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PLANT COMMUNITIES IN SELECTED LONGLEAF PINE LANDSCAPES ON THE CATAHOULA RANGER DISTRICT, KISATCHIE NATIONAL FOREST, LOUISIANA

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Abstract--In Grant Parish, LA, increases in overstory basal area, canopy cover, and development of understory woody plants reduced productivity of herbaceous plants in longleaf pine (*Pinus palustris*) stands that were managed with fire. Still, the herbaceous plant community can reestablish itself on properly managed upland longleaf pine sites in the west gulf region. Management efforts were considered most successful where pinehill bluestem (*Schizachyrium scoparium* var. *divergens*) is the dominant herbaceous plant. The lack of oak (*Quercus* spp.) and hickory (*Carya* spp.) regeneration on more mesic sites was worrisome. Use of nested subplots was the best method for monitoring herbaceous vegetation.

INTRODUCTION

Fire was essential for the formation of many southern pine ecosystems. Today, failure to use prescribed fire in upland longleaf pine (*Pinus palustris*) landscapes results in encroachment by hardwood trees and shrubs and the loss of native pine and herbaceous vegetation. For example, in Alabama, over 90 percent of the green biomass on the forest floor of young unburned longleaf pine stands is woody vegetation, while in periodically burned stands, < 50 percent of the green biomass on the forest floor is woody vegetation (Boyer 1995). This woody vegetation can form a closed midstory that reduces species richness and productivity of the herbaceous plant community (Unpublished field notes. James Haywood. 1997. Research Forester, Southern Research Station, USDA Forest Service, 2500 Shreveport Highway, Pineville, LA 71360).

In January 1993, the Kisatchie National Forest and the Southern Research Station began monitoring the effects of operational-scale burning in longleaf pine forests on overstory and midstory trees and shrubs and understory vegetation. In addition, research studies on the Catahoula Ranger District have provided useful information about the effects of fire. We are reporting on the fire effects from operational-scale burns done on two Ecosystem Management Project (EMP) sites and compare those results to research findings.

SITES

All sites are on the Catahoula Ranger District, Kisatchie National Forest, Grant Parish, LA. Elevations of the sites range from 53 to 76 m. These sites are within the historical range of the Upland Longleaf Pine Forest type of the Humid Temperate, Subtropical, Outer Coastal Plain Mixed Forest, and are located in the Coastal Plains and Flatwoods Western Gulf Ecoregion of the Southern United States (McNab and Avers 1994). The mean January and July temperatures are 10 and 28 ºC, respectively (Louisiana Office of State Climatology 1995). Yearly precipitation averages 143 cm and growing-season precipitation averages 82 cm. The growing season is more than 200 days long; it usually begins before or during early March and ends because of dry weather in October.

PROCEDURES

On RES1, total current-year herbaceous production was determined in February 1994 by clipping the aboveground foliage on 12 systematically located 0.22 m^2 subplots located within each 0.04-ha plot. Dry matter production (oven-dried at 80 ºC for at least 24 hours) was determined after the samples were subdivided into six taxa: pinehill bluestem (*Schizachyrium scoparium* var. *divergens*); other bluestems--mostly broomsedge (*Andropogon virginicus*), Elliott bluestem (*A. elliottii*), big bluestem (*A. gerardii*), and slender bluestem (*S. tenerum*); longleaf uniola (*Chasmanthium sessiliflorum*); other grasses--mostly switchgrass *(Panicum virgatum*), yellow indiangrass (*Sorghastrum avenaceum*), low panicums (*Dichanthelium* spp), lovegrass (*Eragrostis* spp.), and threeawn (*Aristida* spp.); grasslikes--mostly nutrush (*Scleria* spp.), sedge (*Carex* spp.), flatsedge (*Cyperus* spp.), spikesedge (*Eleocharis*

spp.), rush (*Juncus* spp.), and beakrush (*Rhynchospora* spp.); and forbs. In March 1994, all woody, blackberry, and vine stems were counted and heights and crown spreads estimated on five systematically located 40 m^2 subplots.

On RES2, EMP1, and EMP2, 0.04-ha plots were established for measuring heights and diameters at breast height of the overstory and midstory trees. There were 16 plots on the uplands in RES2 and 10 plots on both EMP1 and EMP2. Inventories were made in May 1996 on EMP1 and EMP2 and July 1996 on RES2.

Within each 0.04-ha plot, five 4-m^2 subplots were systematically established for identifying and counting understory woody stems, blackberry stems, and vines and for measuring heights and crown cover of the woody and blackberry stems. This brush was inventoried in April 1995 on EMP2, August 1995 on EMP1, and August 1996 on RES2.

RESULTS AND DISCUSSION

Overstory and Midstory Vegetation

On RES2, EMP1, and EMP2, total stocking and basal area ranged from 54 to 279 stems/ha and 8.0- to 24.4-m^2/ha (table 1). Canopy cover was too sparse to measure accurately on RES2 but averaged 67 percent on EMP1 and EMP2. Longleaf pine dominated the overstory on all sites and made up from 81 to 96 percent of the total basal area. These three stands were classed as pure longleaf pine based on basal area (Ford-Robertson 1971).

More species of overstory and midstory trees and shrubs occurred on EMP1 and EMP2 than on RES2. Species other than longleaf pine represented a greater portion of the stand basal area on EMP1 and EMP2 than on RES2 (table 1).

