United States Department of Agriculture
NRCS Natural Resources Conservation Service

Forest Stand Improvement

Thinning Commercial Stands

Alabama NRCS Job Sheet No. AL666E

Definition

Forest Stand Improvement (sometimes called timber stand improvement, or TSI) is the manipulation of species composition, stand structure and stocking by cutting or killing selected trees and understory vegetation.

Thinning is defined as "the systematic removal of excess trees in order to provide optimum space for selected crop trees to grow and improve wildlife habitat".

The species composition and stocking level of trees in a forest may be changed to achieve a variety of purposes. Forest stand improvements may be done to:

- Improve the quality and quantity of wood production.
- Harvest trees and achieve a desired level of tree stocking.
- Initiate natural regeneration of trees in the forest.
- Improve the habitat of forest wildlife.
- Restore and protect plant communities.

Purpose

The purpose of this practice is to improve the future growth and health of the stand and improve wildlife habitat.

Improving the Forest for Wood Production

Both large and small acreages of hardwood and coniferous forest in Alabama can benefit through forest stand improvement. Removal of diseased, damaged, deformed, and low value species may improve the overall health and composition of the forest. Such operations are referred to as intermediate stand treatments ***(see Table 1)***.

Table 1. Intermediate Stand Treatments

Treatment	Types
Thinning	Commercial
	Precommercial
Release Operations	Cleaning
	Liberation
	Weeding
Salvage cutting	
Sanitation cutting	
Prescribed burning	
Forest fertilization	
Pruning forest stands	Natural
	Artificial

Thinning is the systematic removal of excess trees in order to provide optimum space for selected crop trees to grow. Cleaning, Liberation, and Weeding are pre-commercial operations (usually in younger stands of sapling size, not having reached commercial age) or in older stands incorporated as part of a commercial harvesting operation.

Other purposes may be to improve aesthetics; reduce the potential for damage by wildfire, insects, or disease; and to improve recreational uses of the forest.

Wildlife

To further improve conditions and forage for wildlife a prescribed burn should be conducted in pine stands during the dormant season (December – March). Select log loading areas that benefit the wildlife species of interest and enhance local landscape aesthetics. Firebreaks and fuel breaks should be planted with clover, rye, and wheat or other suitable cover to benefit wildlife.

Guidelines for Thinning Hardwoods

When to Thin

Hardwoods may be thinned for sawtimber as soon as crop trees (well-formed dominant and co-dominant trees in the stand) can be identified. This is usually when trees have reached 11 in. diameter at breast height (DBH) 4.5 ft. above the ground.

Hardwoods released by thinning may grow 40-60 percent faster than trees growing in an overstocked, unimproved forest. When production of high quality sawtimber is the goal favor desirable species such as: Red and White Oak, Sycamore, White Ash, Yellow Poplar, and Gum. Discriminate against: American hornbeam, eastern hophornbeam, Hickories, American Beech, and Red Maple.

When wildlife habitat management is the goal, favor mast producing species that will increase food production for targeted wildlife. Generally favor species such as red and white oaks, American beech, persimmon, mulberry, and various species of hickory.

When feasible, conduct thinning during dormant seasons to minimize damage by insects, diseases, and equipment to the residual stand.

Method of Thinning

Select up to 80 future crop trees per acre to be released. Select crop trees on the basis of the following criteria:

- Crown size, (dominant or co-dominant trees only) position, and condition.
- Relative tree position and spacing.
- Tree health and vigor (crown should not exceed two-thirds total tree height).
- Bole quality (no forks or dead branches in main stem if over 9 in. DBH).
- Species (based on soil type and local market values).

Thin and maintain overstocked stands of trees that are 5-24+ inches DBH to a density of about 85 square feet basal area per acre. A quick way to determine the average desired spacing may be done by multiplying the measured average diameter in inches (DBH) of the dominant and co-dominant crop trees in the stand by the constant: 1.67.

The result will give the approximate desired spacing in feet between trees. Example: Average diameter of trees in stand = 6 inches. Multiply 6 by 1.67 and the result is 10.02 ft. or 10 ft. between trees. The recommended growing space is:10’ X 10’ or 100 sq.ft. per tree. The basal area of trees averaging 6 in. DBH thinned to this spacing is 86.

Guidelines for Thinning Pines

When to Thin

The time to thin will depend on tree size and stand density. Basal area is a measure of stand density that is used by professional foresters. Basal area is the cross-sectional area in square feet that a tree occupies on a per acre basis.

The measurement is taken at 4.5 feet above the ground. Foresters use a tool called a wedge prism to estimate basal area. Trees generally should be thinned when basal areas are 100 square feet or more. Trees are usually thinned down to a residual basal area of 70 or 80 square feet.

Another way to determine when to thin is by observing the live crown ratio of the trees in the stand which is the height of the live crown (the part of the tree with live branches) divided by the total height of the tree. The stand should be thinned when the live crown ratio falls below 35 to 40 percent. A volume of 5 or 6 cords of wood per acre is needed to make a thinning profitable. Most timber is bought and paid for on a ton basis and there are approximately 2.68 tons per standard cord of pine timber.

Thinning Methods

Row Thinning

Row thinning is used in pine plantations where trees are planted in rows. Entire rows are removed at designated intervals. Trees may also be removed on a selective basis in the remaining rows. Intervals may be every third, fourth, fifth, or sixth row. Row thinning is a quick way to reduce the number of stems per acre.

