

**CLAY DIPPED**

**VS.**

**BARE ROOTED**

**seedling survival**



Virginia Division of Forestry



Department of Conservation and Economic Development

# CLAY DIPPED VS. BARE ROOTED SEEDLING SURVIVAL

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## INTRODUCTION

Prior to 1960 the Virginia Division of Forestry nursery at New Kent prepared all pine seedlings for shipment by packaging them in damp sphagnum moss. From 1960 to 1965 a mixture of sphagnum moss and excelsior was used. In 1965, on a trial basis, the nursery began root dipping pine seedlings in a mixture of kaolin clay and water before packaging. Before going operational it was decided to test clay dipped seedlings to determine what the effect might be on planting survival.

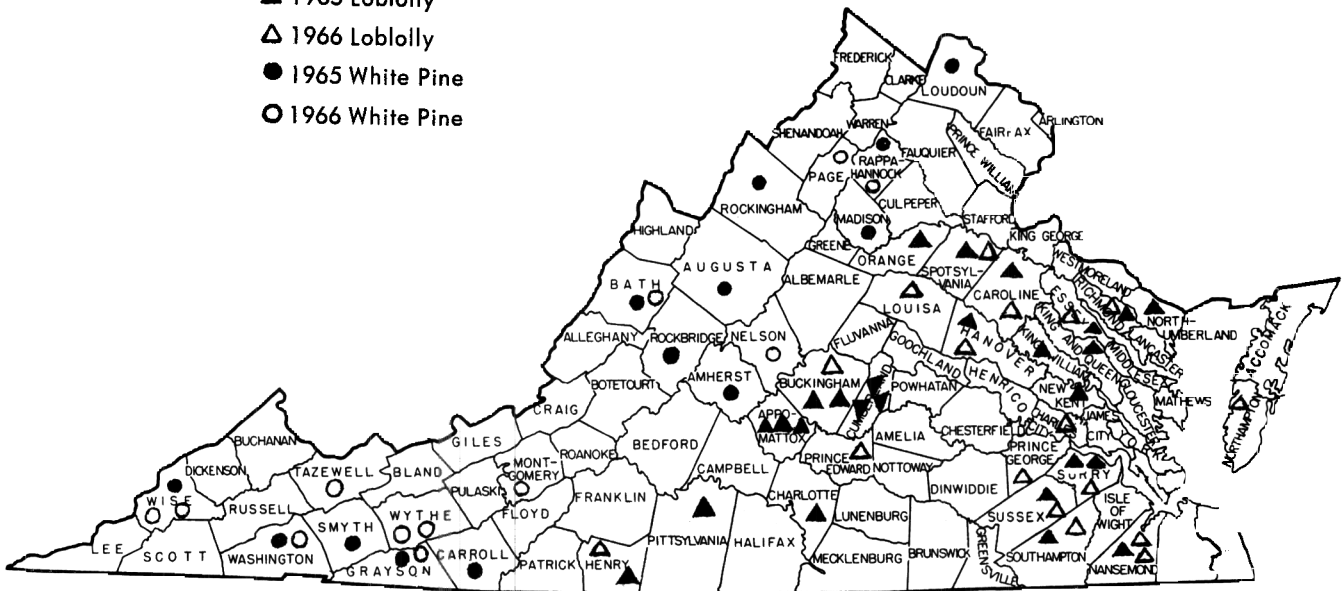
Therefore, during the 1965 spring planting season loblolly and white pine seedlings, some packed clay dipped and some packed in moss (bare rooted) were sent to different areas throughout Virginia for use in test plantings. White pines were planted in the mountains and loblolly pines in the piedmont and coastal plain. At each planting site both clay dipped and bare rooted seedlings were planted in paired plots.

A similar study which included seedling exposure prior to planting was established in spring, 1966.

This report describes these studies and gives their results.

## PLOT LOCATIONS

- ▲ 1965 Loblolly
- △ 1966 Loblolly
- 1965 White Pine
- 1966 White Pine



# 1965 STUDY

## SPECIES

Loblolly (1-0) and white (2-0) pine seedlings. A small section of nursery bed which was uniform as possible was reserved for each species.

## TREATMENT AND PACKAGING

Clay dipped seedlings, 50 in a bundle, were root dipped in kaolin clay<sup>1</sup> and packed 1,000 seedlings in a package for white pine and 2,000 seedlings for loblolly pine. The dipped seedlings were first wrapped in absorbent paper, then covered with waterproof paper and protected with veneer boards. A firm and compact seedling package resulted.

