

CROP-TREE RELEASE INCREASES BLACK BIRCH DIAMETER GROWTH

Jeffrey S. Ward[†]

Black birch (*Betula lenta*) is an increasing component of the southern New England forest where it currently accounts for nearly 7% of sapling and pole trees. In Connecticut, black birch cubic-foot volume has increased 64% since 1972. Because it had been a minor component of the forest until recently, there have been few studies that have examined its growth rate following release.

Crop-tree management (complete release) is one possible method of concentrating growth on individual stems of high value species (Perkey and Wilkins 1994). The concept is similar to weeding in a garden. Crop-tree management increases growth of selected trees by releasing moisture, nutrients, and light that had been utilized by less desirable trees. The rationale of crop-tree management is that limited management resources are best allocated to higher quality trees. Crop-tree thinning increases the value of the future stand by concentrating growth on individual high value trees. Crop-tree release is risky because management effort is concentrated on relatively few stems (Trimble 1974). Therefore, care should be taken in selecting high quality trees.

A precommercial crop-tree study established in 1988 found that relative to unreleased trees, crop-tree release increased diameter growth of black birch by 52% (Ward 1995). Smith and Lamson (1983) also reported that black birch growth increases following release. These studies indicated that further research was warranted on the influence of release on black birch growth. Therefore, research was begun in 1996 to determine how crop-tree release affects diameter and crown growth of black birch, and whether crop-tree release affects potential sawtimber quality.

Methods

In 1996, four crop tree plots were established in cooperation with Division of Forestry-CT DEP, Metropolitan District Commission, the Regional Water Authority, and Northeast Utility Forest Management Lands in cooperation with Ferrucci and Walicki, LLC (Table 1). A fifth plot was established in Suffield in 1997 on Northeast Utility Forest lands. All plots were fully stocked and had not been thinned for at least 20 years.

Table 1.—Initial stand and tree characteristics in a black birch crop tree study in Connecticut.

Plot	Diameter (inches)	Stand age (years)	Year released
Tunxis	4.8	20	1996
Saltonstall	5.1	20	1996
Suffield	8.9	51	1997
Tariffville	11.3	43	1996
Barkhamsted	13.8	99	1996

At least 60 crop trees were selected at each plot (317 trees total). Selection criteria for crop trees were codominant or dominant crown class, at least 17 ft to first fork, and potential grade 1 or 2 buttlog. Crop trees were banded at 4.5 feet and systematically numbered with red paint. Diameters were recorded to the nearest 0.1 cm (0.04 inches). Diameter measurements were taken with a diameter tape and repeated each year during the dormant season. Cookies were cut from at least six stumps on each plot after harvesting. Tree ages were determined from ring counts of the cookies after they were dried and sanded.

[†]Station Forester, The Connecticut Agricultural Experiment Station, New Haven, CT. To contact, call (203) 974-8495 or e-mail at Jeffrey.ward@po.state.ct.us.

The trees were split into two groups: trees 1-30 and trees 31-60. A coin flip determined which group was released on each plot. Release was completed as part of a thinning operation on all plots after the 1996 growing season. Tunxis was a noncommercial operation. The remaining trees that competed with selected crop trees (crowns within 3 feet of crop tree crown) were either felled or girdled. Trees on the Suffield plot were released after the 1997 growing season. For the preliminary analysis, plots were split into three groups: small poles (Tunxis and Saltonstall), large poles/small sawtimber (Suffield/Tariffville), and sawtimber (Barkhamsted).

Results and Discussion

Black birch has responded well to release (Table 2). Black birch on the small poles plots responded immediately to release. Diameter growth of released trees increased 75% the first year compared with unreleased controls. This increased growth has been maintained for 7 years. During this period, released poles have gained an additional inch in diameter. Diameter growth of large poles/small sawtimber was also increased by crop-tree release, albeit after a lag period of several years. Diameter growth since the third year after release has average more than 0.1 inches/year greater than for unreleased large poles/small sawtimber – roughly double that of the control trees.

Table 2.—Mean annual diameter growth (inches) of black birch released on four sides (crop-tree) vs. no release (control) by size class in Connecticut.

	Years since initial release							
	1	2	3	4	5	6	7	Mean
	Small poles							
Crop-tree (n=62)	0.29	0.35	0.21	0.25	0.32	0.23	0.26	0.27
Control (n=64)	0.16	0.19	0.10	0.14	0.15	0.11	0.14	0.14
Difference (%)	75%	83%	118%	82%	110%	113%	83%	92%
	Large poles/small sawtimber							
Crop-tree (n=63)	0.18	0.21	0.18	0.23	0.30	0.22	0.22	0.22
Control (n=64)	0.17	0.18	0.10	0.11	0.16	0.11	0.14	0.14
Difference (%)	6%	21%	72%	100%	92%	98%	64%	60%
	Sawtimber							
Crop-tree (n=31)	0.06	0.20	0.22	0.05	0.18	0.18	0.21	0.16
Control (n=33)	0.09	0.16	0.12	0.07	0.13	0.15	0.13	0.12
Difference (%)	-36%	24%	88%	-32%	46%	26%	61%	31%
	Combined size classes							
Crop-tree (n=156)	0.20	0.27	0.20	0.20	0.29	0.22	0.23	0.23
Control (n=161)	0.15	0.18	0.10	0.12	0.15	0.12	0.14	0.14
Difference (%)	39%	48%	93%	75%	92%	86%	72%	70%

The influence of crop-tree release on larger sawtimber black birch has been erratic and harder to assess. Growth response during the first 3 years was similar to that for the large pole/small sawtimber trees (i.e., slowly increasing). However, during the fourth year after release, diameter growth of released trees sharply declined for an unknown reason. Subsequently, diameter growth of released sawtimber trees has been greater than for unreleased controls. Over the 7-year period of this study, crop-tree release has increased diameter growth of sawtimber black birch by 0.04 inches/year.

This study found that black birch, especially trees with diameter less than 11 inches, respond well to complete release. This suggests that crop-tree management may be a valuable management in areas with a high proportion of black birch. Further research will be needed to assess stand growth rates of black birch using various silvicultural systems.

Literature Cited

- Perkey, A.W., and B.L. Wilkins. 1994. **Crop tree management in eastern hardwoods.** USDA Forest Service Technical Publication NA-TP-19-93.
- Smith, H.C., and N.I. Lamson. 1983. **Precommercial crop-tree release increases diameter growth of Appalachian hardwood saplings.** USDA Forest Service Research Paper NE-534.
- Trimble, G.R. 1974. **Response to crop-tree release by 7-year-old stems of red maple stump sprouts and northern red oak advance reproduction.** USDA Forest Service Research Paper NE-303.
- Ward, J.S. 1995. **Intensity of precommercial crop-tree release increases diameter and crown growth in upland hardwoods.** USDA Forest Service General Technical Report NE-197: 388-398.