



Frontline

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Technical Note No. 18

RECOMMENDATIONS FOR THINNING YELLOW BIRCH AND SUGAR MAPLE SAPLINGS IN NORTHEASTERN ONTARIO

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CATEGORY: Silviculture

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INTRODUCTION

Sugar maple (*Acer saccharum* Marsh) and yellow birch (*Betula alleghaniensis* Britton) are the principal components of Ontario's tolerant hardwood forest type. One of the main objectives in managing northern hardwoods is the production of high-value veneer and sawlogs. Strip clear-cutting in the tolerant hardwood stands of the Great Lakes—St. Lawrence Forest Region of Ontario has resulted in excellent natural regeneration of yellow birch and sugar maple, but many of these stands are presently overstocked. Previous research in eastern Canada and the United States has shown that thinning can improve tree diameters and will thereby shorten rotation length (Heitzman and Nyland 1991).

This note provides recommendations for improving the management of overstocked tolerant hardwood stands. Recommendations are based upon a review of relevant literature and the results of a thinning demonstration conducted by the Canadian Forest Service—Sault Ste. Marie (von Althen et al. 1994).

THE CANADIAN FOREST SERVICE (CFS) THINNING DEMONSTRATION

The demonstration site (located approximately 30 km north of Thessalon, Ontario) once supported a mature sugar maple and yellow birch stand; however, this was highgraded in the late 1930s and early 1960s. The present-day stand originated from 20-meter-wide, alternate clear-cut strips, which were

cut in the winter of 1965/66 and then scarified to favor yellow birch regeneration. Twenty years later, the regenerated strips contained up to 8 800 stems ha⁻¹, mainly yellow birch and sugar maple.

In each study block, crop trees were selected from the dominant and codominant crown classes at an approximate spacing of 6 meters. Crop trees were released by cutting all competing trees within radii of either 10, 20, and 30 percent, and in the case of yellow birch, 40 percent of the total height of dominant and codominant trees. As this height was 10 meters, all trees within either 1, 2, 3, or 4 meters of the bole of the crop tree were felled. Key results of the study are provided in the following discussion and in von Althen et al. (1994).

RECOMMENDATIONS AND DISCUSSION

1. Apply the first crop tree release in 15- to 25-year-old sapling stands.

Lamson and Smith (1987) recommended delaying treatment until stands are at least 10 to 15 years old. Stoeckler and Arbogust (1947) reported that by the age of 11 dominance is expressed well enough in sugar maple to identify desirable crop trees. Godman (1968) suggested that for best results sugar maple should be thinned before the live crown ratio (live crown/total height X 100) drops below 40 percent. Erdmann et al. (1975) and Erdmann (1983) recommended that stands not be released until the first commercial thinning opportunity in pure sapling or pole stands of sugar maple, but suggested that yellow birch should be released earlier for a best response.



In the CFS thinning demonstration, von Althen et al. (1994) found that 20-year-old, overstocked, naturally regenerated sugar maple and yellow birch responded well to release. Crop-tree release increased 5-year diameter increment (Fig. 1) and larger increases were associated with greater release. However, release had little effect on the total height growth of either species. Diameter increment was correlated with the diameter at breast height (DBH) of the crop trees at the time of release. The clear bole length of the yellow birch crop trees decreased in the 40 percent release while the clear bole length of the sugar maple crop trees was little affected by the intensity of release (Fig. 2).

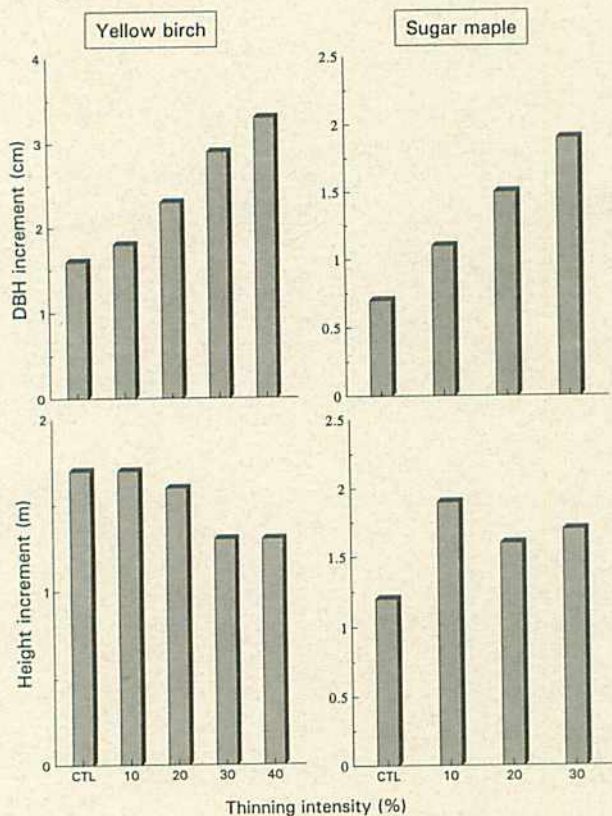


Figure 1. Five-year diameter and height increment of yellow birch and sugar maple crop trees by thinning intensity.

