Evaluation of Ecosystem Response to Silvicultural Treatments in Upland Oak Forests in Northern Mississippi

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INTRODUCTION

- Upland hardwood forests are ecologically diverse and provide vital ecosystem services, including wildlife habitats, carbon sequestration, and timber production.
- However, these forests are in a critical state, with more than 90% degraded or in poor condition.
- Oaks are at risk of declining as the dominant species in these forests because they are not recruiting into the mid and overstory.
- Understanding the factors that affect oak regeneration is critical for developing effective forest management strategies.

OBJECTIVE

- Investigate the response of forest ecosystems to different silvicultural treatments in terms of residual tree growth, regeneration, seedling recruitment, and diversity.

STUDY AREA

- The study will be conducted at the Spirit Hills Farm in Tate County, Mississippi, which spans approximately 526 hectares, with 234 hectares of hardwood or mixed hardwood forest.
- The area features a mix of species in the overstory, midstory, and understory.
- The prevalent species are mockernut hickory, white oak, scarlet oak , southern red oak, post oak, sweetgum, winged elm, black gum, sweetgum and a mix of loblolly pine.
- The understory consists of grasses, false brome, deerberry, and tree seedlings.

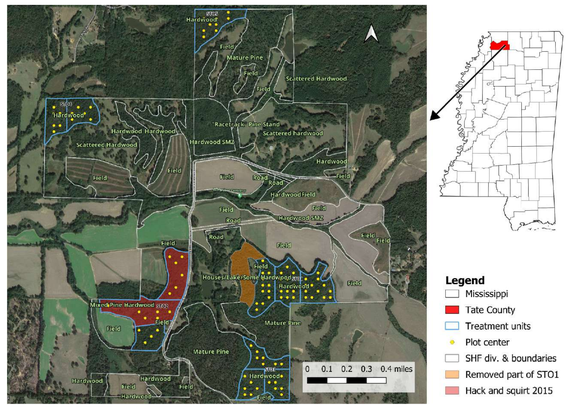

Figure 1. Map of the study area

Treatment

- T1 - Uniform Shelterwood: Involves hack and squirt and overstory removal to achieve a residual basal area of 11.5 m^2/ha.
- T2 - Irregular Shelterwood: Utilizes hack and squirt and overstory removal to achieve a residual basal area of 6.9 m^2/ha.
- T3 - No Treatment: Control areas with no silvicultural treatments applied.

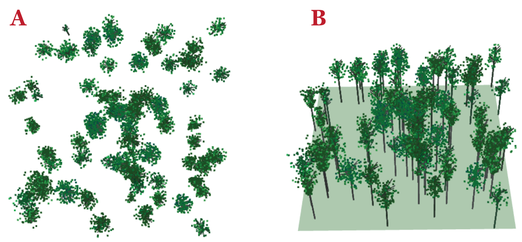

Figure 2. T1 - Overstory removal to 11.5 m^2/ha
(A - overhead view, and B - perspective view)

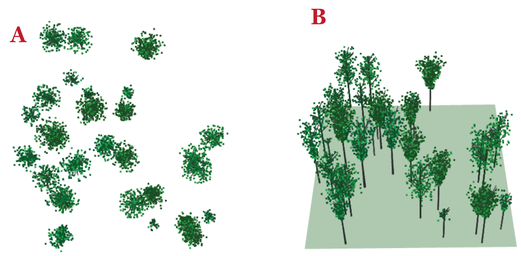

Figure 3. T2 - Overstory removal to 6.9 m^2/ha
(A - overhead view, and B - perspective view)

Monitoring

- Permanent circular plots were established to monitor treatment responses.
- Plot locations were systematically assigned using a systematic layout of 50 x 50 m grid given a 9 m buffer and randomly assigned to grid cells.
- The number of plots for each treatment unit was determined by sample size calculations using proportional allocation according to Avery and Burkhart (2002) and a total of 99 plots will be monitored.
- Overstory, midstory, and understory tree composition, oak seedlings, and herbaceous species cover will be recorded.

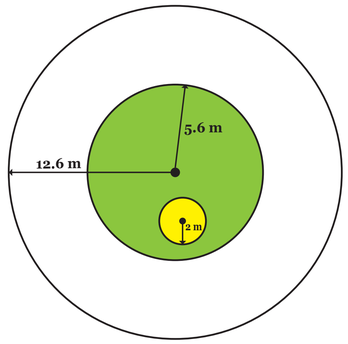

Figure 4. Nested plot design

- Overstory plot (0.05 ha) for live and dead stems ≥ 25 cm DBH
- Midstory plot (0.01 ha) for live and dead stems ≥ 5cm and < 25 cm DBH
- Understory plot for trees species with a diameter 2.54 cm through < 5 cm

CURRENT WORK

- We have begun collection of base line information on the established plots. This include number of trees, basal area, diameter (DBH at 1.3 m), tree height, and canopy cover to assess forest structure.

Figure 5. A and B are pictorial view of different stands in the study area

EXPECTED OUTCOME

- We expect to identify the most effective silvicultural treatments for upland oak forest regeneration and to enhance our understanding of how ecosystems respond to these treatments.
- The findings will inform conservation and management strategies to ensure the long-term sustainability of upland oak forests in northern Mississippi.
- The study will serve as a valuable demonstration site for upland oak silviculture, facilitating outreach and educational efforts at both regional and national levels.

Acknowledgement

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Reference

Avery, T.E. and Burkhart, H.E. 2015. Forest Measurements. 5th Edition. Waveland Press, Inc. Illinois. 456 pages.