DEVELOPING MANAGEMENT OPTIONS FOR LONGLEAF COMMUNITIES OF THE GULF COASTAL PLAIN

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ABSTRACT: Choosing treatments to reduce fuel loads and readjust structure and composition in longleaf communities of the Gulf Coastal Plains region is difficult because benefits and costs of possible treatment combinations are not fully known. The objective of this research project is to develop management options to reduce fuels and restore the ecosystem that are economically viable and socially acceptable. Research is being conducted in cooperation with Auburn University, which furnished appropriate longleaf stands and has collaborated in data collection on wildlife and soils and logistics support for treatment application. Pretreatment data was collected in 2001 and treatments consisting of thinning, burning and their combination were successfully applied in 2002, in spite of obstacles like a poor timber market and severe spring drought. Post year data collection is proceeding and has already yielded useful information on how to burn recently thinned longleaf stands without excessive crown scorch or tree mortality.

INTRODUCTION

Many U.S. forests, especially those that historically burned at short-intervals, are too dense and/or have excessive quantities of fuels. Widespread treatments are needed to restore ecological integrity and reduce the high risk of uncharacteristically severe and destructive wildfires. Among possible treatments, however, the appropriate balance among cutting, mechanical fuel treatments, and prescribed fire is often unclear. For improved decision making, resource managers need much better information about the consequences of alternative management practices involving fire and mechanical, i.e. fire surrogate treatments.

Longleaf (Pinus palustris) communities of the middle and upper Gulf Coastal Plains historically had an overstory dominated by longleaf pine with pockets of other southern pines and occasional hardwoods, while the understory was grass dominated with lesser amounts of woody shrubs. The open condition and grassy understory were maintained by frequent, every 2 to 5 years, low intensity fires from lightning and native American ignitions. Lack of burning for a number of years during the 1900's allowed hardwoods to increase in the mid and overstory layers while woody shrubs gained understory dominance. These changes have resulted in a variety of impacts from lowered economic returns, to degradation of habitat for numerous species, to more severe wildfires during periodic droughts.

The reintroduction of fire seems like an appropriate treatment to reverse these changes, but the benefits and costs of such treatment is not fully known. The Fire and Fire Surrogate Study recently established on the Solon Dixon Forestry and Education Center, one of 13 nationwide locations, will help fill in these information gaps. The research objective is to develop realistic management options that can be used to treat fuels and restore ecosystems. To accomplish this the initial effects of fire and fire surrogate treatments on vegetation, fuel and fire behavior, soils and forest floor, wildlife, forest insects, tree diseases, and treatment costs and utilization economics will be quantified.

METHODS

The Solon Dixon Forest is representative of the longleaf ecosystem of the Gulf Coastal Plain stretching from Alabama to Louisiana. Currently 1 million acres of longleaf-dominated ecosystem remain in this area with 50 percent in the non-industrial private sector. An additional 2 million acres contain some longleaf pine mixed with other pines and/or hardwoods. Much of the forest in the area is dominated by longleaf pine but other southern pines are also abundant including loblolly (P. taeda), shortleaf (P. echinata), slash (P. elliottii), and spruce pine (P. glabra). In many areas, especially the numerous lower bottoms, there is a substantial hardwood component dominated by oaks (Quercus spp.). The understory is dominated by woody shrubs with yaupon holly (Ilex vomitoria) the most abundant and lesser amounts of blueberries (Vaccinium spp.) and gallberry (I. glabra).

The design is a randomized block with three blocks of four treatments each. Treatments include an untreated control (no fire or other disturbance), prescribed fire only, with periodic reburns as needed, mechanical removal of excess trees, and a combination mechanical removal of excess trees and prescribed fire. Treatment units are operational in size at 30 to 40 acres each.

After a year of pretreatment data collection, trees were marked for thinning in appropriate units. Loblolly, slash and spruce pine and hardwoods, which had increased in abundance during fire control, were targeted for removal during thinning. Tree removal was done through a commercial timber sale. The operator used a feller buncher to cut trees, chainsaws to delimb, and grapple skidders to haul tree length material to the loading areas. The thinning, to reduced basal area to 50 to 60 square feet per acre, was began in January and completed in early April 2002. Prescribed burning was done in April and May by block following thinning operations. Data was collected during and following all burns.

