

# USE OF STREAM RESTORATION AND PASSIVE TREATMENT TECHNOLOGIES FOR IMPROVING WATER QUALITY IN AN EASTERN KENTUCKY VALLEY FILL<sup>1</sup>

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**Abstract.** Guy Cove, a 100 acre first-order watershed located in the University of Kentucky's Robinson Forest in Breathitt County, Kentucky, was surface mined in the late 1990's. Circum-neutral mine drainage discharging from the under-drain of a valley fill contains elevated levels of total dissolved solids. A multi-strategy approach was implemented to improve the water quality using three remediation procedures: 1) crown reconfiguration with the creation of a surface-flowing intermittent and four ephemeral streams, 2) reforestation using the Forestry Reclamation Approach, and 3) creation of a bioreactor-wetland treatment system. Surface-flowing streams will limit contact time between water and spoil, reducing the formation of dissolved solids. Loose-dumping of excess spoil in the uplands adjacent to the stream will provide a suitable growing medium for mixed mesophytic hardwood species, will enhance infiltration, and provides base flow to the created stream. Reforestation will enhance water utilization in the watershed through transpiration and reduced recharge to the under-drain. The bioreactor-wetland treatment system is intended to treat effluent from the under-drain until the stream and forest become fully functional. Ten months after installation of these technologies, reductions in sulfate, iron, and manganese for the created stream are 39, 88, and 87%, respectively and 11.1, 64, and 11.8%, respectively for the passive treatment system.

**Additional Key Words:** Total Dissolved Solids, Bioreactor, Sulfate Reducing Bacteria, Surface Mine Reclamation, Reforestation

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