

THE EFFICIENCY OF PASSIVE TREATMENT SYSTEMS AND THEIR IMPACT ON SEATON CREEK¹

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Abstract. The Slippery Rock Creek Watershed has been impact by acid mine drainage for over 100 years. Since 1997, fourteen passive treatment systems have been installed within the watershed treating over 300 million gallons of mine drainage annually. The current study focuses on the impact of mine drainage discharges on Seaton Creek and Murrin Run, the two major tributaries to the head-waters of Slippery Rock Creek. In this study, the efficiencies of six passive treatment systems were analyzed as to their impact on receiving streams. The passive treatment systems installed at Desale I, II, and III are comprised of settling ponds, vertical flow ponds (VFP), aerobic wetland and horizontal limestone beds (HFLB). Two passive treatment systems were installed Goff Station with each system being comprised of two vertical flow ponds and an aerobic wetland. The system at Erico Bridge consists of an anoxic limestone drain that discharges into an aerobic wetland system. For each system monitoring points were located at discharge and above and below each stage in the various systems. At each sampling interval, the pH, alkalinity, and dissolved oxygen were recorded at each monitoring location and water samples were collected for laboratory analysis of acidity, alkalinity, pH, conductivity, total dissolved solids, sulfates, total and dissolved metals (iron, manganese, aluminum). Although each system varied in their efficiency, in all systems the pH increased from <3 to between 6.0 and 7.2 and alkalinity exceed acidity in the final discharge to receiving streams. The systems comprised of a combination of vertical flow ponds and aerobic wetlands were effective in removing iron and manganese and the concentrations of these metals were < 4 mg/l in the final discharge even in those systems where the concentration of iron and aluminum exceeded 50 mg/l in the inflows to the systems. But, only these systems with horizontal limestone beds as the final treatment system were effective in removing manganese from the mine drainages. As a result of the improvement in water quality in the receiving streams, macroinvertebrates and fish are beginning to re-colonize these streams systems. During the last two years, caddisflies, mayflies, dragonflies, damselflies, crayfish and three fish species have been collected in both Seaton Creek and Murrin Run below the discharges from these passive treatment systems.

Additional Key Words: Passive Treatment Systems, water quality, aquatic communities

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