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Soil and Water Science Department Seminar

Speaker: **Mriganka De**
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Title: **Fate and Transport of Effluent-borne Nitrogen from Septic Drainfields to Shallow Groundwater**

Date: Monday, March 23rd

Time: 3:15 pm

Location: McCarty Hall A Room G186

Septic systems can be a significant source of nitrogen (N) in Florida groundwater as over 2.5 million septic systems serve ~33% of Florida's ~19 million population. The objective of this dissertation research was to (1) investigate the fate and mass balance of N in the septic drainfields and (2) determine the transport of N from drainfield to shallow groundwater. Two types of drainfields were constructed: smaller drainfields in lysimeters (0.28 m^2) and two types (drip-dispersal, gravel trench) of larger field drainfields (3.7 m^2) to mimic typical Florida residential drainfields that have an average area of 39.4 m^2. Daily (n=15) and weekly flow weighted (n=52) leachate samples were collected from the smaller drainfields over 13 months (Jan 2013-Jan 2014). Daily (n=13), weekly (n=29), bi-weekly (n=17), and monthly (n=5) samples were collected from the larger drainfields over 20 months (May 2012-Dec 2013). This included sampling soil-water (using suction cup lysimeters) from 0.30, 0.60, and 1.05 m depth below drip line and groundwater (using piezometers) from 3-3.3 m depth below drip line. As recommended by Florida Department of Health for sandy soils, all drainfields received 3 liters of effluent per 0.09 m^2 of drainfield each day in 6-doses at 4-h intervals. In the effluent, total N was 66±9 mg/L (NH_4-N: 89%, organic N: 11%, NO_x-N: 0.2%). In 0.3-1.05 m depth of drainfields, the dominance of NO_x-N (28-45 mg/L) in soil-water samples suggests that nitrification was the major mechanism in the drainfield. Organic N was only slightly lower in drainfield soil-water (5-6 mg/L) than effluent (~7 mg/L). Major fate of N in the drainfield was estimated to be gaseous loss (37%), followed by leaching (33%), soil storage (23%), and plant uptake (6%). In the groundwater, septic systems resulted in elevating NO_x-N to 17-23 mg/L as compared to upstream groundwater (3.4 mg/L). Organic N in groundwater was also elevated to ~3.5 mg/L due to septic plume. Data suggested increased transport of both NO_x-N and organic N to groundwater due to nitrification of effluent-borne N and lack of mineralization of organic N in the drainfields, respectively. In the long-running septic systems, concentrated N plumes can move to surface waters. We suggest that all contributing sources of N in Florida's waters need to be quantified to develop strategies to alleviate impacts of N on water quality.

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