

REVEGETATION OF NON-TOPSOILED, ORPHAN BENTONITE MINE SPOIL IN WYOMING AS INFLUENCED BY ORGANIC AND INORGANIC AMENDMENTS ¹

by

Kellie S. Moore, Edward J. DePuit, Gerald E. Schuman,
James L. Meining, and Herbert G. Fisser ²

Abstract. Revegetation of thousands of hectares of pre-law, abandoned bentonite minespoils in northeastern Wyoming has proven particularly difficult due to absence of topsoil and adverse physiochemical characteristics of spoil such as high clay content and sodicity. This paper presents 7th through 9th year findings of a project evaluating short and long-term effects of initially applied wood residue and N-fertilizer, and a later applied gypsum amendment on re-established vegetation. The initial benefits of higher rates of wood residue amendment (90 and 135 Mg/ha) to revegetation generally persisted through the 9th growing season, as did certain effects of initial N-fertilization within residue-amended treatments. Surface application of 56 Mg/ha of gypsum during the 6th year to ameliorate sodicity significantly enhanced plant growth during the 7th through 9th years. Findings thus supported the desirability of applying wood residue, N-fertilizer, and gypsum amendments in combination and at proper rates for effective revegetation of bentonite mine spoils.

Additional Key Words: Soil amendments, abandoned mined lands, sodicity, gypsum, wood residues.

Introduction

Bentonite clay has been surface-mined extensively in northeastern Wyoming for over 50 years. Although presently mined areas are being reclaimed according to current laws, thousands of hectares of orphan spoils existed a decade ago that were abandoned in a derelict state prior to

enactment of Wyoming's reclamation law in 1973. Natural revegetation of these lands has proven limited even after several decades (Sieg et al 1983). In light of this, reclamation of orphan bentonite spoil has been a major focus of the State of Wyoming's Abandoned Mined Land Program since 1985 (Richmond 1989).

Several characteristics of bentonite spoil make reclamation difficult (Schuman et al 1984), including high expanding clay and soluble salts (particularly Na) content. These characteristics lead to a dispersed soil system which results in poor structure, low water infiltration, and a high runoff potential. The standard practice of topsoiling to overcome spoil problems is usually infeasible on orphan bentonite mined lands because topsoil was not salvaged during pre-law mining operations, and because topsoil borrowing from undisturbed areas often is not economically or environmentally sound (Richmond 1989). Therefore, most efforts toward reclaiming these spoils have centered upon applying various organic and/or inorganic

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² Kellie S. Moore, Edward J. DePuit and Herbert G. Fisser are former Graduate Research Assistant, Professor and Professor, respectively, Dept. Range Management, and James L. Meining is a former Graduate Research Assistant, Dept. Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071; Gerald E. Schuman is a Soil Scientist, USDA-ARS High Plains Grasslands Research Station, 8408 Hildreth Rd., Cheyenne, WY 82009