RECULTIVATION OF SPOIL BANKS DISTURBED BY OPEN-CUT MINING ACTIVITY IN HUNGARY

Szegi, J. (1), Olah, J. (2), Fekete, G. (3), Halasz, T. (4), Varallyay, G. (5), and Bartha, S. (6). ((1) Head of Soil Biology Department, Research Institute of Soil Sciences and Agricultural Chemistry of the Hungarian Academy of Sciences, Budapest, (2) Matraalja Coal Mining Company, Gyongyos, (3) Institute of Ecology and Botany of the Hungarian Academy of Sciences, Vacratot, (4) Green Belt Planning Office of the Pilis State Forestry, Balatonfured, (5) Research Institute of Soil Sciences and Agricultural Chemistry of the Hungarian Academy of Sciences, Budapest, and (6) Institute of Ecology and Botany of the Hungarian Academy of Sciences, Vacratot). Various recultivation processes were studied in the area of the Visonta Open-Cut Mine Enterprise in Hungary. The different recultivation tasks have been integrated with the landscape protection planning, which is responsible for the preservation and enhancement of the landscape. The physical, chemical, and biological properties of spoil which originated from different geological layers were investigated. The recolonization of microorganisms and natural vegetation were studied during the different stages of recultivation. It was found that the development of soils and vegetation were influenced by the pre-mine environment, the physical and chemical characteristics of the spoil, and the intensive human activity at the site. A special soil estimation system was developed to judge the economic usefulness of recultivated spoils. Finally, a rapid, combined recultivation process was carried out in Visonta.

Additional Key Words: reclamation, surface-mine spoil, revegetation, ecosystem development.

SOIL EXTRACTION TESTING TO DETERMINE THE EXTENT OF HEAVY METAL CONTAMINATION

Zahl, E. G. (Civil Engineer, Department of the Interior, Bureau of Mines, Spokane Research Center). Initial results are presented of a current Bureau effort to determine the applicability of a soil extraction test to be used as a screening tool for predicting the suitability of selected rangeland plant species for revegetating acid and heavy metal-contaminated soils. Project areas are located near Red Lodge, MT, and Superfund sites at Anaconda, MT. Research activities included: (1) leaching of study plot soils using various extraction solutions and analysis of leachates for trace element concentrations using emission spectroscopy; (2) collection of samples of interstitial water from the root zone using suction lysimeters and subsequent analysis for element concentrations; and (3) testing of the toxicity of the root-zone environment using bioassays with luminescent bacteria. A statistical comparison is being made of the data from these studies and those previously obtained from costly, long-term revegetation studies. Successful results will lead to a method of determining which plant species are best adapted to surface areas that have various degrees of acid and heavy metal contamination. Such determinations can become important since the degree of contamination can vary considerably from acre to acre, and the proposed method would preclude the need for numerous and costly revegetation studies. The results could be applied to vegetation established to reduce windblown dust and contaminated aquifer recharge waters, as well as to vegetation established for agricultural production.

Additional Key Words: revegetation, acid-contaminated soils.

EVALUATION OF PROCEDURES USED IN FOUR MINE SUBSIDENCE CONTROL PROJECTS

Elder, C. H. (Geologist, USDI-OSMRE-EFO, Pittsburgh, PA). An evaluation was made of the effectiveness of various procedures and materials used to abate abandoned mine subsidence. Four mine subsidence projects were selected: (1) Green Ridge Demonstration Project, Scranton, PA - backfilled with anthracite mine refuse by slurry injection; (2) Watson Hill Subsidence Abatement Project, Fairmont, WV - backfilled with fly ash slurry; (3) Farmington Subsidence Abatement Project, Farmington, WV - backfilled with bituminous mine refuse by slurry injection; and, (4) 70th Street Subsidence Project, Belleville, IL - backfilled with mine refuse by pneumatic/hydraulic injection. Test borings, sampling, and field and laboratory tests were performed to determine lateral and vertical extent of the backfill and physical properties of the materials relating to particle size, sedimentation pattern, strength, and *in situ* bearing capacity. Voids ranging from 1 ft to 6 ft in height were encountered above the backfilled material at all test sites and were sufficient to permit roof collapse and resultant subsidence. Particle size analysis and observed bedding of the backfill materials indicate sorting, grading, and channel deposition rather than radial distribution. Water-saturated mine refuse materials were plastic enough to yield with vertical and lateral pressure as indicated by penetration tests, laboratory analysis, and *in situ* pressure tests. Fly ash remained plastic to fluid having little strength to abate subsidence. An added cementing material may be required for a stable fill capable of supporting overburden. Post-project monitoring of abatement projects is recommended to determine long-term project effectiveness.

Additional Key Words: backfilling, slurry injection, coal refuse, fly ash.