

Report for 2003IA59B: Spatial and temporal patterns in precipitation and dry-fall deposition of Nitrogen and Phosphorus in Iowa: implications for nutrient transport and water quality

There are no reported publications resulting from this project.

Report Follows

Spatial and Temporal Patterns in Precipitation and Dry-fall Deposition of Nitrogen and Phosphorus in Iowa: Implications for Nutrient Transport and Water Quality

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Problem and Research Objectives

This research focuses on two priority areas: Nutrient Management, and Animal Waste and Water Quality. The increased mobility of nutrients (N and P) through atmospheric transport derives from the alterations of land use through agriculture and other landscape changes. Both particulate and gaseous losses to the atmosphere from row-crops and animal agriculture can contribute to local and global water quality problems. This proposal aims to fill essential information gaps by characterizing spatial and temporal patterns in the deposition of nutrients by both precipitation and dryfall.

Atmospheric nutrient (nitrogen and phosphorus; N and P) loading and transport through precipitation and dry deposition is one of the least understood, and maybe one of the most important, pathways of nutrient transport in agricultural landscapes. Atmospheric P deposition through precipitation on a lake's surface has recently been found to contribute >30% of the annual P load, single-handedly preventing eventual remediation to attain projected federal nutrient standards. The purpose of this project is to fill three essential information gaps: (1) to characterize both nitrogen and phosphorus deposition, (2) through both wet- and dry-deposition to dry- and wet-surfaces, and (3) to characterize the spatial and temporal variation of this deposition across the state of Iowa.

Methodology

We measured nutrient deposition from April 1, 2003–March 31, 2004 at five sites representing a range of landscape characteristics common in Iowa. Upon collection, samples were returned to the Limnology Lab at Iowa State University for analysis. Comparisons among types of deposition measures are being made using non-parametric equivalents of ANOVA. Temporal analyses are being made graphically as well as using multivariate methods to relate deposition to storm type, source and intensity. Spatial patterns are being characterized using kriging within geostatistical (GIS) packages. This project will allow a broader understanding of the process of atmospheric nutrient transport in agricultural landscapes and a means of evaluating the role of atmospheric deposition in water quality impairment and remediation.

Principal Findings and Significance

The principal findings have been that (1) atmospheric deposition of N and P are much more substantial than previously concluded, (2) dry deposition is several times the deposition measured in precipitation alone, and (3) local dust deposition can bias results if proper precautions are not taken. These results are highly significant to water quality investigations in that they show a new, major pathway of nutrient transport that can negatively influence water quality. The results in (3) indicate that most atmospheric deposition measurements made using previous standard methods may be in error.