

## FALL PLANTING AND STORAGE USING NON-DORMANT SEEDLING

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Abstract.--Lifting, storing, and planting loblolly pine seedlings in October and November, before they become fully dormant, was tested over a three year period. Survival for immediate planting (the same day or the day after lifting) was satisfactory in two of the three years for October liftings, and in all three years for November liftings. Long term cold storage in 1971 (2 to 3 months) caused almost complete mortality of seedlings lifted in October and November. Two weeks of cold storage in 1972 and 1973 resulted in very poor survival for the October liftings, and satisfactory survival in 1972 but not in 1973 for the November liftings.

### INTRODUCTION

In Virginia, the loblolly pine (*Pinus taeda* L.) planting season begins about December 1, because this is the date when seedlings are considered to be fully dormant. Trew (1969) lifted non-dormant seedlings on October 15 and November 15 and kept them in cold storage for 8 and 6 days respectively before planting. Survival was unsatisfactory: 42 and 32 percent for the October 15 and November 15 liftings respectively.

The studies described in this paper were installed to further test the possibility of using non-dormant seedlings. October and November lifting, storing, and planting were tested over a three year period, from 1971 through 1973.

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## 1 9 7 1    S T U D Y

### Procedure

Seedlings were lifted every two weeks from October 15 through December 15, from an area of the nursery having uniform seedlings. Some seedlings were planted immediately, within a day of lifting. Other seedlings from each lifting were packed in 1,000 seedling packages and placed in cold storage until January 15, when they were planted (the reason for the long period of cold storage was to find out if seedlings might be lifted in the fall and stored until January, when the heavy demand for seedlings usually begins). Seedlings were also lifted on January 15 and March 15 and planted immediately.

Plantings were made on two different sites: a piedmont site on the Cumberland State Forest and a coastal plain site on the Pocahontas State Forest (three randomized blocks of 20 seedling rows on each site).

### Results

All of the immediate plantings survived satisfactorily, but the results were very different for the stored seedlings (table 1). Almost all of the stored seedlings from the October and November liftings died. Apparently the seedlings became fully dormant sometime between November 15 and December 1.

Seedlings planted on October 15 apparently became established quickly. They were the first to begin height growth in the spring, and were already starting to grow when the March 15 planting was made. After three seasons in the field they are the tallest (table 1).

Table I.--Survival and average height after three seasons in the field

Lifting Date	Planting Date	Survival Percent <sup>a/</sup>		Height in Feet	
		Cumberland	Pocahontas	Cumberland	Pocahontas
10315	10315	91.7 cde	77.5 be	6.3 b	6.4 e
	1315	0 a	0 a	---	---
1131	1131	76.7 b	65.8 b	5.4 ab	6.0 be
	1315	0 a	0 a	---	---
11315	11315	77.5 bc	73.2 b	4.8 a	5.9 bc
	1315	1.7 a	2.5 a	---	---
12/1	1231	95.8 e	90.8 cd	5.7 ab	6.1 be
	1315	83.3 bcd	90.8 ed	4.8 a	5.1 a
12315	12315	98.3 e	96.7 d	5.7 ab	6.2 be
	1315	93.3 de	93.2 d	5.2 a	5.6 ab
1315	1315	95.8 e	97.5 d	5.6 ab	5.9 bc
3315	3315	95.8 e	95.8 d	5.2 a	5.8 abc

<sup>a/</sup> Analyses of variances were made (survival percents were transformed to arc sin). Differences between treatments were tested using Duncan's New Multiple Range Test. Means not followed by the same letter are significantly different at the .01 level.

## 1 9 7 2 STUDY

### Procedure

Seedlings were lifted every two weeks from October 1 through December 15, and also on March 1. All seedlings were lifted from part of a single seedbed selected for uniformity of seedling size and seedbed density. Some seedlings were planted immediately, within a day of lifting, and other seedlings from each lifting were placed in cold storage for two weeks and then planted.

The seedlings were planted on a piedmont site on the Cumberland State Forest (three randomized blocks of 20 seedling rows).

Results

All of the immediate plantings survived well (table 2). Storage for just two weeks caused almost complete mortality of seedlings lifted in October, but seedlings lifted in November stored satisfactorily.

Seedlings planted in October, November, and December are taller after three seasons in the field than seedlings planted in March (table 2).

