

# LONGITUDINAL STUDY OF FOUR SUCCESSIVE ALKALINITY PRODUCING SYSTEMS IN WESTERN PENNSYLVANIA<sup>1</sup>

B.P. George<sup>2</sup> and T.O. Morrow

**Abstract:** Successive Alkalinity Producing Systems (SAPS) have been used for over a decade to passively treat Acid Mine Drainage (AMD). Typically, SAPS consist of piping overlain by a limestone layer, which in turn is covered by an organic layer, typically spent mushroom compost in this area. The limestone and organic layers are then flooded, forming a water layer of 0.5 to 2 meters in depth that maintains sufficient head to drive AMD vertically through the organic and limestone layers. Alkalinity is generated biotically in the organic layer by sulfate reducing bacteria and abiotically by dissolution of the limestone layer. In addition, the reducing properties of the organic layer prevent armoring of the limestone by oxidized metals. The purpose of this study was to compare the efficiencies of one to ten year-old SAPS over time and to evaluate the compost layers ability to maintain a reducing environment from 1997 to 2001 in one of the SAPS (Howe Bridge). Water chemistry parameters including pH, conductivity, total acidity and alkalinity, iron, aluminum, manganese, and sulfates were measured at the inflow and outflow of each SAPS. Flow measurements were used to calculate loading and metal removal efficiency. A novel apparatus called an equilibrator was utilized to measure the remaining depth of reducing zones in the compost layer. The compost layer at the Howe Bridge SAPS became less reduced in the 1997 to 2001 time interval. The older systems experienced reduced flows over time but are still effectively treating the AMD able to pass through them. Our findings suggest that SAPS designs can operate effectively for long periods but should include features that maintain planned porosity over the projected life span of the materials used in the system.

Additional key words: acid mine discharge, water pollution, pyrite, passive treatment systems.

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<sup>2</sup> Brendan P. George, Graduate Student, Department of Biology, Clarion University, Clarion, PA 16214  
Terry O. Morrow, Professor, Department of Biology