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**This versatile system, which can be applied in both commercially operable and precommercial stands, was designed to help landowners achieve their stewardship goals.**

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*Talking with landowners to discover their interests helps you to develop a management plan that will satisfy their needs.*

Although Crop Tree Management was developed for use in private, non-industrial forests where woodlot size is often 100 acres or less, its application is not restricted by the size of the forest to be managed. It can be used to do treatments in both commercially operable and precommercial stands.

This system also works well in riparian areas (streamside management zones). Some of the best sites for production of timber, wildlife, aesthetic, and water-quality benefits are found in these places. However, because certain aquatic and vegetative communities depend on these sensitive areas for existence, management of trees in the riparian zone requires a system that:

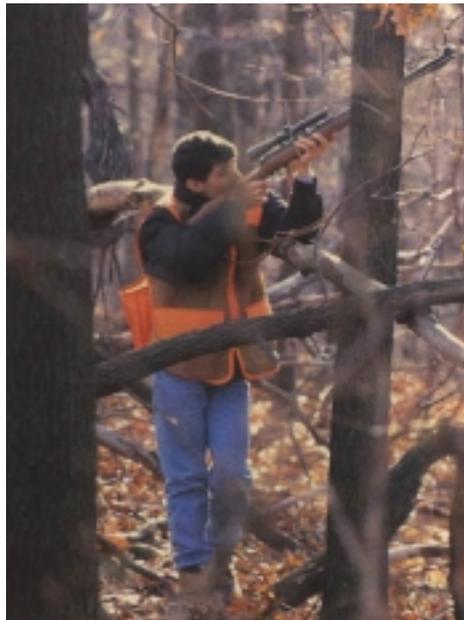
- helps maintain vigorous and diverse vegetation,
- regulates stream temperature, and
- traps sediments and filters pollutants.

Crop Tree Management meets these needs.

At a time when private, non-industrial forestland managers are being challenged to assist their clients in achieving multiple stewardship goals, Crop Tree Management offers an effective way to do so.

## **II. Crop Tree Management –The Process Defined**

### **1.) Identify the Landowner's Property Goals**



The first step in the Crop Tree Management process is helping landowners describe their property goals.

This can be done by asking what use the landowner intends to make of the forestland. You might suggest some possibilities and explain how current and future benefits can be obtained.

For example, if there is a pole-sized hickory stand on the property and the landowner wants to improve squirrel habitat, you could suggest releasing trees with vigorous, healthy crowns to increase production of nuts.

Or, if the landowner wants to harvest firewood, you could advise cutting the poorest-quality trees. Explain to your client how retaining high-quality trees can yield a future harvest of valuable sawtimber.

Because clear communication between you and the landowner is vital, avoid use of technical forestry terms. Instead, *use plain English* to explain the benefits of forest management.

When technical terms must be used, restrict them to descriptions of things that can be seen in the woods. For example, it is all right to use terms like "epicormic branches," "stump sprouts," and "hard mast," **if** good examples of each are shown to the landowner at the time the term is introduced. However, abstract terms like "basal area," "stocking percent," and "rotation" should **not** be used because they can't be observed in a woodlot.



By increasing the landowner's understanding of what can be seen in the forest, you are making your client more aware of the benefits that can be produced by managing individual trees.

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**Don't use technical forestry terms to explain the benefits of forest management to landowners; use "plain English," instead.**

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*Explaining what can be seen in the forest in easily understood terms is the best way to capture and maintain the landowner's interest in managing the resource.*

## 2.) Establish Stand-Specific Objectives

After the overall property goals are identified, objectives for each stand can be established. Although some stands may provide little opportunity to accomplish a property goal, others might have great potential to do so.

For example, improving squirrel habitat by increasing hard-mast production can't be accomplished in a yellow-poplar stand. But, it ***can be achieved*** in a pole-sized, oak-hickory stand.



