Thinning Your Timber **for Profit**

The University of Georgia College of Agricultural & Environmental Sciences
Cooperative Extension Service

THINNING YOUR TIMBER FOR PROFIT

Prepared by Ben Jackson
Extension Timber Harvesting Specialist

Thinning is a process in which a certain number of trees are removed from a stand to increase the growing space available to the residual stand of timber (the trees that are left to grow) and to make some money from the timber that is removed. Pine trees respond well to thinning, particularly in plantation stands where the trees are planted close together.

Depending on your objectives, thinning can be a good pine management practice because of the benefits to the stand. By increasing the growing space available to the remaining trees, a landowner can increase the growth rate of those trees and, more importantly, the rate at which they increase in value. Thinning can also be used to remove poorly formed trees that would have little future value. A last incentive for thinning is the value of the harvested trees. Although thinning rarely removes large volumes of timber, financial returns can be expected in most cases.

This publication emphasizes thinning practices in pine plantations, although much of the information can be applied when thinning natural stands of pine.

When and How Much to Thin

Many landowners are unsure about when to thin their timber and which methods to use to estimate how much timber should be removed. The techniques for determining when to thin and how much to remove are not difficult to use and can be learned quickly.

When to thin often depends on the owner's interests. If your objective is to grow pulpwood only, then thinning may not be the appropriate step to take. On the other hand, if you are growing a stand for multiple products or for sawtimber, thinning may be the fastest way to obtain a marketable timber crop. Thinning should pay for itself and, in most cases, provide the owner some revenue for this effort.

One way of estimating when to thin is by keeping track of the "live crown ratio" of trees in the stand, defined as the height of the live crown (the part of the tree with live branches) divided by the total height of the tree. When the average live crown ratio falls below 35 to 40 percent, the stand should be thinned. For example, if the average height of your stand is 40 feet and the average height of the live crown is 14 feet, then the live crown ratio is 35 percent and the stand would be a candidate for thinning soon.

Another way you can determine if your stand needs thinning is to measure the stand density by estimating the basal area per acre. Basal area is simply the area in square feet taken up by an individual tree trunk at DBH (diameter at breast height); basal area per acre is the sum of these individual values for all the trees growing in 1 acre.

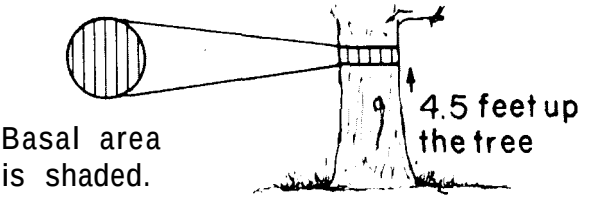
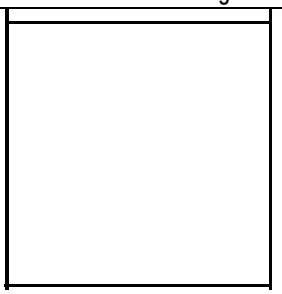


Figure 1: Basal area of a tree.

To avoid measuring a large number of trees over several acres, foresters use a tool called the wedge prism to provide an accurate estimate of the basal area per acre in a stand. You can construct a similar tool to estimate basal area per acre by following the steps outlined in Figure 2.

Cut out this square or use one that is exactly the same size.



Attach the square to a yardstick that is **36** inches long. Use o thumbtack to place the square on the end of the stick.

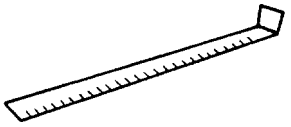


Figure **2: Constructing** *a fool for estimating basal area per acre in a stand of timber.*

To use the tool, go to a part of the tract that represents the average conditions in the stand. Place the tip of the tool against the bridge of your nose and sight in on the first tree that is plainly visible to you. As you sight in on the tree, check to see if the trunk (at 4.5 feet up the tree) is larger or smaller than the square on the end of your stick (See Figure 2). If it is smaller, turn until you sight in on the next tree and follow the same steps. If it is larger, count that tree "in" and turn to sight in on the next tree.

