

CAN BUNDLED SEEDLINGS SURVIVE FREEZING?¹

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When trees are being planted, overnight storage outdoors is common practice, and not infrequently bundled seedlings are subject to freezing temperatures. How does this affect survival of the trees after they are planted?

Following up on limited previous work in this field, TVA Division of Forestry Development began a test in the spring of 1961 to find out how freezing affects bundled seedlings. The species involved were white pine, loblolly pine, and shortleaf pine. Normal storage temperature of 34 degrees F. was used as a check for comparison with two below-freezing temperatures-- 18 degrees F. and zero degrees F. Exposure times were 12 hours, 36 hours, and one week. To simplify data for the two below-freezing temperatures are combined in the table.

Ten bundles with 40 seedlings of each species (120 total) were prepared at the nursery in the usual way. Roots were protected with damp sphagnum moss and the trees were wrapped in brown waterproof paper. Three bundles were placed in each of three storage chambers controlled to the three temperatures under test. A bundle was removed from each chamber at the end of 12 hours, 36 hours, and one week. In addition, one bundle was held for 12 hours at 18 degrees, 24 hours at zero degrees, and 12 hours at 18 degrees. Purpose of this treatment was to determine the effect of gradual freezing and thawing. All bundles were allowed to thaw at normal storage temperature before planting. The trees were outplanted in March and survival was recorded May 17, August 1, and September 26.

The test showed pretty clearly that different species of pine vary in their ability to withstand freezing temperatures. For example, a freezing exposure of 12 hours had no effect on survival of white pine, whereas shortleaf survival was reduced 50 percent and loblolly survival dropped 70 percent. When exposure was increased to 36 hours, only 16 percent of the white pine and none of the shortleaf or loblolly survived. Not a single seedling of any species survived the week-long exposure. Only 5 percent of the white pine seedlings survived the gradual freezing and thawing test.

Survival counts in mid-May gave a fairly good indication of total mortality for loblolly and shortleaf pine at the end of the growing season. White pine, on the other hand, showed quite different survival percents in May and September. Seedlings continued to die during the summer.

Since the tree bundles used in our test were smaller than those generally sent out to tree planters, the damage reported here may be greater than might occur under normal conditions. However, this seems clear. White pine is not likely to be damaged by an overnight freeze, but shortleaf and loblolly pine will be hurt. To be on the safe side, don't let any seedlings freeze while in storage.

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Percent of Seedlings Surviving

Exposure Time	May 17			August 1			September 26		
	Shortleaf White	Shortleaf Loblolly		Shortleaf White	Shortleaf Loblolly		Shortleaf White	Shortleaf Loblolly	
Above freezing (34°)									
12 hours	100	98	100	100	100	100	100	100	100
36 hours.....	100	100	100	98	98	90	98	92	88
One week	98	100	100	98	98	98	98	95	98
Below freezing (0 and 18°)*									
12 hours.....	100	60	35	100	52	31	100	50	30
36 hours.....	92	0	1	17	0	0	16	0	0
One week	62	0	0	0	0	0	0	0	0
Gradual freeze and thaw....	85	0	0	10	0	0	5	0	0

*Half of seedlings were exposed at 0° and half at 18° F.