

Timber Stand Improvement (TSI) Principles

Lesson 6: Timber Stand Improvement

Timber Stand Improvement Practices

Timber stand improvement (TSI) denotes management practices that improve the vigor, productivity, and quality of stands of trees. Many options are open to woodland owners. They may use a TSI program to increase the woodland's value for timber products, water, recreation, forage, wildlife, or natural beauty. In most cases, work done for one use usually benefits other uses.

There are various practices used in timber stand improvement. The combination of practices used and tree species selected should fit the chosen emphasis for the woodland. Professional foresters are available to help determine a woodland's potential as well as its limitations, and to help develop and carry out a suitable management plan. The following practices are among those used in TSI.

Site Preparation for Natural Reproduction in Understocked Stands

"Site preparation for natural reproduction in understocked stands" means preparing a site to allow the natural seeding or resprouting of desirable species. This also might include underplanting seedling stock to fully use the available growing space. This practice is used in poorly stocked stands to fill large openings and increase stand density or to improve the type of trees found in the stand.

Thinning

Thinning is cutting trees from a stand to increase the rate of growth and improve the form of remaining trees. Competition between trees in a stand of timber for such things as soil moisture, light, and nutrients become so intense that the growth rate is reduced. After thinning, the better trees are left so that growth factors such as moisture, light, and nutrients are concentrated on the more valuable trees. See Figure 6.1.

When a stand of trees is very young, there may be 4,000 or 5,000 seedlings growing on a single acre. This stand will have fewer than 100 trees remaining when it is mature and

ready to harvest. Nature will thin out the surplus trees, but this unaided natural process may take the stand 150 to 200 years to reach marketable size. Periodic thinning can improve tree quality and reduce the time span to less than 100 years. See Figure 6.2.

Deciding on the proper spacing when thinning depends on the species, purpose of management, and the quality of the location (site). Figure 6.3 gives a range of spacing for trees of various diameters. For example, a tree with a d.b.h. of 8 inches would require 13 to 17 feet between it and the bordering trees.

Release

Release is removing or deadening undesirable older overtopping trees to encourage fast growth and better quality of vigorous young desirable trees.

Literally millions of worthless trees are in our woods. Poor trees take away light, water, and nutrients from good trees. Types of trees usually removed are:

- ◇ Cull trees, such as rotten, diseased, or fire-scarred trees in addition to wide-spreading "wolf" trees
- ◇ Inferior species of trees, which interfere with the growth and development of selected desirable trees

Certainly, release should be a practice in which goals for the woodlot must be defined. For example, if your plans for a woodland area include hunting, removal of rotten or fire-scarred trees and brushy growth will result in the removal of wildlife habitat.

Pruning

Pruning is removing limbs from trees to produce knot-free lumber. Research has shown that pruning can improve lumber grades by 60 percent. However, due to the expense involved in pruning, prune only selected hardwood trees where high value species are grown on good sites. This TSI practice is primarily recommended in managing black walnuts.

When pruning limbs of young trees, don't remove too much of the leaf surface of the tree. At least half of

