BIOSOLID SOIL AMENDMENTS IN ARID MINELAND RECLAMATION: THE BUTCHER BOY MINE PILOT STUDY

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In order to achieve sustainable growth, communities in the arid western U.S. must develop new techniques to extract natural resources from public lands while protecting their unique desert environment. One promising technique is suggested by an on-going mine reclamation research project using biosolids, the solid residue of municipal wastewater treatment. The Butcher Boy Mine Pilot Study was developed because reclamation of degraded minelands in the arid west has met with only limited success due to the lack of suitable topsoil material. At the same time, communities have been searching for alternatives to disposing biosolids in municipal landfills. The Pilot Study is located near Wadsworth, 60 km north-east of Reno, Nevada. It's objectives are to determine the regulatory feasibility of applying biosolids for reclamation of degraded arid minelands and the long term effectiveness of biosolids in enhancing revegetation of those minelands. Regulatory barriers were overcome and all necessary permits were obtained in October, 1992. The next month, five .4 ha test plots were constructed on regraded tailings ponds at the Butcher Boy Mine. The Truckee Meadows Water Reclamation Facility provided the biosolids. They were applied at 33 to 67 t/ha on four of the plots. The remaining plot served as the control with no biosolids applied. After plowing, the plots were all seeded with grasses and shrubs. First year results are very encouraging. Vegetative cover amounted to as much as 51% on the treated plots compared to only 6% on the control plot. Land application of biosolids in arid mineland reclamation is feasible. Further study on its long term effectiveness is clearly warranted.

A REVEGETATION STRATEGY FOR TACONITE IRON ORE TAILING USING VA MYCORRHIZAE AND NATIVE GRASSES

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Interactions between potentially successful plant species and vesicular-arbuscular mycorrhizal (VAM) fungi influence successful dynamics and long-term sustainability of revegetated ecosystems. Revegetation of coarse taconite iron ore tailing is difficult because tailing has an alkaline pH (8.2), low water retention (1 % by wt.), and low levels of available P (1-3 mg/kg), N (< 1 mg/kg), and organic matter (0 %). Current revegetation practices include planting a mixture of agronomic species and fertilizing annually with 448 kg/ha of diammonium phosphate (18-46-0). The University of Minnesota and the U.S. Bureau of Mines' goal is to establish self-sustaining plant communities with a minimum of fertilization and labor using native grass species. A revegetation strategy was formulated based on information from plant selection experiments in the field and P response curves in the greenhouse. The cool-season grass, Canada wild rye (Elymus canadensis L.), was selected to initially stabilize the site, followed by the warm-season grass big bluestem (Andropogon gerardi Vitm.). This seeding schedule was based on their site suitability and growth characteristics in association with a locally-occurring species of VAM mycorrhizal fungi, Glomus claroideum Schenck & Smith. Canada wild rye shoot yields are less responsive to VAM, but the plant's abundant root system is highly colonized by these fungi and thus it increases the inoculum in the tailing for the more VAM-responsive big bluestem. Phosphorus response curves indicate that inoculation with VAM fungi increases shoot mass and P uptake and maximum shoot mass can be obtained with about 190 kg/ha of KH_2PO_4 fertilizer. Natural immigration of VAM fungal propagules is inadequate and an outside source of inoculum is necessary. The fine tailing basins and their restored vegetation offer a potential source of Glomus claroideum and other adapted VAM fungal species that live under similar chemical stresses as those posed by coarse tailing. It is expected that natural dispersal of plant seeds will slowly diversify and further stabilize the established plant populations.

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