



Forest Stand Improvement Mast Tree Release

Vermont Conservation Practice Job Sheet **VT-666**

Client Name:	Town:
Land Units:	# Trees to Release: # Acres:
Planned By:	Date:
Trees Species to be Released	

Site Specific Guidelines and Recommendations

Mast Tree Release Requirements Checklist

- Primary purpose of release is wildlife habitat oriented
- 20 trees or more per acre
- Select healthy trees in a co-dominant or dominant canopy position in the stand
- Choose mast trees in stands with multiple individuals of the same species
- Minimum size is 3” d.b.h. and 25 feet tall – Focus on pole size class (>6” d.b.h. for beech)
- Mark target mast trees to retain and preferably trees to be removed
- Release trees on 3-4 sides (Do not release Beech on South Side)
- Primary tree species beech, oak and black cherry will be prioritized
 - Secondary species also acceptable – see text below (page 3)
- Species specific guidance will be followed
 - Especially see American Beech section below (page 5)
- Release of mast producing shrubs, while beneficial, is not covered under this practice

Background and Purpose

A common forest management practice called **crop** or **mast tree release** can be used to improve the amount of **mast** or food that trees produce for wildlife. Mast is the seed and fruit produced by trees and shrubs and is critical food for many species of wildlife. For example, consider the importance of beech nuts to bears trying to fatten up for winter or of fall fruits to a wood thrush preparing for migration to Central America. The practice is relatively simple – select a healthy tree with good growth potential and cut or girdle the trees that are competing with it. By

lessening the competition, the tree is allowed to grow a larger crown which will result in increased rates of photosynthesis. In return, increased diameter growth as well as fruit or seed (nut) production will occur. Managing for a variety of mast producers on the property including large trees, small trees (e.g. serviceberry) and shrubs will benefit the greatest number of wildlife and increase the chances of some seed production every year.

The key point of the practice is to expose as much of the crown's surface area to sunlight as possible. Releasing mast trees will make mast production better in both poor and good mast years. Studies have found that released oak trees may produce up to seven times more acorns than un-released trees. Even in poor acorn years, released red oak has been found to produce twice the amount of acorns as un-released trees. At a stand level this difference can be significant, particularly to wildlife experiencing a bad mast year.

Types of Mast

There are two types of mast: hard and soft. **Soft mast** includes berries, fruits and catkins (actually a cluster of flowers). Important soft mast producing species in Vermont include apple, hawthorn, cherries, dogwoods, viburnums (e.g. nannyberry, high bush cranberry, etc.), elderberry, raspberry and blackberry, serviceberry, and mountain ash. Birches, aspen, willow and ironwood have catkins that are also sought after in fall, winter and spring. Fruits and berries provide high energy in the form of sugars and carbohydrates and they are usually available through the summer and fall with some species used as a winter or early spring food (e.g. high bush cranberry). Fruits and berries that carry over into the winter are generally the less desirable fruiting species that are left for last. Wildlife that can be expected to benefit from increase in soft mast would include bear, grouse, turkey, squirrels, chipmunks, fisher, fox, rodents and many songbirds.

Hard mast includes hard shelled seeds and nuts. Important hard mast producing species in Vermont include beech, oaks, and hickories. Other species that produce hard mast include butternut, hazelnuts, ashes, maples, pines, ironwood, fir, spruce, birch, hemlock and basswood. Acorns and other nuts are high in fat, protein and carbohydrates. However, American beech is arguably the most important hard mast source in Vermont having a wider statewide distribution than oaks and about twice as much protein as acorns (~ same fat content). Beechnuts and other sources of hard mast are an important fall and winter food source for wildlife; particularly with Vermont's hard winters. Often these nuts will be fed upon in the spring as well, even after germination. Wildlife that can be expected to benefit from an increase in hard mast would include deer, bear, grouse, turkey, squirrels, chipmunks, fisher, rodents, blue jays, woodpeckers, grosbeaks, nuthatch, and wood duck. Smaller seeded species (e.g. birches, spruce-fir, pine, etc.) will primarily benefit small mammals and numerous songbirds.

