APPENDIX B

Applying Crop Tree Management in Specific Eastern Forest Types

by

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This yellow-poplar stand received a dormant season Crop Tree Management treatment. During the spring the released trees will start expanding their crowns and accelerating growth.

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ALLEGHENY HARDWOOD CROP TREE MANAGEMENT

Crop Tree Selection

1. Commercial thinning can often begin when the stand is 40 to 60 years old. Black cherry and yellow-poplar are generally more responsive to release than white ash. Red and sugar maples, with good crowns and few epicormic branches, also respond well to release.

2. Timber crop trees should have clear, straight boles that are free of forks. Yellow-poplar and black cherry are especially susceptible to having forks that split open in wind and ice storms.

3. For timber production, avoid black cherry trees with black knot, particularly if the defect appears on the main bole. However, black knot that occurs in the crown can be accepted if less than 50 percent of the crown is affected (assume branch will eventually break off at the knot).

4. Black cherry, white ash, and yellow-poplar mature before maple. If these three intolerants are desired in the next stand, crop trees must be maintained as a seed source until it is time to establish regeneration.

5. Black cherry is very effective at compartmentalizing wounds. Consequently, V-shaped stump sprout connections are more acceptable with this species than with many others.

6. To reduce the probability of gum spots caused by bark beetles in black cherry, avoid operations between January and June that result in black cherry slash or standing, dead trees. Black cherry trees cut or deadened between July and January are much less likely to provide suitable habitat for bark beetles.

7. Black cherry is a good soft-mast producer, which makes it a desirable wildlife crop tree.

Residual black cherry trees are resistant to decay from cut V-shaped connected sprouts. This allows more choices when selecting crop trees from a population that includes stump sprouts.

8. White ash and beech have a greater tendency to form cavities than other associated species, increasing their probability of being potential den trees. Beech is also acceptable as a hard-mast producer.

Natural Regeneration

1. Assess the effects of deer on regeneration by estimating the density of the deer population and the quantity of food available within a three-fourths mile radius of the potential regeneration site.

2. Establish a minimum of 20 six-foot radius regeneration plots. Determine if at least 70 percent of them are adequately stocked with advanced regeneration of desirable species.

3. Assess the degree of interference from undesirable plants. Any six-foot radius plot that contains a total of eight stems of beech or striped maple is considered stocked with those competitors.

4. To determine interference by ferns and grasses and site limiting factors such as rockiness, expand the regeneration plots to a radius of 26.4' (0.05-acre). If more than 30 percent of any plot is covered with fern or grass, serious competition can be expected under partial shade.

5. Where desirable advanced regeneration is adequate and interfering understory plants are not extremely dense, remove the overstory.

Where advanced reproduction is inadequate and understory competition is severe, apply appropriate herbicides to the undesirable plants. (As a general guide, if there is less than 15 square feet of understory basal area, ignore it. If there is greater than 15 square feet of undesirable understory, consider a herbicide treatment.)

Where advanced reproduction is inadequate and interfering plants are sparse, apply a two-cut shelterwood.

6. If tolerant species such as sugar maple, beech, and hemlock are desired in the new stand, retain 30 to 80 good-quality stems per acre (3 to 10 inches dbh) with vigorous crowns and few epicormic branches.

A high deer population can affect the species composition of regenerating stands. When the number of deer is out of balance with the available habitat, regeneration may be eliminated.

Crop Tree Selection

When available, beech nuts are consumed by many wildlife species. Because beech trees are more likely to be hollow than many other species, they frequently become den sites for wildlife species that use tree cavities.

Birches that have grown around old, decaying stumps may be unique and, therefore, aesthetically pleasing to landowners.

1. Timber crop trees should have the potential of producing a Grade 1 or 2 log from the butt section of the stem. For yellow birch, sugar maple, and white ash trees with this grade potential and two logs per tree, financial maturity will often be reached at about 20 inches dbh. When sawlog height is one log, financial maturity frequently occurs at 18 inches dbh.

   For paper birch, financial maturity may be reached at 16 inches, regardless of log height. Beech and red maple are often limited to medium grade potential and financial maturity of 14 to 16 inches. With all species, financial maturity may be extended, to a limited degree, by maintaining rapid crop tree growth.

