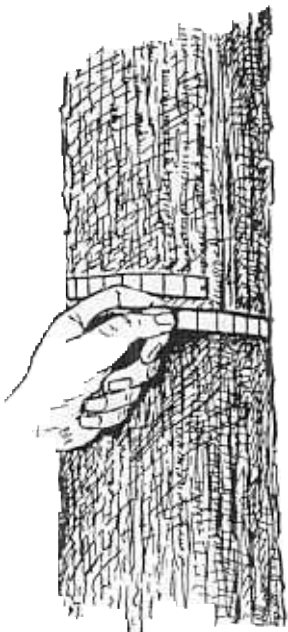
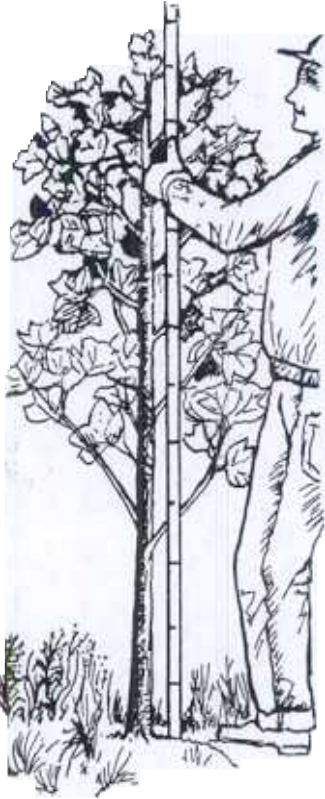


SIMULATED ROOT WRENCHING STUDY



Virginia Division of Forestry



Department of Conservation and Economic Development

Results of Root Wrenching
in a Sandy Nursery Soil

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ABSTRACT

Mechanical root wrenching in the seedbeds was simulated by hand-pulling loblolly pine seedlings to break the tap roots, and half of the seedlings were also top clipped.

Wrenching had no effect on seedling survival or diameter growth in the seedbeds, but top clipping reduced diameter growth.

Three years after planting in the field, neither the wrenching or top clipping treatments had had any effect on survival or height growth.

PROCEDURE

Root wrenching is an operational nursery practice in New Zealand, Australia, parts of Europe, and at some nurseries in the western United States. It is done by undercutting with a tilted blade that cuts the tap roots and raises the seedlings slightly. It is usually done several times during the season, the purpose being to develop a more fibrous root system, reduce height growth, and loosen and aerate the soil.

In the fall of 1972, mechanical root wrenching was simulated by hand-pulling loblolly pine seedlings growing in a very sandy soil (Lakeland ls) at the New Kent Nursery. Seedlings were given a sharp pull, a handful at a time, sufficient to break the tap roots. This loosened the seedlings considerably and caused some to lean over. Seedlings were watered immediately after wrenching to settle the soil. There were three wrenching treatments: control, wrenching once-on September 22, and wrenching twice-on September 22 and October 27. At the time the second wrenching was done five weeks after the first, many of the seedlings were still loose from the first wrenching. They seemed to have made little, if any, new root growth. Top clipping on September 22 was also added as a treatment. There were six treatments:

- | | |
|--|---------------|
| 1. not wrenched | - top clipped |
| 2. not wrenched | - not clipped |
| 3. wrenched on September 22 | - top clipped |
| 4. wrenched on September 22 | - not clipped |
| 5. wrenched on September 22 and October 27 | - top clipped |
| 6. wrenched on September 22 and October 27 | - not clipped |

The six treatments were installed in two different nursery locations (two replications in the nursery). Treatment plots were 1-1/2 feet long (1-1/2 feet wide across the seedbed). Clipping was done with hand clippers using a board as a guide to clip at a uniform height. Clipping heights were 5-1/2 inches and 6-1/2 inches at the two nursery locations, the average seedling heights on September 22.

TREATMENT EFFECTS IN THE SEEDBED

On December 13, a one-foot wide sample was lifted across the bed from the center of each 1-1/2 foot wide plot. Seedlings were separated by root collar diameter (1/32 inch classes). New root growth on wrenched seedlings was primarily sinker roots, few of which developed at the point where the tap root was broken. Wrenching and/or clipping did not effect survival in the seedbed (Table 1). Top clipping reduced diameter growth slightly, but wrenching had no effect on growth in the seedbed (Table 1).

Table 1. Average number of seedlings per square foot and average root collar diameter^{1/}

| <u>Wrenched</u> | <u>Seedbed Density</u> | <u>Root Collar Diameter (32nds)</u> |
|--|----------------------------|---|
| Not wrenched, clipped | 57 | 3.6 |
| Not wrenched, not clipped | 53 | 4.0 |
| September 22, clipped | 59 | 3.6 |
| September 22, not clipped | 54 | 3.8 |
| September 22 and October 27, clipped | 51 | 3.7 |
| September 22 and October 27, not clipped | 52 | 3.9 |

TREATMENT EFFECTS AFTER PLANTING IN THE FIELD

Sixty seedlings were selected from each treatment for planting in the field. These were taken proportionally from each root collar diameter

^{1/} Separate analyses of variance were made for number of seedlings per square foot and root collar diameter. The only statistically significant main effect was the effect of top clipping on root collar diameter (at the .05 level). Duncan's New Multiple Range Test was used to test differences among individual treatment means, and none were significant at the .05 level.

class so that a representative sample was obtained for planting.

Three replications of each of the six treatments were planted in a completely random design, with a replication being a 20-seedling row. The seedlings were planted on the Buckingham State Forest, in the central Piedmont of Virginia, on December 20.

Survival was tallied and the height of each seedling was measured after one, two and three seasons in the field (Table 2). Wrenching and top clipping treatments had no effect on survival and growth in the field.

Table 2. Survival percent and height in feet after one, two and three seasons in the field.

| <u>Treatment</u> | <u>Survival Percent</u> | | | <u>Average Height</u> | | |
|---|-------------------------|----------|----------|-----------------------|----------|----------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>1</u> | <u>2</u> | <u>3</u> |
| Not wrenched, clipped | | 96.7 | 96.7 | .9 | 2.7 | 5.3 |
| Not wrenched, not clipped | | 97.5 | 97.5 | .9 | 2.7 | 5.3 |
| Wrenched Sept. 22, clipped | | 96.7 | 96.7 | .9 | 2.7 | 5.3 |
| Wrenched Sept. 22, not clipped | | 93.3 | 93.3 | .9 | 2.7 | 5.2 |
| Wrenched Sept. 22 & Oct. 27, clipped | | 95.0 | 94.2 | 1.0 | 3.0 | 5.8 |
| Wrenched Sept. 22 & Oct. 27, not clipped | 96.7 | 95.8 | 95.8 | .8 | 2.8 | 5.4 |

DISCUSSION

In this small test, on a very sandy soil characteristic of the New Kent Nursery, simulated root wrenching had no effect on seedling survival or growth, either in the seedbed or after planting in the field. Wrenching did not result in the development of a denser, more compact root system. The main effect on root morphology was the development of sinker roots, mainly from lateral roots.