

PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Sequestration

03/2006



CARBON SEQUESTRATION ON SURFACE MINE LANDS

Background

Large quantities of carbon dioxide (CO₂) are being emitted to the atmosphere by fossil-fuel combustion and other activities. Scientific observations have indicated that atmospheric CO₂ concentrations are steadily rising, which may negatively impact global climate and, consequently, affect the environment and economy of the U.S. Researchers around the globe are addressing methods by which we can reduce atmospheric concentrations of CO₂. One way to offset CO₂ emissions is through enhanced sequestration of carbon in terrestrial systems. Land management practices designed to increase terrestrial carbon inventories include both improving present land use, as well as conversion of land to other uses. Abandoned and previously reclaimed mine lands in the Appalachian region may provide excellent sites for enhanced terrestrial carbon sequestration through reforestation. Since these areas are essentially devoid of carbon after mining, the planting of forests can dramatically affect carbon uptake on these sites, thus increasing carbon accumulation in soils and forest biomass.

To demonstrate the potential for terrestrial carbon sequestration on mined lands, the University of Kentucky, with the U.S. Forest Service and the Office of Surface Mining and Reclamation Enforcement (OSMRE), has initiated a reforestation project at several locations within Kentucky. These sites differ with respect to geology and reclamation practices. In this study, various methods are being employed to decrease both physical and chemical limitations on plant growth so that the establishment of high value forest species (hardwood and conifers) is possible.

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Bent Mountain, KY Mined Land Reclamation Site



PARTNER

University of Kentucky

COST

Total Project Value

\$1,479,805

DOE/Non-DOE Share

\$1,099,540 / \$380,265

ADDRESS

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Primary Project Goal

The primary goal is to establish planting sites to demonstrate low compaction surface mine reclamation techniques for carbon sequestration through the growth and harvesting of high value trees.

Objectives

- To develop concepts that combine indirect capture and storage of CO₂ with concomitant reduction of criteria-pollutant emissions and improved water quality.
- To demonstrate and verify large scale carbon sequestration by reforestation of post-mining lands using high value tree species.

Accomplishments

- Planting sites were identified at three mines in three widely separated locations.
- Experimental plots were established on previously reclaimed mined lands and mine lands being actively reclaimed. Different treatments included levels of tillage, herbicide application, seedling treatment, application of mulch, and amount of fertilization.
- Over 550 acres of mined lands have been planted with hardwood seedling project.
- More detailed studies to address specific questions pertaining to carbon flux are underway to determine the net amount of carbon sequestered in mine soils.
- Biomass from a chronosequence of reclaimed mined lands have been recovered to estimate the potential that this reclamation approach can achieve.
- Established a long-term research site demonstrating the OSMRE approved Forestry Reclamation Approach as a method to increase carbon sequestration rates.

Benefits

The results of this study will not only enhance our understanding of carbon cycling in mined lands but also add to the knowledge base from which specialists draw when planning future reclamations. Considering the potential for mine lands to sequester carbon to offset rising levels of CO₂ in the atmosphere, the results will help justify a change in current mine reclamation practices and perceptions to allow loose dumped material which encourages forest establishment.