Forestry

Figure 6.1 – Examine Trees Before Cutting to Improve the Timber Stand

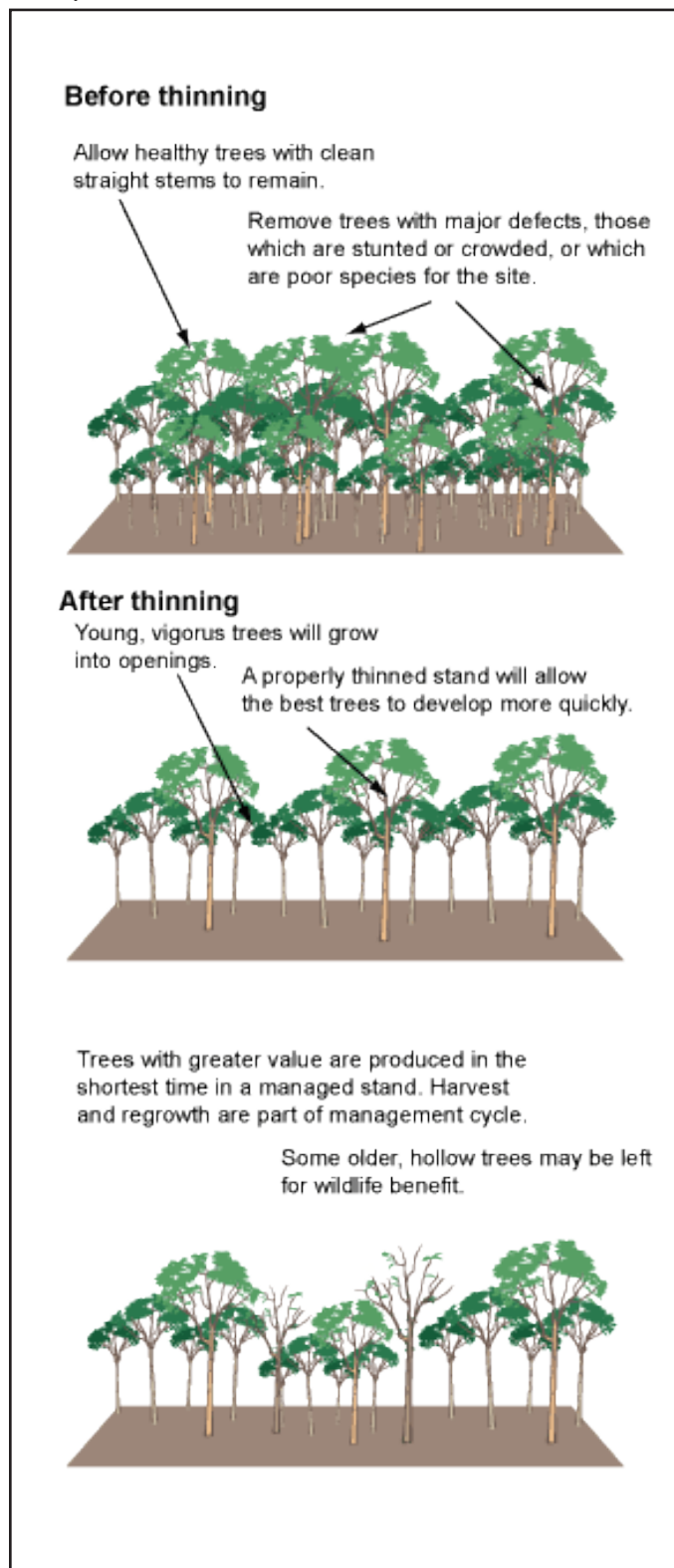
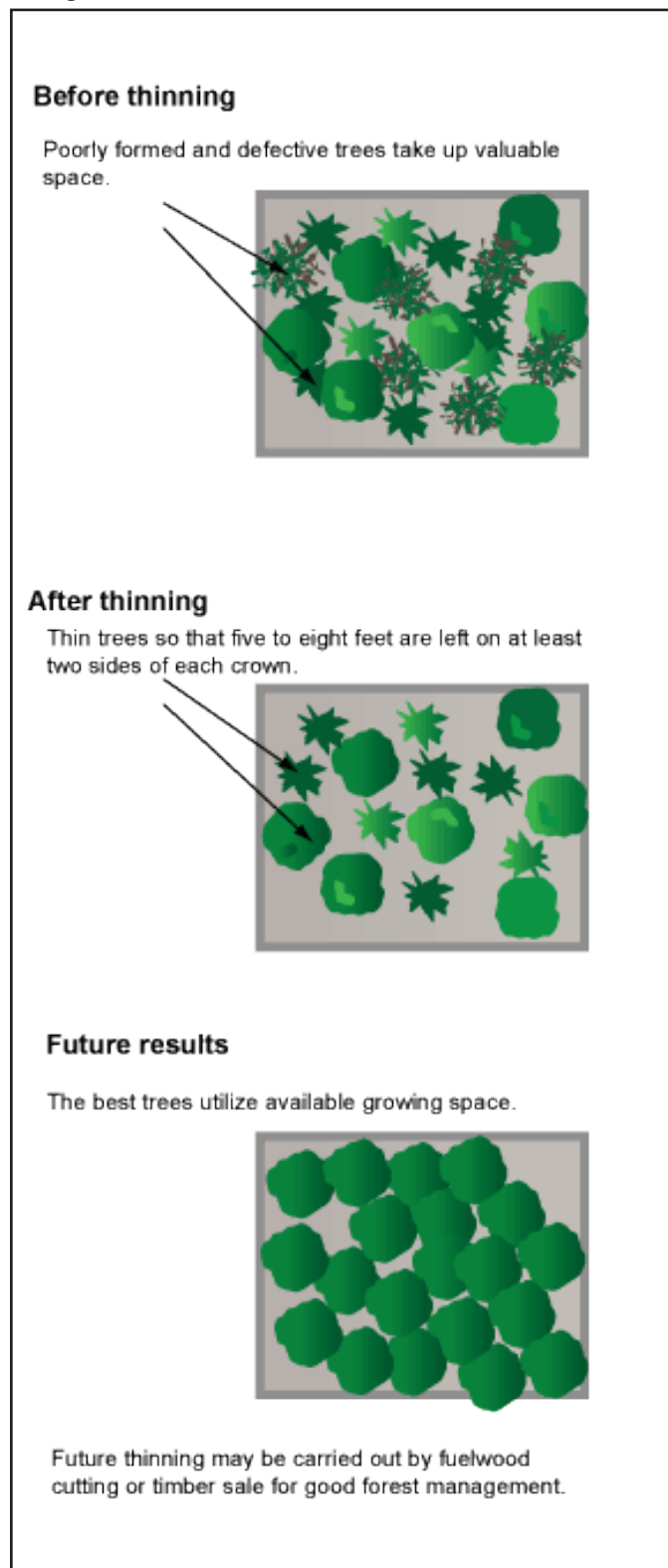