As you sample the trees, be sure to stay in the same spot. Simply turn around in a tight circle, keeping your body in the center. Turn around the spot completely until you have sighted in on every tree you can clearly see from that spot. Then, count up the number of trees that were "in" (larger than the wedge on the stick) and record the total number of "in" trees you counted at the measurement points.

After you have counted all the "in" trees at one point, move to another spot in the stand at least 50 steps away and follow the same procedure at that spot. Take measurements at 10 spots in the stand and add up the number of "in" trees you counted at the measurement points.

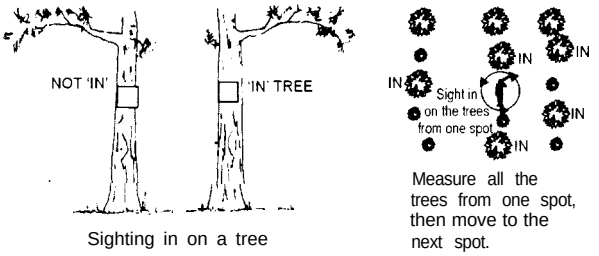


Figure 3: *Using a basal area calculator to estimate the basal area per acre in a stand of timber.*

If you counted 120 trees or more as being "in" (that means that the basal area per acre is at least 120), you should thin the stand. If the number is less than 120 but more than 100, you will want to thin the stand only if the trees are large enough to make the thinning profitable. If you counted fewer than 100 trees, you will want to wait a while to thin the stand.

If the stand needs to be thinned, you must decide how many trees to remove. A common approach is to thin the stand down to some specified basal area per acre, usually between 70 and 90 square feet per acre. Table 1 details the number of trees to leave per acre for three stand density levels and several different stand diameters. Highly productive sites support more trees and could be thinned to a basal area of 90, while poorer sites are often thinned to a basal area of 70.

Table 1: Number of trees per acre required to reach specific stand density at a given average stand diameter

Mean Stand Diameter (inches outside . bark @ DBH)	Desired Number of Trees per Acre for Basal Area of:		
	70	80	90
6	**357**	**408**	**458**
7	262	299	337
8	201	229	258
9	158	181	204
10	128	147	165
11	106	121	136
12	89	102	115

Table 2: Merchantable rough cord volume and green weight per tree for loblolly pine planted in Piedmont.'

Diameter (inchesat DBH)	Total Tree Height (feet) 20	30	40	50	60	70	Units
6	0.01546	0.02385	0.03250	0.04134	0.05033	0.05946	cords
	83.507	128.816	175.496	223.221	271.794	321.082	pounds
7	0.02145	0.03314	0.04519	0.05749	0.07000	0.08269	cords
	115.811	178.983	244.003	310.431	378.001	446.537	pounds
8	0.02820	0.04363	0.05950	0.07571	0.09220	0.10891	cords
	152.307	235.619	321.324	408.852	497.861	588.119	pounds
9	0.05534	0.05534	0.07548	0.09605	0.11696	0.13817	cords
	193.054	298.827	407.606	518.675	631.603	746.100	pounds
10	0.04409	0.06827	0.09313	0.11851	0.14432	0.17048	cords
	238.078	368.651	502.910	639.978	779.924	920.595	pounds

1 W.M. Harrison and B.E Borders, 1996. Yield prediction and growth projection for site-prepared loblolly pine plantations in the Carolinas, Georgia, Alabama and Florida. PMRC Tech. Rep. 1996- 1. Warnell School of Forest Resources, The University of Georgia, Athens. Green weight is to a 3-inch top and includes bark. One cord equals **5400** pounds or 2.7 tons.

Table 2 gives the average cord volume in a single loblolly pine based on its total height and DBH. You can use this information with that provided in Table 1 to estimate how much volume per acre will be taken out during the thinning.

For example, if you had a stand containing approximately 650 trees per acre, with an average DBH of 6 inches and average height of 40 feet, you would want to leave about 3 57 trees per acre to reach a stand density of 70 square feet of basal area per acre. You would harvest about 290 (650 - 357 = 293) trees per acre at an average volume of 0.03250 cords per tree (from Table 2). The total volume removed will average 9.5225 cords per acre (293 x 0.03250 = 9.5225), enough to allow a profitable thinning harvest. If in your state the timber sale transaction must be based on weight, not volume, the conversion would equal 25.7 108 tons per acre (9.5225 x 2.7 = 25.71075).

