Simulation of Septic System Pollutants in Summit County, Colorado, Using Two Watershed Water-Quality Models

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Abstract. Effluent from decentralized wastewater treatment systems travels through the unsaturated soil column and is a potential cause of nutrient and pathogen pollution in drinking water wells. In the Dillon Reservoir Watershed in Summit County, Colorado, there are over one thousand decentralized wastewater treatment systems in use. Field data, including groundwater and surface water samples and flow measurements, are currently being collected monthly in the watershed at three focus areas. The focus areas are subdivisions in the watershed that represent different types of pollutant loadings. The most downstream site is a subdivision located adjacent to the town of Frisco, where nutrient inputs into Dillon Reservoir may also originate from industrial sources. The second subdivision is located outside the town of Breckenridge, where industrial sources of nutrients may be minimal. The third site is located close to the continental divide, where the subdivision is the only likely source of pollutants into the Blue River. With sampling data upstream and downstream of each of these sites, a change in the signature of nitrate, phosphorus, and other chemical parameters can be observed. This information may be used to evaluate and test the performance of mathematical models that are designed to simulate contaminant transport and fate of wastewater pollutants.

The objective of the study is to quantify the influence of septic system pollutants that originate from decentralized wastewater systems on the groundwater and surface water by assessing the performance of two numerical models applied to the watershed. To reach this objective, the Watershed Analysis Risk Management Framework (WARMF) will be compared to the Environmental Protection Agency's model, Better Assessment Science Integrating Point and Nonpoint Sources (BASINS). Both models are capable of simulating watershed water quality and run in a GIS environment. The collected field data, along with information available in public-domain databases, will be used to implement and calibrate the models. The models are evaluated based on the goodness of calibration statistics, the relative ease of obtaining data for model input and model set-up, and the applicability of model results for assessing the impacts of wastewater pollution in the Dillon Reservoir Watershed.

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