Elevated Nitrate and Phosphorus in Spring Discharge Along the Snake River Canyon and Potential Correlations with Land Use in Southern Gooding and Jerome Counties, Idaho

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The Idaho Department of Environmental Quality (DEQ) has conducted a series of investigations evaluating the water quality of spring discharge from the Eastern Snake River Plain (ESRP) aquifer in the Thousand Springs area of southern Idaho. In southern Gooding and Jerome Counties, discrete spring swarms have water chemistry with increasingly elevated nitrate and phosphorus concentrations with diagnostic nitrogen isotope signatures. Ground water from Crystal Springs and Clear Springs (two spring swarms within the Thousand Springs) and twenty domestic wells were sampled in October 2010. The wells selected to sample were screened within the basalt contact zone that channelizes water to the spring discharge and are located up-gradient along theoretical flow paths of the spring discharge. The ground water and spring samples were analyzed for nitrate and phosphorus. Samples with nitrate concentrations > 5 mg/L were subsequently analyzed for nitrogen isotopes. The purpose of this investigation is to determine if a correlation exists between the observed chemistry of spring discharge, the ground water quality up-gradient, and land-use activities occurring along the canyon rim of the Snake River. Previous studies have shown a hydrogeologic divide between a regional and a local ground water flow system (Baldwin et al. 2005). Recent geochemistry results are consistent with the location of this flow system divide. The springs issuing from the regional flow system exhibit lower median nitrate and phosphorus concentrations with little variation throughout the year. The springs issuing from the local flow system show greater temporal variability (seasonality) and higher median concentrations of phosphorus and nitrate. Domestic wells closer to the canyon rim within the local flow system have higher nitrate and phosphorus concentrations compared to wells hydraulically up-gradient and within the regional flow system. Continuing investigation will potentially lead to determining the relative contributions of nitrate and phosphorus from land use activities within the two flow systems up-gradient of the spring discharge.