By knowing the number of trees per acre that will be removed and the average size of those trees, you can estimate the volume or weight of wood that will be taken out. Remember that you will probably have to thin out five to six cords per acre (at least 13.5 tons) to make the thinning profitable.

Thinning Methods

Row Thinning

As the name suggests, a row thinning removes alternate rows from the stand. Row thinnings are normally conducted early in the rotation to increase the growing space available to the remaining trees.

Depending on the original row spacing, a row thinning might remove every third, fifth or seventh row (Figure 4).

There is no need to select trees for removal and, once the pattern of removal is established, the thinning operation can proceed. There is also little residual stand damage from a row thinning harvest.

This method is fast and costs little to conduct, but it does not rid the stand of all poorly formed trees or distribute the increased growing space to all parts of the stand. In fact, some of your better trees may be removed because of the nonselective nature of the thinning operation.

Row thinning is ideal for first thinning were you have a large number of stems per acre and machinery access and maneuverability is limited.

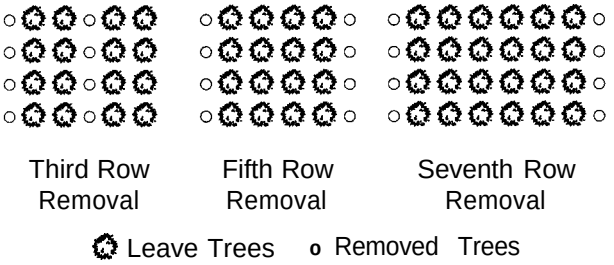


Figure 4: Different row thinning patterns

Small, short-wheelbase feller-bunchers are often used for felling and bunching in row thinnings with a prehauler or skidder used to transport the material from the woods to the haul truck. Depending on the system used, combinations of bucking, limbing and topping can be accomplished using chainsaws, slashers, and/or delimbers. Because row thinnings often require expensive equipment, tracts considered for row thinning must be fairly large.

Selection **Thinning**

Selection thinning, also called leave-tree or low thinning, is a common thinning method in the South. This type of thinning removes trees that have been overtopped by faster growing trees, as well as poorly formed trees that could never be classified as either chip-n-saw or sawtimber.

Selection thinning can be used in plantations or natural stands of pine. During a first thinning where you have many stems per acre, access into the stand is often difficult and tight tree spacing makes it possible to damage residual trees during the thinning harvest. For this reason; provisions should be made in the thinning contract for compensation for damaged residual trees and for cutting unmarked trees. Actually, a selection thinning is preferred for second or even third thinnings because there are fewer trees per acre, access is greater, and damage potential is less. Generally, the cut or leave trees in the stand should be marked before thinning. When marking the trees, apply paint at two points, one at chest height for easy visibility and the other at the groundline as a check to ensure that only appropriate trees are harvested. Another common alternative is to let the logger select trees for removal. This could save money from the cost of marking. Remember, you or your representative should always closely monitor the thinning operation, especially in this situation. When marking trees for removal, take out the poorly formed, crooked, diseased and overtopped trees that would not produce sawtimber material if left in the stand. Typical examples of these types of trees are illustrated in Figure 5.

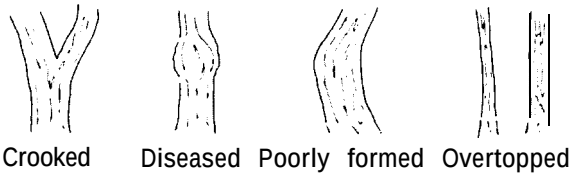


Figure 5: *Trees that should be removed from the stand when thinning.*

Selection thinning with the wrong equipment or in the wrong way can be disastrous to the stand. The landowner should be aware of two situations that may occur during the thinning harvest. Trees can be scarred by equipment, leaving them open to infection and insect damage, or the soil could become compacted from heavy use or operating equipment in wet conditions. The type of equipment used and the capability of the men harvesting the tract will often determine whether these problems occur. A common set of harvesting equipment for thinning is compact and light-weight. Labor intensive pulpwood operations are becoming scare. You should expect to see modem mechanized logging operations composed of feller-bunchers and grapple skidders. They are acceptable for selection thinnings, especially if the operators know their jobs and avoid damaging the trees that are left. Selection thinning with a mechanized system is not always cost effective because of the low volumes harvested and the high capital costs.

