates below the rooting zone to the shallow (1 to 7 m-deep) water table. After the onset of the irrigation season, the water table rises 1 to 2 m and groundwater flow paths orient towards the river, indicating that seepage becomes shallow groundwater return flow to the river. The ongoing project is using 2- and 3-dimensional modeling of the Alcalde Acequia system and the larger 20 km-long valley to identify the total amount of return flow and its effects on the river hydrograph. Preliminary analyses suggest up to 25% augmentation of late-summer and early-fall river flow from groundwater return flow that originated as irrigation seepage. Water quality analyses show the seepage dilutes nutrients and salts in resident groundwater, improving the quality of return flow to the river. Future remote sensing-based calcualtions will be used to confirm initial estimates that riparian evapotranspiration is much less than seepage contributions to groundwater return flow. Ongoing work will provide an integrated characterization of floodplain hydrology at the large watershed scale and enable system dynamics simulation of altered acequia water deliveries.

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