

# EFFECTS OF COMPACTION OF RECLAMATION OF SURFACE MINED LANDS IN EAST TEXAS

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Author: Li Yao

Soil compaction by reclamation vehicles is a potential constraint to the performance of reclaimed surface mine in Texas. The objective of this study were: (1) to establish a baseline study of an area, and (2) to quantify the effects of compaction on soil properties that influence the success of reclamation.

In addition to routine soil chemical and physical properties as a baseline, compaction related soil properties, such as cone index (CI), bulk density, saturated hydraulic conductivity (Ksat), micromorphological features, root density, and coastal bermudagrass yield were measured in this study.

Cone index values ranged from a few hundred KPa in reclaimed uncompacted surface soils to as high as 15 MPa in the most compacted zones under nature soil moisture conditions. Normalized CI values showed that conventionally reclaimed minesoils have compacted layers starting from 15 to 20 cm depths and the CI values in these layers were commonly as high as the induced compaction layers.

Soil compaction was also indicated by the low Ksat values in the subsurface horizons. Slow to very slow infiltration rates were observed in the compacted zones, with Ksat ranging from 0.0016 to 9.82 mm/hr and a averaged Ksat of 0.8 mm/hr. In the surface horizons for all treatments, averaged Ksat were from 5.4 to 8.5 mm/hr which corresponds to the moderately slow class of water movement. Bulk densities were generally higher in the compacted horizons than in the uncompacted ones.

A large variety of micromorphological features indicating mechanical and shear stress due to compaction, such as bent shale and stress cutans, has occurred. Macroporosity was very low and ranged from 3.1% in compacted zones to about 10% in the uncompacted surface horizons of conventionally reclaimed soil. Macropores were dominantly oriented horizontally in both compacted subsurface zones and uncompacted surface zones. High spatial variability was observed in minesoils.

This study indicated that minesoils have been subjected to compaction by the current reclamation operations. Soil physical properties and microstructure were negatively affected by compaction. These conditions decreased rates of water movement, restricted root, negatively impacted plant yield, and would be expected to enhance surface runoff and erosion.

*Doctoral of Philosophy  
Department of Soil and Crop Sciences  
Texas A&M University  
College Station, Texas 77843*