Combination **Thinning**

Combination thinning combines the row and selection thinning methods. Rows are removed to allow access to the interior of the stand where a

selective thinning is conducted to remove the inferior quality trees. As with other thinning operations today, mechanized systems using feller-bunchers, skidders or pre-haulers and loaders are used most often. A typical pattern for combination thinning is illustrated in Figure 6.

Figure 6: Typical pattern for a combination thinning in a pine plantation.

Removing every third, fifth or seventh row allows the equipment entrance to the rest of the stand. The feller-buncher can enter the stand from the corridor, fell and accumulate the marked trees, and carry the bunch to the corridor for bucking and limbing. The skidder or pre-hauler then moves along the corridor, picking up the processed bunches. Combination thinning usually causes less damage than selection thinning, at least with first thinning of young stands. The access corridors also provide openings for later operations.

Strip or Corridor Thinning

Strip thinning is used in place of row thinning methods where the stand is either of natural origin or where the row spacing is hard to follow. Many plantations on sloping sites have this problem and cannot be row thinned. Strip thinning removes a swath of trees in a corridor that runs along the contour. The cut strip should be at least 15 feet wide to allow harvesting equipment easy passage without damaging the residual trees. The strips of uncut timber between these corridors should be about 30 feet, although this width can be varied depending on your needs. Strip thinning can also be combined with selection thinning methods to gain the advantages of a combination thinning.

Timing the Thinning

Timing is an important consideration when thinning because of possible insect and disease damage that might occur if the stand is thinned at the wrong time of year. You can reduce the spread of diseases like Anosus root rot, and insects, particularly bark beetles, into a stand of pines by timing the thinning harvest properly. Check your local conditions for the best times to thin.

Anosus root rot is more likely to infect and spread through a thinned stand if the thinning is done in the winter months. To avoid infecting a stand with Anosus root rot, try to thin in the summer months between June and August (April to August in South Georgia). Studies indicate that thinnings between October and January have the greatest potential for cawing infection. If you must thin during these months, treat the cut stumps with boron immediately after felling. If the stand is already infected, thin frequently to salvage the infected timber.

The presence of the southern pine bark beetle (SPB) also affects the time of thinning. In periods of low beetle infestation, thinning can be scheduled for any time of the year. Where beetle outbreaks have been moderate, observe caution. Do not thin between the months of March and October during periods of moderate infestation. Winter thinning minimizes the risk of beetle infestation.

When a high number of beetle attacks have been observed, do not thin your timber. Harvesting damage to residual trees after a thinning often attracts the beetles and can lead to the destruction of the stand. Studies show that thinning reduces the risk that a stand will be infested with beetles. However, you must be sure that the thinning operation is timed properly and produces little residual tree damage.

Contact your local county Extension agent or local Forestry Commission office for information about southern pine beetle infestation in your county.

Contract Considerations

Many landowners work with consultants to thin their timber. The consultants cruise and mark the timber, find a logger to cut the tract and oversee the operation to ensure that the thinning is done right. You must take on these responsibilities if you do not hire a consultant or use another resource. Two publications from the Georgia Cooperative Extension Service should be helpful when you decide to thin your timber. "Ten Steps to Selling Your Timber," C779, details the steps required to successfully market your timber to the wood industry. The "Sample Timber Sales Contract," C773, provides an example sales contract form that can be used for thinning sales. Be sure to obtain and review these publications before selling your timber.

The University of Georgia and Ft. Valley State University, the U.S. Department of Agriculture and counties of the state cooperating. The Cooperative Extension Service, the University of Georgia College of Agricultural and Environmental Sciences offers educational programs, assistance and materials to all people without regard to race, color, national origin, age, sex or disability.

An Equal Opportunity Employer/Affirmative Action Organization Committed to a Diverse Work Force

Circular 781 **Revised April 1999**

Issued in furtherance of Cooperative Extension work, Acts of May 18 and June 30, 1914, The University of Georgia College of Agricultural and Environmental Sciences and the U.S. Department of Agriculture cooperating.

Gale A. Buchanan, Dean and Director