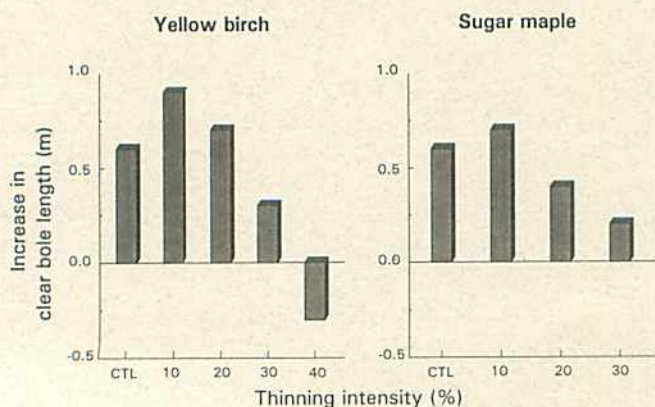


Figure 2. Five-year increase in the length of the clear bole of yellow birch and sugar maple crop trees by thinning intensity. Mean initial yellow birch and sugar maple crown lengths are 5.4 m and 4.5 m, respectively.

2. Release 200 to 250 yellow birch crop trees and 175 to 200 sugar maple crop trees per hectare.

Lamson and Smith (1987) recommended the release of 185 to 250 crop trees ha^{-1} , but the cost of releasing trees and the availability of good crop trees strongly influence this number. To reduce costs, McCauley and Marquis (1972) recommended the release of not more than 200 crop trees per hectare. Erdmann (1987) indicated that in the Lake States 185 crop trees ha^{-1} were sufficient for sugar maple and red maple, but recommended 250 crop trees ha^{-1} for yellow birch to allow for loss from disease and sap sucker (*Sphyrapicus varius*) damage. Also, since managed, even-aged northern hardwood stands generally have about 125 dominant or codominant trees ha^{-1} at maturity (Erdmann 1983), it seems unnecessary to release more than 185 to 250 trees ha^{-1} during precommercial operations.

3. Have crop trees selected by well trained, knowledgeable workers capable of exercising good judgement under variable stand conditions.

A good crop tree is a vigorous dominant or codominant tree with a straight stem; relatively free of surface defects, such as large knots or excessive epicormic branches; and with no major forks in the butt log. In the CFS thinning demonstration, von Althen et al. (1994) found that even when workers were given the characteristics of a good crop tree, if they were inexperienced and had little training, overemphasis was placed on stem form and insufficient emphasis was given to size. This resulted in the selection of a number of small, well-shaped codominants and intermediates. Large dominants of somewhat poorer, but nevertheless acceptable, form were ignored. The work of von Althen et al. (1994) showed that the larger trees, at the time of release, always grew faster than did the smaller ones.

4. For yellow birch, remove all trees with crowns touching the crown of the crop tree, or remove trees to create an opening 150 to 200 cm wide around the circumference of the crop tree crown.

Lamson and Smith (1987) recommended the crown-touching method to release northern hardwood saplings. With this treatment any tree, except another crop tree, is removed if its crown touches the crown of the adjacent crop tree, or if its crown overlaps above or below the edge of the crop-tree crown. Borderline trees close to the crop tree are also cut. Depending on the number of crop trees selected per hectare, most will be released on four sides. The actual distance between crowns released by this method should average 180 cm. Erdmann et al. (1975) found that crown release significantly increased diameter growth of all crop trees in a 16-year-old stand of yellow birch saplings in northern Michigan. Increases averaged about 36 percent in the first year, and 64 percent and 56 percent in the second and third years, respectively.

An alternative to the crown-touching method is the fixed-distance release, in which all competing trees are cut according

to the distance of their boles from that of the crop tree. This method has an advantage in that it sets a standard of release that is not subjective and can therefore be followed by inexperienced fellers. This method provides reasonably good results and the majority of crop tree crowns will be released on at least two sides.

