Vegetation Response to Fire and Herbicide in Intensively-managed Pine of Mississippi

Raymond B. Iglay, *Department of Wildlife and Fisheries, Mississippi State University, Box 9690, Mississippi State, MS 39762*

Bruce D. Leopold, *Department of Wildlife and Fisheries, Mississippi State University, Box 9690, Mississippi State, MS 39762*

L. Wes Burger, Jr., *Department of Wildlife and Fisheries, Mississippi State University, Box 9690, Mississippi State, MS 39762*

Darren A. Miller, *Southern Timberlands Research and Development, Weyerhaeuser NR Company, P.O. Box 2288, Columbus, MS 39704*

Abstract: Costs and risks of prescribed burning have led to increased usage of alternative hardwood competition control measures in intensively-managed pine. However, alternatives such as selective herbicides may not mimic natural approaches or produce plant communities that achieve conservation objectives. Therefore, we examined vegetation response to independent and combined treatments of dormant-season prescribed fire and imazapyr herbicide in intensively-managed, thinned loblolly pine (*Pinus taeda*) stands in Mississippi. We used a randomized complete block design of six pine stands (blocks) with four treatments each (e.g., burn only, herbicide only, burn + herbicide, and control) applied randomly to 10-ha treatment plots. We applied Arsenal (imazapyr) in September 1999 and dormant season prescribed fires January–March 2000, 2003, and 2006. We measured vegetation community parameters (e.g., structure, understory plant coverage, and biomass) during summer (May–July) 1999–2008 and winter (January–March) 1999–2007. We analyzed data using a mixed models repeated measures ANCOVA with pretreatment data as our baseline covariate to test for differences among treatments within years, interaction terms, and differences among treatments. If we detected significant differences for over-, mid-, and understory vegetation structure variables (e.g., basal area, Nudds board, canopy cover), understory plant coverage by forage class, and biomass of collected understory plants ≤1.3 cm diameter, we used principal components analysis to visualize sources of variation within and among treatments. Treatment extremes (e.g., burn + herbicide and control) generally differed with respect to herbaceous and woody understory species, midstory hardwood basal area, and understory species richness. Herbicide treatments (burn + herbicide and herbicide only) controlled hardwood midstory competition better than other treatments, but burn treatments (burn + herbicide and burn only) harbored greater plant species richness and prolonged treatment effects through repeated burns. Differentiation of vegetation communities by treatments supports integration of all treatments in landscape-level biodiversity conservation efforts.

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