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Interdisciplinary collaboration between engineering, mathematics and science

SEMS Research Highlights

Soil Microflora, Elemental and Genetic Analysis in Fabricated Soils

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This newsletter presents the research conducted within the School of Engineering, Mathematics and Science (SEMS) at Robert Morris University (RMU). It covers various relevant topics including: interdisciplinary efforts, successful research grants, student research, posters and papers, journal publications, presentations at national and international conferences, contribution to professional societies, STEM educational research, industrial consulting collaborations and applied research.

Soil erosion has been a major problem for many years as millions of acres of soil are damaged annually worldwide. In Western PA, the Acidic Mine-water Drainage (AMD) flowing out from the abandoned coal mines releases toxic amounts of minerals and heavy metals in the soil and water. This causes decrease in fungal and bacterial activity and a loss of biomass which eventually leads to complete deforestation and the loss of natural vegetation resulting in the so-called "moon landscape" (see Picture). Dr. Maria Kalevitch and her co-workers (Drs. Kefeli, Badger, Dress, Hillwig and Mrs. Maurer) at RMU along with their other academic and industrial partners have been studying this problem for the past decade to find strategies for soil remediation in the region, specifically in Butler County.

One of the ways to remedy this situation is to use fabricated soil (FS) which a mixture of decaying substrates that are rich in alumni-silicates, carbon, nitrogen, phosphorous and potassium sources that help growth and health of the plants. The study included collecting soil samples near the mines to analyze the contents for heavy metals such as copper, iron, manganese, nickel and magnesium. The mineral content was analyzed by Conti, Inc. while microbial analytics was conducted by US-Microsolutions Inc.

It was found that the concentration of these heavy metals

was more than ten times the normal levels in the region, which indicated severe AMD effects in samples areas. In subsequent studies various compositions of FS were developed and analyzed to determine their microbial biomass and biodiversity using genetic methods. The short term and long term effects of using FS treatments to remedy moon landscape is planned in future studies.

This is a publication of SEMS - Research and Outreach Center (ROC) which was established in 2010 by the SEMS Dean Dr. Maria Kalevitch. SEMS-ROC connects SEMS faculty and students with the region, the nation and the globe, demonstrates diversity and interdisciplinary interests of all three departments in the school. For more information on research at RMU – SEMS please contact:
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