

CARBON SEQUESTRATION ON REFORESTED MINELANDS IN APPALACHIA¹

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Abstract: Research to address mechanisms by which atmospheric concentrations of CO₂ may be reduced is of global significance. Enhanced sequestration of carbon in terrestrial systems is a proposed mechanism to offset CO₂ emissions. Reforestation of abandoned and previously reclaimed mine lands has been identified as one such method for increasing terrestrial C sequestration. A chronosequence approach was initiated to evaluate carbon accumulation (biomass and soil) as a function of time on the mined sites. A whole-tree harvesting method was employed for this approach where trees were extracted from the sites and separated into the following components: foliage, stem, branches, and roots. Four tree species: Sycamore, White Ash, White Oak, and Yellow Poplar, representing 3 age classes (2, 3 and 7 years of age) on loose spoil material were examined. Soils and subsamples of each tree component were collected from each site for physical and chemical analyses. The C contents in trees varied by tree age and tree species. The C content varied between 25 to 90 kg ha⁻¹ for 2 yr old trees, between 514 to 841 kg ha⁻¹ for 3 yr old trees, and between 5,590 to 25,005 kg ha⁻¹ for 7 yr old trees. The amount of carbon in the rhizosphere soils ranged from 4,958 to 15,127 kg ha⁻¹, 16,203 to 21,744 kg ha⁻¹, and 28,259 to 41,921 kg ha⁻¹ for 2, 3 and 7 yr sites, respectively. Carbon accumulation rates increased from 750 to 5,028 kg ha⁻¹ yr⁻¹, 4,842 to 9,685 kg ha⁻¹ yr⁻¹, 4,825 to 17,363 kg ha⁻¹ yr⁻¹, and 2,744 to 9,888 kg ha⁻¹ yr⁻¹ for White Ash, White Oak, Yellow Poplar, and Sycamore, respectively. This study showed that successful reclamation and reforestation of mined sites will largely restore the potential of forests and forest soil systems to sequester carbon at pre-mining levels.

Additional Key Words: Reforestation, carbon sequestration, hardwoods

¹Poster paper presented at the 7th International Conference on Acid Rock Drainage (ICARD), March 26-30, 2006, St. Louis MO. R.I. Barnhisel (ed.) American Society of Mining and Reclamation (ASMR), 3134 Montavesta Road, Lexington, KY 40502

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