

Herbicide Transport Trends in Goodwater Creek Experimental Watershed

R.N. Lerch, E.J. Sadler, K.A. Sudduth, C. Baffaut

Abstract

Hydrologic transport of soil-applied herbicides continues to be of great concern relative to contamination of surface waters in the United States. The objectives of this study were to analyze trends in herbicide concentrations and loads in Goodwater Creek Experimental Watershed (GCEW) from 1992 to 2006, and to conduct a retrospective assessment of the potential aquatic ecosystem impacts caused by atrazine contamination using screening criteria established by the U.S. Environmental Protection Agency (USEPA). Located within the Central Claypan Region of northeastern Missouri, GCEW encompasses 77 km² of predominantly agricultural land uses, with an average of 21 percent of the watershed in corn or sorghum. Flow-weighted runoff and weekly base flow grab samples were collected from 1992 to 2006 near the outlet to GCEW and analyzed for acetochlor, alachlor, atrazine, and metolachlor. Using cumulative frequency diagrams and correlation analyses, the results showed no significant time trends for atrazine concentration, but the other herbicides showed trends based on changes in use. Atrazine had the highest relative loads, with a median of 5.9 percent of applied lost annually. Variation in annual loads was a function of the timing of runoff events relative to herbicide application within the watershed, and the magnitude of runoff events was a much less important factor to transport. Atrazine reached concentrations that may be harmful to aquatic ecosystems in 10 out of 15 years, and concentrations typically exceeded the screening criteria for days to weeks each year. Because the atrazine ecological criteria established under the USEPA interim re-registration eligibility decision were exceeded, atrazine registrants will be required to work with farmers in the watershed to implement practices that reduce atrazine transport.

Lerch and Sadler are soil scientists, Sudduth is an agricultural engineer, and Baffaut is a hydrologist, all with the U.S. Department of Agriculture, Agricultural Research Service, Cropping Systems and Water Quality Research Unit, Columbia, MO. Email: Bob.Lerch@ars.usda.gov; John.Sadler@ars.usda.gov; Ken.Sudduth@ars.usda.gov; Claire.Baffaut@ars.usda.gov.