

Characterization of Acidic Coal Mine Drainage Sediments: Approaches to Improving Biological Properties for New Soil Formation

Claudia Rojas¹, Mary Kay Lupton², Mary Ann Bruns³

¹Department of Crop and Soil Sciences, Penn State University, cxr932@psu.edu

²Department of Crop and Soil Sciences, Penn State University

³Department of Crop and Soil Sciences, Penn State University

Decades of unregulated coal mining has led to acid mine drainage (AMD) pollution of at least 17,000 km of waterways in the Appalachian region and 4,000 km in Pennsylvania alone. AMD contains two key contaminants, primary acidity and reactive iron, which itself generates more acidity as it precipitates onto soil surfaces and stream beds.

Massive volumes of AMD emerge continuously from many abandoned underground mines in PA, creating extensive areas of barren land due where AMD overland flow has killed vegetation. Over time, iron oxide precipitates accumulate until AMD flow paths are altered, leaving barren sediments known as a “kill zone”. These non-vegetated areas are highly susceptible to erosion and contribute to the continued loading of streams with precipitates.

In this study, precipitated AMD sediments from an AMD “kill zone” in Clearfield County were characterized. The aim of this research was to evaluate the properties of these precipitates as a parent material for development of new soils to support reforestation.

We compared pH, carbon contents, and acid generation potential of AMD sediments with depth. We propose that these materials are similar to acid sulfate soils which develop commonly in estuaries when reduced sulfur compounds become oxidized.

Therefore, restoration approaches for both types of soil materials should be analogous.