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CONVERSION OF IMMATURE SLASH PINE PLANTATIONS TO MULTI-AGED LONGLEAF PINE FORESTS OVER TIME: A CONSERVATION SILVICULTURE APPROACH

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Abstract: Interest in ecosystem restoration and the present downturn in the pine pulpwood market have produced a need for strategies to convert off-site plantations of slash and loblolly pine to more complex, multi-aged longleaf pine forests. Typically, the conversion process includes clearcutting, site preparation, and planting the desired species. In this model, however, the benefits of having older trees on site (e.g., fuels for prescribed fire, wildlife habitat, carbon storage) are diminished for many years, and other attributes of the ecosystem (e.g., groundcover) are damaged or lost. One alternative is a gradual conversion process where mature trees of the off-site species are retained while the desired species becomes established. A study examining this gradual conversion process has been underway for several years in a 65 year-old slash pine plantation on Ichauway. We recently implemented similar activities in two off-site slash pine plantations (planted 1987) that are more representative of plantations in the region. In summer 2002, following a 5% timber cruise, 4 row thinning treatments (second, third, fourth and fifth-row) with selections between rows were applied. This first thinning reduced average stand basal area by 45% but did not result in large enough openings for successful longleaf planting. Prescribed fire and spot application of herbicides were used to control hardwoods following thinning. A second thinning operation is planned for 2007 followed by planting longleaf pine seedlings in canopy openings. This sequence of thinning and planting will be repeated periodically until longleaf natural regeneration can be utilized. Complete removal of the slash pine overstory is expected to take at least 50 years.

INTRODUCTION

Interest in ecosystem restoration and the present downturn in the pine pulpwood market have produced a need for strategies to convert off-site slash (*Pinus elliottii* var. *elliottii* Engelm.) and loblolly pine (*P. taeda* L.) plantations to more complex, multi-aged longleaf pine (*P. palustris* Mill.) forests. Typically, this conversion process includes clearcutting, site preparation, and planting of the desired species. In this model, however, the benefits of having older trees on site (e.g. fuels for prescribed fires, wildlife habitat, carbon storage) are diminished for many years, and other attributes of this ecosystem (e.g. groundcover) are damaged or lost. An alternative approach is to gradually convert the plantations to naturally regenerated longleaf pine forests over time. One study examining this gradual conversion process has been underway for several years in a 65-year old slash pine plantation. However, most often, landowners have much younger plantations to convert. To address this need, we have implemented a similar study in younger slash pine plantations which are more representative of plantations in the region.

Objectives for this study included:

1. Improvement of stand condition and health through the practice of good resource stewardship.
2. Conversion, over the long-term, of the overstory to a multi-aged longleaf pine forest.
3. Development of a demonstration area for young plantation management and, over time, for species conversion over long rotations.
4. Provide a template for potential adaptive management projects.

METHODS

Study Site

This conservation project took place at the Joseph W. Jones Ecological Research Center at Ichauway, a 29,000 acre ecological reserve in southwest Georgia. Over 18,000 acres of the property are in naturally regenerated, mature (70+ years), upland longleaf pine forests. In 1987, two slash pine plantations (96 acres total) were established on sites historically dominated by longleaf pine. In 2002, the trees were suppressed, fusiform rust was prevalent, and self-thinning was occurring. There was little or no ground cover under the closed canopy. The sparse groundcover reduced the ability to carry fire through the stands, contributing to patches of hardwood encroachment. Initial stand basal area was 75 ft^2 $acre^{-1}$, average diameter at breast height was 7.3 in. and average total height was 52 ft.

Timber Harvest

In summer, 2002, following a 5% timber cruise, four row thinning treatments (second, third, fourth and fifth row removals) with selections between the rows were applied. Individual trees selected for removal were chosen based

on presence of fusiform rust, poor form, suppression or other damage. Selection (between row) thinning was conducted using a small 3-wheel feller-buncher to minimize damage to the residual stand.

Prescribed Fire and Herbicide

Prescribed fire and spot application of hexazinone were used to control hardwoods and slash pine regeneration after thinning.

RESULTS

Approximately 29 tons acre^{-1} of pulpwood was removed from these stands (total of 2,771 tons) during the first thinning operation. The majority of the trees were removed because they were located in take-out rows, followed by trees with poor form and suppressed trees (Figure 1). Basal area was significantly reduced by all thinning treatments (Figure 2). The average stand basal area (across all treatments) was reduced by 45% (to 41 ft^2 acre^{-1}). In all treatments, thinning shifted the diameter distribution to the right (Figure 3), a result of removing the smaller, suppressed trees from the stands. Eventually, the diameter distribution of these stands should approach that of an uneven-aged or multi-aged stand (Figure 4).

