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PROTECTING AND RESTORING LONGLEAF PINE FORESTS ON THE KISATCHIE NATIONAL FOREST IN LOUISIANA

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ABSTRACT: Longleaf pine (*Pinus palustris* Mill.) forests once constituted a major ecosystem in the Southern United States stretching from southeastern Virginia south to central Florida and west into East Texas. These forests covered a wide range of site conditions, from wet pine flatwoods to dry mountain slopes. Intensive exploitation reduced the extent of old-growth longleaf forests to 20 million acres by 1935, 12 million by 1955, 3.8 million by 1985, and 3.2 million acres by 1993.

The continued loss of longleaf pine forests has endangered or threatened nearly 200 associated taxa of vascular plants and several vertebrate species. Protecting the remaining longleaf pine forest and restoring longleaf pine plant communities within their historical ranges is paramount in protecting threatened species from extinction.

In January 1993, the Kisatchie National Forest and Southern Research Station began cooperative Ecosystem Management Projects to monitor how prescribed burning affects overstory and midstory trees and shrubs and understory shrub and herbaceous vegetation and to demonstrate how group selection cutting and shelterwood with reserved trees can be used to restore old growth attributes in longleaf pine forests. Our poster outlines this cooperative effort over the last eight years.

INTRODUCTION

Longleaf pine (*Pinus palustris* Mill.) forests once constituted a major ecosystem in the Southern United States stretching from southeastern Virginia south to central Florida and west into East Texas (Outcalt and Sheffield 1996). These forests covered a wide range of site conditions, from wet pine flatwoods to dry mountain slopes. Intensive exploitation reduced the extent of old-growth longleaf forests to 20 million acres by 1935, 12 million by 1955, 3.8 million by 1985, and 3.2 million acres by 1993.

The continued loss of longleaf pine forests has endangered or threatened nearly 200 associated taxa of vascular plants and several vertebrate species (Brockway et al. 1998). Protecting the remaining longleaf pine forest and restoring longleaf pine plant communities within their historical ranges is paramount in protecting these threatened species from extinction.

In January 1993, the Kisatchie National Forest and Southern Research Station began cooperative Ecosystem Management Projects to monitor how prescribed burning affects overstory and midstory trees and shrubs and understory shrub and herbaceous vegetation and to demonstrate how group selection cutting and shelterwood with reserved trees can be used to restore old growth attributes in longleaf pine forests. The desired future condition is open stands of pure longleaf pine, with few if any midstory hardwood trees, over rich and productive herbaceous plant communities intermixed with understory hardwoods kept in check by repeated prescribed burning. Pure longleaf pine is defined as at least 80% of the overstory basal area, stem numbers, or volume being longleaf pine (Helms 1998).

MONITORING SITES

Sites were selected from existing stands of predominately longleaf pine that were repeatedly prescribed burned in the past and would be burned again within several months of selection. Sites were selected on the Calcasieu (originally the Vernon and Evangeline), Catahoula, Kisatchie, and Winn Ranger Districts of the Kisatchie National Forest near Leesville, Alexandria, Natchitoches, and Winnfield, Louisiana, respectively. All sites were within the upland longleaf pine forest type of the West Gulf Coastal Plain. The mean January and July temperatures range from 34 and 93 °F across these sites (Louisiana Office of State Climatology 1999). Annual rainfall ranges from 56 to 60 inches and is well distributed throughout the year. The growing season is from 230 to 260 days long.

FINDINGS TO DATE

In our work, overstory and midstory basal area and canopy cover and number and stature of understory trees and shrubs were inversely related to current-year herbaceous plant production. This was not surprising because the inverse relationship between longleaf pine basal area and herbaceous plant productivity is well known (Grelen and Lohrey 1978). Although overstory basal areas increased in our forests, repeated prescribed burning was able to keep herbaceous vegetation from disappearing because fire reduces understory loblolly pine (*P. taeda* L.) and hardwood growth and stature over a number of years (Chen and others 1975, Grelen and Epps 1967), and litter does not accumulate sufficiently to smother herbaceous plants.