RESULTS AND DISCUSSION

All treatment units were burned using backing, flanking, or spot fires. Unit 2, which took nearly 17 hours to burn, had the slowest moving fire with an average rate of spread of 100 ft/hr (Figure 1). There was significant bole char on trees in this area, but to date tree mortality has been minimal with only a few small pines lost. Units 1 and 10 also had rather slow moving burns, which required 10 hours to complete. The other areas required less time to burn with initial ignitions around 10 am and completion by 2 or 3 in the afternoon. Average rate of spread was influenced by both burning techniques and thinning treatment. Backing fires had a mean spread rate of 100 ft/hr while spot and flank fires spread rate was 170. In thinned units, spread rate was 135 ft/hr versus 200 in burn only stands. The burns in thinned units were also not as uniform because the skid trails interrupted the fire spread while the slash accumulations resulted in greater flame lengths and a longer residence time. Labor and therefore costs of burns were mostly dictated by the size and configuration of burn units rather than the thinning treatments. Both thinned and unthinned units required an average of 2 person hours per acre to install control lines and execute the prescribed burns.

Excessive tree damage was avoided by the pre-fire movement of slash accumulations away from leave trees. It took an average of 1.5 person hours per acre for this slash movement in the two units where many hardwoods were harvested. On the unit that contained mostly pine, no redistribution of slash was necessary prior to prescribed burning. Crown scorch was greater on hardwoods than on pines with no apparent effect due to thinning (Figure 2). Bole char conversely was generally minimal for hardwood stems but averaged about 2.5 m on pines, again with no difference between thinned and unthinned units. The greater crown scorch on hardwoods was likely a function of tree height as there were more short hardwoods than pines. Pre burn litter depth (Figure 3) was the same on burn and thin and burn treatment units, although there was certainly a lot more slash fuel on the thinned areas. Litter consumption was higher on areas thinned before burning, likely because of slash providing addition fuel that increased residence times and therefore litter consumption. Although some places burned down to mineral soil, even on the thinned units the humus layer generally remained with an average litter depth of 1 cm post burn.

This study shows that commercial thinning can be used to readjust structure and composition of the mid and overstory layers of longleaf communities of the Gulf Coastal Plains region. These stands can also be treated with growing season burns soon after thinning to dispose of slash and help control hardwood and woody shrub growth. This requires some movement of logging slash and the burns will be more spotty, but still successful with proper planning and execution. With this slash movement and careful burns, crown scorch for pines can be kept at less than 10 percent. At this low level, there will be no increase in tree mortality and growth loss in subsequent seasons will be minimal (Johansen and Wade 1987). All of the burns were somewhat more time consuming and thus costly than general prescribed burning, but this must be viewed against the minimal damage and mortality to the remaining stand. Once the stand has readjusted to growing season burns, costs will be more typical. Which of the treatments tested is best suited to management objectives of a healthy and productive longleaf community will require additional data collection over a longer time.

