REFORESTATION OF MINED LAND FOR PRODUCTIVE LAND USES AND ENVIRONMENTAL QUALITY

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PROGRESS REPORT (2004-2005)

Project Overview

During the year 2004-2005, our forestry research and outreach program emphasized reforestation of reclaimed mined lands with native hardwoods. We have a number of research projects in Virginia and adjoining states that test the suitability of different topsoil substitutes, establishment techniques, and hardwood tree species.

Several of our research study sites are now over 20 years old. They are at an age that shows convincingly that mined land can grow productive forests that produce valuable wood products while also providing wildlife habitat and watershed control. We found that valuable hardwoods can be established on mined land if a Forestry Reclamation Approach is used. This includes selecting the right topsoil substitutes, minimizing grading to reduce compaction, using a tree-compatible ground cover, and using a professional tree planter who plants good stock. Two technical articles based on our Powell River Project research sites are featured as part of this report (attached). The first shows that ground cover control with herbicides increases the survival and growth of most hardwood species, and that dense ground cover is a continuing limitation and concern for reforestation. The second report shows the high value of tree stands that is possible on good mine soils.

Our ongoing research includes work by Ted Auch, a Master of Science student in the Virginia Tech Forestry Department, who is completing a five-year assessment of a native hardwood establishment trial, the plots of which are located in Virginia, Kentucky, and West Virginia. This work shows the importance of mine soil quality on reforestation success.

Fifteen years ago we established a 3-acre sugar maple “sugar bush” plantation on the PRP demonstration area. This fall we will analyze a replicated study investigating the benefit of husbandry practices including fertilization and weed control. This study will demonstrate the management practices needed for the care and culture of trees for maple syrup production.

With funding help from the U.S. Department of Energy, we established a study testing the response of three forest types (white pine, hybrid poplar, and mixed native hardwoods) to three levels of forest management input (weed control only, weed control + tillage, and weed control + tillage + fertilization). These are stand-level treatments which will demonstrate the value and cost-benefit of standard forestry practices applied to reforested mined land. The study is in its second growing season.

We continue to monitor an 80-acre native hardwood planting on Rapoca Coal Company land. This cooperative effort between Rapoca, Virginia Tech, and the Virginia DMME serves as a model for the application of Powell River Project reforestation guidelines.

CURRENT RESEARCH ACTIVITIES: 2004-2005

1. Use of herbicides for weed control to improve native hardwood establishment:

- This PRP project is in its fourth growing season. The results after three years were published recently in the proceedings of the American Society for Mining and Reclamation. A copy is attached.

Burger, J. A., D. O. Mitchem, C. E. Zipper, and R. Williams. 2005. Herbaceous ground cover control effects on native hardwoods planted on mined land. In: R. I. Barnhisel (ed.). Proc., 22nd Meeting, Amer. Soc. for Mining and Reclamation. June 18-24, 2005, Breckenridge, CO. ASMR, 3234 Montavesta Rd., Lexington, KY

2. Hardwood establishment field trials:

- This is a large study with 10 3-acre sites located in three states. We completed tree, ground cover, and site measurements for eight continuous years. A preliminary analysis of this project was presented and published at the annual meeting of the American Society of Mining and Reclamation in Breckenridge, Colorado, in June, 2005. Ted Auch, a Powell River Project graduate student, will complete a report on the project by December 2005.

Auch*, W. T**.,** J. A. Burger, and D. O. Mitchem. 2005. Hardwood stocking after five years on reclaimed mined land in the Central Appalachians. In: R. I. Barnhisel (ed.). Proc., 22nd Meeting, Amer. Soc. for Mining and Reclamation. June 18-24, 2005, Breckenridge, CO. ASMR, 3234 Montavesta Rd., Lexington, KY.

3. Response of reclaimed forests to silvicultural treatments:

- Our long-term silvicultural treatments study located on the PRP was re-measured, analyzed, and reported in the proceedings of a meeting on mined land reforestation sponsored by the American Society for Mining and Reclamation. A version of this report is attached.

Casselman, T.C. N., T. R. Fox, J. A. Burger, and A. T. Jones. First-year seedling response to three levels of silvicultural input on post-SMCRA reclaimed lands. In: R. I. Barnhisel (ed.). Proc., 22nd Meeting, Amer. Soc. for Mining and Reclamation. June 18-24, 2005, Breckenridge, CO. ASMR, 3234 Montavesta Rd., Lexington, KY.

4. Restoring forests on mined land for wood products and carbon sequestration:

- This study is largely funded by the Department of Energy. It is a multiple-investigator project that entails replicate study areas in Ohio, West Virginia, and Virginia. The productivity of several forest types across several different mine soils is being tested. Sites are being ameliorated with tillage, fertilization, and weed control (Casselman et al., 2005). The costs and benefits of different forest management scenarios are being compared. The economic and policy implications of forest management on mined land for products and carbon sequestration will be analyzed for the Appalachian region. Methods for classifying forest site quality have been developed (Jones et al., 2005).

Casselman, T.C. N., T. R. Fox, J. A. Burger, and A. T. Jones. First year seedling response to three levels of silvicultural input on post-SMCRA reclaimed lands. In: R. I. Barnhisel (ed.). Proc., 22nd Meeting, Amer. Soc. for Mining and Reclamation. June 18-24, 2005, Breckenridge, CO. ASMR, 3234 Montavesta Rd. Lexington, KY.

Jones, A. T., J. M. Galbraith, and J. A. Burger. 2005 Development of a forest site quality classification model for mine soils in the Appalachian Coalfield Region. In: R. I. Barnhisel (ed.). Proc., 22nd Meeting, Amer. Soc. for Mining and Reclamation. June 18-24, 2005, Breckenridge, CO. ASMR, 3234 Montavesta Rd. Lexington, KY.

5. Evaluation of topsoil substitutes for hardwood reforestation on mined land:

- This greenhouse study was done with the help of Pritchard Mining Co. of West Virginia. The growth of three hardwood species planted in three different topsoil substitutes was compared with tree growth on native topsoil. The effect of inoculation on trees growing in each spoil type with 1 inch of topsoil was compared to tree growth on spoils receiving no inoculation. The results of this work were reported by Showalter (2005).

Showalter, J. M. 2005. Evaluation of topsoil substitutes for hardwood reforestation of mined land. Master of Science Thesis. Virginia Polytechnic Institute and State University.

What Are the Benefits of this Reforestation Research?

The people of the Appalachian region will always depend on its forest resources for socio-economic well-being. The importance of the timber industry in the region is increasing. Worldwide demand for Appalachian timber will increase as the U.S. Forest Service reduces its harvest on national forests. Demand for forest products will create significant opportunities for the owners of Appalachian forest land. Timber harvesting and value-added opportunities in sawmills and wood processing plants will help diversify the economy. Much of this forestry activity will occur on reclaimed mined land. Economic analyses have shown that the economic return on mined land reclaimed according to guidelines based on PRP research can be several times higher than on land currently reclaimed to unmanaged land uses. While improving the value of mined land for the landowner, coal operators benefit through more timely and successful recovery of performance bonds, and local communities benefit from land reclamation that improves water quality, reduces flooding potential, is more aesthetically pleasing, and is more valuable for a diversifying economy.