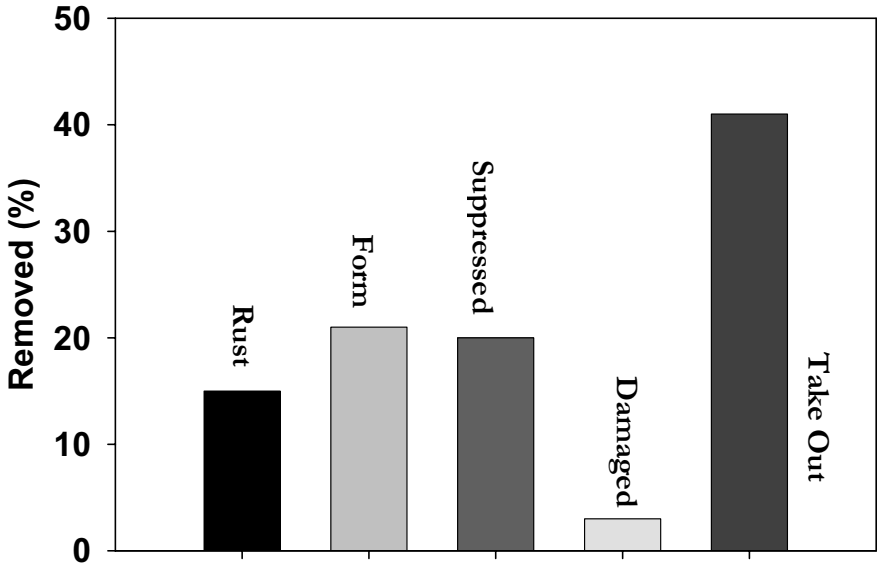

Figure 1. Reasons for removal of slash pine in a thinning operation in a 17-year old plantation.

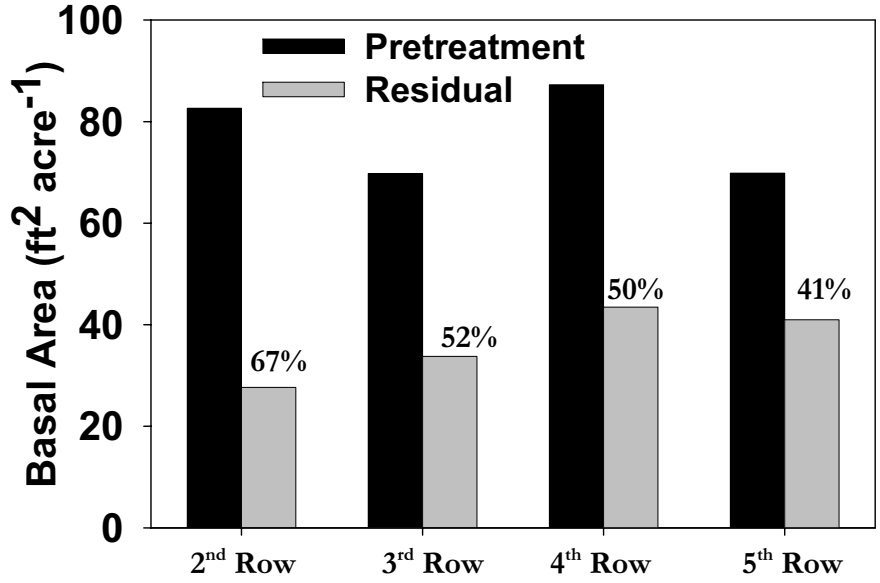

Figure 2. Basal area reduction (%) in a 17-year old slash pine plantation by thinning treatment.