2. If wildlife habitat management is an objective, diversify crop tree selection by species to improve future mast production and to increase the probability of having den trees in the stand. Red oak and beech are valuable hard-mast producers. White ash, beech, and basswood have good potential to be den trees because they have a greater tendency to form cavities than many other species.

3. Birches are more prone than most species to grow over stumps and rocks. Depending on landowner preferences, these trees may be desirable as aesthetic crop trees because of their uniqueness. However, they are poor choices for timber crop trees because of their instability.

4. Paper birch frequently occurs as an associated species with this type. Many landowners with aesthetic objectives prefer paper birch because of the attractiveness of its bark and the beauty of its foliage.

5. Northern hardwoods produce very attractive fall colors. If the landowner has aesthetic objectives related to autumn foliage, there is great potential to produce benefits. Red and sugar maples may be especially desirable aesthetic crop trees.

Natural Regeneration

1. The species composition of the regeneration is influenced by the site characteristics of the stand and the existing overstory composition. On many sites, we can most effectively influence the composition of the next stand by manipulating the percentage of crown closure in the overstory.

2. To favor tolerant regeneration (sugar maple and beech), retain an overstory with 80 percent crown cover. To favor intermediates (primarily yellow birch), retain an overstory with 30 to 50 percent crown cover; perhaps somewhat higher on wet sites.

3. To be considered well-established, spruce should be at least a foot tall; birch at least two feet tall; and beech, sugar maple, and hemlock should be three to four feet tall.

Harvesting trees resulted in this crown canopy admitting enough light to favor the establishment of seedlings and sprouts.

OAK CROP TREE MANAGEMENT

Crop Tree Selection

1. Diversify crop tree selection by species to provide more stable mast crops and to reduce the likelihood of suffering total crop failure because of a destructive agent such as gypsy moths.

2. White oak is often one of the most valuable oak species, but it is also one of the slowest growing. It is very susceptible to epicormic branching and, in many areas, it has been quite vulnerable to mortality after gypsy moth defoliation. White oak is a desirable species for selection as a wildlife crop tree because its acorns are preferred by many wildlife species.

3. Northern red oak is one of the most valuable oak timber crop trees, and it is fast-growing. It is very desirable as a mast producer for wildlife because of its relatively abundant production.

4. Regardless of the species, favor crop trees with vigorous crowns in dominant and codominant positions. Favor trees showing bark characteristics that indicate rapid growth and straight grain. Avoid trees with epicormic branches.

5. Many oak trees originate from seedling sprouts or stump sprouts. Stump sprouts can produce good-quality timber if the stem originates from a low stump. Companion sprouts with a U-shaped connection may be cut at different times, but V-shaped sprout connections should usually be treated as a unit (cut both or neither). The rigidity with which this guideline should be applied varies by species and length of the cutting cycle to be used in the stand.

6. Where the species composition is less than 50 percent oak, the stand's susceptibility to defoliation by gypsy moth is reduced. Generally, oaks with vigorous crowns are more likely to survive defoliation. Oaks on mesic sites have a greater vulnerability to mortality if defoliated.

This oak stand received a pre-commercial Crop Tree Management treatment through the Forestry Incentives Program. Cost-share programs can be used to help private, non-industrial landowners accomplish needed management work.

7. Black and scarlet oak are more likely to develop cavities than white oak and hickory. However, cavities in longer-lived species (like white oak and hickory) provide available shelter for wildlife for a longer period.

Natural Regeneration

1. Oak natural regeneration is relatively easy to establish on areas that have an adequate seed source available and a red oak site index less than 70. Better sites are more challenging to regenerate because of competition from other species. Well developed, advanced regeneration is a key to successful establishment of oak stands. Most oak natural regeneration is established when there is a bumper crop of acorns that provides enough food for insects and wildlife with some left over to germinate.

2. Management activities that establish regeneration and encourage its development should be initiated 20 to 30 years prior to final harvest.

3. Maintaining a closed overstory canopy while herbiciding midstory and understory competitors is often necessary to provide a microclimate suitable for regeneration establishment and development. When seedlings are three to four feet tall, provide additional moisture, light, nutrients, and growing space by opening the main crown canopy with a partial cut.

4. Evaluate the adequacy of established oak regeneration using the procedures described in the SILVAH manual referenced on Page 50. When regeneration meets these guidelines, remove the overstory.

