WETLANDS AND MINE DRAINAGE - AN ECOTECHNOLOGY APPROACH

Mitsch, W. J. (1), Fennessy, M. S. (2), Cardamone M. A. (3), and Palmieri, D. (4). ((1) Professor, School of Natural Resources, The Ohio State University, Columbus, OH 43221, (2) Graduate Assistant, School of Natural Resources, The Ohio State University, Columbus, OH 43221, (3) Assistant Director, Wetlands Research Inc., 53 West Jackson, Chicago, IL 60604, and (4) Graduate Assistant, School of Natural Resources, The Ohio State University, Columbus, OH 43221. Ecotechnology and ecological engineering mean the purposeful matching and design of solar-powered ecosystems for benefit of both humans and nature. The control of acid mine drainage offers significant opportunities to explore the principles of ecotechnology. A general framework of the use of natural ecosystems for the "treatment" of water is presented, based on several years of wetland research in Kentucky and Ohio, followed by specifics of a case study in eastern Ohio. The case study involves a constructed, 0.25-ha wetland, organized into three cells of Typha latifolia, which is being used as an alternative control for acid mine drainage. Changing water quality and vegetation characteristics have provided a measure of the effectiveness of the wetland in removing dissolved iron from the mine effluent. Total reduction of iron from the mine water has averaged 57% within the system, with the largest proportion (21.3%) of the iron removal occurring in the third and final wetland cell, where vegetation density is greatest. The rate of iron removal is lower in the first two wetland cells, where vegetation density is also lower. Distribution of vegetation appears to be independent of distance from the mine effluent; it is controlled by the depth of standing water in the wetland. Growth (height and number of leaf blades) does not appear to be significantly affected by the mine water. If ecotechnology is to be successful in helping to control acid mine drainage, then design parameters and empirical models must be developed for the use of wetland ecosystems.

Additional Key Words: iron removal, Typha latifolia.

PEAT BLANKET TO LOCK ACID MINE SPOILS IN A SELF-SUSTAINING ECOSYSTEM

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Additional Key Words: methane, laboratory incubation, anaerobic environment, acid leaching.

WETLAND/RIPARIAN RECONSTRUCTION FOLLOWING SURFACE MINING: PART III. RECOMMENDATIONS ON CHANNEL MORPHOLOGY TO SUPPORT A WET MEADOW

Behling, R. E. (Professor, Department of Geology and Geography, West Virginia University, Morgantown, WV). Recommendations were formulated for reconstruction work on a 14-ha wetland/stream system, 927 m above sea level, which is being exposed through surface mining along Pendleton Creek, Tucker County, WV. This wet meadow is one of the numerous wetlands in the open-fold region of the Appalachian Plateaus in West Virginia and Maryland. The Pendleton Creek drainage basin is approximately 2.4 km wide, and the valley floor is 190 m wide. Fine-grained alluvium mantles the colluvium and bedrock to a depth of 2-3 m and forms the substrate for the natural wetland in the valley. The natural course of Pendleton Creek was a meandering channel, 4-5 m wide and 1.0-1.5 m deep. The gradient of the Pendleton Creek valley floor is less than 1 degree where the wet meadow exists. Sinuosity of the channel as determined from aerial photographs was 1.6. Bankfull width and depth measured in several locations between meander bends averaged 4.7 m and 1.4 m, respectively. Channel walls were nearly vertical with a curve at the base of the channel, creating a slightly concave floor. The natural channel is grass-lined. It is suggested that a grass-lined, meandering channel (sinuousity about 1.5), with rip-rap at the concave (outer) bank at meander bends would offer the greatest promise for all possible flow regimes of Pendleton Creek. The land adjacent to the channel could be returned to a wetland (a wet meadow would replicate natural conditions) and out-of-bank flow would be encouraged. A trapezoid cross-section for the channel of side slope 1.5:1; bottom width 3.0 m; depth 1.0 m would reflect bankfull conditions similar to those existent under natural conditions.

Additional Key Words: stream hydrology, reclamation, stream flow path, controlled flooding.