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# Irrigation System Seepage Effects on River Floodplain Hydrology

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## Abstract Text:

Changing land and water use patterns in northern New Mexico may reduce irrigation diversions from the Rio Grande into acequia irrigation systems. Groundwater and river flow may be affected by reductions in irrigation. To identify the effects of acequia system seepage on groundwater and river flow, this study measures components of the Rio Grande floodplain water budget and integrates 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, 15-62% of applied irrigation water percolates below the rooting zone to the shallow 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 seepage becomes shallow groundwater return flow to the river. The project uses 2- and 3-dimensional modeling of the Alcalde Acequia system and the larger 20 km-long valley to identify amount of return flow and its effects on the river hydrograph. Preliminary analyses suggest on the order of 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. Remote sensing-based estimates of evapotranspiration will be used to refine initial estimates of riparian vegetation evapotranspiration. Ongoing work will provide an integrated characterization of floodplain hydrology at the large watershed scale and enable system dynamics simulation of future reduced acequia water deliveries.

## Impact Statement:

Through studying surface water-groundwater interactions in acequia-irrigated floodplains in north-central New Mexico, we are developing an understanding of the complexity of the hydrological system of the upper Rio Grande Basin that will help stakeholders make informed decisions.

We've looked at ditch-seepage, the hydrology of the shallow groundwater and seepage impact on water quality. Currently we are looking at the integrated floodplain hydrology for sustainable agriculture and healthy ecosystems in river valleys of water-scarce regions. We have found that there are important issues people need to consider before they change how they manage the water in the Rio Grande Basin.