

Timber Stand Improvement



Figure 1. Proper timber stand improvement practices can increase both timber quality and wildlife habitat.

Most Southern forests are not growing at their full potential. Low productivity is common on millions of acres of privately owned forestland where trees are growing either off-site or in an unmanaged state, or they are an undesirable species. Undesirable or cull trees can occupy significant portions of the total growing space in forests of the South.

Timber stand improvement practices are used to remove trees of undesirable form, quality, condition, growth rate, or species. Removing these trees will stimulate growth of more

desirable stems and can increase timber profits to forestland owners. Timber stand improvement practices could help you obtain your management goals (Figure 1).

What Is TSI?

Timber stand improvement (TSI) is a phrase used to identify forest management practices that improve the vigor, stocking, composition, productivity, and quality of forest stands. Improvement results from removing lower-quality

trees and allowing crop trees to fully use growing space. The chief aim of TSI is continued production of more and better timber products. These practices can be used to convert lower-quality stands into faster-growing and more productive forests of desirable species.

Different TSI practices may be needed at different times during the life of an established stand—from the start of a new crop of trees until the final harvest. Here are some basic TSI practices:

- Prescribed burning in pine stands to help control undesirable vegetation, to prepare seedbeds, to reduce the potential for wildfires, and to improve wildlife habitat.
- Cull tree removal to make growing space available on areas occupied by deformed, defective, and undesirable trees. Cull trees should be cut or controlled with herbicides. Tree species that are undesirable to current management goals are not necessarily culls, so it may be possible to harvest and sell them; however, if they are unmarketable, they should be treated as cull trees.
- Thinning to reduce competition and increase the growth rate of crop trees. Precommercial thinning in young, unmerchantable stands is a costly practice. Intermediate thinnings or improvement cuts in older stands may produce some income for landowners.
- Sanitation cutting to remove trees that have been damaged by insects, diseases, wind, or ice.
- Release of young, vigorous crop trees for faster growth and better quality by removing overtopping and competing trees.

Trees to Remove in TSI

Remove trees that are financially mature or that interfere with growth and development of more valuable stems. Removals should include:

- suppressed trees that will not live until the next thinning
- trees too crooked, forked, or limby to make sawlogs
- trees with fire scars and injuries from insects, disease, wind, or ice
- off-site species
- mature trees
- trees that do not provide a net benefit to management goals
- cull trees with large crowns that occupy too much growing space or shade out more desirable species

Leave these trees in your timber stand:

- high-quality trees
- fast-growing trees
- mast-producing and den trees for wildlife



Figure 2. Prescribed fire can be a very useful timber stand improvement tool that can be used in both timber and wildlife management work.

A common misconception is that TSI practices always involve out-of-pocket costs for the landowner, but some TSI practices can produce income. Thinning is a TSI practice that can produce income if the trees being removed are merchantable. If costs are reasonable and adequate markets are available, financial returns will increase, as well. For example, a prescribed burn before harvesting an old pine stand can increase volume growth in the new stand through the elimination of unwanted plant species as well as by increasing planting ease in the future. Prescribed burning and removing large hardwoods in a young pine stand can both provide good investment returns.

Ask a forester to assist you in choosing the right TSI practices to produce your desired forest management results at the lowest cost. Some TSI practices are quite inexpensive, and some, such as thinning, may produce immediate revenue.

Prescribed Burning

Fire, if used properly, can be a very effective TSI tool for forest improvement, maintenance, and protection of pine stands (Figure 2). Depending on your goals, it may be the cheapest management practice available. Prescribed fire can be used for multiple purposes, including:



Figure 3. Example of a cull black cherry tree.

- reducing the number of undesirable hardwoods in pine stands
- reducing wildfire hazard by controlling fuel buildup
- exposing the mineral soil seedbed for natural regeneration efforts
- improving planting quality by removing brush and logging slash before planting seedlings
- improving wildlife habitat by promoting desirable plant species, by increasing the nutrient content of food plants, and by reducing the amount of heavy brush on the forest floor
- controlling brown spot disease on young longleaf pine seedlings

Prescribed fire is usually not recommended for hardwood stands. Many hardwood species have thin, easily damaged bark. Conversely, pines have thick bark that insulates the cambium (layer of growth cells under the bark) from heat damage. If you are interested in learning more about the use of prescribed fire, contact your county Extension agent or Mississippi Forestry Commission area forester. Unless you are familiar with the use of prescribed fire, never attempt to use it in your timber stands without the help of a forester. Fire is a management tool that should be applied at certain times of the year, during the right weather, and with proper

equipment. A professional forester can help you develop a prescribed burning program for your forestry needs.

Cull Tree Removal

Cull tree removal involves cutting or killing undesirable trees or culls. A cull is any tree whose quality is so poor that you cannot sell it (Figure 3). Cull trees often grow larger but lack quality. They can take up growing space, shade more desirable trees, and often harbor insects and diseases. For timber production purposes, your stand will be improved if they are removed. Sometimes low-quality trees can be left for their wildlife value, and some can be used for firewood or other products; however, most culls need chemical or mechanical control. Methods of cull tree removal include:

- cutting trees for firewood or leaving on site
- injecting herbicides
- hatchet and squirt bottle (“hack-n-squirt”)
 - hypo-hatchet
 - basal spraying
- cutting and treating stumps to prevent sprouting
- directed foliar sprays
- soil applications



Figure 4. This pine stand has been thinned in an effort to concentrate growth on a fewer number of trees for timber production.



Figure 5. Loblolly pine marked as leave trees in a thinning operation. Photo courtesy of Adam Rohnke.

