NATIONAL PROJECT ON WOOD UTILIZATION OPTIONS FOR ECOSYSTEM MANAGEMENT—AN INTERIM REPORT

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ABSTRACT

Using an ecosystem approach to forest management will change silvicultural practices, thus requiring utilization options to provide revenue and help offset the costs of silviculture treatments. The Forest Service, University cooperators, and several industry mills in the U.S. South, West, and Northeast have been involved in a National multidisciplinary research project to provide (1) methods for evaluating the economic feasibility of different silvicultural treatments, (2) various harvesting methods, and (3) product options for woody materials removed from forests maintained under an ecosystem approach. This paper presents the ongoing progress of this project.

INTRODUCTION

The ecosystem approach to forest management is changing silvicultural practices. Some approaches include removing woody materials to achieve desired ecosystem mangement objectives. As a result of the change in the species, size, and quality of wood that is being removed from the forest, utilization options are needed to provide revenue and help offset the cost of silviculture treatments.

Since 1994, 11 Forest Service research units, 9 National forests, 9 University cooperation, and several industry mills have been involved in a National project called "Wood Utilization Options For Ecosystem Management" (WUEM). The objective of this project is to provide methods for evaluating the economic feasibility of different silvicultural treatments, various harvesting methods, and current and future product options for woody materials removed from forests maintained under an ecosystem approach.

To achieve this objective, multidisciplinary research is being conducted to develop alternative utilization options and management decision models to aid National forests in treating specific ecosystem conditions in three U.S. regions: the South, West, and Northeast Research is linking options for silvicultural treatments with forest operations, with impacts on current and future wood qualities, and with options for current and future wood products. In addition, economic evaluation tools are being developed to help managers evaluate the feasibility of various silvicultural treatments, forest operations, and wood products. This paper presents the ongoing progress of the WUEM project.

SOUTHERN FORESTS

Research studies in the South are designed to identify the effect of ecosystem management strategies and resultant silvicultural treatments on species composition, growth, survival, properties, and product quality from forest stands in the Piedmont region. The purpose of this research is to link silviculture, harvesting, wood quality, and economic models to evaluate alternative silviculture treatments for moving the ecosystem toward uneven-aged pine mixed hardwoods.

To develop the link between silviculture and wood quality and wood products, 55 monitoring plots have been established on National Forests and other sites in stands with histories that represent a range of silvicultural practices. National forests include the Oconee, Sumter, Uwharrie. Appalachicola, and Conecuh. Characteristics inventoried include a new tree grade measure that is being used to provide estimates of volume and grade yield for lumber under alternative silvicultural regimes.

Several mill studies have been conducted to determine grades of lumber from trees of various grades grown under different regimes. Nondestructive evaluation (NDE) tests have been conducted to link speed of sound in logs to strength of lumber. Use of NDE helps identify the highest value use for each log, including machine stress-rated (MSR) lumber and laminated veneer lumber (LVL) (1,2).

[1]The Forest Products Laboratory is maintained in cooperation with the University of Wisconsin. This article was written and prepared by U.S. Government employees on official time, and it is therefore in the public domain and not subject to copyright.

A special growth projection model has been developed for loblolly/hardwood stands to project growth under alternative uneven-aged silvicultural regimes. An economic optimization model is being developed to estimate the degree to which alternative silvicultural regimes can meet economic return criteria and/or tree size and species diversity criteria. This model incorporates data on wood utilization options and indicates tradeoffs between economic return and tree size and species diversity (3).

Harvest productivity and cost estimates as a function of removal levels for uneven-aged management of pine stands in the South have been developed. Equations were developed for chainsaw felling, grapple skidding, and tree-length loading that link harvesting productivity to level of removals for a range of silvicultural treatments. Treatments include single-tree group-selection, seedtree, shelterwood, and clearcut. This information is used in the growth projection model (previously mentioned) for evaluating economic return from alternative silvicultural and utilization regimes. An initial version of the uneven-aged pine growth and economic evaluation model has been distributed to all National forests in the South.