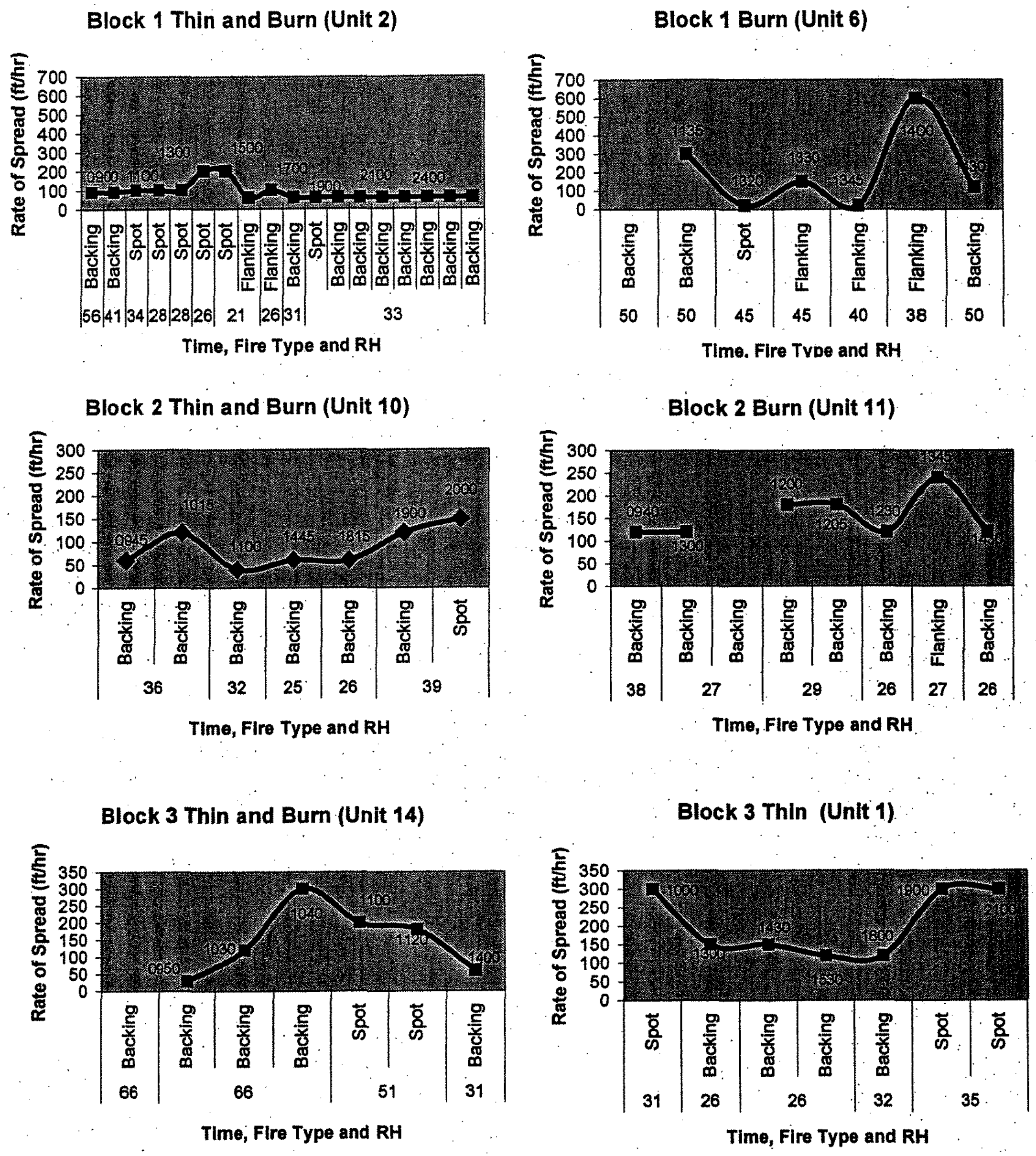

Figure 1. Influence of fire type and relative humidity on rate of spread during prescribed burns of different treatment units at the Solon Dixon Center in southern Alabama. Note unit 11 is two adjoining areas that were burned on consecutive days.

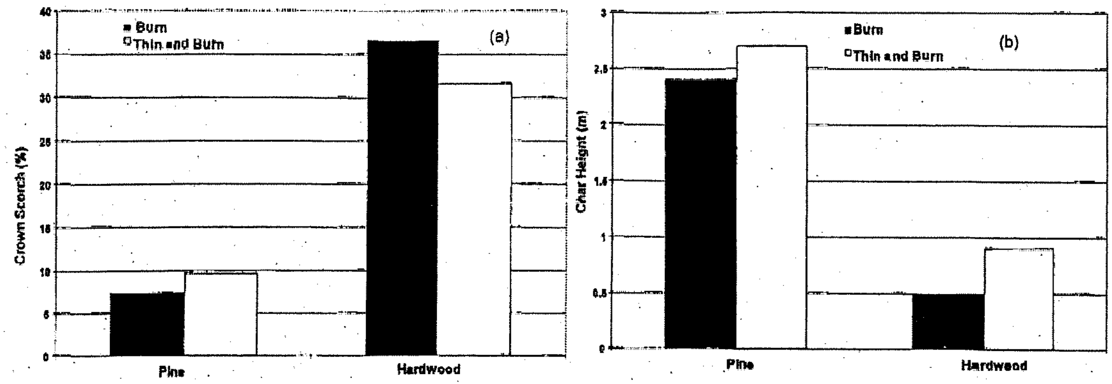

Figure 2. Crown scorch (a) and bole char (b) of southern pines and hardwoods from prescribed burning in stands, with or without prior thinning, on the Solon Dixon Center in southern Alabama.

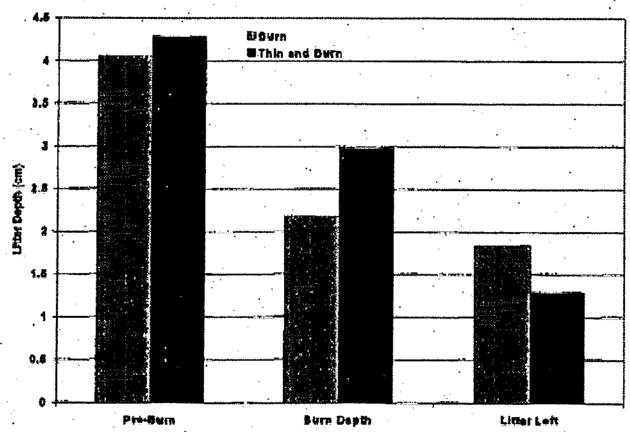

Figure 3. Litter consumption from prescribed burns in stands, with or without prior thinning, on the Solon Dixon Center in southern Alabama.

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