

Trace element sources and sinks in an AMD-impacted stream draining a reclaimed coal strip mine.

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Legacy acid mine drainage (AMD) impacts a first-order stream in the Lake Harris watershed, which is located in Tuscaloosa County, Alabama. Strip mining of coal was conducted between 1968-1976, but the mine site was abandoned and exposed to weathering until a reclamation project was completed in 1986. However, the stream draining the reclaimed mine site displays spatial and temporal variations in aqueous sulfate, iron and trace element concentrations characteristic of AMD, more than 30 years after reclamation.

Stream water and sediment samples were collected monthly at five sampling sites spaced longitudinally along the stream channel between October 2016 and September 2017. Stream water samples were analyzed for major, minor and trace element concentrations by ICP-OES and IC. Stream sediment samples were analyzed by XRD for mineral content and partially digested using USEPA Method 3051A to determine the environmentally available concentrations of major, minor and trace elements by ICP-OES.

Dynamic temporal variation in stream water chemistry can be understood in terms of complex interactions between aqueous solutes and stream sediments controlled by hydrologic, redox, and microbial processes. Geochemical modeling using PHREEQCi provides insight into trace element sources and sinks, to allow better understanding of the processes affecting the mobility of potentially toxic elements within the watershed.