Figure 6.2 – Tree Crowns Compete for Sunlight and Room to Grow



Timber Stand Improvement (TSI) Principles

the food-producing leaf surface should be left intact. Generally, trees should be pruned before they reach 8 inches in diameter. Limbs which are to be removed should be pruned before they reach 2 inches in diameter. This reduces wound size, ensures proper closing, and lessens the impact of disease and insect entry.

Vine Removal

In some areas, vines do considerable damage to trees. Vines not retained because of wildlife food value and fall color should be killed at the same time other stand improvement work is done. Remove vines by cutting them as low to the ground as possible and immediately treat the stump with a herbicide.

Figure 6.3 – Tree Spacing by Diameter

Tree Diameter (inches)	Spacing Range (feet)
2	4.6 – 6.5
3	6.1 – 8.2
4	7.6 – 9.9
5	9.0 – 11.6
6	10.3 – 13.4
7	11.6 – 15.0
8	13.0 – 17.0
9	14.3 – 18.7
10	15.6 – 20.4
11	17.0 – 22.1
12	18.1 – 23.8
13	19.4 – 25.6
14	20.8 – 27.2
15	21.9 – 29.0

Certain species or management purposes may require other spacing. In any thinning, the tallest desirable trees are usually favored.

Source: *Even-Aged Silviculture for Upland Central Hardwoods*, by B.A. Roach and S.F. Gingrich, Agriculture Handbook 355. Upper Darby, PA: USDA, Forest Service, Northeastern Forest Experiment Station, 1968.

Sprouts

A very important aspect in preparing a site for natural reproduction is proper treatment of sprouts. Many Missouri hardwood species sprout heavily from stumps of cut trees. Sprouts grow rapidly and form multi-stemmed clumps. These sprouts can be used economically if handled properly.

