USDA-CSREES 2007 National Water Quality Conference

Water movement in the capillary fringe under simulated septic system drain fields

In a septic system, wastewater applied to the soil in the drain field moves vertically down before reaching an impermeable layer or a water table. If an impermeable or slowly permeable layer exists below the trenches, a zone of saturation forms above this layer before water moving laterally away from the drain field. If a water table exists below the trenches, it is commonly assumed that wastewater percolating through the soil enters the water table before moving laterally with the ground water. Based on this assumption, groundwater samples are commonly collected from various depths below the water table to assess transport of pollutants from septic systems. This may not be the case as the capillary fringe may impede vertical transport of solutes from the trenches through the vadose zone into the ground water. A laboratory column experiment was conducted to evaluate movement of water from a septic system trench through the unsaturated and saturated zones below the drain field. A rectangular column with its front made from a clear polycarbonate sheet, was packed with fine sand. A red dye solution was applied to a gravel packed cut (simulated trench) under different scenarios and the movement of the dye solution through the column was recorded using time lapse photography for several days. Under all scenarios, the red dye solution applied to the simulated trench moved vertically down until reaching the capillary fringe. After entering the capillary fringe, the dye solution moved laterally above the water table until it reached the drainage outlet or was forced vertically down by percolating water applied to the surface as rainfall/irrigation. If the laboratory observations hold true under field conditions, the findings of this study will be important for developing methodologies for monitoring the performance of septic systems.

Author: Aziz Amoozegar
University Affliation: North Carolina State University
Co-Author(s): Chris Niewoehner, David L. Lindbo and Sergio Abit