

# RECLAMATION TECHNIQUE AFFECTS TREE ROOT DEVELOPMENT ON RECLAIMED SURFACE MINED LANDS<sup>1</sup>

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**Abstract.** Much of the land reclaimed since enactment of the 1977 Surface Mining Control and Reclamation Act is over-compacted. Research has shown that excessive compaction in replaced growing media is detrimental to establishment of trees. If trees are to be grown on reclaimed surface mined sites, something must be done to either minimize or alleviate excessive compaction in replaced growing media. The University of Kentucky has developed test cells at a reclaimed surface mine in eastern Kentucky to determine the impact of various spoil handling techniques and compaction alleviation methods on soil compaction and tree survival. The spoil handling techniques being evaluated include compacted, loose dumped, and struck-off techniques. The compacted technique represents the reclamation techniques typically practiced at mountaintop removal operations in the eastern United States. The loose dumped technique represents the placing of growing medium material with trucks, but no grading of the material. The struck-off technique represents the placing of growing medium material with trucks and minimal grading to level off the tops of the piles. The compaction alleviation methods being evaluated include shallow tillage using conventional farm equipment and deep tillage using a dozer with a ripping arm. Test cells have been planted with various tree species and data have been collected at the cells for soil compaction, soil mechanical resistance, and tree survival. The data are currently being correlated to determine how reclamation technique and compaction alleviation method affects tree survival. In September 2001, a tree was removed from a cell representing each reclamation technique and each compaction alleviation method to observe the root structure of growing trees. Each tree selected for removal was of the same specie (Northern Red Oak) and of approximately the same height (18 to 24 inches) and of the same shape. The removed trees have shown that at reclaimed mountaintop removal sites, roots grow along the joints between the rocks in the growing medium. For the compacted reclamation cells, only a single taproot structure is developing. For

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the loose dumped and struck-off cells, an extensive root structure is developing in all directions; large multiple roots are spreading outward from the main trunk of the tree. For the tractor ripped and dozer-ripped cells, the root structure is developing in a similar pattern as it is for the loosed dumped and struck-off cells.

Additional Key Words: reforestation, spoil handling techniques, compaction alleviation.