

HANDLING AND SHIPPING

CONTAINERIZED SOUTHERN PINES^{1/}

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Abstract.--Containerized southern pine seedlings have been shipped from greenhouses to outplanting sites up to 1,000 miles away. Four different methods of shipment have been used. Very little mortality has been attributed directly to shipping. Costs are two to three times more than for bare-rooted nursery stock.

INTRODUCTION

The Southern Region, U. S. Forest Service has been testing containerization of seedlings since 1969. Seedlings are produced on the Kisatchie National Forest near Pollock, Louisiana. This operation is regarded as a pilot project primarily concerned with development of a mechanized handling and growing system and study of the biological aspects of containerized seedlings rather than mass production of seedlings. Thus far, the project has produced in excess of 1.5 million seedlings for shipment throughout the Southern Region. The major effort has been devoted to growing longleaf pine (*Pinus palustris* Mill.), loblolly (*P. taeda* L.), slash (*P. elliottii* Engelm.) and shortleaf (*P. echinata* Mill.) although some eastern white pine (*P. strobus* L.) and a few species of hardwoods have been grown. Fiscal Year 1975 will be the last year of this pilot project; in the next phase of the program we will operate on a production basis.

This paper reports experiences encountered in the handling and shipping of containerized seedlings from Louisiana to outplanting sites throughout the southeastern states.

METHODS

The project was designed to find and use a pilot system (i.e., container, media, boxes,

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etc.) that would: (1) produce an acceptable seedling; (2) not involve large equipment or development costs; (3) take advantage of early research findings; and (4) fill the gap until the "state of the art" advances to the point where a specific system or systems can be recommended for our conditions.

The majority of our seedlings are now being produced in Japanese paperpots that are approximately 1" x 6". We are growing a limited number in the BR-8 wood fiber block. Once the paperpots are placed into a tray and filled with media, they remain there until removed for planting. After seeding, the trays are placed in a greenhouse where the seedlings are grown for approximately ten weeks. The non-returnable tray used for growing and shipping is made of Kraft paperboard. The tray had to be lined with a sheet of 1-mil polyethylene to prevent rapid deterioration of the paperboard. The tray is designed to hold one set of Japanese paperpots (266 containers). Immediately prior to shipping, a paperboard cover is placed over the tray to protect the seedlings and to allow stacking of the trays.

No effort has been made to harden off seedlings by placing in a lath house prior to shipment. The receiving units are advised to place the seedlings in partial shade until they are planted. Shipment has been made by the following means: (1) open stake body or pickup truck; (2) refrigerated transport; (3) air freight; and (4) commercial motor freight. Shipments have been made during the period of December through June.

RESULTS AND DISCUSSION

The nature of this pilot project is such that we were faced with shipping requirements that will not be needed in a normal operation,

Since one objective was to test growth and survival of the seedlings throughout the south-eastern states, it was necessary to ship from greenhouses near Alexandria, Louisiana to out-planting sites at distances up to 1,000 miles away. We have also shipped as few as five thousand seedlings 500 miles. It is anticipated that in an operational program, we will have production centers located throughout the Region with each center serving a radius of 150 to 250 miles.

In our handling of pine containerized seedlings, we have no definite evidence whether or not a period of hardening off between the greenhouse and planting is beneficial for spring and summer plantings. Seedlings taken directly from the greenhouse and planted in June and July seem to do as well as those that have been given a period of partial shade. Our greenhouses are not air conditioned. However, those used by Southern Station, Alexandria Research Center, are air conditioned, and they plant directly from the greenhouse in midsummer with no apparent harmful effect. We do attempt to harden the seedlings planted in December and January by reducing the heat in the greenhouse two weeks prior to shipping.

The most frequently used method of shipping has been in open stake body trucks. Those recipients within a day's travel normally send a truck to pick up their seedlings. We have had very little loss attributed to this means of shipment. The covers used to protect the seedlings have holes in them to allow for ventilation, but the holes are not of sufficient size to produce wind burn or damage. The greatest distance shipped by open truck was approximately 600 miles. The condition of the seedlings upon arrival was good.

Not knowing if the seedlings in the covered tray would undergo a heat buildup, we elected to use refrigerated vans to ship distances greater than the one day's drive. The first shipment made by van was to Florida in June, 1971. The temperature inside the van was maintained at 56° F. After 48 hours, the condition of the seedlings was excellent. There was no evidence of any drying or heating. We have since made shipments that have taken 80 hours to arrive at the final destination. No harmful effects have been detected in any shipments made by refrigerated transport. This method of shipping is definitely more expensive for containerized seedlings than for bare-rooted seedlings. Two factors in the high shipping cost are that a truck cannot be loaded to its minimum weight load and fewer seedlings are shipped. Because the seedlings must remain upright and protected by the bulky covers, a full load is only about 230,000 seedlings. The weight is approximately 18,000 pounds which is 12,000 pounds less than the minimum weight charged by

the truck line. Costs for the containerized seedlings are \$3.00 to \$3.75 per thousand. A load weighing approximately 32,000 pounds and containing about 550,000 bare-rooted seedlings shipped from W. W. Ashe Nursery costs \$1.00 to \$1.25 per thousand seedlings.

The third shipping method we have used is air freight. This method is feasible only for research or a pilot project such as ours. It does provide a method of transporting small numbers of seedlings to distant points. The costs ranged from \$8.85 to \$10.92 per thousand. The seedlings were in good condition when delivered.

The fourth method -- commercial motor freight -- was used only one time. We shipped four thousand loblolly seedlings from Alexandria, Louisiana to Chatsworth, Georgia. The seedlings were enroute eight days. We were somewhat surprised to find that, other than being a little dry, the seedlings were in good condition. This shipment was made in December which undoubtedly contributed to its success. The cost by motor freight was \$6.17 per thousand. We have not tried to determine how much stress the seedlings can tolerate, but it appears after this shipment that they can withstand some pretty rough handling.

We have had some mortality following shipment. In some instances, the loss has been extensive. Although we cannot say with absolute certainty these losses did not result from shipping, it is believed that infection with root rot or other fungi was the primary cause of mortality. We now know that some seedlings were severely infected before shipment. Needless to say, it was these seedlings that had the highest mortality.

For the southern pine species, handling and shipping of containerized seedlings presents no insurmountable problems. Because of their bulkiness, shipping costs are likely to be two or three times more than shipment of bare-rooted nursery stock. This can be reduced by producing the containerized seedlings close to planting sites.

Question: That were the shipping costs per 1,000 seedlings from the Stuart Project?

Gates: Air freight was \$8.85. Refrigerated commercial truck was \$3.00 for a full load, up to \$3.75 for a partial load, for distances up to 1,000 miles. For short-distance transport, Forest Service employees picked seedlings up in an open truck so costs would be labor plus mileage.