*Squirrel habitat has been improved in this oak-hickory stand by giving selected hard-mast trees more room to grow.*



**Having stand-specific objectives focuses your attention, as well as the landowner's, on the portions of the property with the greatest potential to meet goals.**



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## 3.) Develop Crop Tree Selection Criteria

Once you have established the stand-specific objectives, develop selection criteria for each crop tree category. Use these criteria to guide your selection of crop trees. Examples of selection criteria developed for timber, wildlife, aesthetic, and water-quality crop trees begin on Page 15. Explanatory information accompanies each set of criteria to help you understand the guidelines involved. ***Remember: These are only examples; you will need to develop selection criteria to match the specific objectives for each of the stands you will be working in.***

Some trees may satisfy multiple crop tree selection criteria, which makes them very desirable choices for management. For example, a sugar maple could be both a timber and aesthetic crop tree. If it had a cavity, it could also qualify as a wildlife crop tree.



*This sugar maple is both a timber and aesthetic crop tree. It can provide valuable timber products and attractive fall foliage.*

A red oak might be both a timber and wildlife crop tree because it can produce high-quality timber products and valuable mast for wildlife. Blackgum may serve as an aesthetic crop tree because of its attractive fall foliage. It also qualifies as a wildlife crop tree because of the soft mast it produces.



*This red oak is both a timber and wildlife crop tree because it satisfies the criteria for both categories. For the landowner interested in accomplishing these objectives, this is a doubly important tree to release.*

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**Crop Tree Management requires you to choose the trees that best meet the landowner's property goals. This often forces some tough decisions.**

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Applying this system means selecting crop trees that best meet the selection criteria and are, therefore, best able to accomplish the landowner's property goals. Frequently, there are conflicts among the criteria that require judgment to reconcile.

For example, black walnut may be found growing on abandoned pastureland in competition with sugar maple on a north-facing, well-drained, lower slope with moderately deep soil. When making a choice between timber crop trees of these two species on this site, you must consider:

- the quality of the future timber products,
- the potential growth rate of both trees in regard to the position and vigor of the crowns,
- the growth advantage of the sugar maple because it is better adapted to the site, and
- the probable higher per-unit value of the walnut.

*The tree on the right is an off-site black walnut. The tree on the left is a sugar maple growing on a north-facing, well-drained, lower slope. Which tree would you select as a timber crop tree?*



As you can see from this example, the Crop Tree Management System often forces you to make some tough decisions when selecting crop trees.

However, weighing the relative advantages and disadvantages of each potential crop tree provides the opportunity for sound judgment to produce the best possible results.

#### 4.) Inventory the Property

After the crop tree selection criteria have been clearly established, inventory the property to estimate the number of trees that meet these guidelines. Appendix A, *Crop Tree Management Inventory and Marking Procedures*, describes an efficient means of collecting data that will help you make management decisions consistent with the landowner's property goals. The **Crop Tree Release Tally Sheet** (sample included in Appendix A) may be used to inventory and analyze the potential crop trees. You can also use it to record the number of trees to be cut. (*Note: A reproducible version of the tally sheet can be found in the back pocket of this publication.*)



Remember, crop tree selection criteria may change from one stand to another, even if ownership is the same. Not only may there be different stand-specific objectives, but the quality of available crop trees can vary because of site or past management practices.

Trees that are considered poor-quality in one area may be the best available in another. For example, if you are selecting wildlife crop trees to produce hard mast, you may have plenty to choose from in one stand. In that case, you would select only dominant/codominant trees with good, healthy crowns for crop trees. In another stand where hard-mast trees are scarce, you may be forced to select trees with poorer crowns simply because that is all that is available.

If you find small portions of the property where crop trees are lacking, you have two options. One is to do nothing. Simply allow that area to continue to mature without releasing any trees. The other option is to cut all trees that do not meet the crop tree selection criteria. This will create an opening that will permit establishment and development of regeneration.

