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.

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

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.

Timber Crop Tree Selection Criteria

- Dominant/codominant trees (at least 25 feet tall)
  - Healthy crown; large in relation to dbh
  - No dead branches in upper crown
  - Either low-origin stump sprouts (less than six inches at groundline) or seedling-origin stems are acceptable
  - U-shaped connections are acceptable; avoid V-shaped connections
- High-quality trees
  - Butt-log potential of Grade 1 or 2
  - No epicormic branches (living or dead) on butt log
  - No high-risk trees (leaners, splitting forks, etc.)
- High-value commercial species
- Expected longevity of 20+ years
- Species well-adapted to the site

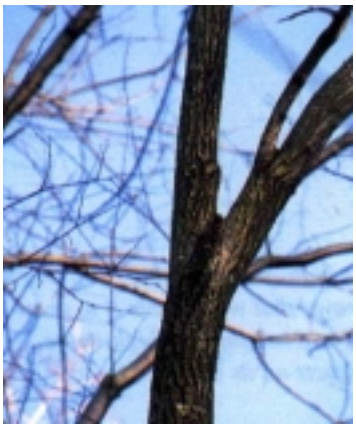
Select dominant/codominant trees, at least 25 feet tall, with large, healthy crowns. Trees of this height with these crown characteristics have already gained a good competitive position in the stand. They will also have developed to the point that approximately 17 feet of the bole should be clear. Such trees respond well to release, and they are less likely to epicormic branch than those that do not meet these guidelines.

Crop Tree Management places special emphasis on the crown as a tree characteristic that must be given serious consideration when selecting crop trees. In fact, when using this system a good rule of thumb is:

If you're not stumbling over debris on the forest floor . . . . You should be looking up at the crowns a lot more.

Trees with small crowns should not be chosen as crop trees. Also avoid trees that have dead branches in the upper crown.

When selecting timber crop trees, don't gamble on trees with evidence of epicormic branching on the butt log -- once released, they usually branch profusely.



High-risk trees, like this one, are not good timber crop tree choices. The seam below the fork increases the likelihood that this tree will split.

Stable, well-formed stump sprouts that originate close to the ground are acceptable choices for crop trees.

Following release, growth response rates of trees with large, healthy crowns can be quite dramatic.

Trees with a few dead lower-crown branches are often acceptable as timber crop trees. However, be cautious about trees with dead branches in the upper crown.

Stump sprouts that originate close to the ground are suitable crop tree candidates if they are stable and have good form. When choosing from multiple-stem sprouts on slopes, the stem that originates from the uphill side of the stump is often the most stable.

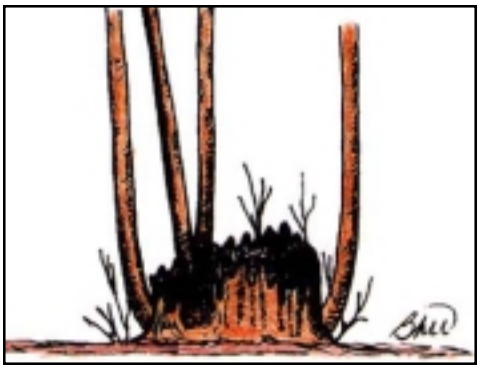


***Figure 5**. The two sprouts in the center have grown together to form a "V-shaped" connection. The other two sprouts on either side of the stump represent a "U-shaped" connection.*

Stump sprouts join at the base in two forms (Figure 5). Trees joined with a "V-shaped" connection generally don't make good crop trees. In most cases, a decision must be made to either cut both or leave both. If one is cut and the other left, the decaying stump of the removed tree provides an entry for rot into the tree that remains.

Trees having a "U-shaped" connection may be considered individually as crop trees. Because their bases are independent of each other, they can be harvested at different times. This means that one can be cut without providing an avenue of decay into the other.

This high-quality timber crop tree has a crown that will enable it to grow well and accumulate high-value products on its bole.

High-quality crop trees with the potential to produce Grade 1 or 2 butt logs can give landowners a reasonable rate of return on their investment.

On good growing sites, crop trees with a growth response of one inch often earn a 4 percent real rate of return.

Skill in evaluating the probability of epicormic branching after release is especially important. You must be able to assess the likelihood of a tree developing epicormic branches, as well as the degree to which they might occur. With a little knowledge and some practice, you can do this with good success.

Epicormic branching following release is affected by several interacting factors. These are:

1.) crown position
2.) crown size relative to dbh
3.) tree vigor
4.) species
5.) genetics
6.) stress
7.) wounds

For most species, dominant/codominant trees with large crowns and good vigor are not likely to epicormic branch to any significant degree following release. When epicormic branching does occur, it usually happens on the upper, less valuable logs instead of the butt log. Contrary to what might be expected, there is no evidence to indicate that leaving midstory trees to provide shade to the bole of crop trees reduces epicormic branching.

There is no evidence to indicate that leaving midstory trees to provide shade to the bole of crop trees reduces epicormic branching.

Certain species have a greater tendency to epicormic branch than others. White oak, basswood, and elm are the most prone, followed by red oak, black cherry, chestnut oak, beech, hickory, yellow-poplar, red maple, sugar maple, sweet birch, and white ash.

