BENEFITS OF DIVERSE WATERSHED MODELING APPROACHES: CASE STUDY FROM NEW YORK STATE

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ABSTRACT

Watershed-scale fate and transport models are important tools for estimating the sources, transformation, and transport of contaminants to surface water systems. A wide variety of modeling approaches exist for estimating inputs, fate, and transport of constituents through watersheds, but most are broadly mathematically categorized as either statistical or process-based. Selection of either approach is often determined by the level of computational detail required for the intended output, spatiotemporal scales of the project or research, the skills of the modeler, and the desired outcomes of the end-user audience.

Our work aims to broadly evaluate the benefits and contributions of statistical versus process-based modeling for assessing exposures in surface water systems. Here we focus specifically on two approaches for estimating nitrate-N fluxes from multiple catchments across a large lacustrine basin in Central New York State. We consider a descriptive/statistical approach, which estimates important factors contributing to nitrate fluxes from 66 catchments based on landscape characteristics, and a simple box model focusing on nitrogen processes and estimating nitrate fluxes from several of these catchments. Movement toward hybrid approaches for fate and transport modeling (e.g., SPARROW) in some modeling communities suggests that these two ostensibly disparate approaches can be complementary and that neither modeling approach needs to operate exclusively of the other. For example, preliminary results suggest that our empirical approach provides insight to important input parameters for developing our process-based model. Further, we suggest that implementation of monitoring networks – both atmospheric and surface water - at spatial and temporal scales appropriate for model calibration is critical to the success of either separate or integrated modeling approaches.

KEYWORDS

Statistical models, process-based models, watersheds, nitrogen, New York State