*The Crop Tree Release Tally Sheet may be used to inventory and analyze crop trees and to record the number of trees to be cut.*

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**Crop tree selection criteria may change from one stand to another, even if ownership is the same.**

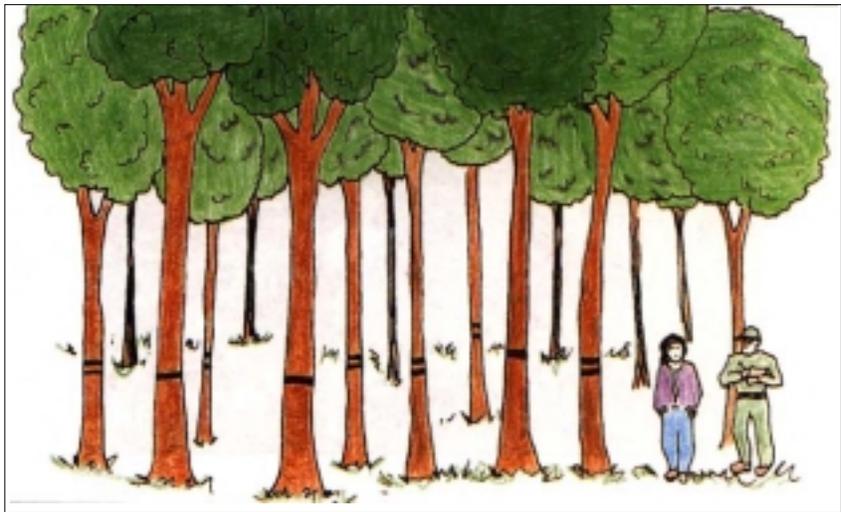
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## 5.) Explain the Proposed Treatment to the Landowner

Prior to marking any crop trees, demonstrate to the landowner how the Crop Tree Management System works. This will help your client understand the prescription and give you an idea of how many crop trees the landowner wants to release (Figure 1).

Establish a few one-fifth-acre circular plots. (Don't try to use variable radius plots for this exercise; keep things simple.) Select crop trees on these plots and temporarily identify them with a band of brightly colored flagging. Explain to the landowner how these crop trees will meet the property goals.



*Figure 1. Helping the landowner visualize the proposed treatment on a small scale is the best way to get your client's feedback. Here, the crop trees are identified with one band of ribbon, and the trees to be cut are double banded. If adjustments need to be made, now is the time to do so.*

After you have talked about the ribboned crop trees, walk around the plots again. This time, identify (with a contrasting color of flagging) all of the trees that need to be removed to fully release the crop trees. Be sure to explain that **only the trees in direct competition with the crop trees will be removed**; those with crowns that do not touch the crop trees will remain in the stand. This helps the landowner visualize what the proposed treatment will look like.

Simulating the proposed treatment on a small scale and discussing it with the landowner helps you get feedback on how well the prescription satisfies your client. If you need to make adjustments in the number of crop trees to be released, or the selection criteria to be used, now is the easiest time to do so because the crop trees have not yet been permanently marked.

## 6.) Decide How Many Crop Trees to Release per Acre

The number of crop trees to release per acre depends on how many trees meet the selection criteria and how many the landowner wants to release. The more crop trees that receive a crown-touching release, the heavier the cutting will be. When fewer crop trees are released, the cut is lighter (See fold-out on Pages 55 and 56).



*When a low number of crop trees are released, the cut is lighter, leaving some areas of the stand relatively undisturbed.*

Many commercially operable Central and Northern hardwood stands have only about 20 to 50 good-quality timber crop trees per acre. The number of crop trees in these previously unmanaged stands usually depends on site, species composition, stand history, and, most importantly, stand age. Younger stands, with more trees in smaller size classes, tend to have more crop trees per acre.

It is sometimes helpful if you can actually show landowners various intensities of cutting on other properties. This way, they can see what slash and regeneration look like and decide how much they are willing to accept in their own woodlots. Some landowners may be dismayed by the difficulty of walking through a lot of woody debris and thick regeneration. However, they must be able to weigh this inconvenience against the positive aspects of both.

Explain to landowners that regeneration often includes desirable species of trees that can effectively meet their overall property goals. Regeneration is also a valuable source of habitat for some species of wildlife. Slash usually decomposes in about four or five years, but until it does, it, too, provides a source of wildlife habitat. Walking trails can be established throughout areas of dense regeneration and slash to make access easier.

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**Younger stands, with more trees in smaller size classes, tend to have more crop trees per acre.**

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*In this 55-year-old stand, all available crop trees were released (32 per acre), which initiated dense understory development. This photograph was taken during the fifth growing season following treatment. Trails were established during the cutting operation and have been maintained on an annual basis.*



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**Regardless of the number of crop trees you decide to release per acre, be sure each of them receives a complete crown-touching release.**

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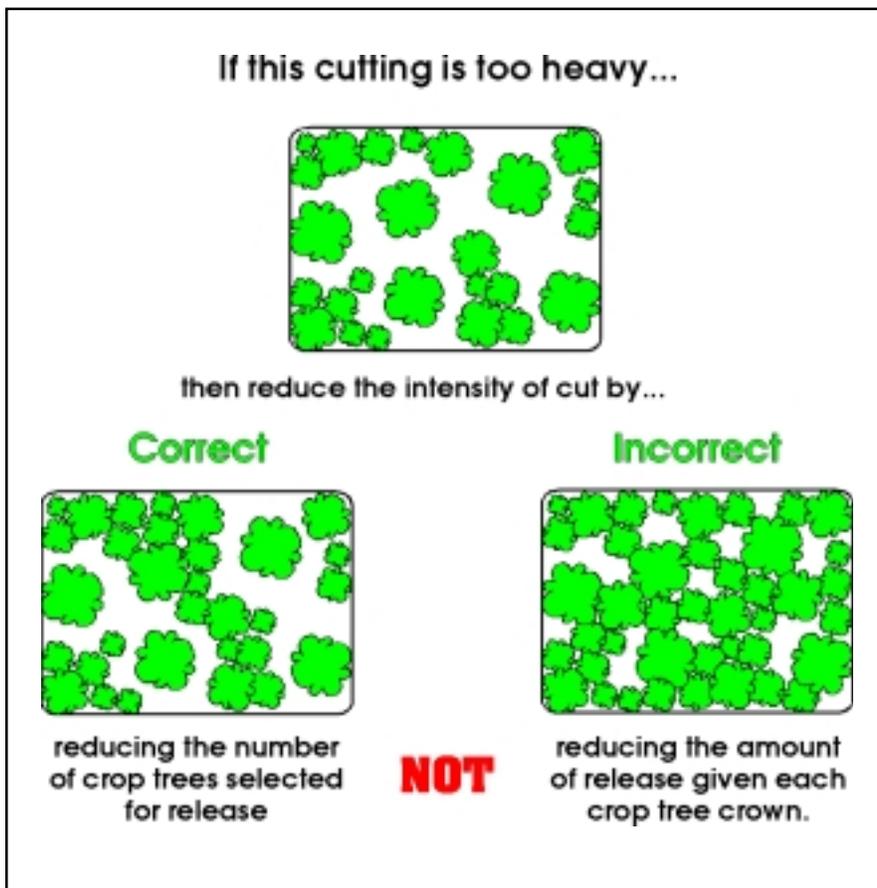
Regardless of the number of crop trees you decide to release per acre, be sure each of them receives a complete crown-touching release. For instance, imagine you survey a stand and find 30 trees per acre that meet the crop tree selection criteria. The landowner, however, is uneasy about the degree of cutting required to fully release that many trees. You discuss it, and both agree that releasing 20 trees per acre would be acceptable.

At this point, you must take another look at your 30 initial choices and drop 10 of them from consideration. Concentrate your attention on selecting the 20 trees per acre that you consider best for meeting your client's property goals, and fully release each of them.

*In this 55-year-old stand, 20 crop trees per acre were released. The understory developing here (fifth growing season following treatment) is more patchy and less dense than that shown in the photograph above.*



In other words, adjust the intensity of cutting by adjusting the number of crop trees selected for release. Don't be tempted to compromise the system by selecting more crop trees than you can fully release (Figure 2).




