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A Guide to Thinning Pine Plantations

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Thinning operations require multiple forest management and market considerations before being undertaken. As of 2025, pulpwood markets are significantly weaker compared to previous years in Arkansas. The market value of pulpwood may fluctuate dramatically based on site accessibility, logging contractors, and mill proximity. Landowners who grew timber for pulpwood 10 to 20 years ago have seen the markets fall considerably in value since then. Larger size classes of pine timber such as chip'n'saw and sawtimber are holding higher values and are more lucrative to cut for logging operations. Because of this, heavy thinning operations across the state are being implemented to improve overall stand productivity and get pulpwood timber into more merchantable size classes. For anyone considering a thinning operation, it is best to contact a consulting forester in your area to assess the potential value of a thinning operation.

What Is Thinning?

In any forest stand, trees compete for light, soil moisture, and nutrients. The more crowded the trees are, the more intense the competition. In a very crowded stand, the individual tree growth rate is reduced, and eventually the weaker trees die. This competition can be reduced by cutting down some of the trees before the stand reaches maturity. The volume of wood produced by a timber stand of a certain age on a particular site is about the same over a wide range of stand densities. This means that if the number of trees in a stand is reduced, a similar volume of wood can be produced with fewer trees while maintaining a good rate of growth. Foresters can, therefore, cut or thin a stand without damaging the site's productivity, often improving productivity by increasing the quantity of resources available to each individual tree (Albaugh, 2017). Cuttings made in immature stands to reduce competition and improve stand quality are called thinnings.

The main objectives for thinning are: (1) to redistribute the growth potential of the stand to the well-formed, high-quality trees, (2) to maintain a sustainable stand growth rate, (3) to capture the economic value of all merchantable timber produced by the stand, and (4) to produce merchantable timber or specific products in a shorter period of time.

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Types of Thinning

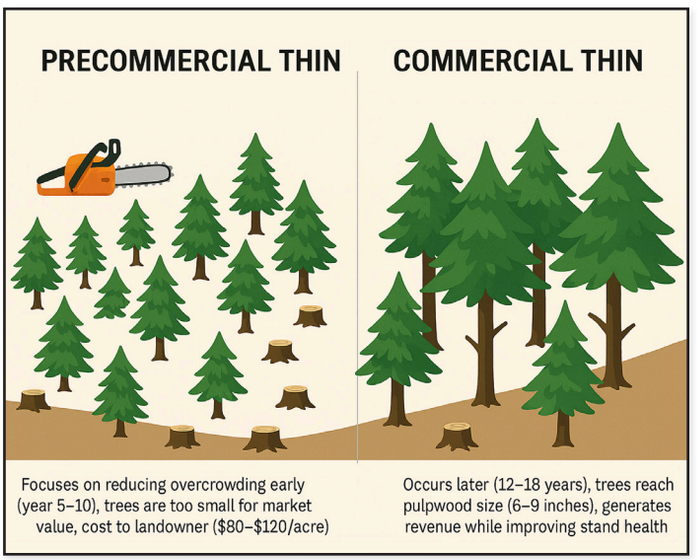
Pre-Commercial Thin

In loblolly pine plantations, there are typically two types of thinning that are deployed, commercial thins and pre-commercial thins. A pre-commercial thin is typically performed at the landowner's expense, and as of 2025 depending on the contractor used, will typically cost anywhere from $80-$120 an acre (Figure 1). Typically, the trees will be too small at this point to have any commercial value, and the pre-commercial thin is primarily used to immediately thin an overstocked stand, or a naturally regenerated stand with high basal areas or trees per acre. As mentioned previously, thinning an overstocked stand early in a stands rotation (year 5-10), can dramatically improve the future overall productivity and forest health of a stand, but due to the upfront costs associated with a pre-commercial thin, it should be left to areas that require it the most or could produce the greatest economic value (Tanger, 2021).

