Public Abstract

First Name:John

Middle Name:Stephen

Last Name:Weber

Adviser's First Name:Keith

Adviser's Last Name:Goyne

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:ENVIRONMENTAL IMPLICATIONS OF PHOSPHATE-BASED AMENDMENTS IN HEAVY METAL CONTAMINATED ALLUVIAL SOIL

A diverse suite of research has focused on the immobilization of lead (Pb) compounds in soil through the application of phosphate-based amendments that create insoluble Pb compounds. Water quality threats associated with the phosphorus (P) remediation technology are a concern, particularly near riparian areas. This study investigated P fertilizer application rates on metals and P loss via surface runoff following P application to a lead contaminated alluvial soil. Soil was treated with Triple Super Phosphate (TSP) at differing molar ratios of P to Pb: 0:1 (control); 4:1; 8:1; and 16:1. Effluents from treated soils were collected during rainfall simulation (RFS) events at six months and one year post-treatment and analyzed for total and dissolved P and Pb loss. At elevated P treatment levels (8:1, 16:1 P:Pb), P and total Pb concentrations were significantly greater ($p < 0.05$) than the control during the first round of RFS, when treatment units were un-vegetated. After one year and the establishment of tall fescue (Festuca arundinacea) on the treatment units, total P content in effluents from the second RFS decreased by an order of magnitude and total Pb concentrations decreased by two to three orders of magnitude. Analysis of metal uptake into the tissues of tall fescue revealed a significant reduction in Pb uptake that was most pronounced for the 16:1 P:Pb treatment. The addition of TSP stimulated pyromorphite formation but the amount of pyromorphite formed was comparable amongst the P-treatments. The findings of this study suggest that P application at a 4:1 P:Pb molar ratio may be a viable means of reducing Pb bioavailability in contaminated alluvial soils while minimizing concerns related to P loss from soils treated.