

SELENIUM AVAILABILITY AND UPTAKE BY VEGETATION GROWING IN THE SOUTHEAST IDAHO PHOSPHATE MINING REGION¹

C.L. Mackowiak² and M.C. Amacher

Abstract: Plants growing on revegetated phosphate mine waste rock dumps in Southeast Idaho are frequently high in Se and may pose a risk to grazing animals. Forage levels above 5 mg/kg total Se as dry mass may result in livestock selenosis, particularly in sheep and horses. These high Se plants are typically found growing in soils where total Se is above 1 mg/kg. Over the past three years, extensive vegetation sampling was conducted at decommissioned mining sites (Se) on the Permian Phosphoria Formation of Southeast Idaho and their Se content compared with the Se content of vegetation growing on undisturbed lands. The oven-dried tissue was analyzed for Se using hydride generation - atomic absorption spectroscopy. Selenium uptake corresponded with the degree of site disturbance, where plants containing the highest Se were found growing on exposed waste rock shale. Additionally, deeply rooted legumes and trees tended to accumulate more Se than did other plant lifeforms. Although not classified as Se accumulators, alfalfa and some forage grasses were able to deplete bioavailable Se from waste shale over time, thereby lessening future Se uptake, which may prove to be a useful phytoremediation tool. Capping the waste shale with highly weathered soils may also lessen Se uptake by vegetation. We found weathered soils and subsoils containing total Se up to 13 mg/kg supported forage growth with tissue Se below 0.1 mg/kg, far below the 5 mg/kg forage threshold. Soil extraction data revealed that most of the Se in these soils exists as insoluble elemental Se, whereas the majority of waste shale Se exists as highly soluble Fe-oxide bound and free Se species. These data will aid in the selection of revegetation species and capping materials for past and future decommissioned phosphate mine sites.

Additional Key Words: capping, selenium, Phosphoria Formation, mine sites, phytoremediation,

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²Cheryl L. Mackowiak, Postdoctoral Research Soil Scientist, and Michael C. Amacher, Research Soil Scientist, USDA-FS, Rocky Mountain Research Station, Logan, UT 84321.