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RESEARCH ARTICLE

The Initial Phase of a Longleaf Pine-Wiregrass Savanna Restoration: Species Establishment and Community Responses

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Abstract

The significant loss of the longleaf pine-wiregrass ecosystem in the southeastern United States has serious implications for biodiversity and ecosystem functioning. In response to this loss, we have initiated a long-term and landscape-scale restoration experiment at the 80,125 ha (310 mi^2) Department of Energy Savannah River Site (SRS) located near Aiken, South Carolina. *Aristida beyrichiana* (wiregrass), an important and dominant grass (i.e., a "matrix" species) of the longleaf pine savanna understory, and 31 other herbaceous "non-matrix" species were planted at six locations throughout SRS in 2002 and 2003. Of the 36,056 transplanted seedlings, 75% were still alive in June 2004, while mean 1–2 year survival across all planted species was 48%. *Lespedeza hirta* (hairy lespedeza) exhibited the greatest overall survival per 3 × 3 m cell at 95%, whereas *Schizachyrium* spp. (little bluestem) exhibited the greatest mean cover among individual species at 5.9%. Wiregrass survival and cover were significantly reduced when planted with non-matrix species. Aggregate cover of all planted species in restored cells averaged 25.9% in 2006. High rates of survival and growth of the planted species resulted in greater species richness (SR), diversity, and vegetative cover in restored cells. Results suggest that the loss of the longleaf pine-wiregrass ecosystem may be ameliorated through restoration efforts and illustrate the positive impact of restoration plantings on biodiversity and vegetative cover.

Key words: ***Aristida beyrichiana*, longleaf pine savanna, restoration, Savannah River Site, wiregrass.**

Introduction

Ecosystems dominated by *Pinus palustris* (longleaf pine) covered approximately 37 million ha throughout the southeastern United States prior to European settlement (Frost 1993). However, historical and continued losses due to logging and agricultural conversion, suppression of naturally occurring fires, and urbanization (Frost 1993; Ware et al. 1993) have reduced the original extent of longleaf pine ecosystems by 97% to approximately 1.3 million ha (Frost 1993), including only 4000 ha of old growth forest (Means 1996). These declines have surpassed those of other major ecosystems in the United States such as wetlands and have made the longleaf pine ecosystem one of the most endangered ecosystems in the United States (Noss et al. 1995).

Communities dominated by longleaf pine include forests, woodlands, and savannas and occur on a variety of sites ranging from xeric sandhills to seasonally wet flatwoods (Platt et al. 1989; Harcombe et al. 1993; Peet & Allard 1993). Regardless of the specific type of community considered, the disappearance of the longleaf pine ecosystem from the landscape has serious implications for biodiversity conservation and ecosystem functioning in the southeastern United States. Longleaf pine ecosystems contain some of the greatest plant species richness in temperate North America and include a large number of rare plant species (Walker & Peet 1983; Hardin & White 1989; Peet & Allard 1993; Walker 1993). Longleaf pine ecosystems also provide critical habitat for rare species such as *Picoides borealis* (red-cockaded woodpecker) (Johnston 2005) and *Gopherus polyphemus* (gopher tortoise) (Buhlmann et al. 2005) and provide for important ecosystem functions and services (Mitchell et al. 1999; Markewitz et al. 2002).

The loss of the longleaf pine savanna ecosystem has generated considerable interest in the restoration of this ecosystem in the southeastern United States (Noss et al. 1995; Van Lear et al. 2005). In longleaf pine savanna, most restoration attempts have focused on two important and interconnected components: the return of fire and the reestablishment of *Aristida beyrichiana* Trin. & Rupr. and *A. stricta* Michx.

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