Comparison of Early Performance of Containerized and Bare-Root Loblolly Pine Seedlings Planted from October through April

Research Report 140 **May 2021**

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The Bottom Line…

Containerized loblolly pine seedlings survived and grew well if planted prior to December or later than March. Bare-root loblolly seedlings performed best if planted in February through April and acceptably when planted in the fall.

Abstract

A study was established beginning in October 2018 to compare loblolly pine seedlings propagated in containers to those raised in traditional beds and planted "bare-root" at three locations – Appomattox-Buckingham, Dragon Run, and Cumberland State Forests. Planting occurred at mid-month in October, November, December, February, March, and April. After the second growing season, the container seedlings had survived and grown well when planted early (October to November) and late (April) but suffered high mortality when planted in the colder months. By comparison, the bare-root seedlings survived reasonably well at any planting date and best when planted in the February to April time frame.

Background

Nurseries have been growing and deploying an increasing number of containerized loblolly pine seedlings over the past decade or more, but there has been only limited experience with planting container seedlings in Virginia. The Virginia Department of Forestry's Garland Gray nursery began growing a pilot-scale container crop in 2017. There has been concern that weather patterns – especially cold temperatures – could diminish the performance (in terms of survival or growth) of container seedlings in Virginia.

Methods

A study to compare the survival and height growth of containerized and bare-root seedlings planted monthly from October through December and February through April (there was no January planting due to frozen soil conditions) was initiated beginning in October 2018. Three locations were established at each of three state forests: Appomattox-Buckingham, Cumberland, and Dragon Run. At each, a split-plot design was installed with treatment date as whole plots and seedling type

(container or bare-root) as the subplots in side-by-side, ten-tree rows. Planting occurred at mid-month (the 15th or 16th) for each date.

The VDOF Garland Gray nursery's Virginia's Best seedlings were used for this test. For the container seedling type, seedlings were de-plugged in mid-October, placed in a plastic bag inside a seedling box and kept stored in the nursery cooler until planted. Bare-root seedlings were hand-lifted within 36 hours of planting for the October through December dates. For February through April plantings, bare-root seedlings were obtained from operationally-lifted stock that was stored in an open-ended bundle in the nursery cooler. All test seedlings were transported to planting sites in a portable cooler and planted within 36 hours of leaving the nursery cooler.

Seedling survival and height were measured after each of the first two growing seasons. Analysis of variance was used to test for differences between seedling types (container vs. bare-root) and planting dates.

Results

The data are summarized in Tables 1 and 2, and Figures 1 and 2. After two years, there are statistically-significant effects of both planting timing and seedling propagation method on survival and growth.

The bare-root seedlings survived well (81% or more) across the range of planting dates, although their survival was better (96% or more) when planted in the February through April time frame. Container seedlings survived better than bare-root seedlings when planting occurred in October. Once freezing temperatures started to occur, container seedling survival dropped off substantially. In the spring, container seedlings survived well when planted in April, even though they had been in storage for six months.

Height growth varied across locations, but was only affected significantly at the October planting date. Containerized seedlings were 5.4 feet tall after two years while bare-root seedlings were 4.6 feet tall when planted in October. The height differences for the other planting dates did not vary significantly due to propagation method. The container seedlings grew less when planted after November. Seedlings at all locations and planting dates were impacted by tipmoth damage, which probably reduced height growth.

Table 1. Survival (%) in the first and second growing seasons of container and bare-root loblolly pine seedlings planted in October through April.

Month	Average Seedling Survival (%)			
	First-Year		Second-Year	
	Bare-Root	Container	Bare-Root	Container
Oct.	81%	100%	81%	99%
Nov.	86%	86%	82%	86%
Dec.	94%	43%	92%	43%
Feb.	98%	67%	96%	67%
Mar.	99%	66%	98%	62%
Apr.	99%	96%	97%	94%

Table 2. Average height (ft.) in the first and second growing seasons of container and bare-root loblolly pine seedlings planted in October through April.

Month	Average Seedling Height (ft.)			
	First-Year		Second-Year	
	Bare-Root	Container	Bare-Root	Container
Oct.	1.5	1.9	4.6	5.4
Nov.	1.4	1.5	4.5	4.9
Dec.	1.4	1.3	4.5	4.3
Feb.	1.4	1.3	4.7	4.3
Mar.	1.5	1.3	4.6	4.2
Apr.	1.3	1.4	4.3	4.5

