BACKBURNING AS AN ALTERNATIVE TO TRADITIONAL PRE-COMMERCIAL THINNING

By F. Thomas Lloyd and Thomas Waldrop

Two studies — at the USDA Forestry Science Laboratories in Macon, Georgia, and Charleston, South Carolina — suggest that the cost of pre-commercial thinning can be reduced with low-intensity prescribed burning.

Where its seeds fall on the bare ground in full sunlight, loblolly pine usually has no trouble establishing itself after a harvest. Unfortunately, from an economic viewpoint, this natural regeneration process is often too successful, resulting in over-stocking. Species such as pines that regenerate primarily from seed can produce too many seedlings.

If timber profits are important land management objectives, then dense pine stands should be thinned when they are young. Thinning concentrates growth on the trees left behind and reduces the time they take to grow to a merchantable size. Unfortunately, this kind of thinning, called pre-commercial thinning, produces no income because it must be done before any of the trees are large enough to be merchantable. To maximize profits, Tree Farmers can either take preventive actions to avoid overcrowding or lower thinning costs for stands that are already too dense. Here we will focus on lowering costs for Tree Farmers by using backburning to thin pine stands.

Pre-commercial Thinning When Pines Are Too Dense

Numerous studies have shown that pre-commercial thinning of natural loblolly pine stands is a sound investment. Two methods of pre-commercial thinning are common. Mechanical thinning uses heavy equipment to mow wide strips, leaving narrow strips of pine or pine and hardwood saplings. The second method, called hand thinning, entails the use of string-trimmer type saws to cut all trees except those pre-selected for size and spacing. Hand thinning gets the best results because it leaves an optimum number of desirable tree species; these trees are evenly spaced for better growth.

Although economic analysis show good results from both of these thinning methods, the costs are relatively high. Many Tree Farmers cannot afford this investment. Others are reluctant because there are risks that can negate or postpone the return on their investment. Perhaps Tree Farmers might be more willing to take the risk if the cost of pre-commercial thinning was lower.

Two studies suggest that the cost of pre-commercial thinning can be reduced with low-intensity prescribed burning. These studies were done at USDA Forestry Science Laboratories in Macon, Georgia, and Charleston, South Carolina.

Because of the natural characteristics of Southern pine to develop a range of sizes (ground-line diameter and height) early in stand life (by age three to six), careful use of backburning fires can successfully thin dense stands. Burning kills many small trees but spares larger trees. The largest trees are often undamaged and will later become the crop trees.

Results of these two studies show that backing fires kill very few pine saplings with ground-line stem diameters over 1.5 inches. Below this threshold size, the smaller a sapling, the greater its probability of being killed. Backing fires are slower and more expensive than other firing methods. However, they are effective and their cost is a fraction (5 to 15 percent) of the cost of mechanical or hand thinning.

The timing of burning is critical, but depends more on tree size than tree age or the season. The ideal time for burning is

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This dense stand had 6,500 stems per acre prior to burning.

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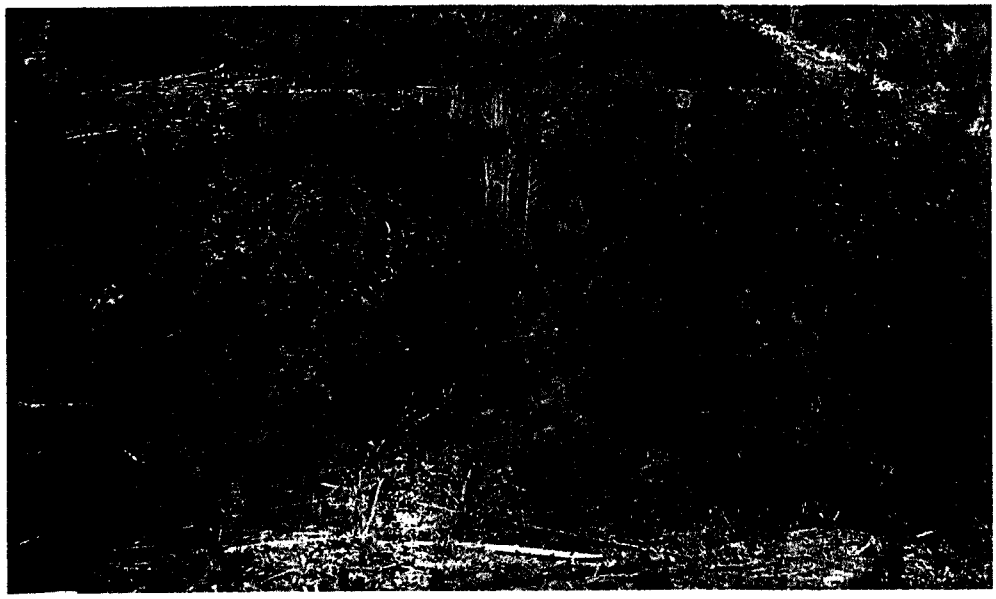
when enough trees reach 1.5 inches in diameter at the ground line to leave a fully stocked stand. Early tests of burning in stands with trees larger than 1.5 inches at the ground line were unsuccessful because low-intensity fires did not kill enough trees.

In the Charleston study, the trees were four years old. However, the best age for burning can be as young as three years or as old as eight years as long as sufficient numbers of trees are 1.5 inches in ground-line diameter. As might be expected, fires this close to the crowns of young trees will scorch the needles. It looks bad, but scorching usually does not kill pines. The main determinant of survival is ground-line stem diameter.

Although these results are promising, widespread application awaits further testing under a range of conditions. Land managers who have training and experience with prescribed fire can play an important role in testing this method by applying it in limited areas.



Five weeks after burning. The trees have experienced severe crown scorch, which caused some loss of growth the year following burning.

The same area three months after burning. Scorched needles have fallen and new needles have emerged.

Economic Analysis

The Charleston study applied five pre-commercial thinning treatments including burning and hand thinning to very dense stands (8,000 to 12,000 pine saplings per acre) at age four. Tree growth was measured until age eight, when most of the trees were uprooted by Hurricane Hugo. Economic analysis were conducted by projecting the eight-year-old stands forward to age 30. Growth projections and economic comparisons were done with a computer growth-simulation model developed at Auburn University and based on data collected by the USDA Forest Service Forest Inventory and Analysis unit in Asheville, North Carolina. The purpose of these economic comparisons was to compare the two thinning treatments, not to predict actual income. It would be a mistake to compare these values with those of other forestry operations or other types of investments.

The economic analysis showed that both burning and hand thinning were good investments. Burning gave the highest internal rates of return (20.3 percent versus 13 percent for hand thinning), suggesting a greater return on each invested dollar. Both methods gave positive net present values (NPV), indicating that they are better choices than not thinning at all. The thinning method with the greatest NPV (indicating the most profit) depended on the discount rate used. At a discount rate of 4 percent, the NPV for stands thinned by hand was $512.91 per acre, as compared to $487.71 for stands thinned by burning. At the higher discount rate of 8 percent, hand thinning increased stand value (NPV = $148.87 per acre) but not as much as burning (NPV = $171.97 per acre). The low cost of burning, compared with the higher discount rate, made additional investment in hand thinning unnecessary.

Pre-commercial thinning of young dense loblolly pine stands can be a good investment. Hand thinning is expensive but it ensures that the best trees and the optimum numbers of trees are left standing. Prescribed burning looks promising and is much less expensive than hand thinning. However, burning allows very little control of tree spacing and its application is somewhat risky. It remains for land managers knowledgeable in the methods of prescribed burning to refine this promising field application.

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