Relationship between aqueous and sediment chemistry and biological recovery across a gradient of acid mine drainage impairment[1]

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Abstract: Acid mine drainage, a product from pyrite weathering in coal mining regions, has caused destructive changes in water chemistry, sediment chemistry, and biological communities in streams worldwide. This study focused on correlations between water and sediment chemistry and its impact on benthic macroinvertebrates in the coal mined areas of four coal-mined watersheds in southern Ohio, Leading Creek, Monday Creek, Raccoon Creek, and Sunday Creek watersheds. They have all been severely, moderately, and lightly impacted by acid mine drainage. Sediment chemistry analysis was completed at 32 sites across a gradient of biological impairment, as indicated by macroinvertebrate multimetric index scores, in addition to historic data analysis of water chemistry, sediment chemistry, and aquatic biology. Aqueous and sediment chemistry were compared with biological impairment to determine which chemical stressors had the largest impact on the biological community. The study results suggest that contaminants including acidity, Al, Fe, and Mn in the water column and sediment metals namely, As, Ca, Cu, Fe, and Mn are the most likely stressors to impede macroinvertebrate recovery. While previous research has shown little influence of sediment chemistry on macroinvertebrate health, this study has shown correlations between biological impairment and elevated sediment metals that should be investigated further.

Additional Key Words: macroinvertebrate, coal mine, geochemistry

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