Research from the Northeastern Forest Experiment Station in Parsons, WV, reveals that we can expect approximately 15 percent of dormant buds on the butt log of red oak trees to sprout. For yellow-poplar, only about 4 percent will sprout.

Neither of these two white oaks is a good choice for a timber crop tree. The one on the left is smaller than most trees in the stand, and it has a sparse crown. The tree on the right has many dormant buds that are likely to respond to any significant degree of release.

Markers must be careful to look for dormant buds or existing epicormic branches on the butt log of the tree. These are warning signs of a tree's potential for epicormic branching, which can lower the value of timber products.

The genetic make-up of individual trees also influences epicormic branching. Avoid selecting trees prone to this deficiency by looking for existing branches and dormant buds. The butt log of selected crop trees should be completely free of epicormic branches (living or dead).

A large branch was cut from this crop tree. This left a major wound which triggered development of epicormic branches.

Stress and wounds can also affect epicormic branching following release. Usually, these factors can be considered prior to cutting and mitigated to some extent. For example, if a stand has recently been defoliated by gypsy moth, cutting can be delayed until the trees recover from the stress of infestation.

It is important to minimize wounds on crop trees by exercising care during the cutting operation. Resist the temptation to trim off any large lower branches from crop trees. Doing so can leave a major wound that may stimulate epicormic branching on the butt log of the tree.

Avoid selecting trees that are high-risk because of characteristics like excessive lean and forks. The susceptibility of trees to damage from such characteristics varies by species. For example, a yellow-poplar or black cherry with a forked stem is more likely to break than a red oak with a similar fork.

The fork of this yellow-poplar was broken during a storm. Some species are more prone to this kind of damage than others.

Species that are valuable for commercial forest products, or those expected to become valuable, should be preferred as timber crop trees. Market preferences can and do change, so the future is certainly not entirely predictable. However, you must use your best judgment to make decisions that have the greatest probability of providing landowners with a good return on their investment.

Don't select trees with a short life expectancy. For example, in a 70-year-old, even-aged, Northern hardwood stand, it makes little sense to select a paper birch as a timber crop tree. This short-lived species isn't likely to respond well to release because it is already biologically old. However, sugar maple and yellow birch trees of that age can be expected to respond very well. Timber crop tree candidates should be at least 20 years younger than the normal biological maturity for that species.

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Select crop trees that are well-adapted to the site. This is particularly important in stands that are succeeding from past agricultural use. These stands are likely to include trees that are not site-suitable because they were established by advantages such as seed size and dispersal rather than by site compatibility.

This can happen, for example, when there is a black walnut seed source available in an abandoned, upland pasture site with shallow soil. The large seed of the walnut gives it an advantage getting established in the grass competition.

It does not grow well, but it survives, and becomes part of the first stand established on the site. Even if walnut is selected and released on this site, it isn't likely to grow as well as other species better adapted to growing on upland slopes with shallow soils.

These black walnut trees have become established on a site not suited to the species. Consequently, although they survive, they will not produce valuable timber products.

Seed dispersal also contributes to trees becoming established in areas where they are not well-adapted. Consider a large, abandoned field situated on an upper slope. The only seed source is a drainage located upwind with a few large yellow-poplar and white ash in it.

Seed size and dispersal are two factors which can be responsible for trees becoming established in areas where they are not well-adapted.

The variety of species available to provide a seed source is limited. However, these few big trees produce a large quantity of wind-blown seed. This increases the probability of these few trees being the parents of the seedlings that occupy the field.

As a result, yellow-poplar and white ash become established on a site that is drier than these species need to grow well. Unless these trees die during periods of drought, they may occupy many growing sites because there is little competition from other species better adapted to the location.

Generally, timber crop trees can be grown along streams if the soils drain adequately. Riparian zones are often excellent growing sites for timber if the soils are deep, well-drained or moderately well-drained, and have good water-holding capacities.

Riparian zones are often excellent growing sites for timber if the soils are deep, well-drained or moderately well-drained, and have good water-holding capacities.

Under these topographic and edaphic conditions, the riparian zone produces some very high-quality timber crop trees — provided the species selected for management are adapted to the moisture conditions.

Important factors to consider in managing trees in riparian zones are flood frequency, flood duration, and high-water tables. Some excellent timber crop tree species growing in these areas are only marginally adapted to the conditions that exist there.

For example, black cherry may be found in riparian zones, but if drainage conditions are poor or if periodic flooding occurs, its potential to produce timber benefits is severely restricted. In fact, there is a good chance these trees will die. Therefore, you must not only consider the general timber value of a species, but whether or not it can survive and grow well under the conditions on the particular site where it is found.

Some good timber crop trees can often be found in riparian zones, especially on rises or terraces above the flood plain.

In the Appalachian and Central hardwood forest regions, high-quality timber crop trees are seldom found in riparian zones where recurrent flooding is common. Many of the species best adapted to these conditions are of low timber value.

However, some very productive growing conditions can be found on certain sites — if flooding is brief, infrequent, and occurs only during the dormant season. Usually, these locations are either on rises of the flood plain or on terraces above it. They are often the best places to look for good timber crop trees.