EMP1 had nine common overstory and midstory species--longleaf pine, mockernut hickory (*Carya tomentosa*), flowering dogwood (*Cornus florida*), sweetgum (*Liquidambar styraciflua*), loblolly pine, southern red oak (*Quercus falcata*), post oak (*Q. stellata*), black oak (*Q. velutina*), and sassafras (*Sassafras albidum*).The common species on EMP2 were longleaf pine, mockernut hickory, blackgum (*Nyssa sylvatica*), loblolly pine, southern red oak, blackjack oak (*Q. marilandica*), post oak, and black oak. On RES2, the common species were longleaf pine, sweetgum, southern red oak, and post oak.

Common Understory Woody Plants

Excluding blackberry, there were 16 tree, 15 shrub, and 15 vine species on EMP1 and 12 tree, 15 shrub, and 12 vine species on EMP2. Excluding pine seedlings, there were 60,100 tree, shrub, and blackberry stems/ha on EMP1 and 74,100/ha on EMP2 (table 2). Height of this brush averaged 0.8 m on EMP1 and 0.5 m on EMP2. Vines numbered 86,600/ha on EMP2 and 71,100/ha on EMP1.

Excluding blackberry, there were six tree, nine shrub, and five vine species on RES2 and three tree, six shrub, and three vine species on RES1. Excluding pine seedlings, there were 24,500 tree, shrub, and blackberry stems/ha on RES2 and 9,700/ha on RES1 (table 2). Vines numbered 27,800/ha on RES2 and 4,900/ha on RES1.

The number of longleaf pine seedlings in the grass stage ranged from none on RES1 to 260,000/ha 21 months after burning on EMP2. The number of loblolly pine seedlings ranged from 150/ha 30 months after burning on RES2 to 9,300/ha on EMP2. However, these small pine seedlings failed to develop because of the presence of overstory trees on RES2, EMP1, and EMP2 or because of continual cutting on RES1. While each successive burn reduced the number of pine seedlings, the population recovered between burns. This cycle should continue until there is either a natural disturbance or change in management.

Tree species common in the understory were red maple (*Acer rubrum*), flowering dogwood, sweetgum, blackgum, black cherry *(Prunus serotina*), southern red oak, post oak, and sassafras, although the stocking and average height of these species varied among sites (table 2). Red maple was not in the overstory on RES2, EMP1, and EMP2. However, red maple is susceptible to fire, and it may be being curtailed by burning on these upland sites (Haywood 1995).

Other hardwoods are also susceptible to fire (Chen and others 1975). Prescribed burning kills back the tops of hardwood stems but the root system is affected less (Silker 1961). This results in an increase in stem numbers, but the regrowth is smaller. However, continual burning--especially on an annual or biennial basis--eventually reduces the numbers and vigor of woody stems (Chen and others 1975, Lotti 1956).

On both EMP1 and EMP2, the overstory species not well represented in the understory were mockernut hickory, black oak, and blackjack oak. On RES2, the overstory species not well represented in the understory was post oak. Thus, it appears that oaks and hickories are not completely regenerating.

Common Herbaceous Plants
On all four sites, the most well distributed plants were pinehill bluestem, low panicums, swamp sunflower (*Helianthus angustifolius*), grassleaf goldaster (*Heterotheca graminifolia*), and bracken fern (*Pteridium aquilinum* var. *pseudocaudatum*).

Common grasses--There were 19, 26, and 18 taxa of grasses commonly found on RES2, EMP1, and EMP2, respectively. The grasses that occurred most frequently were pinehill bluestem and low panicums on RES2 and EMP2 and pinehill bluestem and big bluestem on EMP1 (table 3). Spreading panicum (*Panicum anceps*) was also common on these three sites. On RES1, pinehill bluestem made up 58 percent, other bluestems 14 percent, and all of the other grasses 7 percent of the total current-year herbaceous production.

Other herbaceous plants--The grasslike plant most common on all uplands was nutrush. There were 22, 9, and 22 species or genera of composites on RES2, EMP1, and EMP2, respectively. The composite most common on these three uplands was grassleaf goldaster. Swamp sunflower was common on RES1, RES2 and EMP2. Both of these species are indicators of well-developed herbaceous plant communities.

Effects of the Overstory on Herbaceous Vegetation
The amount of current-year herbaceous production on each site was partly associated with overstory and midstory basal area, canopy cover, and number and size of understory trees and shrubs. EMP1 had the greatest canopy cover, the tallest understory vegetation, and the least current-year herbaceous production. RES1 had no overstory, the fewest understory woody stems, and the greatest herbaceous production.

If overstory competition and understory brush are controlled, these upland longleaf pine sites can support rich and productive herbaceous plant communities dominated by pinehill bluestem. Also, these results suggest that pinehill bluestem could be used as an indicator of management success in establishing and maintaining herbaceous plant communities on upland longleaf pine sites in the west Gulf Coastal Plain. Examples of other species that could be used as indicators on similar sites are swamp sunflower and grassleaf goldaster.

ACKNOWLEDGMENTS
Place acknowledgments here.

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FOOTNOTES
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FIGURE CAPTIONS

Figure 1--The height of woody vegetation on four sites on the Catahoula Ranger District.

Figure 2--Changes in herbaceous plant biomass with increasing overstory basal area.