Having adequate advanced oak reproduction established is a key to successfully regenerating stands that will include an oak component.

Artificial Regeneration

1. Oak seedlings may be planted in old fields or on previously forested sites. However, they usually require post-planting release from competing vegetation for at least three years. Tree shelters can be used to provide protection from animal damage and to accelerate early seedling shoot growth.

2. Oaks may be regenerated by direct seeding of viable acorns. Use of tree shelters can greatly reduce the number of acorns needed to obtain an oak component in a new stand.

PAPER BIRCH CROP TREE MANAGEMENT

Crop Tree Selection

1. In seedling-sapling stands that are overtopped or nearly overtopped with pin cherry, aspen, or red maple sprouts, reduce the competition by cutting. Where appropriate, apply herbicide to cut stumps. In sapling stands, the dominance of the paper birch component in the stand can be evaluated using milacre plots (3.7-foot radius). At least 20 plots should be measured in stands of 10 acres or less and at least one plot per acre in larger areas. In sapling stands, if more than 20 percent of the milacre plots contain aspen or red maple stump sprouts, release will be required to maintain dominance of paper birch in the stand.

In New England, paper birch is not only an aesthetically attractive tree, but it has traditionally been valuable as a timber crop tree.

2. In sapling stands, select crop trees with diameters at least equal to the mean stand diameter. The larger the diameter in relation to the mean, the better the chances of continued superior growth. Any selected paper birch stump sprouts should be thinned to one or two of the best stems.

3. In pole stands and larger, select dominant or codominant full-crowned trees. Timber crop trees should be straight, free of forks, and free of excessive branches for a minimum of 17 feet. There should be no wounds or injuries that can cause degrade in the merchantable stem. Avoid unstable trees growing on stumps or rocks.

4. If the long-term objective for the stand is to regenerate it to paper birch, try to select a high proportion of paper birch crop trees (at least two out of three). If the objective is to eventually convert the stand to more tolerant species, reduce accordingly the ratio of paper birch to other species.

5. For many people, the bright, white bark and attractive foliage of paper birch make it a preferred choice as an aesthetic crop tree.

Natural Regeneration

1. If intensive management for paper birch is anticipated, give preference to areas with a site index of 60 or greater for this species.

2. The establishment and development of paper birch regeneration requires full sunlight. The landowner must be willing to accept openings of at least an acre in size and preferably larger.

3. Stands should normally be regenerated when they are 60 to 80 years old, depending on site, stand condition, market, and landowner property goals.

4. Wind can carry light-winged seeds great distances, but the greatest amounts fall within 200 feet of the parent trees. Sexual maturity and seed bearing begin at about 15 years of age. Paper birch produces some seed nearly every year, a good crop every other year, and a bumper crop one year in 10. Seeds normally germinate in the spring following dispersal, but some may be stored in the forest floor for at least a year.

5. If it is determined that seed trees are needed, leave three to five healthy, desirable, full-crowned trees per acre. The seed trees can be removed after two seasons with minimum damage to the regeneration.

6. Skidder logging during the snowfree season, when the soil is not frozen, provides adequate scarification for germination and establishment of paper birch seedlings.

Clearcuts and/or seed tree cuts are needed to regenerate attractive, valuable stands of paper birch in New England. Public and landowner opposition to these treatments may be the greatest obstacle inhibiting the perpetuation of this valuable forest type.

WHITE PINE CROP TREE MANAGEMENT

(for growing high-value sawtimber)

Crop Tree Selection

1. Choose trees with straight boles and well-developed crowns that are capable of quickly occupying additional growing space. Usually, trees less than 50 years old with one-third or more of their total height in live crown will respond favorably to release.

2. Minimize the portion of the tree containing persistent dead branches. Manage the surrounding stocking to control the size of live branches on the crop tree. Try to keep just enough light on the lower portion of the live crown to keep the branches alive, but not enough light to stimulate rapid branch growth.

3. If growing clear lumber is an objective, try to prune crop trees that are 4 to 10 inches dbh and have small branches (less than 1.5 inches in diameter). However, don't make the mistake of selecting trees that have small branches, but also have small crowns. You must select crop trees that have vigorous crowns that will respond to release.