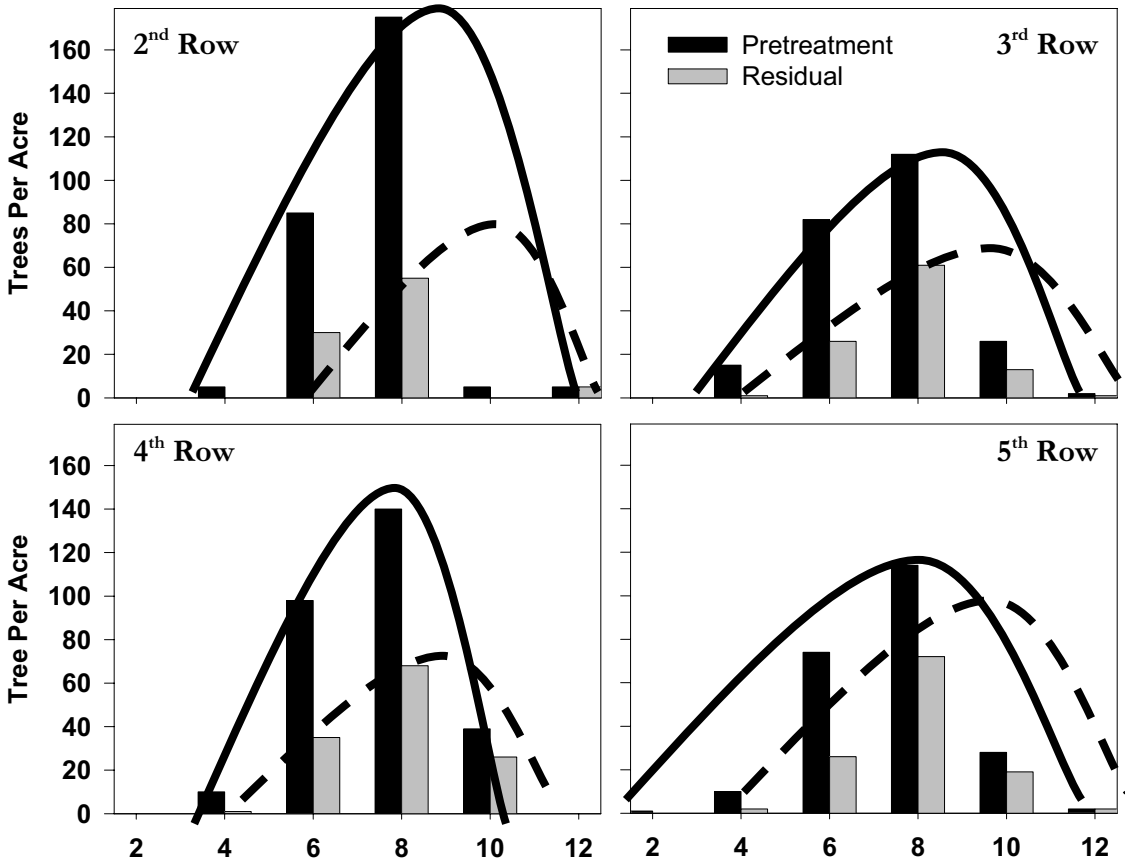

Figure 3. Diameter distributions of 17-year old slash pine plantations before and after thinning (2-inch diameter classes).

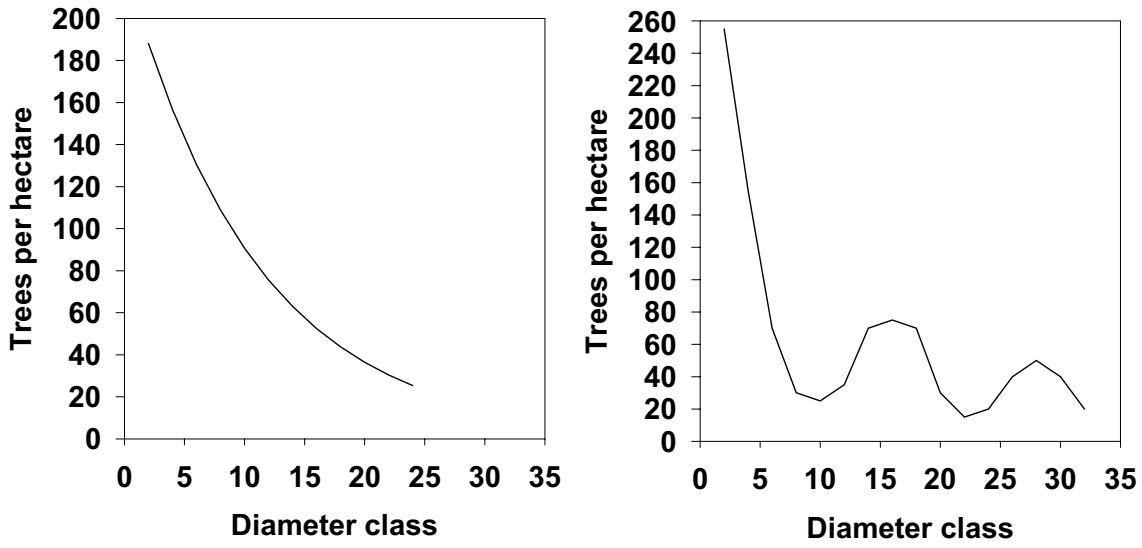

Figure 4. Diameter distributions of (a) an uneven-aged stand and (b) a multi-aged stand (by 2 inch diameter class).

FUTURE WORK

A second thinning operation is planned for 2007 with subsequent planting of longleaf pine seedlings in canopy openings. This sequence of thinning and planting will be repeated until natural longleaf pine regeneration can be established. Complete removal of the slash pine overstory is expected to take up to 50 years. Prescribed fire will be used on a two-year interval, along with spot applications of herbicide when necessary, to control hardwood encroachment.

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