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Estimating phosphorus loads in streams draining poultry-pasture operations in the upper Etowah River basin, Georgia

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Abstract Text:

In the upper Etowah River basin in north-central Georgia, there is a long history of poultry production. A large fraction of the poultry litter generated in the basin is applied to nearby pasture and croplands. This has been linked to water quality problems associated with the eutrophication of Lake Allatoona at the basin outlet. The purpose of this study is to estimate phosphorus (P) and sediment loads in nine headwater streams draining commercial poultry-pasture operations in the upper Etowah River basin and to relate those loads to BMPs and other factors in each of the watersheds studied. An additional three streams draining U.S. National Forest were also monitored to provide reference concentrations and loads. Monitoring data included continuous (5-minute) streamflow, rainfall, and water quality samples collected over a 20-months period. Water quality samples included biweekly grab samples plus storm samples collected using conventional autosamplers. Storm sampling using autosamplers included collection of discrete samples and composite samples. In particular instances, the two types of storm sample were collected simultaneously. Water samples were analyzed for total P, filterable reactive P, and total suspended solids. We are using this data to compare different load estimation methods with emphasis on regression models that utilize laboratory results of both discrete and composite samples as well as models using non-transformed data. Preliminary results demonstrate some success in the use of regression models from agricultural streams where P levels in stormflow are high. In streams where concentrations and overall variability of P is low, averaging methods may be the most appropriate. Preliminary results also suggest that each of the following may be important variables for assessing potential risk of P loss: farm age, presence of a farm pond, and distance between stream channel and location of poultry litter application.

Impact Statement:

Few watershed-scale studies have been performed on estimating P loads in streams draining commercial poultry-pasture operations. Our study provides insight into several research arenas pertinent to assessing risk of P loss from these types of agricultural systems. We will add to the understanding of the types of monitoring and load estimation methods available for quantifying P loads in small streams. Further, our results will be useful for evaluating overall BMP effectiveness in watersheds as well as identifying additional factors for consideration when evaluating potential for P loss.