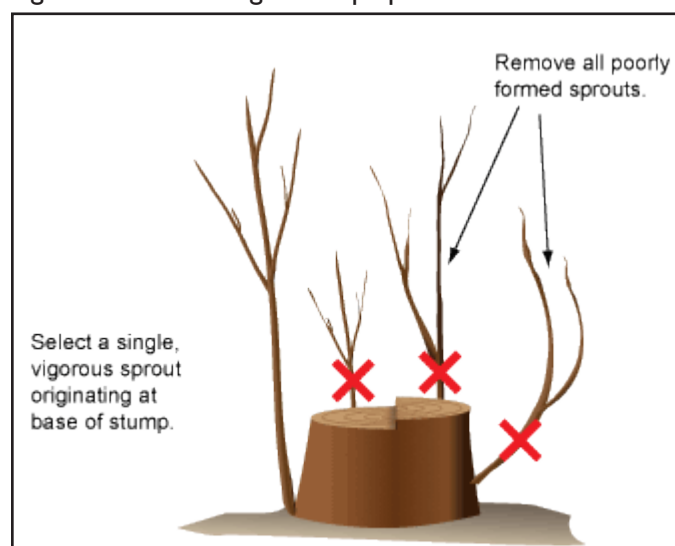
Seedling sprouts are sprouts originating from several seedlings. These are as good as seedling trees if the clumps are thinned to one stem.

Tree stump sprouts are sprouts originating from older trees. Although less desirable than seedling sprouts, they may develop into good quality trees depending on the size of the stump and the origin point of the sprout. See Figure 6.4.

Sprout stands are best managed before they reach 20 years of age. Early treatment permits better selection of trees from the standpoint of attachment to and the size of the parent stump. It also greatly lessens the danger of decay from wounds left in cutting companion sprouts.

Some general rules in managing sprouts under 20 years old or less than 3 inches in diameter at breast height are as follows:

Figure 6.4 – Selecting a Stump Sprout



Forestry

- ◇ Favor the lower sprout, cut the high sprout.
- ◇ Preserve the sprout from the small stump rather than the large stump.
- ◇ Remove the attached sprout with a flush cut.
- ◇ Cut well-separated surplus sprouts at any convenient height.

Use the following guidelines when treating sprouts that are over 20 years old or more than 3 inches in diameter:

- ◇ Companion sprouts joined at the base with a V-shaped crotch, should not be cut. It is usually difficult to remove one without leaving a large wound.
- ◇ When sprouts have a low U-shaped crotch between them or are entirely separated from each other above the ground, one or more can be removed.

Methods of Removing Trees From Competition

There are several methods for removing trees when using the TSI practices of thinning or release. In many cases, a well-planned timber sale (improvement harvest) can accomplish a great amount of TSI where merchantable trees that are too closely spaced may be removed and sold. Also, in release some culled trees may be used for firewood sites.

Undesirable trees that are not marketable may be removed by cutting, dozing, brush hogging, girdling, or chemical control. Chemically treating large trees is often more economical than felling and is more certain to kill trees than girdling. Also, if resprouting control is desired, chemicals are more effective. When using chemical controls, it is important to remember they can injure sensitive trees, crops, or ornamental plants if not used properly according to the label directions.

Silvicides and herbicides can be applied using the following methods:

1. When frilling or using mechanical injection, cuts are made through the bark and into the growing tissue completely around the tree. A suitable chemical is then applied to the fresh cuts. Mechanical injectors can be purchased or rented which apply the chemical at the time they make the cut. Hard-to-kill species such as ash and hickory should have a complete, continuous cut well into the sapwood. Many species may be killed with cuts spaced at intervals several inches apart.
2. Basal spraying may be used effectively on trees which are less than 4 inches in diameter. Spray the chemical oil mixture on the lower 12 inches of the trunk, wetting the bark thoroughly.

Summary

You can increase the financial return from a stand of Missouri forest land by improving tree quality and woodland composition. Timber stand improvement (TSI) includes a broad range of practices: site preparation, thinning, release, pruning, and vine removal. Free technical service is available to help you with your timber stand improvement plan through local district foresters of the Missouri Department of Conservation.

Credits

Slusher, J.P., H.E. Garrett, C. Solomon, and I.L. Sander. *Increase Woodland Products Through Timber Stand Improvement* (Guide G5150). Columbia: University of Missouri Extension, reviewed 1993. Accessed June 4, 2008, from <http://extension.missouri.edu/xplor/agguides/forestry/g05150.htm>.

Palmer, B. *Timber Stand Improvements for Woodland Owners*. Jefferson City: Missouri Department of Conservation.