# American Water Resources Association
# 2013 SPRING SPECIALTY CONFERENCE
# Agricultural Hydrology and Water Quality II
## March 25-27, 2013
**St. Louis, MO**

## Tuesday, March 26
## 1:30 PM – 3:00 PM
## SESSION 21: Nitrogen in Surface and Ground Waters

**Nitrogen Concentrations and Transport Potential in Shallow Groundwater: Contrasting Seep and Non-Seep Regions of a Riparian Zone in an Agricultural Watershed - Mark Williams**, Penn State University, University Park, PA (co-authors: A. Buda, H. Elliott, E. Boyer)

The alteration of water chemistry along groundwater flow paths in stream riparian zones plays an important role in regulating water quality in agricultural watersheds. While denitrification and uptake by vegetation tend to be efficient processes in slow moving shallow groundwater, these nitrogen (N) retention and removal mechanisms decrease in effectiveness as faster flows through soil macropores and other preferential flow pathways become dominant. The objective of our study was to characterize N concentration variability and transport pathways through shallow groundwater draining areas of the riparian zone with and without emergent groundwater seeps. The study was conducted within FD36, a small agricultural watershed (40 ha) in the Ridge and Valley physiographic region of central Pennsylvania. Three seep and adjacent non-seep areas were instrumented with a field of 12 suction-cup lysimeters and 20 piezometers installed in a grid pattern at both 20-cm and 60- cm depths. The lysimeters and piezometers were monitored seasonally for a period of two years (July 2010 - 2012). Initial results indicated that there were large differences in N concentrations and transport pathways between seep and non- seep areas of the riparian zone. Seep discharge areas tended to have mean nitrate-N concentrations that were 2 to 3 times greater than non-seep areas. Spatial variability of nitrate-N concentration was much greater in seeps (range: 0.1 - 44.9 mg L-1) compared to non-seep areas (range: 0.1 - 10.7 mg L-1), which points to the influence of preferential flow paths on N transport potential in emergent groundwater seeps. In addition, we found that chloride concentrations were greater in seep areas than in non-seep areas, suggesting potentially different sources of water to these zones. Thus, our preliminary results show that differences in flow paths between seep and non-seep areas have a large influence on the magnitude of N concentration variability as well as the N removal potential of the riparian zone.

**Temporal Variability in Water and Nitrogen Flux from Tile-Drained Fields Fertilized with Dairy Slurry - Gary Feyereisen**, USDA-ARS, St. Paul, MN (co-authors: S. K. Papiernik, J.M. Baker, C. D. Wente, E. S. Krueger)

Source and transport challenges associated with application of dairy slurry to tile-drained crop lands in northern climates are multiplied by seasonal time constraints and potentially large flushes of subsurface drainage effluent and nitrate-nitrogen occurring during the spring snowmelt. A study was conducted to measure subsurface drainage flow and nitrogen losses from silage corn fertilized by two methods. Anaerobically digested dairy slurry was either injected in autumn or fertigated during the growing season by mixing slurry and water and applying through center pivot irrigation. The experiment was conducted on large fields where drainage areas were 42 ha (104 ac) and 27 ha (67 ac) for the injected and fertigated areas, respectively. Drainage and nitrogen fluxes over three seasons during which these application methods were used will be presented. The current experiment was an extension of previous work to reduce nitrogen loads by cover cropping. A summary of that work will be presented along with a brief review of strategies to minimize the transfer of nitrate-nitrogen via tiles from cropped fields to surface waters.

**Applications of Fluorescence Excitation-emission Matrix Spectroscopy for Detecting Dissolved Organic Nitrogen in Surface Water - Bin Hua**, Lincoln University of Missouri, Jefferson City, MO

Dissolved organic nitrogen (DON) in surface water is an important source of nutrients capable of stimulating algal growth and eutrophication of lakes and estuaries, and the precursor of disinfection-by-products. Understandings of the DON sources and characteristics in lakes and rivers are critical for preventing these environmental problems associated with high levels of DON. However, information on the occurrence, chemical structure and transport of DON is extremely limited due to lack of adequate methods for DON analysis. The objective of this

research was to demonstrate that fluorescence excitation-emission matrix (EEM) spectroscopy coupled with parallel factor analysis (PARAFAC) can be used for rapidly tracking the sources of DON in terrestrial water systems. Water samples were collected monthly from 7 sites along Hickson Creek (Columbia, MO), two sites in a landfill (Columbia City, MO), and three sites in the constructed wetlands in Columbia wastewater treatment plant (Columbia, MO) over one year period. Parallel factor analysis of the fluorescence EEM spectra of the samples revealed 4 factors, namely one protein-like component, 2 humic/fulvic acid-like components, and one xenobioic-like component. The score loading of the protein-like component was characteristic and can be used to identify the source of water and DON origin. The implementation of the results from this research will contribute to the advancement of technology for water quality assessment and monitoring of DON and its behaviors in terrestrial ecosystem.