SFE Fact Sheet 2017-2

Planning for Habitat: The Importance of Assessing Functional Groups in Longleaf Pine Understories

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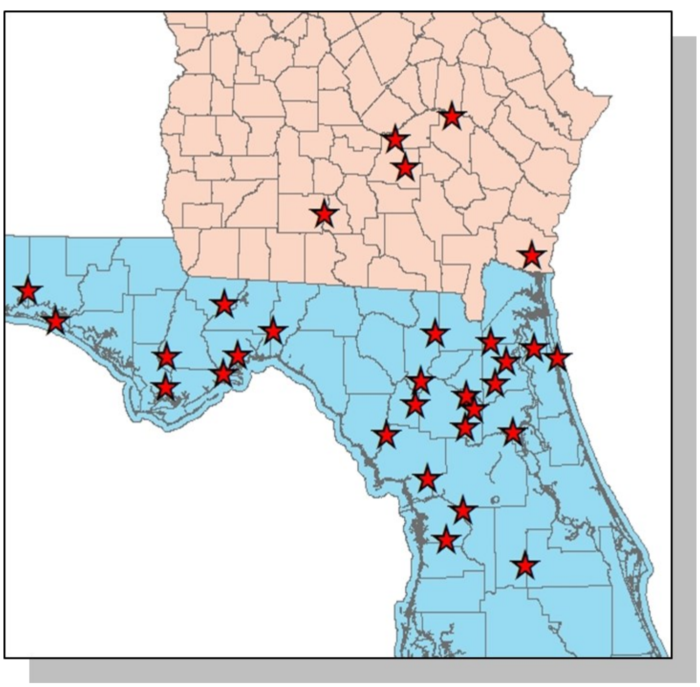
MANAGEMENT IMPLICATIONS

- **A management approach that focuses solely on structural parameters may not maintain or restore resilient wildlife habitat.**
- **Site-specific management should begin with species-level plant and animal surveys to inform subsequent decisions.**

INTRODUCTION

Most longleaf pine ecosystem management focuses on promoting longleaf pines and native bunchgrasses, because the pyrogenicity of these species helps to maintain the open savanna structure upon which the entire system depends.[1] However, there is much more to a longleaf pine understory than grass and pine needles. Old growth pine savannas harbor a diverse array of plant functional groups, including mast-producing shrubs, legumes, warm- and cool-season grasses, and wildflowers. All of these functional groups contain plants that are essential components of wildlife habitat and food web functioning. For example, legumes are of particular importance to wildlife both directly (as a protein-rich food source) and indirectly (by replacing nitrogen lost from the system due to volatilization by fire).



Locations of the longleaf pine understory study sites in Florida and Georgia. Sites had similar land use history and management regime. Sites were grouped by soil type and assessed for understory plant functional group richness.

The management of southeastern pine savannas currently follows an ecological restoration framework, using historical reference sites for identifying both fire-return intervals and target vegetation parameters. Longleaf pine savanna sites are typically evaluated for quality based on non-site-specific structural parameters. These parameters include native bunchgrass dominance in the understory and low pine overstory basal area, both of which are maintained by frequent (every 1-3 years) prescribed fire.

Recent research has revealed conflicts with plant and animal species that are also native components of longleaf pine ecosystems, but survive and reproduce best under somewhat longer fire return intervals (i.e. every 3-5 years) and more heterogeneous vegetation conditions.[2,3,4] Several researchers have expressed concern that adherence to a narrowly defined fire rotation overlooks the critical wildlife habitat role of the mast-producing shrub species that are also native to longleaf pine savannas, many of which require at least 3-5 year inter-fire intervals in order to produce mast.[2,3,4,5]

Assessing functional group composition on managed longleaf pine savannas is essential to maintaining resilient wildlife habitat. The number of species within functional groups (i.e. functional redundancy) is thought to be a primary contributor to ecosystem resilience, because when functional redundancy is high, ecological functions may continue to be performed even as some species are compromised or lost. The study described here investigated differences in longleaf pine understory functional group diversity within sites grouped by three community subtypes (flatwoods, sandhills, and clayhills).

