Identifying biogeochemical processes beneath stormwater infiltration ponds in support of a new best management practice for groundwater protection

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Abstract When applying a stormwater infiltration pond best management practice (BMP) for protecting the quality of underlying groundwater, a common constituent of concern is nitrate. Two stormwater infiltration ponds, the SO and HT ponds, in central Florida, USA, were monitored. A temporal succession of biogeochemical processes was identified beneath the SO pond, including oxygen reduction, denitrification, manganese and iron reduction, and methanogenesis. In contrast, aerobic conditions persisted beneath the HT pond, resulting in nitrate leaching into groundwater. Biogeochemical differences are likely related to soil textural and hydraulic properties that control surface/subsurface oxygen exchange. A new infiltration BMP was developed and a full-scale application was implemented for the HT pond. Preliminary results indicate reductions in nitrate concentration exceeding 50% in soil water and shallow groundwater beneath the HT pond.

Key words biogeochemistry; natural attenuation; groundwater protection; stormwater infiltration; best management practice