Tree Response to Soil Treatments on Quarry Overburden [1]

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Abstract: Multiple studies have investigated the suitability of different tree species for reforestation of reclaimed coalmines, and the results from various regions suggest that many native tree species, including commercially important species such as pines and oaks, are viable choices. A 2x3 factorial experiment to test the effects of fertilizer application, lime application, and surface grading on tree seedling growth and survival was established on 4.5 ha of quarry overburden in 2008. Twelve rectangular plots were constructed: six were lightly graded with a single pass of a bulldozer, and the other six remained ungraded. Liquid lime was applied to one half of each plot, and fertilizer (20:20:20) was applied at a rate that provided 100 Kg/ha or 400 Kg/ha N to randomly selected plots in a manner that created three replicates of all lime, fertilizer, and overburden placement treatment combinations. Seedlings of *Castanea dentata* (American chestnut), *Pinus echinata* (shortleaf pine) and *Quercus alba* (white oak) nursery seedlings were planted, and one quarter of each plot was left unplanted. No herbaceous cover was seeded. After eight years, white oak survival was consistently good across plots with an overall average of 88%. Survival of American chestnut was 65%, while survival of shortleaf pine was 66%. After 8 years of growth, American chestnut had an average height of 1.96 m and root collar diameter of 41 mm, while pine showed the most growth at an average height of 2.14 m and diameter of 67 mm. Despite a high survival rate, oak height at the end of the study was only 0.8 m with a diameter of 24 mm. Initial fertilization had a lasting effect on tree growth, particularly on pine, while initial lime application had little influence on tree growth.

Additional Keywords: hardwoods, amendments, reforestation.

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3. Work reported here was conducted near 36°00’49” N, 84°11’ 26” W.