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**Adjust the intensity of cutting by adjusting the number of crop trees selected for release.**

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*Figure 2. If the landowner indicates that a lighter cutting is desired, adjust the intensity of cutting by releasing fewer crop trees.*

Keep in mind that only the trees in direct competition with the crop trees get cut; all non-competing trees remain in the stand. Although no consideration is given to releasing any of the trees in this second category, some may receive partial release because of their proximity to crop trees. This incidental release can help the residual trees produce timber, wildlife, aesthetic, or water-quality benefits.

What if the landowner indicates no concern about how heavy the cut is? Then you should feel free to release every crop tree that meets the established selection criteria. In a stand well-suited to accomplishing the overall property goals, this often means selecting as many crop trees as the crown-touching release guidelines will allow. Remember, however, that each crop tree must be given a complete release, unless two crop trees are adjacent to each other (See photograph on Page 13).



*Free-to-grow rating of "0." The crown of this tree is crowded around its entire perimeter.*



*Free-to-grow rating of "2." This crown has room to grow on two of its four sides.*



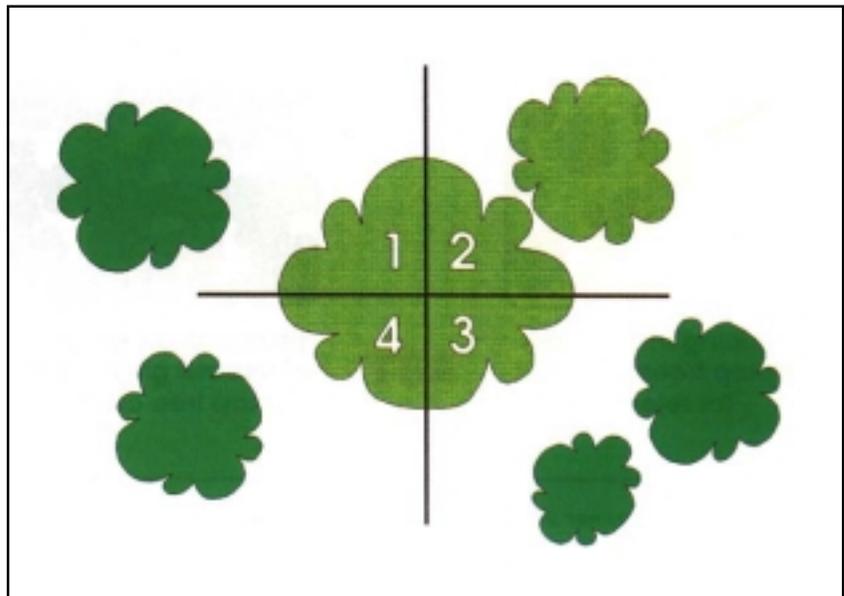
*Free-to-grow rating of "4." This tree has received a crown-touching release which gives it freedom to grow on all four sides.*

## **7.) Decide Which Trees to Cut to Release the Crop Trees**

Our step-by-step explanation of the Crop Tree Management process concludes with a description of how to determine which trees must be removed to fully release the crop trees.

This is done by simply looking up into each crop tree crown and envisioning it divided into four separate quadrants, or sides (Figure 3). A determination is then made as to how many of the four sides are free from competition from neighboring crowns.

For example, a "0" classification means the crop tree crown has no room to grow. In contrast, a rating of "4" means the crop tree is free to grow on all of its four sides.



*Figure 3. The crop tree crown in the center of this illustration has been separated into four quadrants, or sides. A free-to-grow rating is determined by evaluating each side for competition from neighboring crowns. This crop tree is free to grow on three sides.*

Free to grow really means free to expand. A crop tree that has only one or two feet between its crown and a neighboring crown is not free to grow in that quadrant. If there is doubt about whether an adjacent tree is touching and competing, cut it.

