1.C7 REMNANT FIRE DISTURBED MONTANE LONGLEAF PINE FOREST IN WEST CENTRAL GEORGIA, USA.

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Abstract

Fire disturbed ecosystems are characteristic of the southeastern Coastal Plain of the United States. Less well known are fire disturbed mountainous regions of the Piedmont and Appalachian region that support longleaf pine (*Pinus palustris*) ecosystems. The Pine Mountain Range in the Piedmont of West Central Georgia, USA has remnant longleaf pine ecosystems that occupy steep slopes with shallow soils. The montane longleaf ecosystems contain an unusual species composition of coastal plain (*Quercus margaretta*) and Appalachian (*Vaccinium pallidum*) species. Landscape scale analysis of ecosystems revealed three major ecosystems influenced by topography and fire history.

Introduction

Fire adapted longleaf pine (*Pinus palustris*) ecosystems of the southeastern United States are distinguished by open parklike pine savannahs (Landers et al. 1995) and have the most species-rich plant communities outside of the tropics (Peet and Allard 1993). They previously covered 24 million hectares (Croker 1987) but presently occupy only 1.5 million hectares (Kelley and Bechtold 1990). Overcutting and fire suppression are primary factors responsible for the decline of these ecosystems (Croker 1990). Due to this drastic reduction, *P. palustris* ecosystems are considered to be critically endangered (Noss et al. 1995) and contain numerous federally endangered and threatened species.

Montane *P. palustris* ecosystems are found in portions of northern Georgia and Alabama. Vegetation surveys have been conducted in areas such as Forest McClellan, AL (Maceina *et al.* 2000) and Rome, GA (Lipps and Deselm 1969), but there have been no attempts to intensively study the interrelationship between forest communities, soils, and landform variables. This lack of baseline information deters the management and restoration of not only montane *P. palustris* ecosystems but all *P. palustris* ecosystems (Palik et al. 1995).

This study addresses the present deficiencies in information pertaining to the structure and function of P*. palustris* ecosystems. The objective of the study is to identify ecological land units in the Montane Longleaf Pine Forest of West Central Georgia based on the discriminating vegetation, soils, and landform features of mature forest communities.

Methods

The study area was Thunder Scout Reservation in Upson Pike County, GA. The 2,200 acre area is owned by the Flint River Council, Boy Scouts of America and managed for outdoor recreation. Upson County, Georgia retains only 2,900 acres of montane ecosystems with 50% cover of *P. palustris* (Outcalt and Sheffield 1996). This area is within the Piedmont physiographic region and in the Pine Mountain Range. It also is part of the Flint River Water Gap of the Flint River Corridor, an area of ecological and botanical concern (Georgia Department of Natural Resources 2001). The elevation ranges from 200 feet at the Flint River to 347 meter above sea level. The area is characterized by steep rocky slopes.

In the summer of 2003, 15 plots were established in suitable forested sites located through aerial photos, local experts, and ground reconnaissance. The stands were free of recent disturbance with the exception of fire. The Flint River floodplain was excluded from the study. Tree, sapling, seedling, and herbaceous strata

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were sampled in a 20 X 50 meter plot following the Carolina Vegetation Survey protocol (Peet et al. 1998). Soils samples were collected by horizon from four locations within the plot to determine soil horizon depth. Landform variables sampled included slope gradient, aspect, and landform index (LFI).

Ecological land units were delineated through ordination and cluster analysis of presence/absence data. Species occurring in more than one strata were considered separate species. The ordination program employed were correspondence analysis, detrended correspondence analysis, principal components analysis, and nonmetric multidimensional scaling (McCune and Grace 2002). The hierarchical cluster analysis was through PC-ORD using Jaccard, Euclidean, and Sorenson (Bray-Curtis) distance measures (McCune and Grace 2002).

Results

Three landscape scale ecosystems were identified revealing a mixture of species with affinity for both Appalachian and Coastal Plain Forest. A longleaf pine, turkey oak (*Quercus laevis*), Goat's Rue (*Tephrosia virginiana*) forest type occupied steep upper slope positions. The average slope was 32% and mean LFI was 18.3. The relatively high LFI usually indicates more protected sites, however, in this case it reflects the sites upper slope position and very steep slopes. The A and B-horizon depths were 17.5 and 48.5 cm, respectively. Other species indicative of this site were *Carya pallida*, *Cnidoscolus stimulosus*, *Quercus margaretta*, *Q. marilandica*, *Prunus umbellata, Hypoxis hirsuta*, *Pteridium aquilinum*, *Hypericum hypericoides*, *Vaccinium pallidum*, *Vaccinium pallidum* and *Solidago odora*.

A longleaf pine, post oak (*Quercus stellata*), blackseed needlegrass (S*tipa avenacea*) forest type was found on a variety of sites from mountain tops to protected sideslopes. These sites showed less evidence of previous fires with an overstory of oaks mixed with longleaf pine. The mean A and B horizon depths were 16 and 47 cm, respectively. The mean slope gradient was 24% and LFI was 11.9. Species characteristic of this forest type include *Carya pallida*, *C. tomentosa*, *Quercus marilandica*, *Baptisia tinctoria*, Clitoria *mariana*, *Euphorbia pubentissima*, *Hypericum hypericoides*, *Hypoxis hirsuta*, *Ipomoea pandurata*, *Pteridium aquilinum, Prunus umbellata, Vaccinium*

pallidum, *Smilax glauca*, and *Solidago odora*.

A mockernut hickory (*Carya tomentosa*), chestnut oak (*Quercus prinus*), *Dichanthelium ravenelii* forest type was found on lower slopes with little evidence of previous fires. The mean slope was 28% and the LFI was 16.9. LFI indicates sheltered sites at the base of slope often adjacent to ephemeral streams. Mean A and B horizon depths were 19 and 48 cm, respectively. Characteristic species include *Carya glabra*, *Quercus stellata*, *Q. velutina*, *Q. nigra*, *Baptisia tinctoria*, *Clitoria mariana*, *Galium circaezans*, *Hexastylis shuttleworthii*, *Ipomoea pandurata*, *Vaccinium pallidum*, and *Smilax glauca*.

Conclusions

The montane longleaf pine forest of the Pine Mountain Range represents a unique ecosystem blending coastal and Piedmont/Appalachian species. A complex interaction of fire and landform has shaped the forest. The presence of longleaf pine on all sites except the Flint River Floodplain indicates that fire played an historical role in determining plant species distribution. The only forest type dominated by longleaf (longleaf pine-turkey oak-goat's rue) had dense midstory of primarily oaks. Carter *et al.* (1997) found a similar species composition on dry sandy sites in south Alabama. However, the same or nearby site contains *Vaccinium pallidum* and *Quercus prinus*, species found together in the southern Appalachians (Carter *et al.* 2000). Attempts are currently underway at Thunder Scout Reservation to return fire to the ecosystem, but deficiencies in ecological knowledge and fire history make this task difficult.

Acknowledgements

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