WATER COLUMN SATURATION PROFILES OF N_2, CO_2, AND CH_4 IN NATURAL AND CONSTRUCTED SUBTROPICAL PONDS

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Urban stormwater wet ponds (SWPs) capture runoff and retain nutrients (N, P) and sediments before water is discharged downstream. However, Florida ponds exhibit low N removal efficiencies and high capacities to mineralize carbon (C) to carbon dioxide (CO_2) and methane (CH_4), both important greenhouse gases. To better understand internal nutrient and energy dynamics of SWPs, we assessed relationships between morphological, biological, and chemical factors and dissolved N_2, CO_2, and CH_4 gas concentrations, reflecting denitrification (N_2) and C respiration (CO_2, CH_4) of SWPs and natural ponds of southwest and central Florida. We also tested the effect of littoral vegetation, a common SWP management strategy, on N and C cycling. We collected water samples from three depths (depths selected based on pond stratification) at twenty-one sites during the dry season (May 2021) and a subset of ten sites during the wet season (August 2021). We quantified N_2 (via membrane inlet mass spectrometry) and CO_2 and CH_4 (via gas chromatography) concentrations, as well as dissolved organic matter composition (via spectrofluorometry), nutrient ions (NO_3^-, NH_4^+, and PO_4^{3-}), and other water conditions (temp, pH, conductivity, dissolved oxygen). Preliminary analyses suggest that natural ponds are more supersaturated with N_2 than SWPs and N dynamics may be driven by primary producers (e.g., algae) in the ponds. Furthermore, we expect pond morphology that supports anoxic sediments and profundal waters will influence CH_4 and N_2 saturation and that littoral vegetation will positively enhance N_2 saturation and CH_4 production. This study can enhance our knowledge of the role that small and urban subtropical ponds play in greenhouse gas production, their ability to remove N from urban runoff, and benefits of implementing biological management strategies.

PRESENTER BIO: Audrey is a second-year PhD student in the Soil and Water Sciences Department working in Dr. AJ Reisinger's Urban Ecosystem Ecology Lab. Her work focuses on drivers of urban pond biogeochemistry and ecosystem functioning and how their discharge influences downstream aquatic ecosystems.