Row thinning **(*see Figure 1*)** minimizes equipment damage to residual trees. Unfortunately, it also involves the removal of quality trees as well as trees that need to be removed in a thinning. Row thinning is ideal for a first thinning where you have a large number of stems per acre and machinery access and maneuverability is limited.

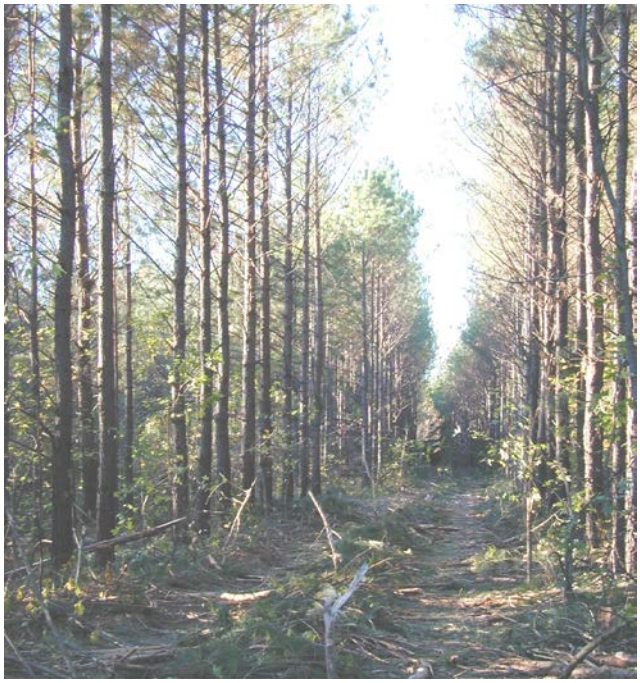

Figure 1. Row of pines removed in a first thinning.

Feller bunchers with short wheel bases are often used for felling and bunching trees in row thinning **(*see Figure 2)*** with a prehauler or skidder used to transport trees from the forest to the haul truck. Because row thinning often requires expensive equipment, tracts considered for row thinning must be fairly large.

Figure 2. Feller buncher removes a row of pine.

Strip Thinning

Strip thinning or corridor thinning is used in natural stands or in plantations where it is not possible to follow the rows. In strip thinning, all of the trees in a strip of a certain width are removed. Strips should follow the contour and be wide enough to allow the operation of the necessary machinery.

The cut strip should be at least 15 feet wide. Strips of uncut timber between corridors should be about 30 to 40 feet. The width can be varied according to landowner objectives.

Selection Thinning

Selection thinning, also called leave-tree or low thinning, is a common method in the South. This type of thinning removes trees that have been overtopped by faster growing trees and trees that are poorly formed or diseased.

Selection thinning is usually used in natural stands and plantations that have previously been thinned. It is seldom used in unthinned plantations because of the potential damage to residual trees. Cut or leave trees should be marked before thinning.

Another method is to let the timber harvester select the trees to be removed. This method saves the cost of marking but should be closely monitored to ensure that the best trees are retained and that the proper number of trees are being left for future growth. It is advisable to have a professional forester to oversee this type of thinning.

Landowners that have an interest in wildlife management as well as timber may want to thin heavier than normal timber management operations ti increase light to the forest floor. The increased light will promote tender grasses, vines, and forbs a preferred food for many wildlife species.

Specifications

Site-specific requirements are listed on the specifications sheet. Additional provisions are entered on the job sketch sheet. Specifications are prepared in accordance with the NRCS Field Office Technical Guide. See Alabama NRCS conservation practice standard, Forest Stand Improvement - Code 666.

Operation and maintenance

Trees and shrubs in a forest can eventually become crowded again and slowing their growth and the growth, survival, and composition of understory species. As the stand matures, periodic thinning of the stand is an important activity for maintaining plant health and wildlife benefit. Dead or dying trees within the stand can serve as nesting cavities for many species of wildlife and should be left standing.

REFERENCES

Alabama Forestry Commission. 1993. Alabama's Best Management Practices for Forestry.

North Carolina Cooperative Extension. Woodland Owner Notes Thinning Pine Stands.

FOREST STAND IMPROVEMENT (THINNING) – WORK SHEET

LANDOWNER _____ **FIELD NUMBER** _____

PURPOSE (check all that apply)	
☐ Improve growth of residual trees	☐ Improve aesthetics and recreation opportunities
☐ Improve health and reduce wildfire risk	☐ Provide for natural regeneration
☐ Create wildlife habitat and establish wildlife corridors	☐ Increase carbon storage

STAND INFORMATION

Stand #	Trees/acre	Current Basal Area	Thinning dates	Desired Basal Area
1				
2				
3				
4				
5				
6				
7				
8				

FOREST ROADS, SKIDDER TRAILS, AND LANDINGS

Roads, trails and landings will be of a size, gradient, number and location to economically and efficiently accomplish the intended purpose and expected users and equipment. For additional information refer to NRCS Standard 655. Additional requirements:

BEST MANAGEMENT PRACTICES FOR FORESTRY

Best Management Practices (BMP) for Forestry will be followed throughout the harvest operation. Additional requirements:

THINNING METHODS

Define the thinning method to be used:

OPERATION AND MAINTENANCE

The thinning operation should be inspected periodically to ensure proper residual density is obtained and residual trees are not damaged. Keep large dead and dying trees for cavity nesting birds by marking with paint or flagging with ribbon before logging begins. Additional requirements: