LOW COST FOREST MANAGEMENT ALTERNATIVES FOR LOBLOLLY/SHORTLEAF PINE

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Abstract. Although intensive forest management is a good investment, private non-industrial landowners often lack the necessary capital. Unaware of alternatives, many owners make no attempt to manage their cut-over, poorly stocked forest land. Work at the USFS Crossett Experimental Forest shows that rehabilitation of existing stands, natural regeneration, and cost-effective competition control make productive forest management affordable.

INTRODUCTION

Most private nonindustrial landowners need forest management techniques that are both effective and affordable. To help meet these needs, U. S. Forest Service researchers at Monticello/Crossett, Arkansas, have been conducting studies in loblolly pine (Pinus taeda L.) stands that contain a minor proportion of shortleaf pine (P. echinata Mill.). These stands are found on upland sites in the West Gulf Coastal Plain.

Their research suggests that when managing this forest type on similar sites, you should think about your options in this order:

(1) Can you manage what you have?

(2) Can you use natural regeneration?

(3) Can you use techniques that give adequate site preparation and/or brush control at a minimal cost?

MANAGE WHAT YOU HAVE

Many landowners have cutover land that contains some residual pine stocking with a lot of competition from brush and low-grade hardwoods. Or, perhaps, the pine was completely removed but pine has seeded in from adjacent stands; however it will not develop because of competition from hardwoods. Rehabilitating such stands usually costs less than starting over, and it often produces sawlogs faster. Let's consider some common situations and what you might do about them.

Understory pine

Pines sometimes seed in under scattered low-quality hardwoods. Six hundred (600) free-to-grow seedlings per acre would meet the Forest Survey standards for full stocking (Birdsey et al. 1981). However, there would be at least an adequate stand if you can harvest or deaden the overtopping hardwood trees and leave a minimum of 350 to 400 well-distributed pine seedlings per acre.

Oppressed trees

Loggers often leave the small older pines or "whips". Although the trees may be tall, straight, and well-pruned, there is usually a question about whether they can start growing again. A study at the Crossett Experimental Forest showed that trees that still have good apical dominance will normally recover if they have at least a 20 percent live crown ratio and are at least two inches in diameter at the base of the live crown (McLemore and Baker 1986). Trees with smaller crowns and smaller diameters at the base of the crown usually won't grow enough to be worth keeping.
Another part of the study followed the growth of trees that ranged in age from 11 to 43 years. They had averaged 0.08 inches of dbh growth per year during the five years immediately prior to being released when the larger trees in the stand were harvested. The trees quickly responded in terms of diameter growth, which averaged about one-half inch of dbh per year during the first five years following release (Baker 1989). The crowns of the trees expanded more laterally than in height during the first five years. Preliminary analysis of the most recent measurements indicates that dbh growth continued to average about one-half inch per year during the second five years but that the trees grew more rapidly in height compared to the first five years following release. At the end of ten years, the trees had grown an average of five inches in diameter and 10 feet in height.

Understocked stands

How poorly stocked can a stand be and still be manageable? To help answer this question, uneven-aged loblolly/shortleaf pine stands were cut back to replicated plots having 10, 20, 30, 40, and 50% of full stocking based on tree number and size (McLemore 1981). The study was conducted on both a good site (site index = 90 at age 50 for loblolly pine) and a medium site (site index = 75 at age 50 for loblolly pine). The trees that were left on each plot ranged from seedlings to 12 inches dbh and were well-distributed over the plot. All hardwoods having a groundline diameter of one inch or larger were injected with herbicide.

Trees on the understocked stands grew quickly. On the good site, the stand that started with 30 percent stocking was 42 percent stocked five years later (Baker 1989). During this time, its growth averaged 1/2 cord of pulpwood and 150 board feet (Doyle) of sawlog volume per acre per year. At this rate, the stand would take 11 years to grow to acceptable (60 percent) stocking. On the medium site, growth was a little slower; it would take about 12 years to grow to acceptable stocking. On the other hand, if a plantation was established on a good site, it would not be ready for its first pulpwood thinning until it was at least 12 to 15 years old.

Stands were considered to have recovered when they attained 60 percent stocking, based on tree numbers and sizes. This corresponds to the minimum "acceptable" stocking under Forest Survey standards (Baker 1989). Based on experience, the researchers also considered a merchantable basal area of 40 square feet per acre to be the threshold of acceptable stocking for uneven-aged loblolly-shortleaf pine stands.

It appears that stands having at least 15 to 25 percent stocking or 5 square feet of merchantable basal area per acre in well-distributed, vigorous trees of good form can become acceptably stocked in 15 years or less without additional regeneration at a rehabilitation cost of about $45 to $50 per acre for tree injection (Baker 1989). Recovery was, on the average, about 6 percent faster on the good site than on the medium site.

Brush thickeits

Inadequate competition control often results in pine saplings being overtopped by hardwood brush. If the owner cannot treat the entire area, an alternative is to release about 100 pines per acre. (That's approximately the number that remain when a fully-stocked stand of trees averages 14 to 16 inches in diameter.)

To spot treat, select a pine crop tree about every 20 feet. Use herbicides to deaden any hardwoods which grow or will grow over the pine crop tree. Repeat this on a 20-by-20-foot grid to release approximately 100 pines per acre. The remaining hardwoods help prune the pines. Admittedly this method is a compromise, but it does produce some quality trees. If just three-quarters of the released pines grow to be 14-inch sawtimber trees, the owner will harvest over 5,000 board feet per acre plus some hardwood pulpwood.

Uneven-aged management

The selection system is a good way to rehabilitate a cut-over stand that has some trees of seed-bearing age (Baker 1986, Guldin and Baker 1988). Most landowners will want a forester's help, but the basic principles of uneven-aged management are fairly easy to understand.

First, you must periodically control the hardwoods or you won't get pine regeneration. Get rid of overstory and midstory hardwoods. Sell them if you can, or deaden them with herbicide. Then control the understory brush periodically with herbicides. Control of the understory hardwoods enables pine reproduction to become established and grow.

Second, to keep trees of all sizes in the stand, you must harvest on a cutting cycle of every 3 to 10 years. The length of your cutting cycle depends on the number of trees of each size that you want to leave, on their growth rate, and also on how much volume it takes to make an operable harvest for a logger.

Third, an uneven-aged loblolly/shortleaf pine stand should be cut back whenever it has 75 square feet of merchantable basal area per acre. As a rule, these uneven-aged stands on average or better sites grow about 3 square feet of basal area per acre per year. Thus if your cutting cycle is five years, your harvest should leave about 60 square feet of basal area per acre in trees four inches in diameter and larger. About three-fourths of the basal area should be in trees 10 inches in diameter and larger. Five years later, the stand will have grown back to about 75 square feet of basal area and be ready for another harvest.
Uneven-aged stands on good sites grow 350 to 400 board feet (Doyle) per acre per year. Volume growth is less on poorer sites because the trees are shorter, but basal area growth is still about 2 to 3 square feet per acre per year even on relatively poor sites.

Under management, stands on good sites recover quickly. The famous Crockett Poor Forty started out with just 2340 board feet and 35 square feet of merchantable pine basal area (Baker 1986, Baker and Bishop 1986). Even though half the annual growth was harvested, the stand still only took 15 years to become fully stocked. Growth averaged 291 board feet per acre per year during those first 14 years. Since then, it has averaged 450 board feet per acre per year (Reynolds et al. 1984, Baker and Bishop 1986).

COST-EFFECTIVE COMPETITION CONTROL

If your objective is maximum growth and you have the money to invest, pines will grow better without any competition from undesirable hardwoods. However, most of us have to compromise to put each dollar where it will do the most good.

