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Northern Hardwood Forest Management

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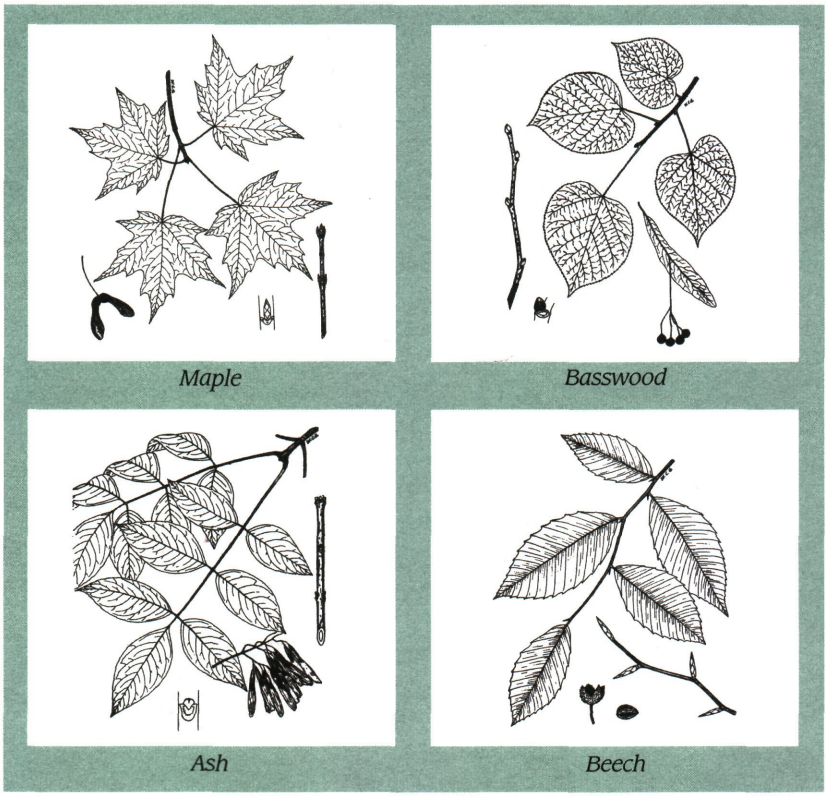
Northern hardwood forests in Michigan are composed primarily of sugar maple with various mixtures of beech, ash, basswood, yellow birch and other species. This forest type is typically found in well drained, upland loamy sites. Compared with other hardwoods on similar sites, sugar maple and beech grow slowly, yet their ability to produce large, high-quality timber make northern hardwood forests economically valuable. Mature sugar maple trees in these stands are also sources of sap for making maple syrup. Northern hardwood forests are also extremely beneficial for many interior songbird species and, in some locations, the red-shouldered hawk, which is on the state list of threatened species. These forests can also serve as a good place to find morel mushrooms. Other plant species found in northern hardwood forest stands include jack-in-the-pulpit, maidenhair fern, common trillium and American ginseng (on the state threatened list). These forests also provide a stunning autumn display of yellow-gold sugar maples and vivid red maples. Depending on landowner goals and the condition of the stand, responsible forest management practices can greatly improve any or all of these benefits.