4. Natural pruning of white pine is often better in mixed stands of conifers and hardwoods than it is in solid white pine stands. White pines grown in association with hardwoods are often of good form.

Managing the size of live branches and minimizing the number of persistent dead branches on the bole is an important part of Crop Tree Management in white pine.

Natural Regeneration

1. Choose the right site. Stands with a hardwood site index of 60 or higher can be difficult to regenerate to pine.

2. After age 50, begin discriminating against overstory hardwoods when selecting crop trees. However, when choosing between hardwood crop trees, remember:

   a.) retaining mast-producing hardwoods, such as red oak, may encourage establishment of white pine seedlings because of the associated digging activities of small mammals;

   b.) established white pine seedlings do not compete as well beneath red maple and oak as they do under light-foliaged species such as birch, aspen, and pitch pine;

   c.) because of the later "leafing out" of oaks in the spring, white pine seedlings compete more effectively under oak than under maple; and

   d.) if white pine weevil is a problem, keeping some overhead cover reduces the likelihood of severe damage by that pest.

3. Start hardwood control measures early. Optimum white pine seed-bearing age begins when trees are 50 years old; therefore, hardwood understory control can begin at that time.

4. In thinnings after age 50, strive for some site disturbance to encourage the establishment of white pine in the understory.

5. Coordinating site disturbances with good seed crops, which occur every three to five years, improves the chances of successfully establishing regeneration.

Site disturbance and a good seed crop resulted in the establishment of these white pine seedlings.

Artificial Reforestation

1. In areas where white pine weevil is a problem, spacing should not be wider than 6-feet-by-6-feet to help prevent the development of broad crowns and crooked boles. If this pest is not a problem, wider spacings (such as 10-feet-by-10-feet, or even 12-feet-by-12-feet) are appropriate.

2. If there is significant hardwood competition, it must be treated to give slow-growing, young seedlings an opportunity to develop.

3. If the planting is in a cutover area, there is potential for damage from the pales weevil. The best way to avoid this possibility is to delay planting for two or three years to allow the weevil population time to subside.

4. In areas where the deer population is high in relation to the amount of available food, browsing of nutrient-rich white pine seedlings from the nursery may be a serious problem. Placing netting on the seedlings can protect the terminal buds. It may be necessary to raise the netting once each year to maintain protection of the terminal bud.

Netting on this recently planted white pine nursery stock will help protect it from damage caused by deer browsing.

HEMLOCK CROP TREE MANAGEMENT

Crop Tree Selection

1. Suppressed, understory hemlock trees are viable crop tree candidates. The older they are when released, the greater they seem to respond. Suppressed trees have fewer problems with butt rot and shake, and their smaller limbs prune earlier.

2. Maintain dense stands by releasing relatively few crop trees. This minimizes root damage caused by logging. It also limits exposure to full sunlight and the associated high evaporation of soil moisture.

3. For timber crop trees, avoid selecting trees with many large, broken, or dead limbs; seams; or injuries in the butt section. Rot, decay, and shake are often associated with these indicators.

4. Timber crop trees should usually be considered mature when they are 16 to 18 inches dbh.

5. Hemlock is a valuable source of cover for many wildlife species.

Patches of hemlock in a hardwood stand can provide variety that is aesthetically attractive and valuable as habitat for wildlife.

Natural Regeneration

1. A two- or three-cut shelterwood is the best method of regenerating hemlock. It compensates for slow seedling development for the first two years by reducing moisture stress and preventing hardwood establishment.

2. Remove trees mostly from the codominant and lower crown classes.

3. Avoid creating openings larger than one-half the height of the main canopy trees.

4. For the preparatory cut, use the stocking chart's B level (NA-FR-30, ***Managing Eastern Hemlock, A Preliminary Guide***) as the residual stocking. For the seed cut, leave 110 square feet of basal area in a high-density overstory that has 70 to 80 percent crown cover.

5. Use summer logging to accomplish site scarification. This process will mix the organic layer with mineral soil. Until the seedlings become rooted into the mineral soil, they are highly vulnerable to moisture stress.

6. Kill or remove advanced hardwood regeneration.

7. When reproduction is well-established (three to five feet tall), remove the overstory trees. Winter logging is preferred to provide protection for the advanced regeneration.

Overstory shade helps protect hemlock seedlings from moisture stress.