Regenerative Studies in a 50-Year-Old Appalachian Clear Cut

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Abstract

The Pisgah National Forest, located in the Southern Appalachian range, has seen the decline of oaks for decades. A number of stands which were clear-cut in the 1980's were selected to study the regeneration and diversity of oaks. Oaks are keystone group which are struggling to compete with mesic species in the absence of disturbances such as wildfires. The data collected on saplings in odd plots suggested that, after 50 years, oaks and mesic species maintained equal footing in the regenerative layer. However, the scope of the data was limited. Although oaks may be able to recover after a clear-cut given decades, their importance suggests that management strategies are necessary to support oaks in competing with mesic species after a clear-cut.

Introduction

Most of Appalachia's forests have experienced a clear-cut. Clear-cutting involves the harvesting of all trees in an area, typically for commercial purposes. Although some tree species regenerate well after a clear-cut, others do not. Oak trees are an ecological keystone in the Pisgah National Forest, where their numbers have declined since harvesting began in the 18th century. Oaks tend to be out-competed by less desirable mesic tree species, such as the Tulip poplar and Red maple, in previously clear-cut forests.

- Even after 30 years, a clear-cut forest can shift from primarily oak and hickory species to primarily mesic species, which are less productive for the ecosystem (Yeagle et al, 2003)
- Oaks are an essential part of the food web, providing fat, nutrients, and proteins to birds, mammals, and insects as well as habitat (Bargali et al, 2015)
- Since oaks are adapted to tolerate and take advantage of natural wildfires, Eastern oak populations are struggling due to the suppression of wildfire , causing mesofication (Alexander et al, 2021)

Hypothesis

The hypothesis is that the regenerative layer in the understory will be dominated by mesic species rather than oak species.

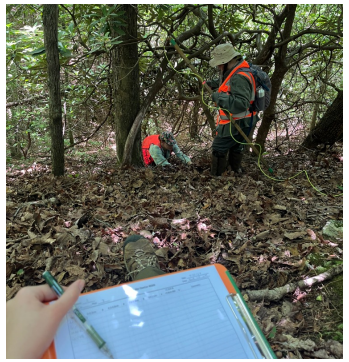

Image 1. Regen data collection in Plot 7 by Lauren Daniels and Antigone Burke

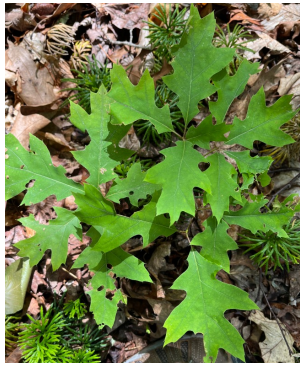

Image 2. Photo of a *Quercus coccinea* (Scarlet oak) sapling cluster

Image 2. Photo of an *Acer rubrum* (Red maple) sapling

Methodology

Regen data was taken only at odd plots in the stands pre-established by the Bent Creek crew. Data collection began by finding the plot center using GPS. Once the plot center was determined, a circle with a radius of 2.3 meters around the plot center was established using a pre-measured length of rope attached to a pole and stake. Only tree species in the circle under 3.8cm DBH were surveyed, herbaceous and shrubby species were ignored. Trees were identified, measured to determine size class, and tallied on the data sheet. The maximum count that could be reached for a species in one size class was 30.

Results

Date	Year	Comp	Stand	Plot	Spp	0.0-0.3m	0.3-0.6m	0.6-0.9m	0.9-1.2m	>1.2m
30 May	2024	2	16	7	ACRU	30				
30 May	2024	2	16	7	QUCO	30	1			
30 May	2024	2	16	7	MAFR	2				
30 May	2024	2	16	7	AMAR	1				
30 May	2024	2	16	7	QUMO	4	1			
30 May	2024	2	16	7	NYSY	2	1			
30 May	2024	2	16	7	SAAL	9				

A total of 7 species were observed, and none of the saplings surpassed the 0.3-0.6m size class. The two most abundant species were *Acer rubrum* (Red maple) and *Quercus coccinea* (Scarlet oak). Some *Quercus montana* (Chestnut oak) saplings were also observed. There was also a notable amount of *Sassafras albidium* (Sassafras) saplings. Other species observed include *Magnolia fraseri* (Frasier Magnolia), *Amelancier arborea* (Common serviceberry), and *Nyssa sylvatica* (Black gum).

Discussion

The results indicate that the hypothesis should be rejected, but more data is needed. The plot seemed to be equally shared by oaks (*Quercus sp.*) and mesic species (*Acer rubrum* and *Sassafras albidium*). However, since our methods include ceasing to count the species in a certain size class once the tally reaches 30, it is possible that there are more Red maple or Scarlet oak saplings than the data suggests. The absence of trees in a size class greater than 0.3-0.6m suggests that the saplings are being suppressed by the larger overstory trees, preventing light from reaching the regenerative layer. This may be caused by a lack of disturbance, particularly the absence of wildfires. The scope of this data is limited to only one plot, hence why more data is needed. The results suggest that although clear-cuts tend to favor mesic species over oaks in regeneration, time may give oaks a chance to re-establish. However, the USDA should consider that 50 years may be too long of a period to wait for oaks to re-establish by themselves in a clear-cut and seek management strategies that help oaks outcompete mesic species. Future studies should include comparisons between the regenerative layer and the overstory.

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Acknowledgements

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