

PLANTING OF BASSWOOD IS SUCCESSFUL IN HARDWOOD CUTOVERS

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Basswood (*Tilia americana L.*) is an important species in the lumber industry. It is capable of producing high quality saw logs over a shorter rotation than many other tolerant hardwoods, and commands a steady, high price on the market. On suitable sites, the aim is a basswood stand composition of 15 to 25 percent by volume. Natural regeneration generally will not produce this level of stocking.

In southern Ontario, basswood plantings are few and what there are (2) have been established outside the forest. This report summarizes the results from plantings in hardwood cutovers in the Tweed Forest District, a 3,500 square mile area of forested land where basswood is a climax species of the sugar maple-beech- (yellow birch) forest type. The survival and growth of basswood nursery stock is satisfactory, and planting can be recommended under certain forest conditions on northern hardwood sites between the latitudes of 44°15' and 45°45' N., an area known as the south central and southeastern regions of southern Ontario.

Material and Methods

Stand Treatment

Stands where basswood had been planted contained various proportions of mature and overmature sugar maple, beech, basswood, hemlock, yellow birch, white ash, and white oak. Cutting of stands to different intensities and poisoning of the residual trees prior to or following the planting created a variety of conditions from very dense to very open. In addition to the generally dominant sugar maple reproduction, some sites have been densely invaded by such species as striped maple, cherry, aspen, dogwood, elderberry, raspberry, blackberry, and thimbleberry, not necessarily in that order.

Plot Design

Plots were located under the following conditions: (a) In stand openings measuring 1/3 acre, 1 acre,

and 30 acres; (b) on cutover strips 1 chain wide and 10 chains long on steep slopes bordered by uncut stands on both sides and exposed to the north, east, and south; and (c) cutover strips running north-south on level terrain bordered by an uncut stand in the west and a strip of young regeneration in the east.

Trees in (a) were planted from 5- to 6-feet apart in plots 1 or 2 chains square replicated 2, 4, or 5 times. Trees in (b) and (c) were planted 8 feet apart in rows 12 feet apart, three rows to a strip replicated 4 times.

On the plots where tops and roots of the planting stock were pruned, there were six or nine trees in each of the treatments, which were replicated 4 times. Seedlings of the 2-0 stock were top-pruned and root-pruned, both at points 6 inches from the root collar. Saplings of the 4-0 stock were rootpruned at the nursery, and in the field their stems were pruned back to (a) 36 in. (b) 24 in., and (c) 8 in., above the root collar. The control saplings measured about 4.5 ft. in height.

Nursery Stock

The nursery stock was supplied by the Ontario Department of Lands and Forests. The seedlings varied appreciably in shoot length, root length, and stem diameter. Therefore, it is suspected that sometimes survival and growth may have been considerably affected by the quality of the stock itself.

Over 10,000 basswood seedlings were planted in May and October between 1962 and 1966. All were 2-0 stock; 100 were 4-0 stock. All fall planted seedlings have failed in both survival and growth and were excluded from the analysis.

Results

Survival

The average survival of basswood was 71 percent, being highest in small openings (Areas 1 to 6, 11, 12). In the strips on level terrain (Area 8), survival was better than on steep slopes (Areas 9 and 10), or in the large, 30-acre opening (Area 7) (fig. 1).

