

Overview of Long-Term Effects of Surface Coal Mining on Ground-Water Levels and Quality in Two Small Watersheds in Eastern Ohio

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Two small watersheds in eastern Ohio that have been surface mined and reclaimed were studied during 1986-1989. The water-level and water-quality data collected were compared with premining (1976, 1976-80) and postmining (1977-83, 1981-84) data collected during previous investigations. Before mining, two aquifers were perched above clay beds underlying two major coal seams. The upper perched aquifers and the upper coal seams were removed during mining and were replaced with graded spoil. This created new perched upper aquifers with different hydraulic and chemical characteristics. The perched aquifers undisturbed by mining (middle aquifers) are beneath the underclays of the upper aquifers. Water levels in the upper aquifers reached hydraulic equilibrium from 2 to 5 years after mining. Water levels in the middle aquifers increased more than 5 feet during mining and reached equilibrium almost immediately thereafter. Statistically significant changes in pH and concentrations of many dissolved constituents occurred in both watersheds because of surface mining. In the upper aquifer of one watershed, for example, the premining medians for pH and concentrations of sulfate and dissolved solids were 7.0, 85 mg/L (milligrams per liter), and 335 mg/L, respectively; postmining medians were 6.7, 825 mg/L, and 1,495 mg/L, respectively. The premining median concentration of iron and manganese was 30 ug/L (micrograms per liter) for each constituent; postmining median concentrations were 31 ug/L and 1,015 ug/L, respectively. The water chemistry in the middle aquifer underwent similar changes. The continued decrease in pH indicated that ground water had not reached geochemical equilibrium in either watershed more than 8 years after mining.

ADDITIONAL KEY WORDS: Jefferson County, Muskingum County, geochemical equilibrium, hydraulic equilibrium, spoil aquifer.