The disadvantage of the fixed-distance method is its failure to remove trees with boles growing outside the cutting distance but leaning toward the crop tree and thereby interfering with crop tree crown expansion. This method also fails to remove overtopping trees with stems located outside the cutting distance. On the basis of these disadvantages, von Althen et al. (1994) recommended the crown-touching method.

5. For sugar maple, remove all trees with crowns touching the crown of the crop tree, or remove trees to create an opening of 120 to 150 cm around the circumference of the crop tree crown.

Drinkwater (1960) crown thinned around 21- to 26-year-old dominant and codominant sugar maple trees in Nova Scotia. He found that a release of 150–180 cm produced significantly better 5-year diameter and basal area growth responses than did either the control or a 90- to 120-cm release treatment. Dominant trees responded best. For best growth and quality development of saplings, Drinkwater (1960) recommended the 150- to 180-cm release treatment. Von Althen et al. (1994) found that under northeastern Ontario conditions, the crown expansion of sugar maple was slower than that of yellow birch (Figs. 3 and 4). The authors therefore recommended a smaller opening around the crowns of sugar maple than around those of yellow birch. Stem quality should not be degraded at the thinning levels recommended.

6. If recommended thinning intensities are used, repeat the release at 10-year intervals.

Von Althen et al. (1994) found that a thinning level of 30 percent in yellow birch created an opening 150 to 200 cm wide surrounding the released crop trees. A lower intensity release resulted in canopy closure within 5 years (Fig. 3). At a 30 percent release, 5 years after treatment the crop trees had increased their DBH and crown diameters, but not the clear bole length. During the second 5-year period the canopy will close, thereby reducing vigor and increasing mortality on the lower branches. There will be an extension of the clear bole length once the crown has closed.

Crown expansion of sugar maple is much slower than that of yellow birch (Figs. 3 and 4). To maintain good form and reduce epicormic branching the 20 percent thinning level, producing an opening 120 to 150 cm wide around the crop tree, is recommended. This level of thinning will result in crown closure within 10 years.

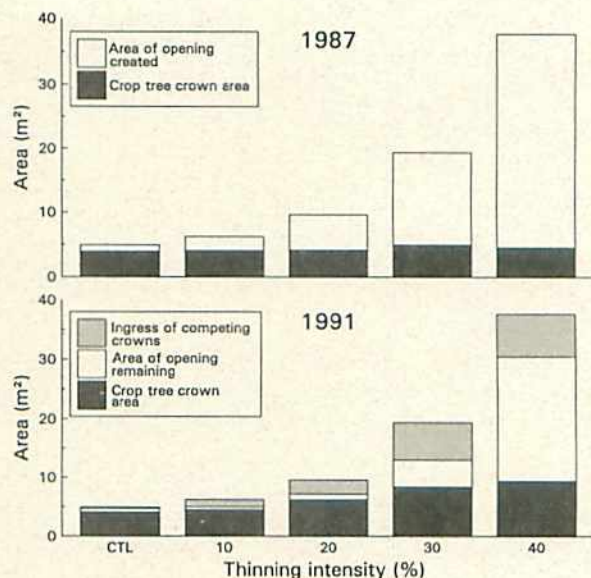


Figure 3. Available area for crown expansion of yellow birch crop trees shortly after thinning and 5 years later by thinning intensity.

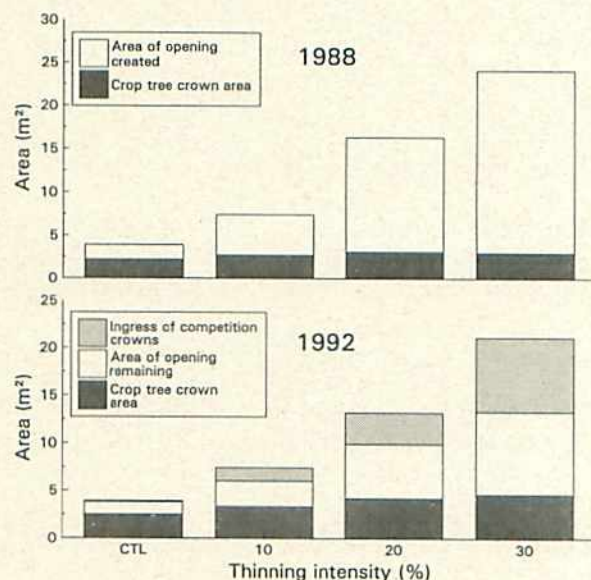


Figure 4. Available area for crown expansion of sugar maple crop trees shortly after thinning and 5 years later by thinning intensity.

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