Phosphorus, Iron and Trace Metal Interactions at the Sediment Layer-Water Column Interface: The Role of Recovered Mine Drainage Residuals[1]

Zepei Tang* and Robert W. Nairn[2]

Abstract: In this research, the goal was to understand the nutrient and metal cycling processes at the sediment layer-water column interface in a large terminal reservoir, with impacts from various environmental parameters (such as algae blooms and mixing) and to investigate the feasibility to use recovered mine drainage residuals (MDRs) for phosphorus (P) release control. The study site was the Grand Lake o' the Cherokees, Oklahoma, as it has both elevated metals concentrations from the Tri-State Lead-Zinc Mining District and elevated nutrient concentrations from agriculture run-off, resulting in eutrophication and substantial algae blooms. There are three hypotheses: 1) algae blooms impact P distribution between the water column and sediments; 2) mixing/bioturbation can increase P concentrations in the water column and decrease the net P sink in sediment; 3) MDRs can perform as P-sorbing products to decrease bioavailable P concentrations in the water column. Field characterization studies have been done to collect *in-situ* water quality data (pH, DO, SC, T, turbidity, alkalinity, etc.) as well as water and sediment samples for nutrient and trace metal analyses. A laboratory bench-top preliminary experiment was designed to identify the ideal MDR type, dose, and reaction time for optimal P-sorbtion performance. A greenhouse microcosm experiments will test different control parameters on P distribution in the system. A pond mesocosm experiment will examine the pilot-scale feasibility of MDR in a real-world condition. It is expected that the results will show that MDRs can be used to control P release in the water column; therefore, future engineering designs can be provided for addressing eutrophication in lakes.

Additional Key Words: AMD, MDR, phosphorus release control

---

[1] Oral (or Poster) paper presented at the 2017 National Meeting of the American Society of Mining and Reclamation, Morgantown, WV: ***What's Next for Reclamation?*** April 9 - 13, 2017. Published by ASMR, 1305 Weathervane Dr. Champaign, IL 61821.

[2] Zepei Tang, Graduate Research Associate, University of Oklahoma, Norman, OK 73019 (student) and Robert W. Nairn, Viersen Family Foundation Presidential Professor, Center for Restoration of Ecosystems and Watersheds, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, OK 73019.