Nevertheless as a pine canopy closes, the ill effects of shading by the overstory and competition for water and nutrients cannot be entirely overcome by applying a fire regime and herbaceous vegetation inevitably declines (Wolters 1982). Indeed, the decline of herbaceous communities on our repeatedly burned forest sites was unfortunate because the desired future condition may not be reached.

Thinning of the overstory coupled with continued prescribed burning to reduce small woody vegetation improves conditions for herbaceous plant development (Grelen and Lohrey 1978), and thinning may be needed if the desired future condition is to be reached or maintained on our upland longleaf pine sites.

Another finding was the lack of longleaf pine recruitment on our sites. Longleaf pine regeneration cannot develop sufficiently under established forest canopy unless basal areas are reduced to below 30 ft^2/acre (Boyer 1993). So some means of stand conversion may be needed to obtain advanced longleaf regeneration.

MANAGEMENT IMPLICATIONS

If grass-stage longleaf pine seedlings develop in open ranges of established grass cover, as were common in the West Gulf Region as late as the early 1960s, the seedlings reach sufficient girth to tolerate burning. However, open-range conditions are rare today, and forest managers wishing to restore upland mixed pine or mixed pine-hardwood forests to pure longleaf pine often have stands with poorly developed herbaceous plant communities.

Under today's conditions, we believe that on most upland sites a series of preharvest treatments are needed to ensure the restoration of longleaf pine and associated plant communities. The treatments would mostly involve prescribed burning and thinning prior to final overstory removal. These treatments are necessary to establish a herbaceous plant community under the existing overstory before final harvest.

Prescribed burning should be the first treatment applied as fire is considered a necessary management tool for preparing sites for longleaf pine regeneration (Wahlenberg 1946). Implementing a timely fire regime is also needed for fuel reduction, and reducing midstory trees and shrubs.

However, to accomplish complete midstory control, herbicides or mechanical means may have to be used where vegetation is too large to control with prescribed burning. Also, a herbicide or mechanical treatment may be required where managers must restore certain plant communities as quickly as possible because the effects of a single prescribed burn are often transitory, and a series of burns over many years must be completed and maintained to have lasting changes in plant communities (Brockway et al. 1998).

As the midstory is controlled and accumulated litter removed, grasses and forbs will naturally reestablish on forested uplands in the West Gulf Region (Haywood et al. 1998). This herbaceous plant cover supports low intensity burns with minimal smoke. The continued implementation of fire is essential and should be applied when woody stems start to become reestablished in the understory. Frequency of burns is dependent upon site productivity and the desired or existing plant community.

Thinning treatments remove the immediate loblolly pine seed source and reduce canopy cover allowing more sunlight to reach the forest floor. This further favors the natural recovery of herbaceous vegetation (Grelen and Lohrey 1978). Once a herbaceous understory is in place, the overstory can be harvested and longleaf pine seedlings planted. Or if longleaf pines are present, a natural regeneration system can be used employing either shelterwood, shelterwood with reserves, or group selection methods. The latter two methods of cut maintain mature trees on the site. This may be the most ecologically beneficial provided the distribution of

the mature trees is controlled to favor longleaf pine recruitment in openings (Palik et al. 1997). Brockway and Outcalt (1998) recommend group selection with the openings being 130 to 165 ft in diameter (0.3 to 0.5 ac). This provides enough open space for the intolerant longleaf pine seedlings to develop without intensive intraspecific competition with adult longleaf pines for light, water, and nutrients.

CONCLUSIONS

As the stand canopy becomes more open in character with the continual application of fire and thinnings, the recovering grass-dominated herbaceous plant community intermixed with pine needles will provide fuels for prescribed fires to control hardwoods and loblolly pine seedlings and promote the establishment of the longleaf pine regeneration. At this stage of stand development, spring burns will best help establish longleaf pine (Haywood and Grelen 2000, Grelen 1975). Although not all of the desired herbaceous plants may now be found in the stand, over time the desired species should reestablish themselves in the West Gulf Region (Haywood et al. 1998).

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