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Phosphorous Exchange Rates and Phosphorus Fractions of Wetland Sediments in the Upper St. Johns River Basin of Central Florida

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Abstract:

Phosphorus enrichment in lakes and wetlands of Florida has been a major environmental and ecological concern since 1970s. We investigated phosphorus exchange rates between water column and sediments of 31 undisturbed soil cores taken from wetlands of the upper St. Johns River Basin in east central Florida. Those wetlands are in Blue Cypress Marsh Conservation Area (BCMCA), Moccasin Island Marsh Restoration Area (MIMRA), Sawgrass Lake (SL) and St. Johns Marsh Conservation Area (SJMCA). Higher P fluxes observed during the first 30 days of incubation were due to initial disturbance of sample removal from the field and that fluxes between 60 and 90 days of incubation reflect more the ambient field conditions. Positive P fluxes (0.1 ± 0.0 mg.m⁻².day⁻¹ to 1.0 ± 0.1 mg.m⁻².day⁻¹) were generally observed in BCMCA and MIMRA by the end of the 90-day incubation period. Negative P fluxes that were observed in the sediments of SL and SJMCA (-0.1 ± 0.9 mg.m⁻².day⁻¹ to -3.4 ± 2.5 mg.m⁻².day⁻¹) indicated a greater capacity to remove DRP from overlying waters. Correlations between pH and P distribution were negligible except in the Ca-bound P fraction of MIMRA sediments. Accumulated amounts of P at 0-10 cm were also not strong indicators of flux into the overlying waters. Total P profiles of BCMCA and MIMRA did however corresponded with positive fluxes when concentrations were greater than 40 g.m⁻³. The four main pools of P are the exchangeable (3.4 ± 1.3 %), Fe-bound (11.6 ± 2.8 %), Ca-bound P (2.2 ± 1.6 %) and organic (83 ± 4 %). This study indicates that the main control of P exchange rates between water columns and soil cores was not the inorganic P fractions but the microbial remineralization of the organic P fractions.

Impact Statement:

Phosphorus enrichment in lakes and wetlands is a major environmental and ecological concern in Florida since 1970s. This study indicates that the main control of P exchange rates between water columns and soil cores was not the inorganic P fractions but the microbial remineralization of the organic P fractions.

Category: Watershed Assessment and Restoration

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