The Effect of Variations in Hydrogeologic and Physicochemical Transport Properties on the Model-Predicted Vulnerability of Colorado Groundwater to Pesticides

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Abstract. Groundwater vulnerability to pesticide contamination is a topic of increasing interest and research. Vulnerability assessments aid state officials in constructing a pesticide management plan to optimize crop productivity and minimize contamination by pesticides. Farmers and their cooperative extension agents can also use the assessment to decide best management practices. Determination of vulnerability requires consideration of factors that promote or retard pesticide chemical transport thought the vadose zone to the groundwater table. Such factors include depth to water table, vadose-zone hydraulic conductivity, aquifer hydraulic conductivity, well depths, parent materials, amount of recharge, infiltration capacity, pesticide aqueous solubility, soil organic fraction, organic-carbon partition coefficient, Henry's constant, biochemical-degradation rate, and agronomic factors related land-use and pesticide management. As a preliminary step in development of a vulnerability assessment for Colorado, two existing models are used to evaluate the relative importance of hydrogeologic and pesticide chemical-transport factors on the predicted vulnerability. These models include the LPI model (Meeks and Dean, 1990) and the attenuation factor model (Rao *et al.*1985). Specifically, a model sensitivity study is conducted to determine which vulnerability factors have the greatest impact on the calculated vulnerability for the LPI and AF methods, and to assess the effect that the variability of input parameters (i.e., hydrogeologic data and reported pesticide characteristic data) impart on the model result. Several pesticides that are important to the state of Colorado, and that represent a wide range of pesticide properties, are included in this study. Preliminary results show that the vulnerability prediction is most sensitive to soil organic carbon fraction, biochemical half life, and depth to water table, while physical soil properties and subsurface air-water partitioning have very little impact.