

Squillace, P.J., and Engberg, R.A., 1988, Surface-water quality of the Cedar River basin, Iowa-Minnesota, with emphasis on the occurrence and transport of herbicides, May 1984 through November 1985: U.S. Geological Survey Water Resources Investigation Report 88-4060, 81 p.

Abstract: The surface-water quality in the Cedar River basin was evaluated by analyzing the occurrence, distribution, and transport of common inorganic constituents and selected trace inorganic and organic constituents, with emphasis on herbicides. The surface-water quality of the Cedar River basin was monitored from May 1984 through November 1985. Depth integrated surface-water samples generally were collected monthly at six stations for a considerable range of river discharge. Samples were analyzed for concentrations of common inorganic constituents in the dissolved phase and for concentrations of primary nutrients, trace elements, organic carbon, and herbicides in the dissolved and the dissolved plus suspended phases.

Water in the Cedar River was determined to be a calcium bicarbonate type; suspended-sediment concentrations ranged from 3 to 676 milligrams per liter. Concentrations of dissolved fluoride, dissolved nitrite plus nitrate, dissolved arsenic, dissolved lead, and dissolved mercury were less than those of the U.S. Environmental Protection Agency's drinking-water standards for public water supplies.

Generally, herbicides were detected only in the dissolved phase, which indicates that herbicides are not being absorbed on the suspended sediment. However, the lack of detection of absorbed herbicides also may indicate a need for re-examination of traditionally acceptable methods of treating water samples at the sampling site, separating sediment and water, and extracting organic compounds from sediment. The largest concentrations of several dissolved herbicides were detected after application on agricultural areas in the spring and early summer in both wet and dry periods. However, dissolved atrazine concentrations also increased in the winter during periods of high streamflow resulting from snow melt. The maximum concentration of dissolved herbicides detected at all sampling sites during the study were: alachlor, 21 micrograms per liter; atrazine, 16 micrograms per liter; cyanazine, 8.7 micrograms per liter; metolachlor, 11.0 micrograms per liter; and metribuzin, 3.0 micrograms per liter.

Herbicides can be transported from agricultural areas to the river by overland flow, drainage from agricultural areas conveyed by tile drains, and ground water. Hydrograph separation for 10 locations in the Cedar River basin indicates that the ground-water contribution varies within the basin and probably ranges from 56 to 80 percent of the annual river discharge. The predominance of ground-water contribution, the persistent detection of dissolved atrazine even during base flow, and the variety of dissolved herbicides detected in the river during the dry spring of 1985 indicate that some herbicides are being transported to the river by ground water. Atrazine transported to the Cedar River was estimated to be about 1.4 to 4.0 percent of that applied, depending on the assumed application rate. The large river discharge in June 1984, which was predominantly overland flow, contained 70 percent of the atrazine transported to the river during 194.