EVALUATION OF THE EFFICIENCY OF PASSIVE TREATMENT SYSTEMS ON WATER QUALITY IN THE HEADWATERS OF SLIPPERY ROCK CREEK[1]

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Abstract: To treat acid mine drainage, both active and passive methods are utilized for the removal of acid and metals. Individual passive technologies target specific aspects of acid mine drainage, and consequently overall efficiency of passive systems can be significantly enhanced with the linking of multiple components. Within the Slippery Rock Creek Watershed, a wide variety of passive systems are being employed to treat acidic mine discharges. Two anoxic limestone drains (ALDs) used in conjunction with aerobic wetlands consistently maintain pHs between 6.4 and 7.2 pH units. Iron concentrations are reduced significantly within these ALD/wetland systems, with an average removal of 32 mg/L at an average flow of 89 gpm, but these systems are generally not effective in removing manganese from acid mine discharges. But, when Vertical flow ponds (VFPs) are used in combination with aerobic wetlands and horizontal flow limestone beds (HFLBs), the discharges to receiving streams are have alkalinity in excess of acidity, alone with a reduction in metal concentrations. For the two VFP/aerobic wetland and HFLB systems, 27 mg/L of alkalinity (as $CaCO_3$) was added to the average flow of 61 gpm to receiving streams and iron, manganese, and aluminum concentrations were reduced by 40 mg/L, 16 mg/L and 27 mg/L, respectively. In addition, pH units were increased from between 2.87 and 3.80 in the inflows to an average of between 6.8 and 7.2. These studies are continuing to analyze the efficiencies of the individual system components.

Additional Key Words: Passive Treatment, Water Quality, Watershed

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