Regeneration and young stands

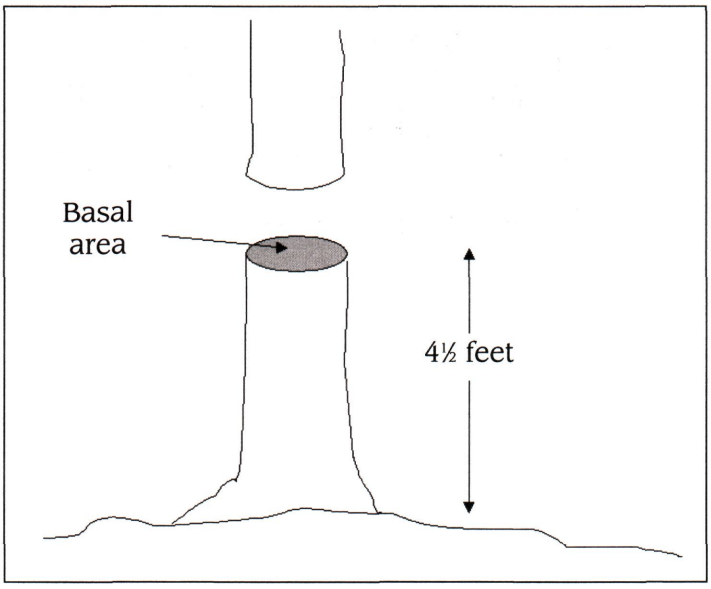
Regenerating northern hardwood stands can involve a wide range of practices, depending on site capabilities and the landowner's favored tree species. If sugar maple is the desired species, relatively closed-canopy conditions should be maintained to favor the sugar maple's tolerance for shade. Harvesting methods such as single-tree selection or group selection are best for creating these conditions. These strategies are often referred to as all-aged or uneven-aged management because all sizes of trees, from seedlings to large sawtimber, are present at all times. It is rarely necessary to plant seedlings to replace the harvested trees in uneven-aged management. The seeds produced by the existing mature trees readily regenerate and establish themselves.

Alternatively, if a greater range of tree species is desired, conduct a two-stage shelterwood harvest. The first cut should leave about 60 percent of the forest canopy, which provides protection from too much exposure to the sun. The remaining mature trees serve as a source of seed for additional regeneration. After approximately four to six years (depending on the quality of the site), the young regeneration should be well established. The remaining mature trees can then be harvested. Remember that this method, though typically more beneficial for wildlife for the first 20 years, will require a longer rotation time than uneven-aged management techniques.

Managing mature stands

Trees in northern hardwood stands do well with partial protection from direct sunlight during their development. This protection is provided by controlling the amount of light that filters through the forest canopy. The greater the amount of available light, the larger the number of trees in the stand. Additionally, there is typically a greater diversity of tree species with greater light levels because the stand can include more shade-intolerant species. If the number of trees in the understory remains large, however, competition becomes too severe. Under these conditions, trees lack sufficient light, water and nutrients. Some trees may "starve" to death, but before dying, they consume scarce resources and keep other more vigorous trees from thriving. An acceptable practice to reduce this competition is thinning the stand, but care must be taken to avoid cutting too heavily. The remaining trees may suffer from sunscald or develop branches lower down on the trunk—an undesirable trait for future timber production.

To create the stand density that will produce optimum conditions for growth and productivity, professional foresters take measurements of basal area (B.A.) per acre for use as an index of density or competition for soil and water resources. Basal area is the sum of the cross-sections of all trees on an acre measured at breast height (4.5 feet above-ground). This measurement is then given as square feet of basal area per acre. Both root competition and crown size are related to the cross-sectional area of a tree, so it gives a ready check on competition for light, moisture and mineral nutrients. Basal area is easier to measure and use than the number of trees per acre. For example, 70 square feet of basal area per acre could contain 350 to 470 trees per acre, depending on tree diameter.



Basal area is the cross-sectional area of the tree at breast height (4.5 feet), measured in square feet.

Research and management experience indicate that northern hardwood stands grow best at basal areas between 70 and 90 square feet per acre. At this stand density, sawlog-sized trees have good form and the trunks are free of lower limbs. Well thinned stands will usually grow about 3 square feet of basal area per acre per year. Stands with more than 90 square feet of basal area per acre become too dense. Growth per tree begins to slow, and tree vigor and health begin to decline because of the competition for sunlight, water and soil nutrients.