Bare rooted seedlings were packed using a mixture of damp sphagnum moss and excelsior and contained the same number per package as the clay dipped.

## DELIVERY AND STORAGE

Seedling delivery to the various Virginia Division of Forestry district offices and state forests was made in mid-March and seedlings were kept inside unheated buildings approximately one week prior to delivery to the site selected for planting.

## PLANTING SITES

For loblolly pine, plantings were made on 26 different tracts in 22 counties throughout the piedmont and coastal plain. Included were 5 plantings on fields, 13 on cutover land, and 8 on bulldozed or disced areas.

For white pine, plantings were made on 13 different tracts in 13 mountain counties. Six of these plantings were established on fields and seven on cutover land.

## PLOTS ESTABLISHED

Two seedling packages, one containing clay dipped and the other moss packed (bare rooted) seedlings were delivered to each tract. One hundred seedlings were randomly selected from each package for planting. These were hand planted by Virginia Division of Forestry personnel during the latter part of March in 10 rows of 10 seedlings each using a spacing of 6.6 feet by 6.6 feet. There was a minimum of seedling exposure prior to being planted.

1. Approximately three pounds dry weight kaolin clay (refractory ground, 27 microns and smaller) mixed with water was used per 1,000 seedlings. It was estimated that the package weight for 2,000 seedlings was increased by approximately nine pounds comparing conventional moss packed with clay dipped.

## RESULTS

Survival data were taken in late fall-early winter, 1965.

### Loblolly pine.....

Clay dipped seedling survival ranged from 75 to 98 percent with an average survival of 93.3 percent and bare rooted ranged from 57 to 98 percent with an average survival of 90.7 percent. The difference of 2.6 percent was not statistically significant. Of the 26 paired plots used, clay dipped seedlings survived better on 17, bare rooted survived better on 6 plots, and on 3 paired plots survival was the same.

### White pine....

Clay dipped seedling survival ranged from 71 to 95 percent with an average survival of 86.1 percent and bare rooted ranged from 90 to 100 percent with an average survival of 95.8 percent. The difference of 9.7 percent in favor of bare rooted seedlings is statistically significant at the 0.005 level ( $\frac{1}{2}$  of 1 percent). On all 13 paired plots bare rooted seedlings survived better than clay dipped seedlings.

## 1966 STUDY

In the 1966 study the seedlings were purposely exposed by hand carrying the seedlings for varying lengths of time before planting. The purpose of exposing the seedlings was to determine the effect of this exposure on planting survival for both clay dipped and bare rooted seedlings. Except for exposure, the 1966 study is similar to the one established in 1965.

### PLANTING SITES

A total of 18 loblolly pine planting sites, which included 3 plantings on fields, 8 on cut-over, and 7 on disked or bulldozed, were established in 17 piedmont and coastal plain counties.

Fourteen white pine plantings were established in 11 mountain counties. Nine of these plantings were established on fields and five on cut-over land.

## EXPOSURE TREATMENTS

After the seedlings were removed from the package they were carried by hand, (roots exposed) until planted. The 100 clay dipped and 100 bare rooted seedlings received the same treatment which consisted of exposing the 10 seedlings planted in row one from 0 to 5 minutes, the 10 seedlings in row two from 6 to 10 minutes, and so on until the 10 seedlings planted in row ten were exposed from 46 to 50 minutes before being planted.

Seedlings were planted on sunny days beginning in the early afternoon.

## RESULTS

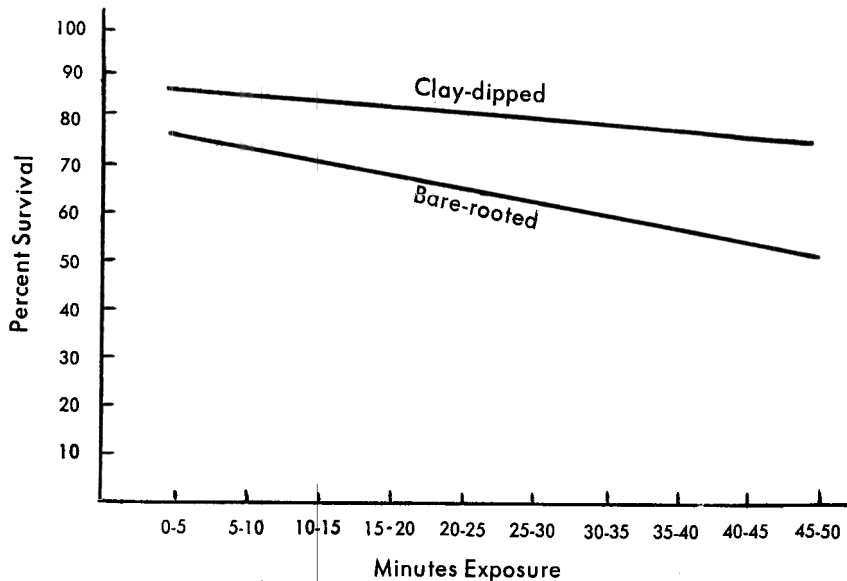
Survival data were taken in early winter, 1966, and are summarized below.