Commercial Thinning

Commercial thinnings have two main benefits: (1) They produce an economic value and () they improve the productivity and health of the remaining stand of timber. A commercial thin, depending on the local wood markets, often has and produces an economic value to the landowner and the logger depending on the area of the tract, size class distribution across the stand, and proximity to good markets. When foresters discuss thinning a stand, this is what they are referring to.

Figure 1: Precommercial thin vs. commercial thin.



Pine Trees Increase in Value Quickly

The combination of a productive site and proper management practices can result in growth rates of up to or greater than 10 percent per year (Table 1). The timber products produced by a stand can be an important factor in determining when to cut a pine stand. Trees in the 6-9-inch diameter range are normally sold as pulpwood. When they reach the 10-inch diameter size or larger, they can be sold as sawlogs at a significantly higher value than pulpwood. The example in Table 1 illustrates a large increase in value as a tree grows from a 6-inch pulpwood tree at age 14 to a 10-inch sawtimber tree at age 21. Thinning operations provide growing conditions that allow trees to reach larger diameters and higher values in less time.

Q3 2025 Average Stumpage Values for Arkansas						
Pine Pulpwood ($/Ton)	$3.89					
Pine Sawtimber ($/Ton)	$23.60					
	Tree Age (years)					
	14	21	28	35	42	49
Diameter of tree (inches)	6	10	12	15	19	20
Height of tree (feet)	41	54	64	72	78	83
Pulpwood volume of tree (cords)	0.04	0.12	0.23	0.39	0.61	0.84
Sawlog volume of tree (board feet Doyle scale)	----	36	48	121	215	322
Pulpwood value of tree (@10.00 per cord)	$0.40	$1.20	$2.30	$3.90	$6.10	$8.40
Sawlog value of tree (@ $130 per 1,000 board feet)	----	$4.68	$6.24	$15.73	$27.95	$41.86

Table 1. Growth in volume and economic value of an example tree.

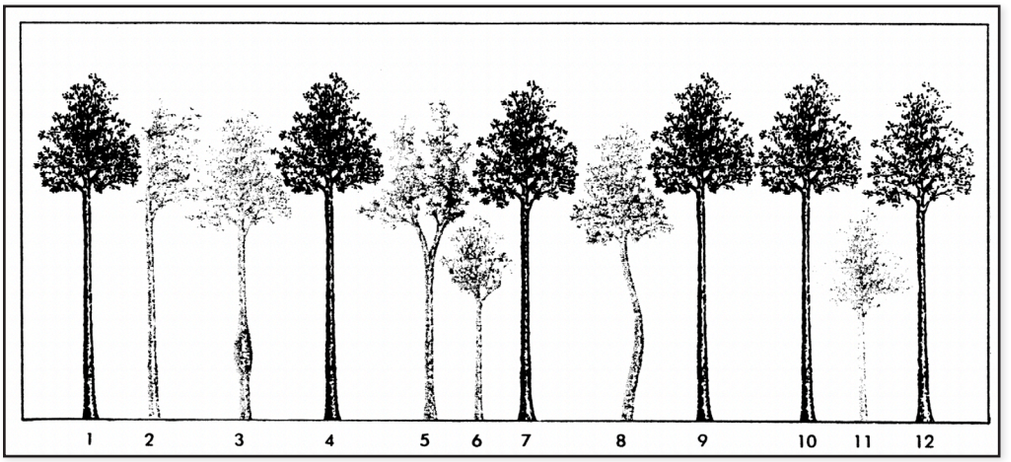
Always Leave the Best Trees for Future Growth

Most pine stands are even aged. That is, all the trees were planted at the same time. For naturally regenerated stands, the ages can fluctuate dramatically and require on-site management decisions to be made. In every even-aged stand, there will be well-formed (straight, no forking) dominant, co-dominant and suppressed trees throughout the stand. The well-formed dominant and co-dominant trees will typically maintain their dominance and can be identified from an early age (~ 8 years old). These dominant and co-dominant trees are the "money trees" that more resources are dedicated to because they will reach a larger size class

faster than the suppressed trees within a stand. The purpose of any thinning operation should be to provide more growing space for the dominant and co-dominant well-formed, fast-growing trees while harvesting the trees that are diseased, damaged or poorly formed and those that will not live until the next scheduled harvest.