This of course is what row-crop farmers are doing now -- optimizing returns, not maximizing production. For forest landowners, this means settling for an adequately stocked stand when the cost of getting full stocking is too high. Likewise, you must be sure that your trees survive and grow well, but you may not be able to afford maximum competition control.

If possible, control the competition before your final harvest. If you are going to use chemicals, it is usually easier to control single stems before the harvest rather than clumps of sprouts after it. If you are going to use prescribed burning, remember that only one fire usually just causes hardwoods to sprout. It generally takes at least three prescribed fires, at about three-year intervals, to achieve a useful degree of hardwood control.

How much competition control is needed depends in part on the size of the seed crop. When the seed crop is poor to average, more competition control is necessary than in an bumper seed year (Cain 1988).

You don't always need competition control. Pines that have their terminal buds up above the hardwoods are usually able to stay ahead of the competition. If you have an adequate number of young pines that are free to grow, you can afford to leave them alone.

There are times when larger cull hardwoods should be left temporarily. One is when they are helping to prune widely-spaced pines. Another is when their shade is keeping a worse brush problem from developing until you can schedule the area for regeneration. Of course, this doesn't consider good hardwoods that might be left for timber production along streams or drainages within an upland pine forest, or those left for wildlife or to meet other specific landowner objectives.

When herbicides are needed, the landowner has many more options now than there were just a few years ago. Some of the new herbicides are selective and kill only hardwoods. Some can be applied to the ground, to be taken up by plant roots. Some will control herbaceous vegetation as well as woody brush. Now that more choices are available, it is easier for foresters and county Extension agents to help the landowner select a cost-effective herbicide and application method.

Many of the older herbicides and application techniques remain effective, however. Injection is still the cheapest.

NATURAL REGENERATION

Natural regeneration increases the rate of return from your timber by reducing the initial costs. Generally the site preparation is less intensive, but even if you spend the same amount you will still save the 7 or 8 cents it costs to buy and plant each seedling.

There are four basic methods for naturally regenerating southern pines: clearcut, seed-tree, shelterwood, and selection. Which method works the best? They all work well for loblolly/shortleaf pine on most sites, but get local advice if you are dealing with other species or unusually adverse conditions. So which method should you use? That depends on the situation. Each method has its own set of advantages and disadvantages, which the forester should discuss with the landowner.

Plan well ahead. If you use the seed tree or the shelterwood method to regenerate southern pine, choose your seed trees about five years in advance and thin around them. That will allow their crowns to fill out so they will produce more seed. If you choose clearcutting with natural regeneration, the clearcut opening should have mature seedbearing pines to the west or northwest of the opening. The opening should not be wider than 4 chains (about 250 feet) from east to west. If you choose the selection method, cutting cycle harvests and hardwood control should be conducted during the summer or early autumn, so that there will be a favorable site when seeds fall in October. Whichever method you choose, if you control as many of the hardwoods as possible before the harvest, they will not sprout and compete with the pine seedlings later.

If possible, harvest in a year when there is a good seed crop. Try to have a mineral soil seedbed exposed when the cones open. Logging often exposes enough soil for natural regeneration. Fire is effective too, if it will not damage residual crop or seed trees. Other methods of exposing a seedbed include disking, raking, or pulling a tree top or a log through openings where regeneration is needed.
means of deadening trees that are two inches in diameter or larger (Miller and Mitchell 1988). A landowner who is willing to do the work only needs a hatchet, squirt bottle, and one of several herbicides labeled for injection (McLemore and Yeiser 1987). Vendors in the south Arkansas area seem to be charging about $45 an acre, varying somewhat with conditions. Haywood and Burton (1987) found that while tree injection was not as effective in terms of volume production at age 12 as several mechanical site preparation methods tested in this region, the return on investment was comparable.

FOR MORE INFORMATION

Readers may contact either of the authors for a list of available publications of the USDA Forest Service's Monticello/Crossett Research Unit.

LITERATURE CITED


