

OAK REGENERATION THREE YEARS AFTER CLEARING AND THINNING IN THE LAKE O'DONNELL WATERSHED

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INTRODUCTION

Oak-hickory forests are being replaced by forests dominated by maple, yellow poplar and black cherry in the eastern US (Iverson et al. 2008). Previous studies have examined the effects of thinning and fire on oak regeneration, and changes in oak-hickory forests are related to shifts in the fire disturbance regime and shade cast by mid- and understory vegetation (Lorimer et al. 1994)

The objectives of this study are the following:

- Use thinning and fire treatments to create a new cohort of oak seedlings
- Reduce the exotic tree component in the stand
- Minimize residual damage with modern harvest equipment
- Create a long-term research site for use by Sewanee students (7 to date)

STUDY SITE

- Located in the watershed of Lake O'Donnell (Smalley's broad undulating uplands)
- Soils of the Hartsell series (Ultisols)
- NW Aspect, 1980 ft. elevation



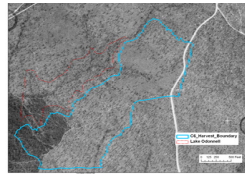
Location of the study site on the Domain of the University of the South.

SITE HISTORY

- Reliable spring at what is now Lake O'Donnell, likely long-term use by Native Americans
- Little written record prior to 1950 concerning Compartment 6
- Harvested several times in the 1950s

Harvest history in Compartment 6

Year	Tree species	Purpose
1952	Dogwood	Mallets, weaving shuttles
1955	White oak	Bourbon staves, headings
1956	Oaks, black gum, hickory, maple	Ties, tie siding, stave bolts, handles



Aerial image taken in 1950; note the very low tree density.

THINNING & HARVEST

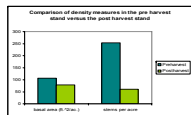
- Harvest took place October – December 2006
- Forwarder and processor used to thin the forest from below, removing stems 10" dbh and below, and to create 9 clearings



Clearing created in harvest and equipment used.

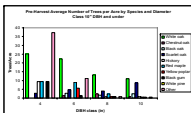


- Result was a marked decrease in stems per acre with a less drastic decrease in basal area

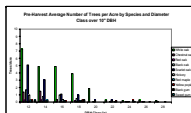


Smith and Smith 2007

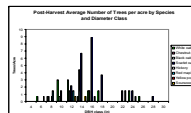
- Decrease in oaks, particularly white oak in mid-story
- Shift in distribution toward trees with greater diameters shown in pre-harvest and post-harvest inventories



Winslow et al. 2006



Winslow et al. 2006



Smith and Smith 2007

METHODS



-134 circular plots of 3.72' radius (1/1000 acre)

-Use of English measures for ease of interpretation for land managers

- 54 plots in clearings, 36 in edge, 44 in forest

- Measured height of each seedling in plots, examined for deer browse and made an estimate of herbaceous cover

- Then, oak seedlings tagged in 3 clearing sites, 3 edge sites and 3 forest sites, growth will be followed over time
- Photosynthesis rates of tagged seedlings measured with Li-Cor 6400 photosynthesis system

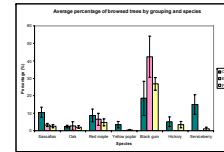
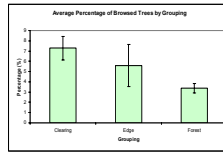
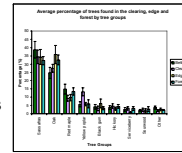


RESULTS

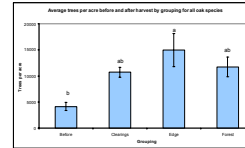
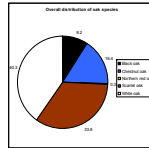
- 27 tree species found in plots, 6 species observed outside of plots.

- # seedlings per acre before the harvest were significantly lower than in post-harvest treatments (p=0.004)

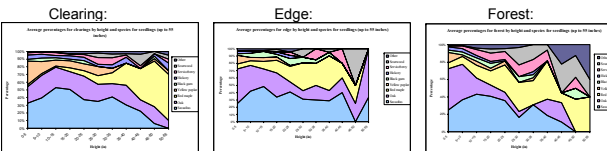
- Deer browse was low but most prevalent in the clearings, and black gum was the most preferred tree



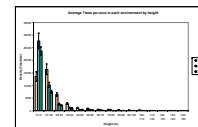
- White oak was the most abundant of the oaks and the highest density of oak seedlings was found in the edge (post-harvest significantly higher than pre-harvest for all treatments)



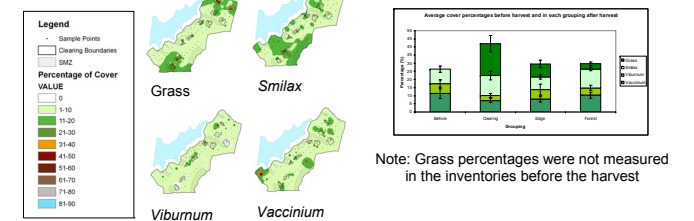
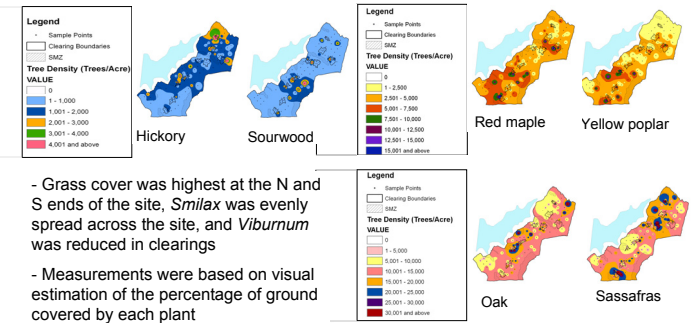
- Red maple increased in percentage in the larger height classes, especially in the clearings, and the forest had a greater diversity of tall seedlings



- Note: There are fewer trees in the larger height classes, so a species can dominate the larger height classes even with a low density

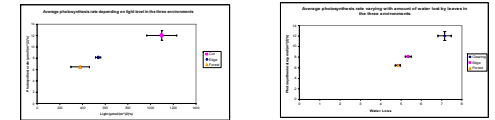


-The spatial distribution of seedling densities varied greatly by species or by species assemblage. Please note the differences in the values (trees/acre) for the three legends below.

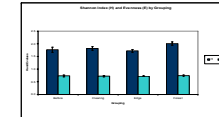


Note: Grass percentages were not measured in the inventories before the harvest

- Light and the photosynthesis rates of oaks were the highest in the clearing as was the amount of water lost through stomata



- Diversity as measured by the Shannon Index and Evenness did not vary much after the treatments



CONCLUSIONS

-Oak regeneration is occurring in large numbers

-Clearings will be treated: cutting of red maple and sourwood stump sprouts and thinning of oak and hickory sprouts has already occurred in 3 clearings, burning will occur in Winter 2009 of 3 different clearings, 3 will be left as controls

- Hope to determine which harvest option is most effective in encouraging oak regeneration while studying changes in forest structure

LITERATURE CITED

Iverson, L.R., Hutchinson, T.F., Prasad, A.M. and Peters, M.P., 2008. Thinning, fire, and oak regeneration across a heterogeneous landscape in the eastern U.S.: 7-year results. *Forest Ecology Management*, 255, 3035-3050.

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