Basin infiltration to fractured bedrock: The Navajo Sandstone of southwestern Utah, USA

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ABSTRACT

As alluvial aquifers in arid climates become increasingly exploited, fractured bedrock is being targeted for water-resources development and artificial recharge. The Navajo Sandstone of the southwestern United States is one such target aquifer. This paper describes studies at Sand Hollow Reservoir in southern Utah, conjunctively managed for both surface-water storage and aquifer recharge. This large and deep surface-water reservoir (6-square-kilometer area and about 30 meters deep) is underlain by fractured sandstone, either exposed or covered by a veneer of soils. A water-budget approach, including surface evaporation rates calculated with the Jensen-Haise Method, was used to determine net recharge. Since the completion of the reservoir in 2002, evaporation rates have ranged from about 0.01 to 1 centimeter per day and recharge rates to the underlying sandstone have varied from about 0.1 to 10 centimeters per day. Dynamic viscosity calculations indicate that as much as 40 percent of this variation in recharge rates is caused by seasonal reservoir water-temperature fluctuations (about 30 degrees Celsius). Based on water-budget and water-quality data, other factors likely controlling infiltration rates include permeability of the surficial soils and fractured sandstone, siltation/biofilm development, and trapped air.