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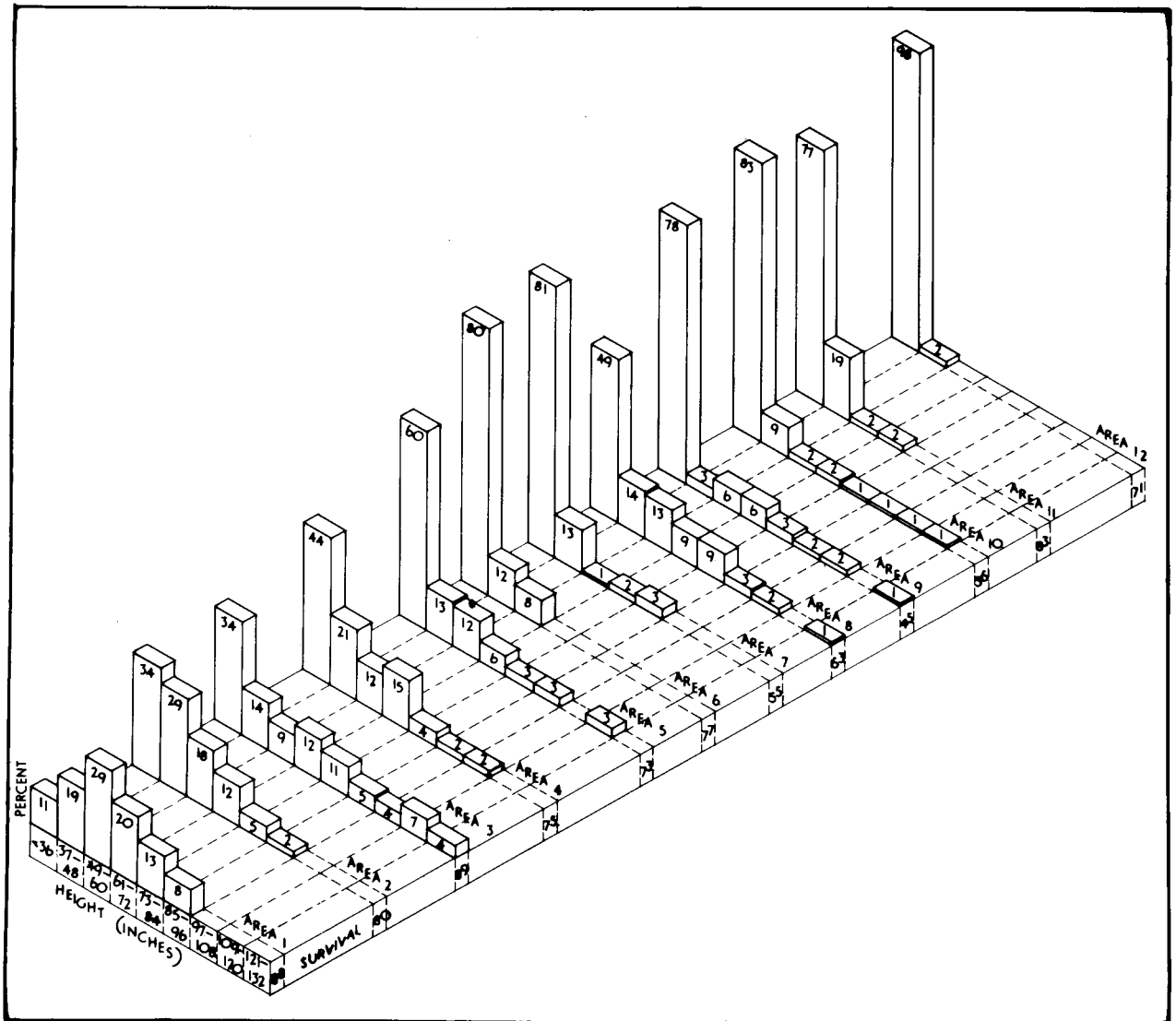


Figure 1.—Survival and distribution of height growth of basswood stock planted between 1962 and 1966

Trees on east slopes survived better than on north slopes by 11 percent. South slopes are not presented because of the small number of seedlings found; in one strip, however, survival was 75 percent.

The poor survival and/or growth performance of the basswood in the unsuccessful plantings is attributed mainly to the following conditions: (a) steep rocky terrain, (b) abundance and rapid spread of the lower vegetation following cutting, (c) presence of an overly dense overhead canopy, and (d) occasionally, poor stock quality.

In two plots, each 1 acre in size on level terrain

(Areas 3, 5), trees (a) whose tops were growing free of competition produced 48 percent more height growth than trees (b) which were oppressed by competing vegetation. Overtopped basswood produced 128 percent and 80 percent less height growth.

Height Growth

For purposes of analysis, trees have been grouped into height classes at 12-inch intervals from 3 feet and less to 11 feet (fig. 1). In six successful plantings (Areas 1 to 5, 8), 27.5 percent of the basswood saplings measured 6 feet and more in height, 15.5

percent of the trees were in the 5-foot class, and 18 percent in the 4-foot class after a minimum of four and maximum of seven growing seasons. The rest of the trees, 39 percent, are less than 3 feet in height and regarded as stunted in growth.

Best height growth was recorded on Areas 1 and 3, where 43 percent and 41 percent of the seedlings, respectively, attained a size of 6 feet and more, after 4 and 7 growing seasons. The above mentioned plantings were located in stand openings 1/3 acre and 1 acre in size containing a residual basal area of about 35 sq. ft.

Throughout the successful plantings, there were a number of saplings taller than 11 feet. Although no detailed correlation of seedling suppression and growth has been planned within the framework of this study, some saplings growing with the upper part of their crowns in full freedom grew 4 feet in 1 season.

Undergrowth

As the microenvironment differed appreciably from tree to tree, evaluation of the effects of the competing vegetation was difficult.

In general, growth has been very slow where there was an abundance of the lower vegetation from the first year following planting. This condition generally prevailed in plots of the 30-acre opening and to some extent also on the 1-acre clearings. It was more prevalent on slopes exposed to the east and south rather than on sites sloping to the north.