The following types of trees should be included in the harvest during thinning: (1) overtopped trees, (2) forked trees, (3) trees with broken tops, (4) trees with one-sided crowns, (5) trees with crooked stems, (6) trees with trunk swellings (cankers) caused by fusiform rust disease and (7) trees damaged by insects, fire or weather (Figure 2).

Figure 2. The trees above removed by thinning are (2) one-sided crown, (3) fusiform canker, (5) forked stem, (6) overtopped tree, (8) crooked stem and (11) small tree too close to larger neighbors.



When to Thin

Perhaps the simplest method of determining when a stand should be thinned is when the crowns start touching one another. The needles on pine trees are the engines that drive productivity. Having more needles improves the overall productivity of that individual tree. When trees begin to compete for light and shade out lower limbs, they lose that potential for improved productivity, so maintaining the crown size of trees is a great way to increase the stand's productivity. One of the best ways to maintain crown size is to thin a stand at or before canopy closure before the trees begin shedding away lower limbs of their crown.

When to thin can vary dramatically based on overall site characteristics, planting densities, and genetics. Due to economic factors as of 2025, the pulpwood market in Arkansas is not as strong as it once was, nor is the logging industry. This is pushing industry and landowners to opt for lower planting densities (300-450 TPA) and improved genetics to increase the size class and stem quality of their timber at an earlier age to make it more appealing for a logger. Lower planting densities increase the amount of resources available to each tree, thus increasing the growth productivity of each tree.

For timber planted with higher planting densities (600+ TPA), the first commercial thinning in a pine stand is normally made when the trees reach pulpwood size, about 6 to 9 inches in diameter. In a plantation, the trees will normally be 12 to 18 years old when they reach this size depending on site characteristics and planting densities (Figure 3). In a natural stand, the trees will probably not reach this size until they are several years older due to increased competition and variability across a stand.

Within a few years, after the diseased, damaged, poorly formed and weak trees are removed by thinning, the branches and roots of the remaining trees will grow to fill in the gaps created by the thinning. A similar crowded condition that existed before thinning will redevelop. Before the trees get so crowded that the growth rate slows down, thin the stand again.

Figure 3: Growth increment bore collected from a high density natural 3529-year-old un-thinned loblolly pine (left) vs. an 18-year-old planted and thinned loblolly pine (right). As the tree ages, the rings get smaller per year as the competition for light and resources increases between trees.

How to Thin

Several thinning methods can be employed in pine stands. The most common ones are row thinning, gap thinning, and select thinning. Often, these types of thinning are used together in a stand depending on the type of pine stand and its overall size class. One of the primary factors that help determine which method to use is whether the pine stand is a natural stand or a plantation. Another factor that affects the thinning method is the level of diseased or damaged trees present in a pine stand. With any thinning method, provisions should be made in the logging contract for damage to unmarked trees. Often, these provisions include a penalty for damaging unmarked trees during the logging operation.

Natural Pine Stands

In natural pine stands, thinning can be accomplished by individual tree selection,also known as select thinning. With this method, any tree can be selected and marked for harvest, which allows for the removal of less desirable stems and focuses growth on the best trees, or crop trees. Due to the removal of lower-value, undesirable stems, the select thinning method will not bring the top price for the wood sold. But remember, the objective is to favor the best trees for future growth, not to produce maximum income from the thinning operation.