Thinning

Thinning overcrowded stands increases diameter growth of residual trees and decreases losses from natural mortality. Larger diameter trees are more valuable as sawtimber, plywood, and veneer than smaller trees, which are used for pulpwood or other low-value products. Thinning does not increase total volume or fiber yield of a stand, but substantially increases yield of lumber, plywood, and poles (Figure 4).

Marking Trees for Thinning

You can learn how to mark your own pine stands for thinning (see Mississippi State University Extension Publication 2832 Thinning Pine Trees by the Leave Tree Method). An example marking is in Figure 5. All you need is help from a forester, a thinning guide that gives the number and spacing of trees at various ages, and practice. MSU Extension offers pine thinning workshops intended to teach private landowners the basics of performing thinning operations. Contact your county Extension agent if you are interested in attending one of these workshops. Due to the biological complexities inherent to hardwood forests, selective marking in these systems requires the expertise of an experienced forester.

Precommercial thinning is cutting in young, dense stands where the trees are too small to sell as wood products. This type of thinning produces no immediate income, but the cost may be justified by the value of increased future

growth. The purpose of precommercial thinning is to reduce competition and improve the growth rate of remaining trees. Unwanted trees can be removed with herbicides, mechanical equipment, or by cutting.

Commercial thinning of merchantable size trees produces some income for the landowner, depending upon the quantity, size, and quality of trees being removed. A commercial thinning is referred to as an improvement cut if the very poor-quality trees being removed are marketable. From an economic standpoint, there should be sufficient volume to justify a harvesting operation by the buyer. The money a landowner receives for standing trees, called stumpage, decreases as the cost of harvesting increases. Harvesting cost per unit of wood decreases as tree size, quality, and volume per acre increase. You may want to delay thinning until trees are large enough to make an economical harvest, even though increased growth of crop trees may also be delayed.

Pine Beetle Prevention

You can reduce the likelihood of Southern Pine Beetle attack in your pine timber by using proper thinning practices (Figure 6). Overstocked stands are more susceptible to beetle attack. Overcrowding weakens the ability of trees to repel pine beetle penetration. Healthy trees can often “pitch out” a beetle with increased resin flow. Also, cutting slow-growing, overmature trees during thinning operations reduces the chance of beetle attack.

Sanitation Cutting

Sanitation cutting is normally scheduled during thinning operations, so that trees damaged by insects, disease, fire, wind, or ice can be sold along with healthy trees (Figure 7). You must decide whether or not to remove each tree based on its condition and likelihood of surviving until the next scheduled thinning. Sanitation cutting may not be economical unless it is done during a commercial thinning operation. If you cut only deformed trees, you may not be able to sell them. If the trees cannot be sold, use the cheapest means of cull tree removal rather than sanitation cutting. Sanitation cutting alone is profitable only after a natural disaster, such as a hurricane, wind storm, or ice storm, where numerous valuable trees are damaged. You should remember that in the event of extreme weather, downed timber will be damaged. This will be reflected by lower prices when your timber is sold.



Figure 6. Southern pine beetle control efforts result in major losses to stands. Timber stand improvement practices like thinning can help to prevent or reduce these losses.



Figure 7. Beetle infested logs cut as part of a sanitation cut in a pine thinning operation.



Figure 8. Young stand of Nuttall oak that has been released from encroaching competition by eastern baccharis through the use of herbicides.

Release

Release is a TSI practice that can be used to regulate species composition and improve the quality and growth of very young stands of trees. A new crop of trees can become overtopped by faster-growing species or residuals from the previous stand. Unless these new trees are released from shading, they often do not survive. The overtopping trees may be of a desirable species, or may be low-quality or culls. Undesirable, competing species may also be growing among young crop trees. You can harvest overtopping and competing trees if they can be sold, or you can remove them with herbicide if they are unmerchantable. You can inject or aerially spray hardwoods growing over young pine trees. If chemical site preparation was not performed or successful, woody release can be used to control hardwoods in established pine stands. If deemed necessary, woody release should be performed in years two to five. After this point, the competitive impact of undesired stems has a permanent negative effect on pine growth and rotation length.

Release operations can still be performed later in the rotation, but should be implemented in conjunction with some other

technique like thinning. Exercise caution when releasing desirable hardwood trees in hardwood stands because herbicide sprays can kill both desirable and undesirable hardwoods (Figure 8). Usually the most appropriate method for release in hardwood stands is injection or hack-n-squirt. Get professional help from a forester before using herbicide release of young trees. For more information on using injection for timber stand improvement, please see Mississippi State University Extension Publication 2942 Tree Injection for Timber Stand Improvement.

Tax Considerations

Timber stand improvement practices may qualify for deduction as annual expenses from your ordinary income. Keep good records of your TSI costs. Contact your county Extension agent for more information on forest taxation, management, marketing, and multiple use management.

For more information and publications on forest management, marketing, and protection, contact your local Extension office.

More Information

The following publications provide more detailed information on topics related to timber stand improvement. Copies are available at the Extension office in your county.

P1532 *Weed Control Guidelines for Mississippi* (See Woody Plants section)

P1588 *Direct Seeding: A Forest Regeneration Alternative*

P1612 *Forestry/Wildlife Myths and Misconceptions*

P1816 *Natural Regeneration Using Seed Trees*

P1834 *Evaluating High-Graded Hardwood Stands*

P2004 *Bottomland Hardwood Management: Species/Site Relationships*

P2260 *Are My Pine Trees Ready to Thin?*

P2832 *Thinning Pine Trees by the Leave Tree Method*

P2942 *Tree Injection for Timber Stand Improvement*

P3468 *Hardwoods: Intermediate Treatments*

P3673 *Tree Injection with Reduced Labor Requirements*

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