Report for 2000NV2G: A Multi-Level Approach to Modeling Ground- and Surface Water Exchange in Agriculturally-Dominated Settings

- Water Resources Research Institute Reports:
  - Pohll, G., D. McGraw, J. Ralson, B. Bohm, J. Thomas, A. McKay, M. Widmer, T. Minor, G. Lamorey, O. Dahan, R. Carroll, K. Cupp, E. Jacobson, E. McDonald, E. Stevick and J. Huntington, 2001. Evaluation of Groundwater and Solute Transport in the Fernley-Wadsworth Area. Desert Research Institute, Division of Hydrologic Sciences Report. No. 41173.
- Other Publications:
  - Cook, Casey Wynton, 2001, A Discrete State Compartment Model of the Fernley-Wadsworth Groundwater System, University of New Mexico, Master's Thesis.
  - Kish, Suzanne, 2002, A Surface Water Quality Model for Agriculturally Dominated Areas in the Lower Truckee River Basin, University of Florida, Master's Thesis.
  - Peterson, Sarah, 2003, Impact of Agricultural Activities on Ground and Surface Water Quality and Related Instream Biological Communities in the Lower Truckee River Basin, Nevada, University of Nevada, Reno, Master's Thesis.
  - Gheberemicael, Senait, Dec 2002, Sources of and Controls on Arsenic in the Groundwater of Fernley Area, Nevada, unpublished MS thesis, University of New Mexico.

Report Follows:

Statement of Problem and Research Objectives:

Flood irrigation of field crops is believed to be linked to non-point source groundwater solute returns in the lower Truckee River Basin. The objectives of the research are to characterize the source of solutes to the lower Truckee River, and determine the potential benefits in converting land and water use from agriculture to urban and municipal uses. Additional objectives include characterizing the impacts of groundwater nutrient inputs on attached benthic algal communities in the river.

Methodology:

Field studies, including drilling and coring activities, are being integrated with numerical groundwater flow and transport and surface water quality models.

Principal findings and significance (progress report):

To-date, approximately 40 shallow and deep wells have been installed in the study area. These wells are providing valuable information on the nature and distribution of subsurface salts and nutrients in the study area. Additionally, the wells are serving as monitoring wells for hydrologic and geochemical data collection. A computer geologic model of the study area has been completed. The numerical groundwater flow model has been developed; to-date, flow model boundaries and hydraulic parameters have been assigned. The model has been calibrated to transient conditions. Both the transport and mixing cell models are complete as well, and we are currently comparing results through multiple model runs.

Bench-scale experiments addressing periphyton growth under varying groundwater fluxes are complete. The metabolism chambers appear to be working well, have been installed in the field, and experiments are underway. Biomass monitoring has been ongoing for the past year, and results suggest subsurface nutrient inputs at several reaches throughout the lower river basin; i.e., we are seeing biomass increases in areas of no apparent surface nutrient inputs.