In two plots, each 1/3 acre in size on level terrain (Areas 2, 6), 37 percent of the basswood saplings attained a height of 5 feet and more in Area 2, 4 growing seasons after planting. These trees were growing predominantly among herbaceous vegetation, such as raspberry and thimbleberry. In Area 6, only 8 percent of saplings belonged to the same height class, but they were mixed with hardwood regeneration. On Area 6, following cutting, there was an extensive light penetration from the east, while on Area 2, the residual trees shaded the opening all around. The type and density of the undergrowth and most likely the timing of its effective spread appear of considerable importance. These factors, in combination with the overhead canopy, are influencing to a great extent the height growth of planted stock.

Stand Canopy

The canopy of the residual trees, i.e. their distribution and crown size, greatly affected the rate of spread and abundance of the invading vegetation.

Basswood was growing best under a light overhead canopy in the openings 1/3 acre and 1 acre in size, containing about 35 sq. ft. of residual basal area per acre (Areas 1 to 5). Areas with no overhead canopy were quickly covered with a dense vegetation, which overshadowed

the great majority of seedlings by the end of the second growing season (Area 7). In plantings under a full overhead canopy, most of the trees were stunted from 4 to 8 years after planting (Areas 11, 12).

In general, clearcut strips running north and south on level terrain (Area 8) were better stocked with sugar maple regeneration than strips on slopes (Areas 9, 10). Also, slopes exposed to the north were frequently dominated by striped maple and other undesirable species, while sections of herbaceous vegetation were more frequent on slopes exposed to the south and east.

There is every indication that the type and abundance of subordinate vegetation dominating old stands prior to cutting determine to a considerable degree the establishment of natural regeneration and success in planting following logging.

Pruning of Nursery Stock

The effect of top and root pruning on the growth of basswood 2-0 and 4-0 stock were tested in a pilot experiment initiated in 1966.

Basswood seedlings of the 2-0 stock which were (a) top pruned, (b) root pruned, and (c) both top pruned and root pruned, produced 5 percent, 22 percent, and 28 percent, respectively, less height growth than the controls after the fourth growing season. The controls averaged 45 in. in height with the tallest sapling 96 inches.

Saplings of the 4-0 stock, 4 years after treatments (a), (b), and (c), produced 5 percent, 4 percent, and 0 percent, less height growth than the controls, which averaged 63 in. in height at that time. The tallest sapling, measuring 98 in., was located in the (b) treatment.

Studies on the growth of graded nursery stock (3) show that basswood seedlings with large root-collar diameters tend to produce very good growth in plantations. Similarly, pruning of lateral branches is also expected to benefit early development of basswood (1).

Browsing

In general, damage to trees from browsing by deer was negligible. It was observed on two 1-acre openings where damage was inflicted on 16 percent and 7 percent of the trees. It was also noted in the 30-acre clearing where less than 5 percent of the trees were browsed. Sometimes, browsed trees produced more height growth than those unbrowsed.

Discussion and Recommendations

The results gave sufficient proof that planting nursery grown basswood in hardwood cutovers can be successful. On one-half of the present plantings, 60 percent of the saplings were considered as potentially capable of becoming part of the future main stand. To speed the growth of trees, particularly those in the 4-foot and 5-foot height classes, the trees should be kept free from the suppressing underbrush. The economic value of releasing basswood, measuring 3 feet in height and less, is often questionable because of the large amount of underbrush that would have to be removed around each stem. There is also the danger of loss of vigor if small seedlings are suppressed for too long a period.

Starting with initial conditions that are generally comparable, some saplings grew taller in 4 years than others in 7 years. This fact underlines the importance of the interaction of a series of factors of micro-environment. To gain a better understanding of planting requirements, general conditions, as well as the microenvironment, should be closely evaluated in addition to the planting stock, planting time, and planting job. Sometimes, difficult terrain, such as steep, rocky slopes, may be just as suitable for planting of basswood as areas with apparently optimal conditions.

Planting in hardwood cutovers logically calls for three factors to be considered : (1) Amount and kind of vegetation under the old stand; (2) intensity, type, and size of cut, and (3) tending of the young growth.

From this, the following recommendations can be drawn: (A) Basswood established in cutover strips with side protection from the west and also in openings measuring 1 /3 acre and 1 acre in size under an evenly distributed residual stand containing about 35 sq. ft. of basal area per acre, give better survival and growth than plantings established in the open or under a dense canopy of residual trees. (B) On hillsides, occasional plateaus seem to be more suitable for planting basswood stock than the steep slopes. (C) Early release of basswood from the overhead canopy and underbrush should generally be carried out after the third growing season following planting.

(D) For best results, nursery propagation of improved quality stock is most desirable.

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