SAMPLING DESIGN

The understories of 30 frequently-burned savannas were sampled in Florida and Georgia, on preserves ranging in size from 50 to 230,000 ha. (123 to 568,000 ac.) The study focused on sites deemed "high quality" and "restored" by their managing agencies, with little history of anthropogenic disturbance other than fire suppression. Many of the study sites are statewide reference sites designated by the Florida Natural Areas Inventory. Sites with a history of agricultural use were avoided, as this is already known to be associated with long-term alterations in longleaf pine savanna plant communities.[6,7,9,10] Sites included in the study met the following criteria: 1) No history of intensive agriculture or forestry. This was determined through communication with managing agencies, historical aerial photos, and the presence of old growth indicator species sensitive to soil disturbance (primarily wiregrass, *Aristida stricta*). 2) At least three officially documented prescribed fires. The majority of study sites had been in active fire rotation between 10 and 25 years; three sites had much longer periods of active rotation (35-50 years). Additional non-fire fuel treatments (i.e. chemical and mechanical hardwood removal) had been conducted on many of the sites in addition to prescribed fire, and were considered as part of the analysis.

The study sites were stratified into three soil types, all of which are common in longleaf pine systems: Spodosols (mesic/wet sands, known regionally as flatwoods), 12 sites; Entisols (xeric sands, known regionally as sandhills), 12 sites; and Ultisols (mesic sandy loams, known regionally as clayhills), 6 sites. Understory plant species composition was sampled using a nested quadrat sampling design during fall 2014 and 2015.

RESULTS

The study revealed pronounced differences in species and functional group richness among sites. Table 1 shows the ranges of species richness, broken down by soil type and functional group. The most species-rich sites typically contained anywhere from two to five times as many species per functional group as the least species-rich sites. These differences were statistically significant for forb, legume, shrub, tree, and overall species richness, but not for warm-season and cool-season grass richness.

Table 1. Range of functional group richness values found on study sites

	# of Species per site	
Sandhills (12 sites)	Range	Mean
Cool-season grasses	1 – 5	3
Warm-season grasses	8 – 19	14
Forbs	14 – 32	24
Legumes	1 – 14	10
Shrubs	5 – 16	9
Trees	3 – 12	6
All species	45 – 88	68
Flatwoods (12 sites)	Range	Mean
Cool-season grasses	2 – 9	4
Warm-season grasses	5 – 16	10
Forbs	10 – 49	20
Legumes	0 – 4	1
Shrubs	12 – 21	16
Trees	1 – 6	4
All species	36 – 93	58
Clayhills (6 sites)	Range	Mean
Cool-season grasses	4 – 6	5
Warm-season grasses	8 – 20	15
Forbs	9 – 48	36
Legumes	6 – 12	9
Shrubs	11 – 24	16
Trees	4 – 15	9
All species	62 – 112	94

SUMMARY

This study showed that longleaf pine savanna sites can vary greatly in their functional group richness and composition—and therefore their resilience—despite their overall structural similarity. While not described here, the study also found that site-to-site differences in functional richness can be partially attributed to the long term fire history, overstory tree density, and number of mechanical/chemical fuel treatments applied to a site (all variables that are likely interrelated). In many cases, shorter fire-return intervals, lower overstory tree density, and the application of mechanical or chemical fuel treatments were associated with higher species richness in understory functional groups. However, the overstory-fire-understory relationships were not consistent. These relationships varied greatly depending on the functional group and soil type in question, and for some functional group-soil type combinations there was no relationship between understory functional richness and fuel/fire history at all.

A one-size-fits-all management approach that focuses solely on structural parameters may not be best for maintaining and restoring ecosystem functioning and resilience, especially given the variability that can exist among “restored” sites. For example, a site low in legume species richness may benefit from varying the season of burn and the fire return interval to promote specific legume species rather than implementing solely early growing season burns on a fixed return interval[11], as is common practice among managing agencies in the Southeast.

The results of this study suggest that site-specific management should begin with a species-level plant and animal survey to provide baseline data, and burn prescriptions should be based on the species and functional group composition present on an individual site.

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