Thesis-Schmesis

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2022-08-03

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# Abstract

# Introduction

Montane treeless areas, grassy and heath balds, exist globally and are characterized as being dominated by herbaceous vegetation or woody ericaceous species, respectively. It is theorized that balds originated over ten thousand years ago and are hypothesized to be maintained by grazing of large herbivores and some deliberate burning (Murdock 1968, Gersmehl 1970, Lenze 2015). According to Gersmehl (1970), true balds occur above 4,600 feet in elevation and can be characterized as follows; gently sloping but rarely greater than 20-degrees, often dominated by *Danthonia compressa*, forest encroachment is evident at the margins, relict trees are scattered in most areas, most are often sheltered on two or more sides by taller forest growth, soils are between 2 and 4 feet deep with high moisture content and organic matter, and at least one perennial spring is evident on the margin. Round Bald is a part of the Roan Mountain Massif and is located along the Appalachian Trail about 16 miles North of Bakersville, North Carolina and 14 miles South of Roan Mountain, Tennessee. The Balds of the Roan Massif host many rare and endemic species recognized as rare on national and regional levels.

In February of 2022, there was a low-intensity surface fire that burned approximately 4.5 arces of land on the south-facing slope of Round Bald.

# Methods

Round Bald is located in the Roan Mountain Massif of the Unaka mountain range of the Southern Appalachian Mountains, at an elevation of 1,775 m and approximately 36°06’N and 82°60’W. The Appalachian Trail (AT) runs along the study site and acts as the center line for the plant community transects. Round Bald is located about 12.8 miles north of Bakersville, North Carolina in the Pisgah National Forest and 12.4 miles south of Roan Mountain, Tennessee in Cherokee National Forest. The first four transects established by Stokes and Horton (2022) were relocated and used in this study, as the fire did not extend to the subsequent transects. Here we are looking at differences in plant community composition and soil seed bank following low-intensity ground fire.

In this study we sampled the first four transects established by Stokes and Horton (2022) using the new AT as the central line. Individual plots were relocated from Gaia GPS data (Trailbehind Inc. 2017) and then marked again to reflect current plot location. Distance north and south was measured from each plot to the AT. Plots were laid out as perpendicular to the new AT as previous waypoints indicated. Transects were separated by 150 meters, as established by Stokes and Horton (2022), and plots were 8-12 meters from each other. Historic plots described by Hamel and Somers (1990) were not sampled. Plant Community percent covers data were collected for the first growing season in June 2022 and the second season *in June 2023*. Soil seed bank samples were only taken during the first sampling season and grown for one year.

Plant community percent cover was measured using a 1 x 1 square meter PVC quadrat divided into 100 equal sized squares. Quadrat was placed about 2 feet above the ground and was photographed at each plot. Digital photographs were marked to indicate dominant vegetation type determined by visual estimation of each square, plot coverage totals were tallied at the end of the sampling day. Vegetation types were categorized following recommendations from USFS botanist Gary Kauffman and used previously by Stokes and Horton (2022). At the time of sampling little to no vegetation was greater than one meter in height so vegetation was recorded as ground layer (<1 m). Four soil probes were depressed until they met resistance at each quadrat corner to measure average soil depth. In total, 99 plots were sampled along four transects, 47 of which were out of the fire and the other 52 plots were in the fire.

Following plant community sampling, data was input into excel to determine soil seed bank samples from the existing plant community plots. Plots were pooled in either of two categories; greater than 50% blackberry or less than 25% blackberry. Those categories were divided into plots within the fire and those outside of the fire. Six soil seed bank samples were individually picked at random from each of the four pools. Soil collections followed a method from Price et al. (2010) and modified for this study. Approximately 225 grams of soil was collected from each plot and placed into 8-oz deli containers marked with plot number, blackberry percent category, and whether or not fire occurred. This approach was modified following Price et al. (2010) and the samples were placed into growing trays (36.8 x 22.9 x 5.6 cm³) with enough soil (*Miracle-Gro Moisture Control Potting Mix*) to reach a depth of 5 cm. All seed bank samples were collected on July 9th and transferred to growth trays on July 13th, 2022. In total there were 30 seed bank trays in five categories each with six samples; >50% blackberry - in fire, >50% blackberry out of fire, <25% blackberry in fire, <25% blackberry out of fire, and control. Temperature and relative humidity were recorded on a twice daily basis using a *Govee Wireless Thermometer Hygrometer*. Trays were then randomly placed in two rows of fifteen trays at ambient temperature and humidity in the greenhouse anteroom and watered every 2-3 days. Each month trays were randomly reorganized to reduce error from fluctuations in air flow, temperature, or humidity. Trays were relocated into the greenhouse following completion of construction and trays were watered, rotated, and identified as previous.

Seed bank trials followed the seedling emergence method from Price et al. (2010), in which, seedlings were identified as they emerged, counted, and removed or transplanted until identifiable.

## Statistical Methods

Data sets were imported to the statistical program R studio for analysis (R Core Team 2021).

# Results

# Discussion

# Acknowledgements

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