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CURRENT TOPICS IN AGRICULTURAL HYDROLOGY AND WATER QUALITY: INTRODUCTION[1]

John D. Williams and Dana W. Kolpin[2]
Guest Associate Editors

The Journal of the American Water Resources Association (JAWRA) is pleased to present a select group of papers originally presented in May 2003 in Kansas City, Missouri, at the AWRA Spring Specialty Conference "Agricultural Hydrology and Water Quality." When the organizers first conceived the idea of a specialty conference focused on agricultural hydrology, the intent was to bring together policy makers, specialists, and researchers from around the world who deal with the management of lands dedicated to agricultural production. The conference was a success, with 200 oral papers and posters presented, from 32 states and nine countries.

The papers presented in this special issue capture the broad range of topics in the area of agricultural hydrology and water quality, not unusual for an industry that has evolved and grown exponentially in the last few decades. For example, commercial fertilizers and pesticides have increased production and reduced labor, but they also appear in increasing frequency and concentration in associated water bodies. Industrial scale confined animal feeding operations are replacing animal production on small farms and ranches, concentrating formally nonpoint sources of animal waste and veterinary pharmaceuticals. The papers in this issue of *JAWRA* identify some of these problems and provide some insight into how problems such as these can be addressed.

Dr. Brian Haggard and coauthors representing three U.S. Department of Agriculture-Agricultural Research Service (USDA-ARS) laboratories and the University of Arkansas report results from a rainfall simulation experiment to evaluate management of poultry litters to reduce runoff of nutrients and xenobiotics found in poultry litters. Based on the authors' findings, producers can reduce concentrations of phosphorus and β_{17}-estradiol by treating the pelleted litter with alum. Professor Kathleen Miller, on the research staff of the Montana Bureau of Mines and Geology, reports on the imazamethabenz-methyl (U.S. trade name Assert®) contamination of an aquifer used for drinking water by three public water supplies and more than 400 private wells in Montana. After examining three commonly used irrigation techniques, the author reports that the degree of Assert contamination is controlled by: (1) hydraulic loading rates of each irrigation method, (2) Assert persistence in soil, (3) hydraulic characteristics of the aquifer, and (4) adsorption/desorption of Assert onto clay particles and organic matter.

Coauthors Dr. Alan Stueber, at Southern Illinois University, Edwardsville, Illinois, and Dr. Robert Criss, at Washington University, St. Louis, Missouri, show the relative contributions of karst ground water and treated wastewater to water quality in a small Illinois stream. Although the karst water dominates stream flow 11:1, the wastewater originating from outside the small stream contributes the majority of Na, K, Cl, NO_3, F, P, and atrazine found in the stream. Dr. Doug Boyer, USDA-ARS, Beaver, West Virginia, evaluates the success of the President of the United States' Initiative for Water Quality and Environmental Quality Incentives Program (EQIP) management of grazing systems on the quality of water flowing into karst systems. These results demonstrate the difficulty in identifying and treating nonpoint

[1]Special Issue of the *Journal of the American Water Resources Association* (JAWRA) (Copyright © 2005).
[2]Respectively, Research Hydrologist, USDA-Agricultural Research Service, Columbia Plateau Conservation Center, P.O. Box 370, Pendleton, Oregon 97801; and Hydrologist, U.S. Geological Survey, P.O. Box 1230, Iowa City, Iowa 52244 (E-Mail/Williams: johnd.williams@oregonstate.edu).

sources of water pollution while at the same time trying to meet other landuse objectives. Although the author presents evidence that highly focused grazing prescriptions might improve forage production on a farm, the end result likely might be increased contamination of surface water draining into the underlying karst aquatic system.

Christopher Blattel and coauthors, at Southern Illinois University, Carbondale, Illinois, evaluate the capacity of native giant cane and hardwood riparian forest buffers to reduce orthophosphate or dissolved reactive phosphate before it contributes to surface flow. Although vegetation in buffers removed some dissolved reactive phosphate, their findings do not support early reports of higher effectiveness in similar systems. The authors list a number of conditions that could have contributed to the discrepancies, providing guidance for further research on the subject. Dr. John Westra, at Louisiana State University, Baton Rouge Louisiana, and coauthors from the University of Minnesota and the U.S. Geological Survey, in St. Paul, Minnesota, demonstrate the economic, physical, and biological consequences of implementing best management practices on watershed scales. Comparing cold and warm water systems, they demonstrate that best management practices reduce producer incomes 1 to 2 percent and are beneficial to fish communities in the cold water system but not the warm water system. This exercise can be used to focus funding on implementation of best management practices where they will be most economically efficient.

Bill Battaglin and four coauthors from the U.S. Geological Survey report on findings from a regional survey in the Midwestern United States of stream contamination from 21 herbicides and herbicides transformation products. The focus of the survey was the relative occurrence of glyphosate and its primary transformation product, AMPA, to other herbicides found in streams after pre-emergence, post-emergence, and harvest-time herbicide applications. Glyphosate applications in the United States have greatly increased since the introduction of "Roundup-ready" crops.

Drs. A. Bakhsh and Ramesh Kanwar, at Iowa State University, Ames, Iowa, report their research investigating the spatial relationships of NO_3-N leaching loss to soil and landscape attributes using cluster and discriminant analysis and geographical information system (GIS) technology. They successfully used this combination of tools to select soil type, elevation, and subsurface drainage as factors necessary to identify field locations with low, medium, and high levels of leached NO_3-N. This information can be used to manage fertilizer inputs and to reduce the costly loss of commercial fertilizer and the concomitant contamination of surface and ground water.

Dr. J. Singh, of the Illinois State Water Survey, and coauthors evaluated the hydrologic performance of two watershed scale models, HSPF and SWAT, to simulate the hydrology of the Iroquois River in Illinois and Indiana. The Iroquois River watershed is large, agricultural basin with fields that are extensively tile-drained, thus a unique test of the models. The authors report that SWAT predicted streamflows better and required fewer parameters and data preparation than HSPF. Dr. M. Srinivasan, at USDA-ARS, University Park, Pennsylvania, and coauthors from Cornell University, Ithaca, New York, compare two models to identify runoff areas that can be managed to control phosphorus contamination. The soil and water assessment tool (SWAT) and the soil moisture distribution and routing (SMDR) model were tested. Although each model performed certain tasks well, the authors show where improvement can be made. They conclude that SMDR has the capability to represent a watershed as grids and may allow targeted management of phosphorus sources, unlike SWAT's use of hydrologic response units.

The Guest Associate Editors thank the reviewers and authors who made the extra effort to move their papers through the journal peer review process. Thanks to *JAWRA* for providing a venue for the subject matter, and AWRA, organizers, and participants who originally made the 2003 Spring Specialty Conference a success. Thanks, finally, to the AWRA Agricultural Hydrology Technical Committee for their efforts in bringing attention to the important role of agriculture in the management of water resources.

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