### Loblolly pine.....

Clay dipped seedling survival ranged from 40 to 97 percent (for individual tracts, all exposure times included) with an average survival of 79.8 percent and bare rooted ranged from 40 to 91 percent with an average survival of 63.4 percent. The difference of 16.4 percent in favor of clay dipped was significant at the 0.005 level ( $\frac{1}{2}$  of 1 percent). Of the 18 paired plots used, clay dipped seedlings survived better on 16 while bare rooted survived better on only two.

With increased exposure time survival decreased for both bare rooted and clay dipped seedlings as shown in the graph below. With increased exposure, bare rooted seedling survival tended to decrease more rapidly than clay dipped but this difference in rate of decrease was not significant.

Loblolly pine—1966

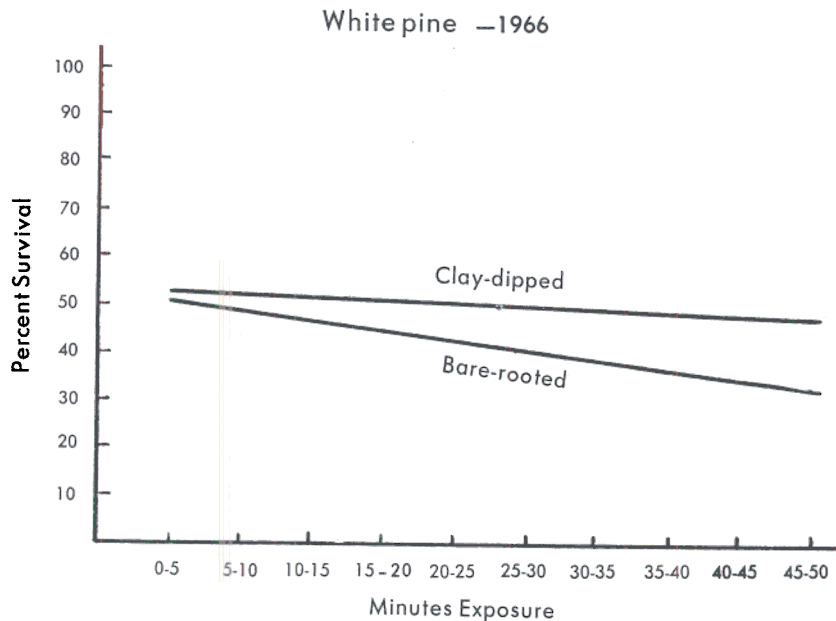


## White pine.....

For individual tracts, all exposure times included, clay dipped seedling planting survival ranged from 6 to 86 percent with an average survival of 49.1 percent and bare rooted ranged from 4 to 86 percent with an average survival of 41.3 percent. The difference of 7.8 percent in favor of clay dipped was significant at the 0.005 level. There were a total of 14 paired plots used and of these, clay dipped seedlings survived better on 11, on one bare rooted survived better, and two had the same survival.

The summer of 1966 was characterized by prolonged drought which was particularly severe in the section of Virginia where white pine was planted and not included in the analysis were three paired plots where all seedlings died.

As exposure time increased survival decreased for both clay dipped and bare rooted seedlings. This is shown in the graph below. With increased exposure bare rooted survival decreased more sharply than the clay dipped with the difference in rate of decrease being significant at the 5 percent level.



## CONCLUSIONS

1. In 1965 clay dipped loblolly pine seedlings survived somewhat better but the difference was not significant. Clay dipped loblolly pine seedlings survived better than bare rooted in 1966 with the difference of 16.4 percent in favor of clay dipped being significant. The two year results indicate that clay dipped seedlings survive somewhat better than bare rooted.

2. The results for white pine are inconclusive because bare rooted seedlings survived better in 1965 while in 1966 clay dipped seedlings survived better.

3. In the 1966 study as exposure time increased survival decreased for both loblolly and white pine, whether clay dipped or bare rooted. Therefore, it is *necessary* to protect clay dipped and bare rooted seedling roots alike before planting. Undue exposure should be avoided.