

Large Stock, Deep Planting Improve Cottonwood Growth in Upper Mississippi Valley

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Recent studies show that large, deep-planted cottonwood seedlings have better survival and growth rates than small, bar-planted seedlings in northeastern Missouri and southeastern Iowa, and that cuttings do not survive as well as seedlings. Regardless of the planting method or planting stock used, adequate site preparation and good weed control are essential to satisfactory growth and survival of cottonwood.

Cottonwood planting and culture are being tried commercially by several landowners in the upper Mississippi Valley. Early results have been poor, probably because of improper planting methods and/or poor planting stock. Successful methods of planting cottonwood have been developed for southern bottomlands (1, 2). Recommended methods include raising large seedlings, deep planting, intensive site preparation, and clean cultivation. However, only a few tests of these methods have been made in the upper Mississippi Valley (3, 4). A recent study shows that deep planting of large stock can result in better survival and growth rates than the commonly-used practice of hand planting nursery-run seedlings or cuttings.

Methods

Test planting sites were near the Coralville Reservoir in Johnson County, Iowa, and on Crandon Forest Farms in Clark County, Mo. Both are typical bottomland sites subject to occasional flooding during spring and winter. The Coralville plots are on Buckner loamy sand; the Crandon plots are on Wabash silt loam. Both areas had been cultivated

for row crops until the year before these plantings. They were plowed and disked in April 1966, when the cottonwood was planted for this study. The following combinations of planting stock and planting depth were used

1. small seedlings, bar planted

2. small seedlings, deep planted
3. large seedlings, bar planted
4. large seedlings, deep planted
In addition, 18-inch cuttings, bar planted, and 30-inch cuttings, deep planted, were tested on the Coralville plots. The "small" seedlings, which were typical of seedlings produced at most nurseries, had a caliper of $\frac{1}{4}$ to $\frac{3}{8}$ inch and were 18 to 24 inches tall. The large seedlings had a caliper of $\frac{3}{8}$ to $\frac{1}{2}$ inch and were 48 to 60 inches tall. Deep planting (24 to 30 inches) was done with a tractor-mounted post-hole digger. The tops of all seedlings were cut off flush with the ground after planting.

Plots were arranged in a ran

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domized block design on each area.

Each plot on the Coralville Reservoir contained 15 trees, spaced 8 by 8 feet, and each planting stock-planting depth combination was replicated on four plots. Each plot on Crandon Forest Farms contained 10 trees, spaced 14 by 14 feet, and each combination was replicated on three plots.

Clean cultivation was maintained by roto-tilling on the Coralville plots, and by disking on the Crandon plots. At least four cultivations were necessary each year for adequate weed control; the overall weed control was much better on the Coralville plots than on the Crandon plots.

Results

At the end of two growing seasons, the large seedlings on the Coralville plots had grown 1 to 2 feet more in height and 0.2 to 0.3 inches more in diameter than the small seedlings (table 1). The same trends were apparent on the Crandon plots, but the results were not statistically significant. The combination of deep planting and large seedlings on the two areas resulted in an average of 2 feet more height growth and 0.5 inches more diameter growth than bar planting small seedlings. Deep plant

ing did not significantly increase growth on either area, but it did result in better survival on the Crandon plots.

The cuttings grew about as fast as large seedlings, but did not survive as

poor rooting. In addition, many of the cuttings produced multiple sprouts and required some additional pruning to maintain a single stem.

The overall growth was poorer on the Crandon plots than on the Coralville plots. At the end of 2 years, the trees on the Crandon plots averaged almost 4 feet shorter than those on the Coralville area. This is attributed mainly to poorer weed control on the Crandon area because heavy spring rains prevented proper timing of cultivations. Consequently, weeds quickly overtopped the seedlings and interfered with cultivation. Many of the small bar-planted seedlings were damaged during the cultivations because they did not grow as fast in the spring as the large seedlings and were difficult for the tractor operator to see.

Discussion

The combination of large seedlings and deep planting seems to have more potential than cuttings or bar-

planted small seedlings in terms of vigor and stocking. But regardless of the planting method used, adequate site preparation and good weed control are musts for planting success.

The basic problems confronting the tree planter are, of course, the cost of the extra-large stock and the cost of planting it. However, at the wide spacing now recommended for cottonwood plantations, the cost of planting stock represents a small part

therefore, would probably pay a premium price for larger planting stock, if necessary, to ensure good survival and growth and to avoid replanting.

The total cost of site preparation (plowing and disking) and deep planting (stock not included) averaged \$25.20 per acre on 17 acres adjacent to the Crandon test planting (4). Similar costs for hand planting small seedlings would probably average \$15 to \$20 per acre. Thus, the additional cost involved in deep planting does not seem to be prohibitive, and may be well justified in

terms of better survival and growth rates.

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TABLE 1.—*Survival and growth of cottonwood seedlings at the end of the second growing season*

CORALVILLE				
Planting stock	Planting method	Survival	Avg. height	Avg. diameter
		Percent	Feet	Inches
Small seedlings	Bar planted	92	13.1	1.6
	Deep planted	90	13.7	1.8
Large seedlings	Bar planted	95	14.3	1.9
	Deep planted	98	14.9	2.0
18-inch cuttings	Bar planted	72	14.0	1.7
30-inch cuttings	Deep planted	85	13.4	1.7
CRANDON				
Small seedlings	Bar planted	37	8.4	1.4
	Deep planted	87	10.0	1.8
Large seedlings	Bar planted	50	10.2	1.7
	Deep planted	93	10.7	2.0

¹Measured at 4.5 ft. on trees at Coralville and at 0.5 feet on trees at Crandon.

well. The failures were due mainly to of the total investment. Tree planters,