Growth Rates of Hardwood Trees Nine Years after Reclamation in Response to Substrates and Amendments[1]

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Abstract: To promote successful reforestation on mined lands, the Appalachian Reforestation Initiative supports the Forestry Reclamation Approach (FRA). The first step of the FRA is to create a suitable rooting medium. Growth media plots for reforestation studies were established at the Birch River Mine in Webster County, WV to assess the effects of mulch and hydroseeding treatments on the growth of twelve hardwood species on gray and brown sandstone. In 2006, a 5-ha plot was constructed with half having 1.5 m of brown sandstone placed at the surface and other half with 1.5 m of gray sandstone. Bark mulch was applied to the center of the plot covering both brown and gray substrates and the ends of the 5-ha plot were hydroseeded, resulting in eight treatment combinations. Twelve hardwood tree species were transplanted across the plot in spring 2007. Tree volume data and soil samples were collected each year and growth rates over 9 years were compared for all trees species combined, as well as selected species in all treatments. For brown vs gray mine soils (including mulch and hydroseed treatments), brown mine soils had growth rates for all trees combined of 1,675 $cm^3\ year^{-1}$ vs 1,041 $cm^3\ year^{-1}$ for gray mine soils. For the brown mine soil areas, mulched areas had significantly higher growth rates for all trees combined than brown non-mulched areas (2,369 vs 986 $cm^3\ year^{-1}$, respectively). For hydroseeding, all trees combined had significantly higher growth rates in the brown hydroseeded treatments than non-hydroseeded areas (2,109 vs 1,246 $cm^3\ year^{-1}$). In gray sandstone mine soils, mulch treatments resulted in significant increases in growth over non-mulched treatments for all species combined (1,881 vs 200 $cm^3\ year^{-1}$) and growth rates for all tree species combined were significantly higher on the gray hydroseeded treatments compared to the gray non-hydroseeded treatments (1,131 vs 951 $cm^3\ year^{-1}$. Amendments such as bark mulch and hydroseeding can improve the growth rates of trees on both brown and gray sandstone and should be used when planting trees for mined land reforestation.

Additional Key Words: gray sandstone, brown sandstone, hydroseeding, mulch, reforestation

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