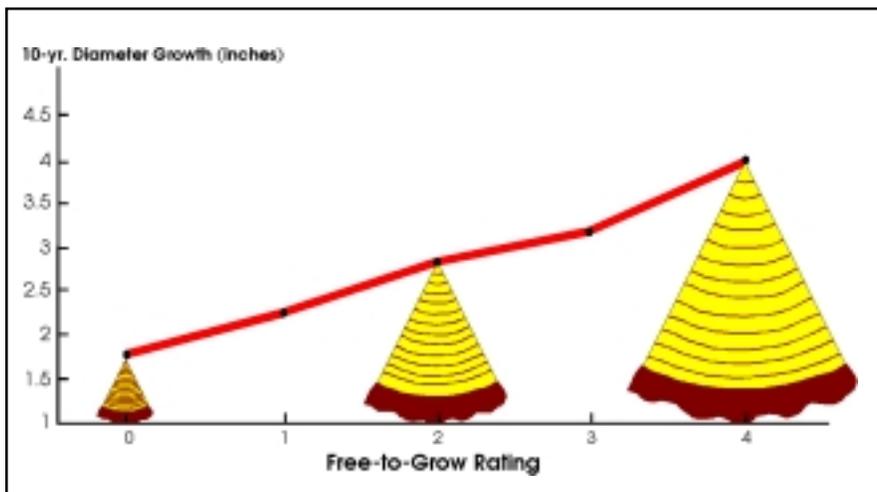
Healthy crowns of immature hardwood trees generally expand at the rate of a foot per year. Therefore, the growing space between adjoining crowns decreases by about two feet annually. Consequently, 15 feet of space between crowns provides adequate release for about seven or eight years.

A crown-touching release essentially involves removal of all trees with crowns that interfere with, or touch, the crop tree. In the event of two crop trees occurring close together with adjoining crowns, it is acceptable to consider the two as one crown, and then release fully around the dual crown. This means the two crop trees each receive a three-sided release rather than a four-sided release, as otherwise recommended.



*A complete crown-touching release is required for all crop trees unless two of them happen to have adjoining crowns. In this case only, a three-sided release is acceptable. Be sure, however, to fully release the entire dual crown.*

Why is a complete crown-touching release so important? Many of the best crop trees in stands that have received area-wide thinnings have been released on only one or two sides of the crown. Research has revealed that this limited degree of release captures only about half of the diameter growth potential of the crop trees (Figure 4).



**Figure 4.** This chart shows the dramatic difference a complete crown-touching release makes in the growth of crop trees. Represented here is the 10-year diameter growth in inches for the 20 best crop trees per acre in a 54-year-old stand.

As you can see, giving a crown-touching release to selected high-value crop trees can greatly enhance the benefits they are capable of producing.

**Many of the best crop trees in stands that have received area-wide thinnings have been released on only one or two sides of the crown.**

Nearly every timber crop tree available was released on this site. Rapid growth is being recorded as the trees respond to the crown-touching release they received.



Appendix B, *Applying Crop Tree Management in Specific Eastern Forest Types*, provides a brief synopsis of pertinent information you might find helpful when using this system to manage the various species of trees found in your area. White pine and hemlock are also included because managing these conifer inclusions may be critical to accomplishing the landowner's goals.

### III. Managing Timber Crop Trees

Although today's landowners are interested in managing their woodlots for other benefits, timber production still remains an objective of many and an important source of public benefit. Often cited as a secondary rather than a primary objective, managing for timber has become a real challenge.

In Eastern hardwoods, we should consider concentrating our efforts on managing individual trees with the greatest potential for producing high-value products. The limiting factors are: 1) the number of trees we can find or get established per acre at a reasonable cost, and 2) our ability to grow them at a rapid rate while retaining the characteristics that make them valuable.

It is value that counts; not volume. We have an excess supply of low-value volume and a shortage of potentially high-value trees. Doesn't it make sense to manage the good trees we do have to produce high-value volume in a shorter period of time? Crop Tree Management can provide high-quality timber products from individual trees growing at a rapid rate.

Following is an *example* of selection criteria developed for timber crop trees.

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**We should consider concentrating our efforts on managing individual trees with the greatest potential for producing high-value products.**

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