

Boyd, R.A., 2000, Herbicides and herbicide degradates in shallow groundwater and the Cedar River near a municipal well field, Cedar Rapids, Iowa: *The Science of the Total Environment* 248, p. 241-253

Abstract: Water samples were collected near a Cedar Rapids, Iowa municipal well field from June 1998 to August 1998 and analyzed for selected triazine and acetanilide herbicides and degradates. The purpose of this study was to evaluate the occurrence of herbicides and herbicide degradates in the well field during a period following springtime application of herbicides to upstream cropland. The well field is in an alluvial aquifer adjacent to the Cedar River. Parent herbicide concentrations generally were greatest in June, and decreased in July and August. Atrazine was most frequently detected and occurred at the greatest concentrations; acetochlor, cyanazine and metolachlor also were detected, but at lesser concentrations than atrazine. Triazine degradate concentrations were relatively small ($<0.05 \mu\text{g/l}$) and generally decreased from June to August. Although the rate of groundwater movement is relatively fast (approx. 1 m per day) in the alluvial aquifer near the Cedar River, deethylatrazine (DEA) to atrazine ratios in groundwater samples collected near the Cedar River indicate that atrazine and DEA probably are gradually transported into the alluvial aquifer from the Cedar River. Deisopropylatrazine (DIA) to DEA ratios in water samples indicate most DIA in the Cedar River and alluvial aquifer is produced by atrazine degradation, although some could be from cyanazine degradation. Acetanilide degradates were detected more frequently and at greater concentrations than their corresponding parent herbicides. Ethanesulfonic-acid (ESA) degradates comprised at least 80% of the total acetanilide-degradate concentrations in samples collected from the Cedar River and alluvial aquifer in June, July and August; oxanilic acid degradates comprised less than 20% of the total concentrations. ESA-Degradate concentrations generally were smallest in June and greater in July and August. Acetanilide degradate concentrations in groundwater adjacent to the Cedar River indicate acetanilide degradates are transported into the alluvial aquifer in a manner similar to that indicated for atrazine and DEA.