Schulmeyer, P.M., and Schnoebelen, D.J., 1998, Hydrogeology and water quality in the Cedar Rapids area, Iowa, 1992-96: U.S. Geological Survey Water-Resources Investigations Report 97-4261, 77p.

Abstract: The U.S. Geological Survey (USGS) and the city of Cedar Rapids conducted a cooperative study from 1992 to 1996 to assess the hydrogeology and water quality in the Cedar River, Cedar River alluvial aquifer, Devonian aquifer, and Silurian aquifer in a 231-square mile area of Benton and Linn Counties near Cedar Rapids, Iowa. The city of Cedar Rapids withdrew an average of 34 million gallons per day between July 1, 1995, and June 30, 1996, from the Cedar River alluvial aquifer for its drinking-water supply.

The ground-water flow system in the 231-square mile area was simulated using a modular, three-dimensional, finite-difference ground-water flow model (MODFLOW) under steady state conditions. The three-layer ground-water flow model simulates ground-water flow in layer 1 for unconsolidated deposits that include the Cedar River alluvial aquifer; in layer 2 for the Devonian aquifer and buried-channel aquifer; and in layer-3 for the Silurian aquifer. Primary sources of inflow to the ground-water flow system in the model area include infiltration of precipitation (63.5 percent) and leakage from the Cedar River (34.7). Pumpage from municipal, industrial, and private wells accounts for about 48.3 percent of system outflow.

Primary sources of inflow to the Cedar River alluvial aquifer include leakage from the Cedar River (74.2 percent), leakage from adjacent or underlying hydrogeologic units (20.9 percent), and infiltration of precipitation (4.9 percent). Pumpage by municipal water-supply wells from the alluvial aquifer accounts for about 78.0 percent of system outflow.

Simulations of two hypothetical conditions using the steady-state ground-water flow model were conducted to evaluate quantitative changes on sources of water to the Cedar River alluvial aquifer. Results for the scenario representing a period of less-than-average annual precipitation for 1961-90 indicate a 32.0-percent reduction of total ground-water flow and a 5.7-percent increase in river leakage to the Cedar River alluvial aquifer. Results for the scenario representing increased pumping from the Cedar River alluvial aquifer, with pumping increased 68.3 percent from about 41 million gallons per day (for the calibrated model) to about 70 million gallons per day, indicate a 70.9-percent increase in simulated river leakage.

Commonly used herbicides in Iowa such as atrazine (and the metabolite products deethylatrazine and deisopropylatrazine), cyanazine, and metolachlor, when detected in the Cedar River alluvial aquifer, were typically at small concentrations (less than 1.0 microgram per liter). Atrazine concentrations in 26 of the 64 wells sampled were less than the 0.05 microgram per liter minimum reporting level. Most ground-water samples collected from the Devonian and Silurian aquifers had herbicide concentrations less than 0.05 microgram per liter. Nitrite-plus-nitrate nitrogen (nitrate) concentrations in ground-water samples varied from less than the minimum reporting level (0.05 milligram per liter) to 15.0 milligrams per liter. Nitrate was not detected in samples from 18 wells, and nitrate concentrations greater than the Maximum Contaminant Level for nitrate as nitrogen (10 milligrams per liter) were detected in samples from 4 wells.

Several areas in the Cedar River alluvial aquifer with large iron and manganese concentrations could be related to the original depositional environment of the sediment.

In general, large iron and manganese concentrations in ground water are often associated with abundant organic and argillaceous material in sediment near old meander channels and sloughs.