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SYMPOSIUM

Pesticides and Watershed-Scale Modeling: Solutions for Water Quality Management

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The three papers that follow in this issue of *J. Agric. Food Chem.* were presented at a symposium held at the Fall 2004 National Meeting of the American Chemical Society in Philadelphia titled "Agrochemicals and Watershed-Scale Modeling: Solutions for Water Quality Management." In North America, nutrients and sediments are much more important agricultural nonpoint pollutants than pesticides, yet these papers show that industry pesticide scientists are at the cutting edge of watershed-scale modeling. Pesticides are potential "impairments" in stream reaches listed as part of the Clean Water Act (CWA) Total Maximum Daily Load (TMDL) cleanup process and may trigger regulatory actions under both CWA and pesticide regulatory laws, especially the Food Quality Protection Act (FQPA). Under this pressure, watershed-scale modeling is a rapidly developing, key technology for analysis of the complex hydrologic, climatic, geologic, and chemical processes that determine the contribution of pesticides to water quality at the outflow. Some examples of key papers are given in the Literature Cited (*1*−*5*).

Models are expected to predict the magnitude, frequency, duration, and spatial distributions of potential water body contamination and also to help evaluate options for mitigating pollutant transport from agricultural lands. The CWA, with its emphasis on watershed-scale pollution management, highlighted the great information gap that existed between our fairly comprehensive knowledge of the effects of agricultural practices on water quality draining from fields and our lack of understanding of how those processes integrate in space and time in a watershed that includes those fields. Each four-dimensional watershed is unique and requires an enormous suite of parameters to describe. The symposium presenters made it clear that modeling cannot replace the ground truth of monitoring. However, for purposes of analyzing alternative management practices and "what-if" scenarios, modeling is a much less expensive and more flexible approach than monitoring, and so the technology is evolving at a rapid pace.

Specific research areas covered by the symposium included the following:

- an introduction to watershed modeling that is being used by the U.S. Department of Agriculture in the nationwide Conservation Effects Assessment Project (CEAP), which will use models to estimate the soil, water, air, and wildlife effects of USDA Farm Bill conservation programs;
- innovations in watershed-scale water quality assessment, including fractal and regression analyses;
- regulatory directions including U.S. Environmental Protection Agency predictive methodologies and comparisons with monitoring data; and
- dealing with nonagricultural components of the landscape including turf and riparian buffer systems.

The symposium demonstrated that the pesticide science community is beginning to understand, as a result of a large amount of arduous research, the limitations and thus the appropriate application of the suite of modeling tools available and to propose a modest interpretation of the predictions. It is unfortunate that most of the presenters were not able to translate their talks into papers and thus capture this moment, but the symposium organizers—Aldos E. Barefoot, William L. Hall, and myself—are grateful to the Drs. Jones, Jackson, and Ramanarayanan for providing the samples that follow.

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