Target Trees

Primary species for this management include beech, oaks, black cherry, hickory and butternut (where available). These are considered the best of the best wildlife trees. In general, beech, oaks and black cherry will make up the majority of the primary species as they have the greatest distribution across the state. Hickories are confined to the areas of lowest elevation in the state and butternut is becoming uncommon due to butternut canker. Shagbark hickory may be targeted for both mast increase as well as bole "daylighting" to support roosting Indiana bat.

Secondary species would include ash, basswood (important nectar source for bees), birch, aspen, maple, pine, fir, spruce, hemlock, cedar *and* small trees such as serviceberry, pin cherry and ironwood if they have good canopy position and will respond to release. While these species generally aren't highlighted as critical mast sources for wildlife (like beech), they can support a wider array of wildlife because of the smaller seed size and due to the wider variety of forest types they're found in. For instance, a bear is supported by large seeded beech and oak (among others) whereas finches may only be served by smaller seeds of birch and conifers. Increasing the number of tree and shrub species under management will increase the probability of some seed production every year. So, during those poor mast years for beech or oak, there may well be decent seed year for ash or pine.

Tree and Area Selection

When evaluating your property to determine where to focus your efforts, decide where you can provide the best wildlife habitat for the effort. If possible, choose productive sites with good soils. Sites where the trees grow tall and fast should be productive mast producers. Choose trees that are healthy with large crowns that are **dominant or co-dominant** (crown classes) in the canopy. The greatest production of mast within a stand comes from dominant and co-dominant trees. Intermediate and suppressed trees produce very little mast because the crowns receive limited sunlight. In addition trees of this crown class typically do not respond as well when released. See **Figure 1** below for more information concerning crown classes.

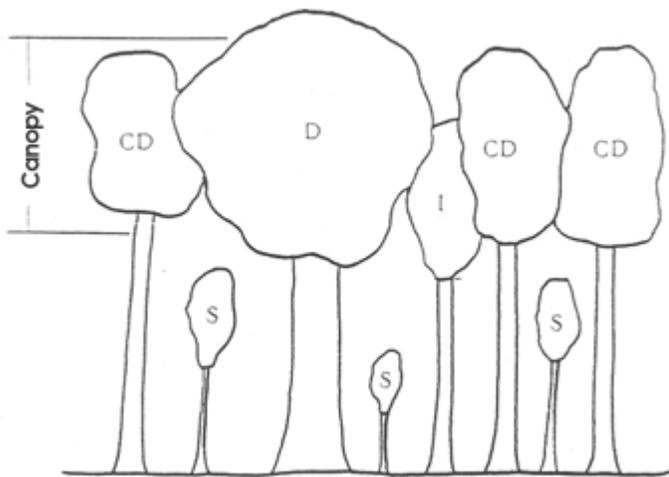


Fig. 1 - Crown Classes (Maryland DNR Image)

Dominant (D) – Trees receive full sunlight from above and some from the sides, crown extends above canopy

Co-dominant (CD) – Trees receive full sunlight from above and partial sunlight from the sides, forms the general level of the canopy crown cover

Intermediate (I) – Shorter than D and CD, little direct sunlight from above and usually none from the sides

Suppressed (S) – (AKA Overtopped) Crowns entirely below canopy, little to no direct sunlight

Focus attention on mast trees in stands with multiple individuals of the same species to maximize pollination and seed production. Trees spaced at more than 150 feet apart in forest stands have little probability of pollination and good seed production – the goal is to have more than 3 regularly spaced trees per acre to ensure seed production. Ideal conditions would be to have groups of target species in a concentrated area.

After identifying a potential mast tree, visualize the trees that would be cut. These are the trees with crowns that are competing for space with the mast tree's crown. If they are live den or nest trees, do not cut or girdle them. Snags (dead or dying standing trees) should rarely need to be

removed. Wildlife cover trees such as den and nest trees and snags are an important cover (cavities, large nests) and food source (insects) for wildlife. If competing trees are large, straight, sawtimber sized trees such as sugar maple, black cherry, oak, ash or yellow birch, consider the monetary value before making a decision to cut. In some cases, the best decision will be to complete only a partial release or to select a different mast tree to release. When considering releasing roosting or potential roosting trees for Indiana bat, first consult with the Vermont Fish and Wildlife Department.

