Dr. David Singer, Assistant Professor in the Department of Geology at the Kent State University completed an Ohio Water Resources Center funded project titled "**Soil Development on Coal Mine Tailings: Impact of Trace Metal Sources and Mobility to Acid Mine Drainage**". His project aimed to evaluate how soil development on coal mine tailings may potentially promote or limit the mobility of trace metals that further contribute to degradation of water quality via acid mine drainage (AMD). His results will help guide AMD reclamation projects regarding how to address metal and acid leaching from soils developing on historic mine waste, which often covers a significant amount of area at reclamation sites.

Figure 1 Soil core samples being bagged and labeled by Laura Zemanek, MS Student at KSU. Photo by David Singer

Restoration at sites such as Huff Run in Ohio target discharge from surface and below ground mines, but typically do not target leaching from historic mine tailings. Soils from two locations within the Huff Run Watershed were examined – one impacted by AMD leaching from coal mine waste, and the other location at an undisturbed shale which is part of a highwall as a control site. Solid phase characterization of soils was performed on samples collected in 10 cm depth increments from the soil surface to 1.2 m depth (Figure 1) using bulk X-ray diffraction, sequential extraction procedure and ICP/OES for metals and loss on ignition for organic content. The analysis showed that metal solubility increased near the soil surface, but differed between sites and depths; Fe and Al were more mobile in the highwall; Mn was more mobile in mine tailings. Interestingly, sulfate was lower in the mine tailings pore water, which was not expected as it was hypothesized that greater AMD production would also result in increased sulfate concentrations. Results from the sequential extraction (Figure 2) suggest that a pool of Fe, Mn, and Al can continue to be mobilized during weathering and impact downgradient water. Finally, the mine tailings seem to be a potentially larger source of Mn to streams than previously understood.

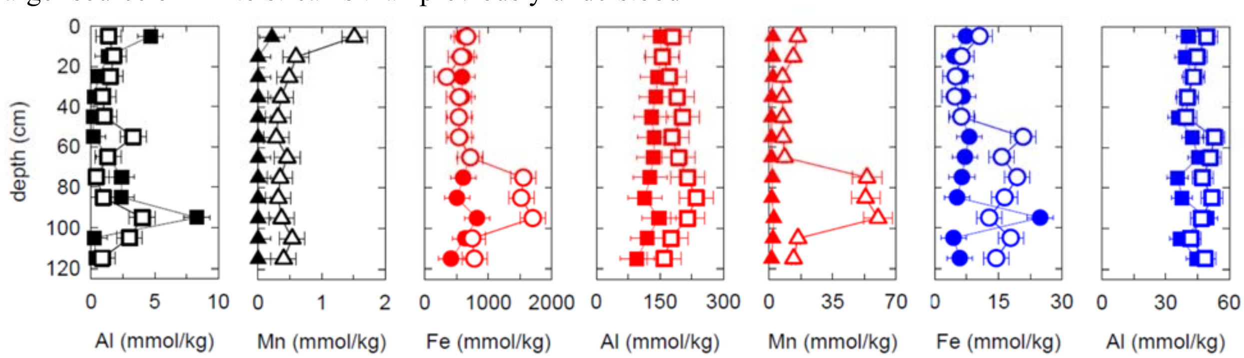

Figure 2 Sequential extraction data for Fe (circles), Al (squares), and Mn (triangles) from the highwall (closed symbols) and mine tailings (open symbols) soil cores. The three fractions are exchangeable (black), reducible (red), and oxidizable (blue).

<u>Researcher Profile:</u> Dr. David Singer an environmental mineralogist and geochemist, focusing on the fate and transport of metals and radionuclides in the environment. In particular, he is interested in the (bio)geochemical processes that occur at mineral surfaces which can limit or promote contaminant transport in a range of surface environments. His research has ranged from applied characterization studies of contaminated field sites to fundamental studies of the processes by which metals are sequestered at mineral surfaces. Recent work has aimed at determining the mechanisms by which heavy metals or radionuclides can interact with complex and porous mineral interfaces. Research opportunities and contact information are available at: https://sites.google.com/a/kent.edu/dsinger/