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TACKLING THE WATER QUALITY CHALLENGE IN THE NEW MILLENNIUM: USING NEW TECHNOLOGY TO TRACK TECTONIC SALINITY SOURCES TO SURFACE AND GROUND WATER

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ABSTRACT: Quantitative forecasting of the effects of climate change on water quality in arid regions is critically dependent on our understanding of deep groundwater contributions to surface waters. In the arid Southwest, saline surface water and brackish groundwater pose particular problems for water management. The Jemez and Rio Salado watersheds in northern New Mexico are classic examples of arid-region salinization due primarily to tectonic inputs (deep fluids emerging along fault conduits). These hydrologic systems are important both to local constituencies (including a mix of private, tribal and public lands) as well as regional mangers because of their contribution to the middle Rio Grande system, and as recharge components to Sandoval County and the northwestern part of the Albuquerque basin. Under base flow conditions of the Jemez River, deep groundwater inputs utilizing fault pathways result in high salinity and arsenic contents. Climate change scenarios predicting reduced snowpack and changes in runoff timing, linked to a solute loading/discharge model, highlight serious water quality concerns for the Jemez River. Three sets of data are presented to demonstrate how a quantitative loading model for particular solutes of concern (in this case, sulfate and arsenic) can be integrated with climate change scenarios. (1) Traditional ';campaign'; water sampling over the 2006-2011 water years along a 60 km reach of the Jemez river show that in times of low flow, the salinity, sulfate concentration and arsenic concentration all exceed designated use limits. (2) The deployment of continuous sensors for temperature, conductance (salinity), pH, and dissolved oxygen in the Jemez river in 2011 provide information on coupling of discharge, temperature, dissolved oxygen, pH and specific conductance at a much more highly resolved timescale- with implications for aquatic systems. (3) Preliminary results from a 2-km Distributed Temperature Sensor (DTS) deployment in the Rio Salado across the Nacimiento fault indicate a diffuse leakage from the fault system into the shallow alluvial aquifer. Combined, these results indicate the need for a wider application of environmental sensors in hydrologic systems to inform water management decisions, both now and in the face of climate change.

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