For this practice, trees must be 25 feet tall or taller. Twenty or more trees will be released per acre if possible. Minimum diameter for mast trees is 3” d.b.h. but understand that snow and ice damage can be a problem at these smaller diameters. In general, most forest grown trees seldom begin to bear seed until 5-8” d.b.h. so focus attention on the larger pole size trees. A general exception to this rule is for smaller or intolerant species such as paper birch, serviceberry, and pin cherry which produce good seed crops in the sapling size class (2-4” d.b.h.). Seed production by shorter lived species such as paper birch, aspen, pin cherry, serviceberry and balsam fir drops off quickly at young ages and sizes so do not release trees over 10” d.b.h. In addition, some studies have indicated that oak acorn production drops off in trees greater than 20” d.b.h. . In summary, focus attention on the pole size class for release and greatest potential increase in tree growth and mast production. Trees with some dead branches and cavities are suitable since this practice is intended for wildlife habitat and not timber production.

Release Techniques and Guidelines

Release target tree crowns from competition by cutting surrounding trees. Look up at the prospective tree and visualize the crown with four quadrants or sides to determine a “free to grow” rating. This is simply determining how many sides of the crown are free from competition from neighboring crowns. A “0” rating means the crown has no room to grow. A “4” rating means the crown is free to grow on all four sides. Look for competing trees; those with crowns that are touching or within a couple feet of the mast tree’s crown.

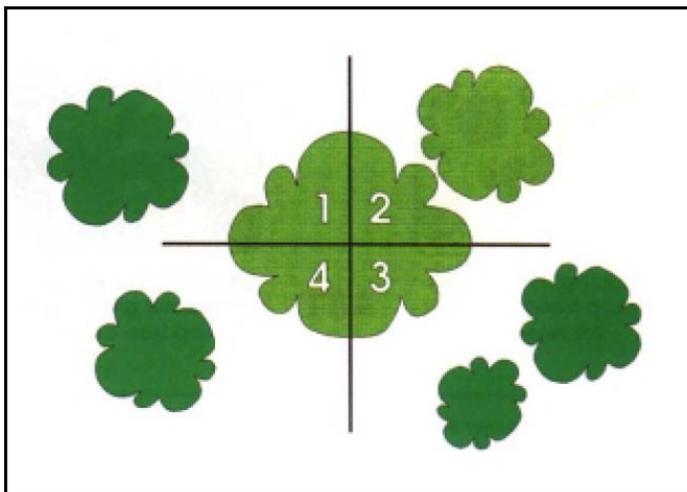


Figure 2. The crop tree crown has been separated into four quadrants, or sides. A free-to-grow rating is determined by evaluating each side for competition from neighboring crowns. This crop tree is free to grow on three sides (USFS Crop Tree Management in Eastern Hardwoods).

A forester or other trained individual will at least mark/flag the target mast trees that are being released. Competing trees should also be marked (differently than mast trees) for cutting

so that adjacent crowns are not left within 10 feet of the mast tree crown. **Release the mast tree on 3-4 sides** unless there is a shared or “dual” crown with another desirable mast tree. **Figure 2** above shows the mast tree (at center), with the four quadrants drawn, where the only competition is in quadrant or side two. Thus, the tree is free to grow on three sides (rating of “3”). Only one tree must be removed and that is from side two. An alternative to complete removal of competing trees is girdling. Girdling involves the removal of bark and cambium from the target tree through the use of two cuts (usually with chainsaw) that encircle the entire tree. **DO NOT** girdle near power lines, roads/trails, structures, campsites, or other potential human hazard areas.

American Beech

American Beech Management provides a unique opportunity. Black bears thrive on beechnuts as a protein and fat rich food source and in fall they will seek out remote beech stands to feed in prior to winter. Current and historic bear claw marks can be found on certain beech trees in these stands – while many trees in the stands go untouched. It is generally accepted that in areas with bear, the prime mast producers will be the trees with claw marks as the bears only climb trees that produce significant amounts of beechnuts.

