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DEMONSTRATE THE POTENTIAL FOR LARGE-SCALE CARBON SEQUESTRATION BY REFORESTATION OF MINED LANDS USING MANAGED FORESTS.

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Project Description and Objectives:

This project evaluated the feasibility of restoring high-quality forests on mined land, and it measured carbon sequestration benefits that could be achieved from the application of reforestation procedures.

Applicability to Mining and Reclamation:

While there is great potential for sequestering carbon on reclaimed mined land, owners of mined land must know the capability of their mined lands to sequester carbon and the extent to which returns from carbon sequestration markets can augment their timber production income for this potential to be realized. To answer these questions, methods are needed for measuring, monitoring, and projecting carbon sequestration in forests on mined lands across site quality gradients.

As a result, this study examined ways to estimate forest productivity and carbon sequestration potential on mined lands and also examined husbandry practices that enhance the potential of mined land to sequester carbon. Mine sites in the Appalachian and Mid-Continent regions were examined for the forest productivity and carbon sequestration portion of the study.

While the husbandry practices portion of the study focused on mine sites located in the Appalachian Region, the methodologies developed can be applied across the country.

Methodology:

In examining the forestry productivity and carbon sequestration potential portions of the study, the investigators compared site productivity of 14 mined and 8 non-mined sites in seven states in the eastern and mid western coalfields. Tree growth was measured on the sites for growth comparisons.

In addition the researchers dug soil pits to examine the soil horizons and to determine how various soil factors affected site productivity. To examine the carbon sequestration potential of the mine sites, the researchers developed models to describe the sequestration potential using collected tree, litter, and soil data from these mine sites.

Highlights:

Mine soil quality results:

- Productive mine sites were well drained, ungraded mixtures of weathered coarse and fine textured materials.
- Ample rooting media, proper aeration and adequate moisture and nutrient supply were identified as necessary for tree growth.
- Construction of reclaimed mine sites should take into account mechanical processes, but also the physical and chemical conditions of the soils.

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Highlights (continued):

- Improper selection of spoil material; lack of original soil, biota and seed pools; compaction; and, competitive ground covers negatively influence mine soils.

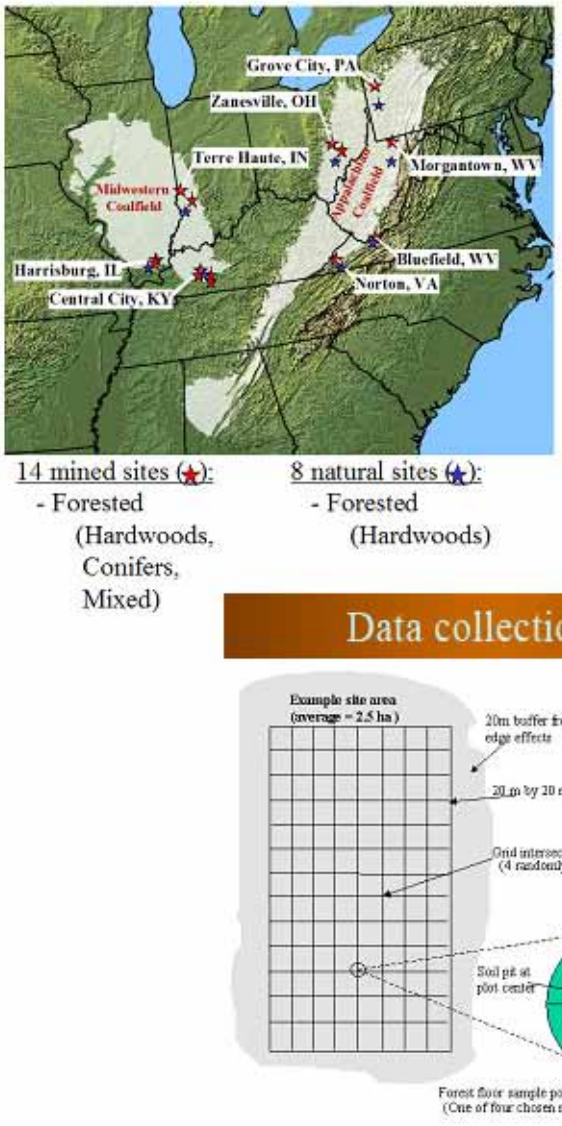
Carbon sequestration results:

- On average, the highest amount of ecosystem C on mined land was sequestered by pine stands followed by hardwood stands and then mixed stands.
- Non-mined hardwood stands sequestered about 42%, 62%, and 79% more cumulative C in total tree biomass, litter, and soils, than the pine, hardwood, and mixed stands on mined land, respectively.
- The C sequestration in non mined hardwood stands was greater on high quality sites; low quality sites were similar to mined hardwood stands.
- The higher the original forest quality, the less likely long term productivity was restored and the greater the disparity.

Results/Findings:

Productive forests for wood products and carbon sequestration can be established and grown on reclaimed mined land provided that reclamation is done to accommodate tree planting. Successful reforestation of surface mined land requires selecting sites with suitable soil characteristics for good establishment and growth of trees. Soil conditions can be altered through silvicultural treatments to ameliorate conditions that limit tree establishment and growth on these lands. Reclamation procedures that utilize sandstone overburden as the minesoil parent material reduce compaction caused by the use of heavy equipment to grade the site, and establish tree compatible ground cover can reduce the need for these silivicultural treatments.

Mined land can be as productive as forest land was prior to disturbance. Reforestation of grasslands can be done but tillage, weed control and fertilization are costly. Developing markets for carbon, bio-energy, and bio-fuel should increase viability of post-SMCRA reclamation.



ABOVE PHOTO: Mined and non-mined forested study site approximate locations and data collection procedures used by Rodrigue (2001) and Rodrigue and Burger (2004).

Website Information:

The final project report can be found at **http://www.techtransfer.osmre.gov/NTTMainSite/appliedscience/2005appscience/CompletedProjects/VATechCarbonSequestration2005.pdf**

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