

Redox transformations of iron in an acid mine drainage remediated stream

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ABSTRACT:

The Raccoon Creek watershed in southeastern Ohio is heavily affected by acid mine drainage. Acid mine drainage is the acidic discharge due to the oxidation of pyrite from improperly abandoned underground and surface mines. The area of interest in this study is the Hewett Fork stream located in the Raccoon Creek watershed. Remediation efforts in this area have been made, namely with the addition of the Carbondale doser that adds calcium oxide to the acid water. This study examined the conversion of Fe (II) to Fe (III) and its relationship to other ions (Al, Sulfate), total dissolved solids and pH, along the flow path of the Hewett Fork stream and its relationship to the three biological recovery zones identified in the stream (Impaired, Transition, and Improved Zones). High total dissolved iron, aluminum and sulfate are identified in the Impaired Zone, and decreasing values in the Transition Zone. Ferrous iron and aluminum follow similar trends, with higher values in the Impaired Zone and a decrease in concentration as ferrous iron is oxidized and aluminum minerals form. These results suggest that oxidation of iron and precipitation of minerals contributes to improve water quality and helps to the biological recovery.