Natural pine stands differ from plantations in that tree spacing is not uniform. This irregular spacing can create access problems for large harvesting equipment used by many contractors. Therefore, a series of corridors are often harvested in natural stands to provide equipment access. This operation is similar to row thinning in pine plantations. After the corridors or access openings are established, select thinning can be used in the remaining trees. Due to increases in cost, often a select thinning is not economically feasible for the logger or landowner, and thus a gap thinning is performed where larger sections of timber in a stand are thinned out, creating a series of openings in the canopy around the stand. This type of thinning is typically more lucrative for the logger and landowner.

Pine Plantations

Individual tree selection or select thinning is also an effective way to thin pine plantations. However, the row thinning operation,also known as mechanical thinning, has become preferred to the initial thinning of pine plantations because it is generally quick, economical and allows harvesters to use larger equipment. Row thinning, as the name implies, involves removing entire rows within a plantation. Row thinning involves removing every second to seventh row, depending on the intensity of the thinning operation. However, since row thinning removes trees without regard to tree size or vigor, it does not improve the quality of the stand.

A common method for the initial thinning (stand age 12-18 years) is a combination of row thinning and select thinning. The row thinning is the first part of the operation and is commonly employed in every third or fourth row. In areas where storm damage (e.g., ice storm, wind throw and others) is a concern, or if the landowner desires more control over which trees are removed, the row thinning may only remove every fourth or fifth row. The row thinning provides better access for harvesting equipment. After the row thinning, individual trees are selected for harvest between the thinned rows. In thinning operations beyond the initial thinning, the free thinning method alone will probably be the method of choice.

How Much to Thin

Most pine stands that need thinning maintain a basal area near or greater than 100 square feet per acre. Thinning operations in pine stands should always leave an optimum stocking level of residual trees. The optimum stocking level after a thinning will differ depending on the productivity of a forest site. However, a residual basal area of 60 to 70 square feet per acre is often desirable in stands that contain primarily pulpwood size material. A residual basal area of 70 square feet per acre is often desired if a pine stand contains primarily sawtimber size material.

Table 2 illustrates the number of trees per acre required for a stand to maintain the desired pulpwood or sawtimber basal areas after a thinning. An important factor in determining the trees per acre to retain is the size or diameter of the trees present. For example, if the average diameter in a pine stand is 8 inches, approximately 172 trees would be necessary for the stand to have a basal area of 60 square feet per acre. If a stand contained primarily sawtimber size trees with an average diameter of 14 inches, approximately 65 trees per

acre would be necessary to establish a basal area of 70 square feet per acre (Table 2).

Average Tree Diameter	Target Post-thinning Basal Area Per Acre	Trees Per Acre
6	60	306
8	60	172
10	60	110
12	70	89
14	70	65
16	70	50
18	70	40
20	70	32

Table 2. Approximate number of trees per acre for the desired residual basal area per acre.

Key Points to Remember

1. Thinnings are cuttings made in immature stands to stimulate the growth of the remaining trees and improve the yield of the stand.
2. Trees compete for light, moisture and nutrients. If they become too crowded, individual tree growth slows and they may eventually die. Forest stands are also more susceptible to insects and diseases when they compete heavily for light, moisture and nutrients.
3. Pines grow rapidly, and trees that are merchantable for sawlogs are worth far more than trees grown for pulpwood. Thinning helps forests reach sawlog size earlier.
4. The purpose of a thinning operation should be to provide more growing space for the best trees while primarily harvesting the smaller, diseased, damaged, poorly formed and dying trees.
5. The first commercial thinning in a pine stand is usually made between years 12 and 18 when the trees reach pulpwood size.
6. Subsequent thinnings should be made before the live crown ratios drop below 30 percent or when the crowns begin to touch (generally every 5 or 6 years).
7. For natural stands in previous years, select thinning was the go to method, however, economic factors have shifted select thinnings to gap or group thinning.
8. A modified row thinning is acceptable as the first thinning in pine plantations. Every third to fifth row can be removed and intermediate rows thinned by select thinning.
9. Subsequent thinnings in pine plantations are often best accomplished by select thinning.

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