PROJECT facts

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

Sequestration

03/2006

ENHANCEMENT OF TERRESTRIAL CARBON SINKS THROUGH RECLAMATION OF ABANDONED MINE LANDS IN THE APPALACHIANS

CONTACTS

Sean Plasynski
Sequestration Technology Manager
National Energy Technology Laboratory
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-4867
sean.plasynski@netl.doe.gov

John Litynski
Project Manager
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507
304-285-1339
john.litynski@netl.doe.gov

Gary D. Kronrad
Arthur Temple College of Forestry
Stephen F. Austin State University
SFA Station
P.O. Box 13024
Nacogdoches, TX 75962
gkondrad@sfasu.edu

Background

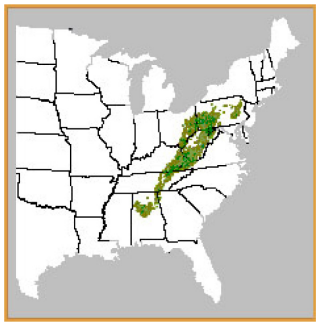
The continuing demand for fossil-fuel-based power and the associated rise in atmospheric carbon dioxide (CO_2) concentration will require the development of innovative ways to capture and store carbon. Terrestrial ecosystems, including both soil and the related vegetation, are recognized as significant biological CO_2 "scrubbers" and are major sinks for removing CO_2 from the atmosphere. Since reclaimed mined lands are essentially devoid of soil carbon, these areas provide an excellent opportunity to sequester carbon in both soils and vegetation.

Much of the strip mining in the Eastern U.S. is on forested lands. Unfortunately, after mining, most of these areas are restored as grasslands. However, much more carbon is stored in a hectare of forest than in a hectare of grasslands. Stephen F. Austin State University (SFASU) is studying the CO_2 sequestration potential resulting from afforestation of abandoned mined lands using Northern red oak. Within the Appalachian coal region, there may be up to 400,000 hectares of abandoned mined lands. These areas contain little or no vegetation, provide little wildlife habitat, and may pollute streams. Reclamation and afforestation of these sites has the potential to sequester large quantities of carbon in terrestrial ecosystems. Utility companies with high CO_2 emissions are interested in mitigating these emissions through the use of carbon credits. In order to establish a carbon credit market and claim carbon credits, utility companies need to partner with landowners who do not currently have forests on their land. Abandoned mined lands in Appalachia should offer excellent sites for such partnerships.

The success of the project to determine optimum rotations on mine lands led to expansion of the project to model the top commercial tree species in the United States throughout the different ecosystems in the U.S.

Primary Project Goal

This project will determine how to increase carbon sequestration in forests while increasing forest yields and providing other desirable ecosystem benefits.



Abandoned Mine Lands in Appalachia

PARTNERS

Stephen F. Austin State University

Texas Utilities Electric Company

USDA Forest Service

COST

Total Project Value
$1,595,146

DOE/Non-DOE Share
$1,097,670 / $497,476

ADDRESS

National Energy Technology Laboratory

1450 Queen Avenue SW
Albany, OR 97321-2198
541-967-5892

2175 University Avenue South
Suite 201
Fairbanks, AK 99709
907-452-2559

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4764

626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-4687

One West Third Street, Suite 1400
Tulsa, OK 74103-3519
918-699-2000

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

Objectives

- To determine the profitability of forest management in the Appalachian region when only timber is considered and when both timber and carbon credits are considered.
- To determine optimal forest management schedules using Forest Management Optimizer (FORMOP).
- To determine the amount of carbon that can be sequestered on abandoned mined lands and other ecosystems throughout the United States

Accomplishments

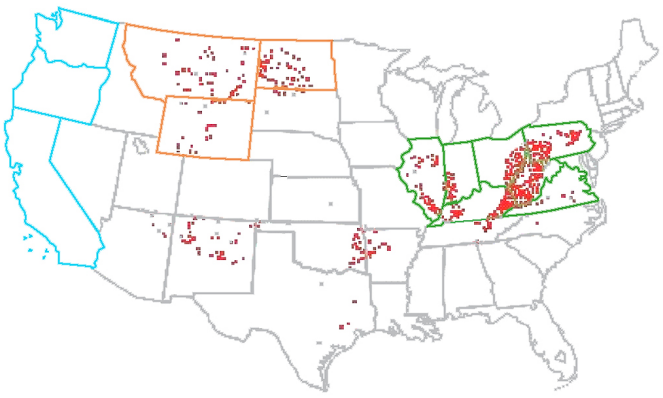
FORMOP, a combination of the U.S.D.A. Forest Service's growth and yield models and dynamic and economic programs, was used to simulate tree growth as a function of variables such as site quality, thinning frequency and intensity, and rotation length. Results indicate that costs of sequestering carbon in Northern red oak stands on West Virginia abandoned mined lands range from $7.20-40.50/tonne. These numbers reflect the cost of carbon sequestration without considering profits from timber management. When the timber revenues are taken into consideration, the net revenue earned from the reforestation of these lands ranges from a profit of approximately $34/tonne of carbon to a loss of $40/tonne. The market price of carbon credits will determine the attractiveness of sequestration projects on these poorer quality mined lands.

The FORMOP model has been optimized to combine the economic and growth model into one program capable of analyzing millions of rotation cycles and stumpage prices to determine the best management schemes for the commercial trees species in the United States.

Benefits

Mine reclamation, afforestation and forest management can provide two major benefits. The first is financial. Growing forests can generate revenue, create jobs, and enhance local economies. The second is environmental. Afforestation can reduce the negative effects of global warming by storing carbon in trees, enhance wildlife habitat, improve air and water quality, reduce soil erosion, and increase recreational opportunities.

Identifying the optimal management plans for each of the commercial tree species can add additional board feet and sequester an incremental amount of additional carbon.



Approximately 1.6 million acres of land in the United States supports only limited vegetation due to past and present mining operations.