Using Natural Tracers to Improve Estimates of Groundwater Recharge Resulting from Snowmelt

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PURPOSE OF THE STUDY

Although snow is recognized as an important contributor to the groundwater in New Mexico's aquifers, our knowledge of what portion of the groundwater in various aquifers originated as snowmelt is not good. Some of the methods currently used to estimate the contribution of snowmelt to groundwater recharge may yield values that are too low. This study will use natural tracers (substances that are naturally present, rather than being added) in snow and groundwater to get improved estimates of the importance of snow in groundwater recharge. Improving estimates of the proportion of groundwater recharge derived from snow will improve estimates of total groundwater recharge. In turn, these improved estimates of groundwater recharge will allow water planners to make better decisions regarding our water resources.

Precipitation collectors at a site outside Los Alamos, New Mexico. The different collector designs allow determination of the isotope signatures of fresh snow and infiltration water derived from snowmelt.

RESULTS

- Based on observations at several sites, the study shows that snowmelt is a significant (often 40 - 60 percent) contributor to groundwater recharge in the Southwest.

- The methodologies described in Earman's dissertation can be applied to other sites in the Southwest to estimate the contribution of snowmelt at those specific locations. One predicted impact of climate change due to increased atmospheric CO_2 is that the proportion of snow in precipitation in the western U.S. will decline over the next 50 years. If these predictions are correct, climate change could have a significant impact on groundwater resources in the Southwest.

BENEFITS

- The mechanisms contributing to stable isotope alteration in snow were investigated, providing a deeper understanding of the process, allowing further research to begin at a higher level of understanding.

Sam Earman completed his doctoral degree in the fall of 2004 at New Mexico Tech. The WRRI Student Water Research Grant provided funding for some of the work described in his dissertation.

- Sam Earman presented his results at the Geological Society of America annual meeting. A manuscript based on this research will be submitted for journal publication. Coverage of the research was presented in the *Socorro El Defensor Chieftan* and the *Magdalena Mountain Mail*.

Snow covers the high portion of a mountain range while the valley floor below is dry, illustrating the potential importance of snow to groundwater recharge.

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