WESTERN FORESTS

In the West, forests densely stocked and of small diameter. Silvicultural treatment projections have identified treatment options that will move stands toward a late successional condition. The "no treatment" option is projected to leave stagnant stands indefinitely.

Thinning operations, studied on the Colville National Forest, identified how operation costs decrease with increasing tree size. Results indicate how, with current markets for such timber in that locality, a small difference in average diameter of trees selected for harvest from a stand can determine economic viability of the timber sale (4).

Harvesting systems used for improvement cuttings to manipulate ecosystem structure and composition in western stands were reviewed. The review compared and contrasted harvesting system alternatives (5,6). The harvesting cost estimates were then used to determine potential economic return to stumpage, when using small-diameter trees for a range of specific products. The study estimated manufacturing costs, capital costs and "return to wood" for oriented strandboard, stud lumber, random-length dimension lumber, MSR lumber, LVL, and pulp for paper. Results indicate that pulp and LVL are likely to yield the greatest return to wood among the realistic processing alternatives (7).

Studies are also underway to evaluate the pulpability of wood from dense, small-diameter stands. Wood chips from the Colville National Forest have been tested for mechanical and chemical pulpability. Raw materials include small-diameter Douglas-fir, western larch, and lodgepole pine. Mechanical pulping tests at the Forest Products Laboratory indicate that lodgepole pine consumed the most energy, but yielded the strongest handsheets of paper.

Three mill studies have been done to link log quality to that of the resulting lumber or veneer using NDE. Data collected from the mills indicate a strong correlation between log quality and lumber quality. Such correlations provide a means to assess the highest value-added product that can be achieved from each individual log.

Financial analysis software is currently being developed that will allow resource managers to understand how different mixes of species, classes, and sites of timber affect the economic projection for a particular sale. This software also considers how different product possibilities can alter the economic feasibility of a treatment.

NORTHEASTERN FORESTS

Studies in the Northeast are designed to identify the short- and long-term links between ecosystem management and wood utilization opportunities (8,9). Initial research focused on central Appalachian hardwood stands in the Monongahela and Allegheny National Forests.

In 1995-1996, several meetings were held to identify issues associated with specific National Forest ecosystem management activities that could affect short- or long-term wood utilization opportunities and to determine the specific types of information required to accomplish ecosystem management objectives (10,11). Many of these issues are closely related to the maturing of the Monongahela and Allegheny National Forests and maintaining their inherent diversity. Regeneration, maintaining species diversity, and maintaining health are the main problems in these forests. Two-age management is a key system being studied.

For the Central Appalachian hardwoods, studies are underway to link silvicultural treatments to estimates of multi-product volumes and to harvesting costs. One study, based on data from 100 forest plots in West Virginia, developed methods to estimate multi-product volumes from hardwood trees. A second study linked cut stand attributes to forest operation costs for hardwood forests. Information from both studies is being used to improve a model that, for a given treatment, will estimate product yields, forest operation costs, and overall economic feasibility.

To evaluate implications of two-age management for future stands, a study is underway to assess regeneration. Data on regeneration has been collected on the Monongahela National Forest from 20 stands harvested under two-age management.

Within the bounds of the WUEM project, work has expanded to the Northern hardwoods in New England to examine links between silviculture and tree quality/utilization options. Data from 421 plots on the USDA Forest Service, Bartlett Experimental Forest, which were grown under alternative silvicultural regimes, have been used to estimate lumber yields by species and grade.

CONCLUDING REMARKS

To summarize, the National project on Wood Utilization Options For Ecosystem Management (WUEM) is focusing on moving from even-aged pine stands to uneven-aged mixed species stands in the Southern region of the United States. In the West, the project is focusing on late successional structural diversity in areas now covered with densely stocked, small-diameter stands. In the Northeast, focus is on management concerns for the Central Appalachian and Northern hardwood forests. The WUEM project is an effective means to pull together and focus research on silviculture, forest operations, wood qualities, wood products, and economic feasibility and to support outreach efforts that aid in managing specific ecosystem conditions (12).

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