When stands reach high basal areas (more than 100 square feet per acre), thinning should be conducted to reduce the density. If the target is an uneven-aged structure, some of all tree sizes should be cut or killed. Undesirable trees, called culls, should also be cut. These are the hollow, crooked, injured, diseased or otherwise low-value trees. Avoid *high grading* the stand—removing only the largest, best quality trees. Removing only the best trees will create poor stand conditions in the future. It is also important to avoid injuring the trees that are to remain in the stand. Any resulting damage can invite attack by pests and disease. Stands should not be thinned below 70 square feet of basal area per acre in trees 5 inches and larger in diameter at breast height (DBH). Be aware that thinning activities do not increase total growth in the stand. Thinning merely transfers the

growth to fewer, more desirable trees, increasing both the quality and the quantity of harvestable growth in the future. It also may reduce the loss due to mortality from overly crowded conditions.

Once a northern hardwood stand contains more than half of its basal area in sawtimber-sized trees (larger than 14 to 16 inches DBH), the stand can be *selectively* harvested at 10- to 15-year intervals. Each thinning should remove no more than one-third of the trees. Again, avoid *high grading*, or removing only the most valuable and largest trees. Also avoid what is often referred to as a diameter-limit cut — when only trees of a certain diameter and larger are removed. Diameter-limit cuts will high grade the stand and reduce its future value. Instead, use the selection system of thinning, where a range of diameters and tree quality will be harvested. Selective thinning under this system will remove lower quality trees along with some of the higher quality trees in each harvest. This results in higher future stand quality, greater long-term value and a greater long-term stream of timber income. Periodic selection cuts can be made in this way indefinitely, as long as the amount that has been cut equals the forest's growth since the last thinning.

Wildlife considerations

Northern hardwood forests support a wide variety of mammalian and interior forest songbird species. These types of forests, however, are not as supportive of typical game species such as deer or grouse because the trees commonly found in this forest type create less of their necessary food supplies. The uneven-aged management practices suggested here will sustain good wildlife habitat for other species, and additional practices can encourage greater diversity. For instance, leaving one to three snags (dead trees) standing per acre after harvests provides valuable nesting cavities for various bird species such as woodpeckers, owls and songbirds. To stimulate the growth of low-growing herbs, shrubs and tree seedlings, leave between 70 and 75 square feet of basal area in trees over 5 inches DBH when harvesting. Be aware that thinning below 70 square feet per acre will create shrubby growth for a few years, followed by the emergence of a secondary canopy that shades out low-growing herbaceous plants. Encouraging wildlife species that require edge conditions may require creating larger openings with irregular edges. Generally, a larger number of smaller open patches is preferred over a few larger openings. These openings may encourage the growth of less shade-tolerant tree species, though the results will vary among regions in the state. It is important to remember that these created openings may affect the future timber quality of surrounding merchantable trees. Consult a local professional forester to discuss your long-term goals.

Other points to consider

A potentially devastating disease has recently been found in Michigan that may significantly affect the composition of northern hardwood forests in the future. Beech bark disease, accidentally introduced to American beech trees in Canada in the late 1800s, consists of a relationship between a sap-feeding scale insect and some species of *Nectria* fungi. Though the spread of the disease has been slow, it has now been found in parts of the Upper Peninsula and northern lower Michigan. Heavily infested trees look as if they are covered by a white wool, a result of the white wax covering the bodies of the scale insects. The scale feeds on inner bark sap and infects the tree with the fungus as wounds are created for feeding. The *Nectria* fungus kills areas of woody tissue. If enough of the tissue is killed, the tree becomes girdled and dies. There is no economical remedy for beech bark disease at this time. If you suspect infestation in your woodlot, immediate removal of the affected trees may be necessary.

With any harvest, pay attention to nearby lakes, streams, wetlands or other water bodies. A vegetative buffer should remain around all water sources. Special care should be taken in seasonally wet areas when harvesting. A well defined set of best management practices addresses these issues. A professional forester can provide this information. Several publications are available on the topic — consult the reference list for titles and contact information.

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Other *Tree Series* Extension bulletins:

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