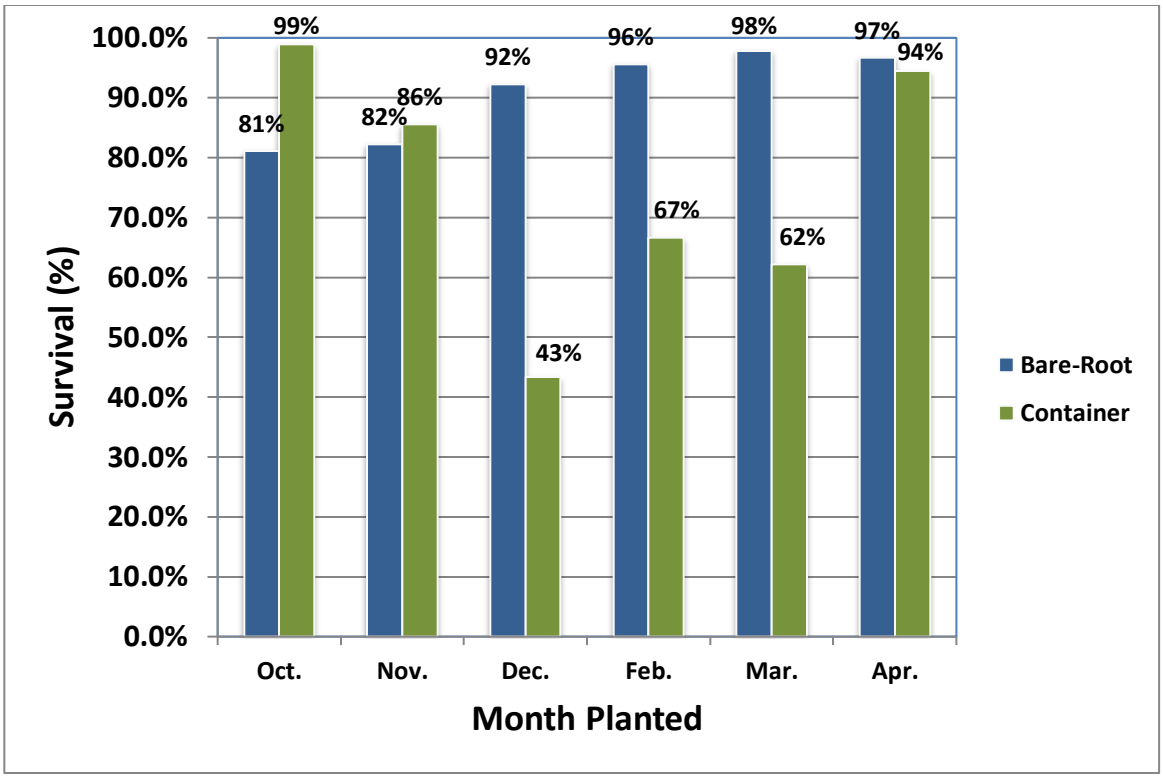

Figure 1. Two-year survival (%) of container and bare-root loblolly pine seedlings planted in October through April.

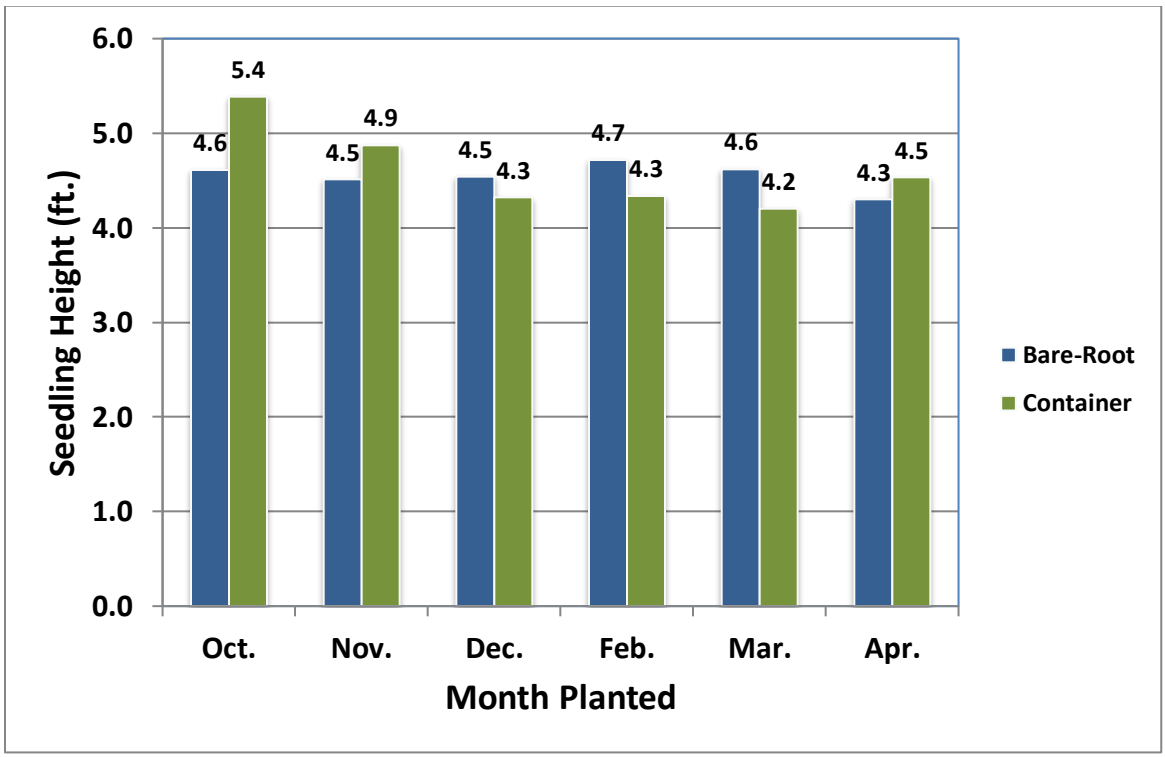

Figure 2. Average two-year height (ft.) of container and bare-root loblolly pine seedlings planted in October through April.