A Lab-Based System to Study the Microbial Impacts on Passive Remediation Systems for AMD[1]

M. Valkanas* and N. Trun[2]

Abstract: Abandoned mine drainage (AMD) affects over 3,000 miles of streams in Pennsylvania and 300,000 miles in the United States. Passive remediation systems are commonly used to treat AMD and efficiently remove contamination through the increase of pH (if necessary), aeration, settling ponds, and wetlands. Passive systems depend primarily on geochemical reactions. Microbial communities are naturally formed in these systems and vary, depending on the pH and the type of contaminants present. To study causal relationships of observations we have made in situ on contaminant levels and microbial communities, we have developed a lab-based system to study the impacts of bacteria on AMD contaminants. Slurries were collected from several ponds in two different passive remediation systems, both treating alkaline mine drainage. Bacterial communities were isolated and grown in the lab-based system to determine the impact microbial communities have on sterilized AMD. There was resolubilization of iron by bacteria from both systems, showing the potential for microbial communities to affect soluble contaminant levels. Starting with bacteria from the passive systems, enrichment cultures were grown in different media through 5 transfers and incubated in the lab-based system (after 3rd and 5th transfers). The enrichment cultures identified bacterial communities that could resolubilize iron and, to a lesser extent, manganese. We are currently identifying the bacteria and metabolic reactions in the enrichment cultures responsible for the observed effects. This will lead to a better understanding of the bacteria that have a direct impact on AMD.

Additional Key Words: AMD Passive Treatment; Bacterial AMD communities; Microbiome Analysis; Water Quality Analysis; Wingfield Pines; Lowber; Alkaline Mine Drainage.

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2. Michelle Valkanas, Department of Biological Sciences, Duquesne University, Pittsburgh, PA 15282 (Graduate Student); Nancy Trun, Associate Professor, Department of Biological Sciences, Duquesne University, Pittsburgh, PA 15282.