Table 2.--Survival and average height after three seasons in the field

Lifting Date	Planting Date	Survival Percent	b	Height in Feet
1031	1031	3.3	a	5.1 ab
	10315	3.3	a	
10315	10315	80.0	be	5.3 b
	1131	11.7	a	
1131	1131	91.7	be	5.2 b
	11315	90.0	be	5.0 ab
11315	11315	90.0	be	4.8 ab
	1231	71.7	b	4.9 ab
1231	1231	93.3	be	5.2 b
	12315	96.7	e	4.8 ab
12315	12315	96.7	c	5.2 b
	131	86.7	be	5.0 ab
331	331	91.7	be	4.6 ab
	3315	91.7	be	4.4 a

b3 Analyses of variances were made (survival percents were transformed to arcsin). Differences between treatments were tested using Dunnett's New Multiple Range Test. Means not followed by the same letter are significantly different at the .01 level.

## 1 9 7 3 STUDY

### Procedure

As in the 1972 study, seedlings were lifted every two weeks from October 1 through December 15, and also on March 1. Some seedlings were planted immediately, within a day of lifting, and other seedlings from each lifting were placed in cold storage for two weeks before planting.

Seedlings were lifted from 12 different locations in the nursery. On each lifting date a small sample was lifted from each of the 12 locations, and these 12 samples were combined to obtain the seedlings for immediate planting and storage.

The seedlings were planted on a piedmont site on the Buckingham State Forest (three randomized blocks of 20 seedling rows). In addition, the immediate planting was repeated (also three randomized blocks of 20 seedling rows), on a very sandy, coastal plain site.

### Results

On both sites, immediate plantings in October were unsatisfactory, but immediate plantings in November did about as well as later plantings (table 3). As in the 1972 study, storage for just two weeks caused almost complete mortality of seedlings lifted in October, but seedlings lifted in November did not survive as well after storage as in the 1972 study.

Seedlings planted in October, November, and December (with the exception of the October 15 planting) are taller after two seasons in the field than seedlings planted in March (table 3).

Table 3.--Survival and average height after two seasons in the field

Lifting Date	Planting Date	Survival Percent		Height in Feet					
		Piedmont	Coastal	Piedmont	Coastal				
1031	1031	46.7	c	29.2	b	3.4	c	2.9	c
	10/15	5.8	a						
10315	10315	20.8	b	12.5	a	2.6	a	2.1	ab
	1131	.8	a						
1131	1131	77.5	ef	88.3	d	3.3	c	2.8	c
	11315	37.5	bc			2.9	abc		
11315	11315	78.3	ef	70.8	e	3.2	bc	2.6	be
	1231	50.8	cd			2.8	abc		
1231	1231	81.7	ef	89.2	d	3.0	abc	2.6	abc
	12315	71.7	de			3.0	abc		
12315	12315	89.2	ef	87.5	d	3.3	bc	2.6	bc
	131	91.7	f			3.2	abc		
331	331	78.3	ef	73.3	c	2.9	abc	2.1	a
	3315	49.2	ed			2.7	ab		

c3 Analyses of variance were made (survival percents were transformed to arc sin). Differences between treatments were tested using Dunnett's New Multiple Range Test. Means not followed by the same letter are significantly different at the .01 level.

#### DISCUSSION

October is apparently too early to consider lifting and planting. In one of the three years, even seedlings planted within a day of lifting failed to survive satisfactorily, and storage for just two weeks caused almost complete mortality in both years it was tested. Seedlings are far from being dormant in October, as top growth usually continues in the seedbeds until about November 1. In addition to the seedlings not being dormant, the weather is often hot and dry in October.

Extending the planting season forward into November appears feasible if the seedlings can be planted within a few days of lifting. Seedlings planted <sup>w</sup>within a day of lifting survived satisfactorily in all three years, but storage for two weeks caused survival to drop below satisfactory levels in one of the two years it was tested.

Height growth was not reduced by planting in October and November. In fact, seedlings planted in October, November and December apparently became established sooner than seedlings planted in March, and consequently made better growth.

#### LITERATURE CITED

Trew, I. F. 1969. Late season (May to November) loblolly pine planting in Virginia Piedmont. West Virginia Pulp and Paper Company, Research Report No. 35.