

Effect of Grading on Productivity of High-Value Tree Species in Appalachian Surface Mines¹

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Abstract: Surface coal mining has disturbed more than one million acres of Appalachian forest. Reclamation employed in compliance with federal regulations often compacts substitute soil material (spoil) and inhibits tree growth. In 1996, University of Kentucky researchers established an experiment on the since renamed Starfire Mine in eastern Kentucky. The study established nine reclamation cells to investigate the effects of soil compaction on tree growth and survival and develop guidelines regarding site preparation and tree species compatible with mine reforestation. The study evaluated three spoil grading treatments: 1) no grading (loose-dump); 2) graded with one equipment pass (strike-off); and 3) multi-pass grading resulting in uniform surface appearance (compacted). Treatments were planted with six native tree species. Nineteen growing seasons following planting, differences in survival and growth were compared among species and treatment. Survival ranged from 3.8% for black walnut in compacted spoil to 87 % for white ash in the loose-dump treatment. Analysis of overstory tree height data revealed significantly larger mean overstory heights for all species in the loose-dump and strike-off treatments versus the compacted treatment with the exception of black walnut. Mean overstory heights were not significantly different between loose-dump and strike-off treatments. Long-term data indicate the benefit of low compaction grading for reforestation of Appalachian surface mines. Data further suggest that strike-off sites may support tree survival and growth as well as sites where end-dumping practices leave spoil uncompacted. The strike-off reforestation treatments exhibit generally uniform topography that may facilitate efficient application of silvicultural treatments and timber harvesting, making this a promising approach for reclamation of Appalachia's surface mines.

Additional Key Words: Forestry Reclamation Approach, hardwood forests, compaction

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