

The Relationship Between Compaction and Saturated Hydraulic Conductivity of Post-Mine Soils in East Texas

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Abstract: Post-mine soils that have been compacted may present root zone limitations that could cause reduced levels of vegetation productivity. Earth-moving equipment used in all weather conditions can create potential problems with compaction when wet soil materials are handled. Two methods of overburden removal were evaluated. The dragline method removes the entire overburden (up to 50 m deep) with a dragline bucket, replacing the overburden randomly in the area to be reclaimed. The cross-pit spreader (XPS) method removes the top 18 m of overburden from the surface, placing it on the surface of the area to be reclaimed using a conveyor-belt system. Post-mine soils derived from the two methods of overburden handling are expected to differ in their physical properties. The two post-mine soils were measured for zones of compaction using a cone penetrometer (values ranged from 1 to 12 MPa). The soils were also measured for saturated hydraulic conductivity (K_{sat}) using a single-ring infiltrometer. Zones of high resistance measured by the penetrometer were reflected by low K_{sat} values, as measured by the infiltrometer. K_{sat} values ranged from a high of 8.3×10^{-4} to a low of $3.5 \times 10^{-6} \text{ m s}^{-1}$. The dragline soil exhibited more zones of high resistance than the cross-pit spreader soil. Although variability is very high, the potential for reduced productivity resulting from compaction exists in both minesoils.

Additional Key Words: Compaction, Post-mine soils, Penetrometer, Infiltrimeter

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