Acid Mine Drainage in Ore Knob Mine Tailings Pile– Impacts on Ore Knob Watershed

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Ore Knob Branch and Peak Creek within the New River Basin are classified as 'Not Supporting' due to discharge of acid mine drainage with high iron, sulfate, and low pH from a former copper/zinc mine located near Ore Knob. When the mine was active in the 1950s-60s, waste tailings were discharged into the Ore Knob watershed filling the valley bottom, forming a 9 ha, 21 m pile with high levels of iron, copper and zinc sulfides. Oxygen rapidly diffuses through the tailings pile surface, oxidizing the iron sulfide minerals (primarily pyrite and pyrrhotite) and producing large amounts of dissolved Fe^{2+}, SO_4^{2-}, and acidity. These pollutants are carried to the water table with infiltrating rainwater, and eventually discharge to Ore Knob Branch through a series of seeps on the downstream embankment face. Surface water has been periodically monitored at seven locations in the Ore Knob Branch and Peak Creek watersheds from March 2007 to August 2008. Surface water discharging from the tailings pile contains extremely high concentrations of ferrous iron (Fe^{2+}), sulfate (SO_4) and acidity. As this water migrates downstream along Ore Knob Branch, the pH decreases to 3.1, due to oxidation of Fe^{+2} to $Fe(OH)_3$ and H^+. A loading analysis indicates that approximately 403,000 Kg/yr of SO_4, 106,000 Kg/yr of Fe^{+2} and 242,000 Kg/yr of acidity are released to Ore Knob Branch from the tailings pile. Groundwater monitoring results indicates low iron concentration (12 mg/l) in the most upstream monitoring well compared with high iron concentration (1770 mg/l) in the most downstream wells showing the effect of tailings pile on pollutant generation. Most of the SO_4, Fe^{2+} and acidity are produced by oxidation of iron sulfides immediately below the tailings pile surface.

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