USING FOREST VEGETATION SIMULATOR TO AID COMMUNICATIONS BETWEEN NATURAL RESOURCE MANAGERS AND STAKEHOLDERS

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Abstract—Due to differences in perspective, natural resource managers and members of the general public often find it difficult to communicate with each other concerning alternative management scenarios. Natural resource managers often consider and describe the forest in numeric terms such as number of trees, basal area, and volume per acre. Members of the general public are more likely to consider management implications from a visual perspective. With the ability to produce computer-generated, graphical images of the stand over time, the Stand Visualization System (SVS) and the Forest Vegetation Simulator (FVS) may provide an interactive means of communication that bridges the gap between these two perspectives. To demonstrate the potential of this tool, FVS was used to project future stand conditions based on five different real estate cuts applied in a pine plantation. The graphical and numeric information produced by SVS and FVS was then used to determine relative stakeholder preference for each regime over time.

INTRODUCTION

Rapid population growth and urbanization of once rural areas have become a great concern to forest managers operating near the wildland-urban interface (WUI). Despite the fact that the forested setting of WUI is often cited as one of the amenities attracting people to these areas, care and maintenance of the forest is often of very low priority for the new stakeholders. Typical manipulation of the forest in an urbanizing area centers on the facilitation of real estate and infrastructure development, with little or no consideration given to how the forest will respond to urbanization over time. Wear and Gries (2002) cite urbanization as the leading threat to southern forest land for the next 40 years.

As once-rural pine plantations are being converted to residential developments, social resistance to traditional plantation management practices may limit the range of alternative management practices available to natural resource managers. The resistance of WUI stakeholders to nonindustrial forest management may be due, in part, to the fear of aesthetic results as well as adverse economic factors and distrust in traditional forest management practices. A further limiting factor may be the forest managers' inability to effectively communicate aesthetic outcomes from alternative management practices to those unfamiliar with forest operations. This is perhaps because forest managers are trained to consider management implications in numeric terms, such as number of trees, basal area, and volume per acre while such abstract terms mean little to the lay person. Instead, they are more likely to consider potential management implications from a visual perspective (e.g. what will it look like?). With the ability to produce computer-generated, graphical images of the stand over time, the Stand Visualization System (SVS) module of the Forest Vegetation Simulator (FVS) may offer forest managers and their constituents an interactive means of communication that bridges the gap between these two perspectives.

To demonstrate the potential of this tool, FVS was used to project future stand conditions based on five different management regimes applied in a pine plantation at the wildland-urban interface in the Piedmont region of central Alabama. The graphical and numeric information produced by FVS was then used to determine relative stakeholder preference for the aesthetics, economics, and wildfire potential associated with each regime over time.

METHODS

Study Area

The study was located within a 40-ha stand belonging to Alabama Power Company that was of high real estate value due to its proximity to Lake Martin near Dadeville, AL. The site consisted of an 18-year-old pine plantation containing approximately 27.5 $m^2 ha^{-1}$ of pine basal area in the overstory and another 1.9 $m^2 ha^{-1}$ of hardwood basal area in the understory. Soils on this site are typical of the Piedmont physiographic region of central Alabama. Slopes are moderate, and the site is transected by a stream that empties directly into Lake Martin at the edge of the property.

Treatments

Five treatments representing a gradient of removal intensities and spatial distributions were applied to the stand. These same treatments were projected 20 years into the future using the FVS growth and yield software. The treatments are as follows:

1. No removal—no removal was simulated throughout the projection period. The stand was allowed to continue growing without management. Regeneration is not expected to occur in this stand.
2. Conventional removal—a typical fifth-row thin with operator select on the residual rows, reducing the residual basal area to approximately 16.0 $m^2 ha^{-1}$. This treatment left most of the larger trees and provided them with resources needed for growth but relatively little regeneration is expected to occur.
3. Heavy thin—a typical fifth-row thin with operator select on the residual rows reduced the residual basal area to approximately 9.2 $m^2 ha^{-1}$. This treatment left only the largest trees and provided them with resources needed for growth; moderate amounts of regeneration are expected to occur.

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Citation for proceedings: Connor, Kristina F., ed. 2006. Proceedings of the 13th biennial southern silvicultural research conference. Gen. Tech. Rep. SRS–92. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 640 p.

4. Strip removal—complete removal of two strips totaling one third of the stand at each of three entries. The Conventional thin was applied to the residual portion of the stand at each 10-year cycle. This treatment is the quickest means of converting the stand to mixed species and provides a protected view of the ongoing forest conversion from a downhill perspective. Large amounts of regeneration are expected in the strips.
5. Maintenance removal—a typical fifth-row thin with operator select on the residual rows reduced the residual basal area to approximately 16.0 $m^2 ha^{-1}$ and maintained this amount throughout the life of the stand. This treatment results in progressively fewer but larger trees in the stand throughout time. Relatively little regeneration is expected during the projection period.

Factors of Interest

Three pieces of information from the projections are of particular interest:

1. Aesthetics—SVS used FVS output to produce several images for each treatment. The time series of images included: initial stand conditions prior to any removal treatments, the post-treatment stand, and an image of the stand at each 10-year interval. Two view perspectives, a profile view and a perspective view, of each image were produced.
2. Wildfire hazard—Using the fire and fuel extension of FVS, we produced a relative wildfire fire hazard based on flame length. Each image was assigned to one of three wildfire hazard categories including: low (0 to 1.19 m), moderate (1.20 to 1.83 m), and high (≥1.84 m).
3. Economics—Each time the prescription called for a removal, a cost and revenue for each image and a net present value of each management regime was calculated over the entire projection cycle.

Additionally, an estimate of wildlife species one might expect to find utilizing the forest structure existing at each point in time, for each management regime, is presented. Each of these factors was included in the survey instrument.

Survey Instrument

A survey instrument consisting of two parts was produced to determine the preferences for each of the management regimes. Part I collected demographic data, knowledge of forest management, and experience with forest management. Part II asked the respondent to rate their preference for each image on a Liekert scale and to rank their preference for each alternative relative to the others. Each image included the aesthetic, economic, fire hazard, and wildlife information outlined above. This section of the survey also included a time series of images for each management regime.

Four different stakeholder groups were included in the target population including: (1) an urban residence group, (2) a rural residence group, (3) a wildland-urban interface residence group, and (4) all county commissioners in Alabama. The first three groups provide an idea of how the preference for each strategy will change across a population density gradient, while the commissioner group provides a policy perspective.

RESULTS

We are currently in the data collection phase of the project. The management scenarios have been developed, the research protocol was submitted and approved by the Office of Human Subjects Research, the survey instrument has been finalized and tested, and the target population has been contacted and invited to participate in the survey. Completion of the study is projected for August 2005.

LITERATURE CITED

Wear, D.N.; Greis, J.G. 2002. Southern forest resource assessment. Gen. Tech. Rep. SRS-53. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 635 p.