SEASONAL BIENNIAL BURNING HAS NEGLIGIBLE EFFECTS ON LONGLEAF PINE BASAL AREA GROWTH

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EXTENDED ABSTRACT

Historically, prescribed burning outside the dormant season has been avoided in the Southeastern United States (Ryan and others 2013). Part of the hesitancy to burn in the growing season derives from a fear of residual damage to valuable overstory trees. However, recognition of the ecological benefits of growing season burns, combined with a regional surge in prescribed burning demand, have increased interest in burning outside the dormant season (Knapp and others 2009, Outcalt 2008). To evaluate the potential impacts, we continued a long-term experiment examining the effects of seasonal biennial burning on longleaf pine (*Pinus palustris*) survival and productivity over 44 years at the Escambia Experimental Forest in southern Alabama (Boyer 1987).

The study was initiated in 1974 in three blocks of naturally regenerated longleaf pine. Each block contained 12 plots (0.4 acres) initially stocked at 500 trees per acre. In 1990, the plots were thinned to an average residual density of 70 square feet per acre to reduce intraspecific competition. Each plot was originally assigned a treatment combination of season of biennial burning (spring, summer, winter, or no burn) and non-fire hardwood control (mechanical removal of all woody stems >4.3 feet tall every 5 years, chemical treatment [2,4-D] at the start of the experiment, or no hardwood control) in a randomized complete block design. However, initial reports found no effect of the non-fire hardwood control methods prompting us to pool these treatments within burning treatments. Our study followed the plot-averaged basal area growth of 892 mature longleaf pines from 1995 through 2018. The corresponding stand age for this measurement interval was 37-60 years. The effects of biennial burning seasonality on cumulative basal area growth were investigated with a mixed-effects analysis of variance (ANOVA). The model included burn season as a fixed effect and block as a random effect. Treatments were considered significantly different at $\alpha = 0.05$.

Across all burning treatments, basal area growth averaged 8.71 square feet per acre. Overall, basal area growth was highest in the no burning treatment (9.96 square feet per acre) compared to all other seasonal burning treatments (fig 1). However, this difference was not statistically significant ($F = 0.33$, $P = 0.8083$). Among burning treatments, basal area growth was highest in summer burns (8.43 square feet per acre) followed by winter (8.32 square feet per acre) and spring burns (8.14 square feet per acre), but statistically significant differences were not detected (fig 1).

Collectively, our results demonstrate that spring or summer burning under a biennial regime will have minimal impact on longleaf pine growth (Willis and others 2021). The

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lack of fire effects likely resulted from a combination of low fuel accumulation and existing bark thickness of the mature longleaf pine examined in this study. We suspect that the effects of fire frequency on fuel accumulation overwhelmed any potential negative effects of burning in the growing season. Future studies should explore these relationships at longer fire return intervals with younger trees.

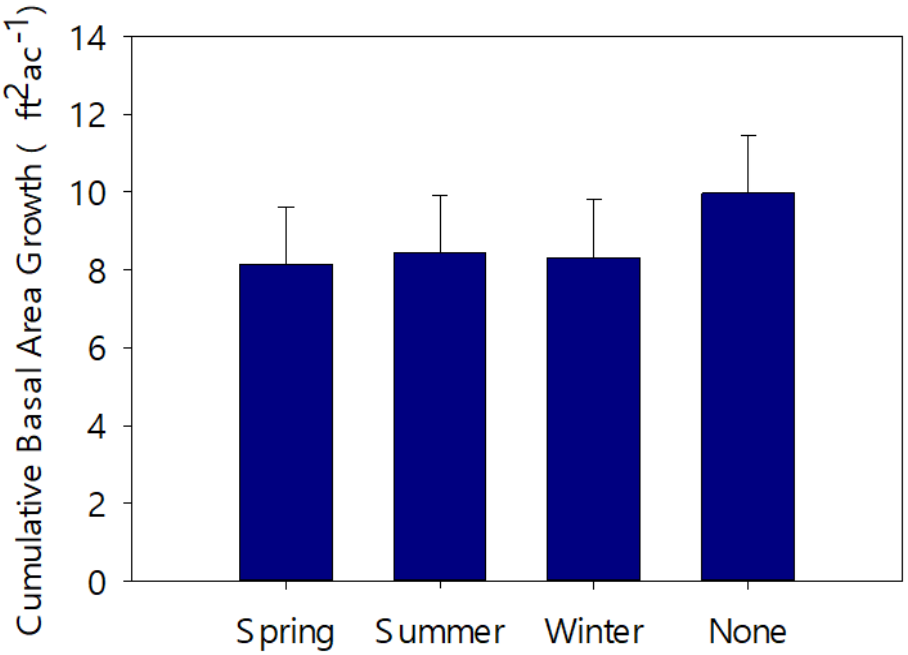

Figure 1—The estimated cumulative basal area growth (square feet per acre) of longleaf pine ±1 standard error (SE) from 1995 through 2018 in winter, spring, and summer biennial burning and an unburned treatment.

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