

The Challenge of Understanding Nutrient-Biota Interactions in Agriculturally Dominated Landscapes

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In 2002, the U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Program began a study of nutrient-biota interactions in five agricultural areas across the United States. The large-scale study component focused on nutrients, benthic assemblages, stream metabolism, and habitat. Median total nitrogen ranged from 1.1 to 2.1 mg/L and total phosphorus ranged from 0.04 to 0.46 mg/L, with highest concentrations associated with open-channel streams with minimal riparian habitat. Chlorophyll a concentrations on hard substrates (rock or wood) were not correlated with nitrogen or phosphorus, whereas chlorophyll a concentrations on fine-grained substrates and in seston were correlated with phosphorus. These relationships are influenced further by habitat variables such as suspended sediment and canopy. Preliminary analysis indicates that benthic algal assemblages, based on taxa biovolumes, were influenced by habitat and nutrients in some streams, but by only habitat in others. Nutrient mass-balance calculations along a subset of stream reaches provide information on the dominant pathways and processes affecting nutrient transport. However, agriculturally-impacted streams often have variable nutrient fluxes and concentrations, making mass balance calculations in these systems more difficult. Streams in agriculturally dominated landscapes provide unique opportunities and challenges that must be adequately addressed to more accurately establish nutrient criteria.