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MINE LAND RECLAMATION AND AMERICAN CHESTNUT RESTORATION: BRINGING TECHNOLOGIES TOGETHER

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Project Description and Objectives:

Hundreds of thousands of acres of mine land exist throughout the central Appalachians that have been reclaimed using standard practices (specified by SMCRA) of site re-grading followed by seeding with aggressive grasses and forbs. After 20-30 years there is no evidence of these sites returning to their natural pre-mining condition of forested habitat. This project demonstrated how soil disturbance treatments could be used to promote woody species establishment by reducing soil compaction, increasing aeration & drainage, promoting healthy root and mycorrhizal development, and decreasing herbaceous competition.

Applicability to Mining and Reclamation:

Soil compaction and interspecific plant competition have been identified as the two most limiting factors in the breakdown of the natural processes of plant community succession on reclaimed mine lands in the Appalachians. Often, critical soil fungi needed for seedling establishment and survival are missing from the soil. Under these conditions, woody plants are unable to colonize the habitats and reclamation back to pre-mining conditions is likely to take hundreds of years as opposed to tens of years. In addition, these soils have a relatively high level of biological activity after 20-30 years and are well positioned for community change. Reclaimed mine lands, often low in pH and certain soil ions, as well as high in rock content, provide a reasonably good growth medium for American chestnut.

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ABOVE PHOTO: Typical habitat throughout central Appalachia 20-30 years following reclamation (shown in dormant season).



ABOVE PHOTO: D-6 sized dozer equipped with 36-inch ripping bar.

Methodology:

For our study site, we utilized the Tri-Valley Wildlife Management Area (TVWMA) which is owned and managed by the Ohio Department of Natural Resources. The TVWMA is located in east central Ohio (Madison County) and was reclaimed in the early 1980s. The site is currently dominated by fescue. Three 1-acre blocks (replicates) were created in a demonstration area that received different treatments: deep (to 36-inches) cross-ripping on 5-ft centers, a surface (to 12 inches) plow & disk treatment, and a combined rip and plow & disk treatment, in addition to an untreated control. A total of 1200 American chestnut seedlings were planted onto the site, such that one fourth went into each treatment type. Seedlings were further subdivided into those that were pure American, 7/8th hybrids (partially blight resistant), and 15/16th hybrids (putatively blight resistant). Soil conditions, chestnut root colonization by fungi, overall seedling growth, and climate were monitored regularly throughout the growing season.

Highlights:

Soil treatments and growing conditions.

Soils structure was greatly improved following the treatments. Soil bulk density, aeration, and drainage all changed dramatically. Soil chemistry was found to be of reasonable quality in as much as it had contained vegetation for over twenty years, thus organic matter and various inorganic ions were at reasonable levels to support woody plant growth.

Chestnut survival and growth.

Several issues need to be dealt with when planting woody seedlings:

- 1) Trees must be protected from competing herbaceous vegetation that re-develops following soil disturbance.
- 2) Seedlings must be protected from herbivores.
- 3) Seedlings must be buffered against environmental conditions.

Weed mats were used to reduce plant-plant competition. Poultry netting was used to deter deer browsing. Gravel around the stem was used to deter vole bark stripping. Hydrated TerraSorb® gel was used to buffer the root system against transplant shock and subsequent drought conditions.

Results/Findings:

This study demonstrates that soil disturbance treatments 20-30 years following traditional reclamation approaches can provide a quality habitat for successful re-introduction of woody species. Seedlings inoculated with mycorrhizae exhibited a positive host response when compared to the non-mycorrhizal controls. Additionally, these high light, low fertility, well-drained environments appear to provide an environment quite suitable to the re-establishment of American chestnut hybrids and could ultimately serve as epicenters on the landscape for the restoration of this once important species.



ABOVE PHOTO: Combined ripped & plowed-disked treatment in first growing season. Note increased diversity of native forbs and planting method for hybrid chestnut seedlings.

Website Information:

The final project report can be found at <http://www.techtransfer.osmre.gov/NTTMainSite/appliedscience/2006appsience/CompletedProjects/OHamerChestnutPAngel2006.pdf>

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