American beech has also experienced significant declines in Vermont and the region due to the beech bark disease complex (Beech Scale insect/Nectria sp. fungus combination). Many trees have succumbed to the disease while others have shown varying degrees of resistance to the disease. The Vermont Agency of Natural Resources (ANR) has authored ‘**VT ANR Management Guidelines for Optimizing Mast Yields in Beech Mast Production Areas**’ which provides a key set of guidelines for resource managers to follow. The general concept is to prioritize and focus management on bear clawed beech trees and stands while favoring disease resistant trees within the stand. Over time, trees with no resistance to the disease would be removed while resistant trees would be retained. This approach will optimize long-term mast yields and minimize the impacts of the disease on management areas.

The ANR Guidelines are in depth and cannot be fully covered within this job sheet. Also, the guidelines were designed with State Lands in mind. Regardless, the guidelines are now a useful reference and we can use some key elements to promote mast production and disease resistance on private lands.

When managing beech on private lands:

- Prioritize stands with historic/current bear claw mark scars
- Minimize root disturbance as it leads to beech root suckering (harvest in winter)
- Target 6” d.b.h. or greater - Caution, bear scarring only evident at 8”d.b.h or more
- Release Canopy on 3 sides – North, East, West – **NOT ON SOUTH SIDE**
 - Beech is susceptible to sun scald in later winter/early spring
 - Do not paint beech trees to be retained – Causes injury and disease
- Use uneven aged management – maintain high canopy cover to favor beech
 - Don’t exceed ½ acre size group selection cuts
 - No clearcuts within 200 feet of mast management area
 - Maintain a minimum of 70 sq. ft. basal area stocking post treatment
- **Identify Crop Trees** with partial or full resistance and/or good mast production
 - Smooth bark (no disease); bear scars present (‘super beech’)

- Raised lesions (partial resistance) or “blocky bark”, disease repeatedly walled off, AND <10% of branches yellow or recently dead; bear scars present
- Smooth bark (no disease); no bear scars (keep for genetic resistance)
- **Release Crop Trees by removing competing** beech with no disease resistance or low resistance and low mast production (no bear scars) during repeated treatments over time.

Note: Non-beech trees will also need to be removed during this beech crop tree release.

 - Extensive sunken lesions, dead bark ,or decay indicate high disease susceptibility
 - Beech with poor (narrow) crowns or >50% yellow or recently dead crown
 - Any Beech ≥ 8 ”dbh with evidence of disease susceptibility and no bear scars
 - DO NOT girdle diseased beech – it will generate many disease susceptible sprouts before the parent tree completely dies.

Other Habitat Benefits

The forest canopy will be opened up as the trees surrounding the mast or crop trees are cut. This increase in sunlight to the forest floor will improve vertical forest structure by stimulating understory development of forbs, shrubs and trees that were previously inhibited. This will increase the amount of woody browse and may improve habitat for forest songbirds that prefer to nest in the understory shrub layer. Encouraging growth and development of pole sized mast trees into larger sawtimber sized trees will also promote larger cavity trees as these species age. These are important for denning and nesting for a variety of wildlife.



Left – Dual crown of mast trees that was released on all four sides (2 crowns treated as one)

Right – Mast tree with free to grow rating of “2” – Room to grow on 2 sides, needs release on 2 sides - USFS



Considerations

Where there is a co-objective for sawlog production, consultation with a forester is warranted. Often, foresters will recommend release of timber crop trees on 2-3 sides. This will lessen the potential for “epicormic branching” which occurs when branches sprout from dormant buds on the trunks of trees and which consequently lowers the value of potential sawlogs. In Vermont, oaks are particularly susceptible to epicormic branching. For more information about individual species of mast/crop trees and more in depth information about this forestry practice see links to ‘Guide to Wildlife Tree Management in New England Northern Hardwoods’ and ‘Crop Tree Management in Eastern Hardwoods’ respectively below.

Resources for More Information – Much of the information and figures found in this document were adopted from these publications
 Guide to Wildlife Tree Management in New England Northern Hardwoods – USFS GTR NE-118

<http://www.treesearch.fs.fed.us/pubs/4165>

Crop Tree Management in Eastern Hardwoods – Forest Resources Management - USFS NA-TP-19-93

http://www.fs.fed.us/na/morgantown/frm/perkey/ctm/ctm_index.html

VT ANR Management Guidelines for Optimizing Mast Yields in Beech Mast Production Areas

http://www.vtfishandwildlife.com/library.cfm?libbase =Reports_and_Documents