

## 12. Assessments of spatial-temporal variations in phosphorus pools and mineralization in the Bronx River bed sediments

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### Abstract:

Sediment characteristics influence the distribution and bioavailability of phosphorus (P) in river sediments. In this study, we analyzed different P fractions in the sediments of the Bronx River, the New York City, NY using sequential extraction, and characterized various P compounds by <sup>31</sup>P Phosphorus Nuclear Magnetic Resonance Spectroscopy (<sup>31</sup>P NMR). The results showed that the average P pool rank order was HCl-P > NaOH-P > NaHCO<sub>3</sub>-P > residueP, and their relative proportions were 3.7 : 2.0 : 1.4 : 1 in sediment collected in 2006, while HCl-P > NaOH-P > residue-P > NaHCO<sub>3</sub>-P, with their relative proportion of 27.8 : 6.2 : 2.7 : 1 in sediments obtained in 2007. The <sup>31</sup>P NMR analysis revealed that glycerophosphate (GlyP), nucleoside monophosphates (NMP), and some amount of polynucleotides (PolyN) as the major organic P compounds in the bed sediments. The strong correlation between microbial P and organic P, along with the changes in microbial P over time indicate that much of the organic P in the river bed sediments is potentially bioavailable. The sediment transport, deposition, assimilation, the exchange of P between sediments and water columns, the land use changes, raw sewer discharge, oil spill, construction, fertilizer application, etc., as well as the hydro-climatic changes could result in the spatial and temporal variations in P bioavailability in the river bed sediments. The estimations of P pools and their bioavailability in river bed sediments could help determine the spatial and temporal variations in P transport and impacts of land use on water quality, in turn, help regulate P in the river watershed.

Keywords: P pool, P distribution, sediments, P mineralization

Topic: C. Urban soils and ecosystem services

Sub-topic: C3. Urban soils and hydrology

Presentation type: Oral

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