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SOIL PROPERTIES AND HARDWOOD GROWTH SIX MONTHS AFTER PLANTING ON BROWN AND GRAY SANDSTONE SOILS AT THE FOLA MINE IN CLAY COUNTY, WEST VIRGINIA

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Project Description and Objectives:

The forestry reclamation approach (FRA) is a five-step method for reclaiming mined lands to forest in Appalachia.

The steps include:

1) Creating a suitable substrate growth media for trees,
2) Not compacting the substrate,
3) Seeding a non-aggressive herbaceous cover,
4) Planting commercially valuable trees, and
5) Planting trees properly.

The first step, creating a suitable substrate, has not had adequate scientific testing and operators use a variety of spoil materials on forestry sites. This project examined the physical and chemical properties of three soil/spoil materials as soil substrate for forestry: weathered brown sandstone, unweathered gray sandstone, and mixtures of these two materials.

Applicability to Mining and Reclamation:

The project was to resolve the controversy concerning the "best available" substrate material that should be used for forestry development. The State of West Virginia has more strict guidelines concerning substrate materials than surrounding states and this study was to determine the right type of spoil materials to use as substrates. The results of this study could be best applied to the Appalachian coal region.

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ABOVE PHOTO: Picture of a brown sandstone plot in foreground and gray sandstone plot in background, taken in May 2008, about two months after planting.

ABOVE PHOTO: Picture taken on August 18, 2008, approximately six months after tree planting. The brown plot in the foreground shows good tree growth as well as good native species colonization in the substrate. The gray plot beyond the brown shows less colonization.

Methodology:

The study was conducted at Consol's Fola Coal property in Clay County, WV. Eight, 2-acre plots were established and composed of two plots of four feet of brown sandstone/top soil materials placed at the surface, two plots of four feet of gray sandstone spoil materials at the surface, and four plots of a mixture of brown and gray sandstone materials. Eleven species of hardwood trees were planted across all plots at a density of 680 trees per acre. After six months, tree survival was determined. Soil samples were extracted and analyzed for nutrients.

Highlights:

Tree survival ranged from 80% on gray substrate to 100% on brown substrate across all eleven hardwood species. Soil pH was varied from 6.8 to 7.6 among substrates. Unfortunately, Fola Coal covered over the plots in fall 2008 because they had no other areas permitted for excess spoil disposal except for the location where these plots were established. Despite arguments and pleas, the company was forced to eliminate the plots and therefore the project was terminated six months after the plots were established and trees planted.

Results/Findings:

Preliminary results showed that tree survival was 100% on brown sandstone plots, 80% on gray sandstone plots, and 87% on mixtures of brown and gray plots. This result is somewhat different from other studies because generally no difference in tree survival between these two spoil types is found based on other studies. All trees showed signs of wildlife damage but tree mortality was not due to wildlife damage at this stage of tree development. Soil pH for brown was 7.5, gray was 7.6, and mixtures were 6.8. All were higher than the soil pH of native soil in the area at 4.4. Electrical conductivity (a measure of salt content) was 84 µS/cm on brown, and 245 and 275 µS/cm for the other substrates. No other significant differences were found for nutrients among substrates.

Above Photo: Picture of trees growing on brown and gray mixture plots about six months after trees were planted.

Above Photo: Picture shows forestry plots being covered by spoil in October 2008.

Website Information:

The final project report can be found at **http://www.techtransfer.osmre.gov/NTTMainSite/appliedscience/2008/Projects/WVU08SkousenHardwoodFR.pdf**

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