

# RESEARCH NOTE

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## SOME GUIDELINES FOR PLANTING 2-0 DOUGLAS-FIR IN OREGON

### A PRELIMINARY REPORT

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The Dwight L. Phipps State Forest Nursery at Elkton annually supplies 22 million 2-0 Douglas-fir seedlings to Oregon land managers. Some managers report excellent success in planting, but others report failures, particularly when planting late in the season. In some instances poor survival seemed to be related to storage.

Physiological changes that affect survival are known to occur in Douglas-fir planting stock, but the effects of environmental conditions on those physiological changes in seedlings grown at the State Forest Nursery have not been studied. Storage of seedlings is a common practice, but the effects of storage on physiological conditions vary with season. For example, seedlings lifted in October cannot be stored without reducing subsequent survival, but seedlings lifted in January can be stored safely for many weeks.

An experiment was conducted to measure the effect of lifting date and duration of storage on subsequent growth and survival of Douglas-fir seedlings. Also, a new type of storage container (a closed box), which was being used for the first time at the nursery, was compared with the one used previously in terms of seedling survival.

### PROCEDURE

Seedlings were lifted at the State Forest Nursery on four different dates. Some were planted immediately and some were stored for 3, 6, or 9 weeks before being planted. Two kinds of storage containers were used; open bundles and closed, essentially sealed, cardboard boxes lined with a polyethylene bag. Seedlings from each group were planted at two sites near Corvallis; a fairly level field of bare ground (comparable to Christmas tree plantations) and a gentle north-facing slope covered with grass and weeds (comparable to many reforestation sites). Seedlings also were weighed and planted in a covered soil bin where moisture could be controlled closely, but which otherwise presented a natural environment. Mortality and growth were measured the following September.

## RESULTS

Table 1 shows mortality on both the bare and the grassy planting site. Type of storage container did not affect mortality. Differences in date of lifting or duration of storage were not important for seedlings planted at the bare site, but both effects were important at the grassy site. Seedling weight at time of lifting was about the same for all four lifting dates. Table 2 shows the average percentage increase in fresh weight for seedlings planted in the soil bin. Date of lifting and duration of storage caused important differences in fresh weight.

## DISCUSSION

These results indicate that when seedlings are outplanted on a site with little or no vegetative competition, good survival can result despite late lifting date or long (9-week) storage period, or both. But on a site where strong vegetative competition is present, planting seedlings lifted after February or planting stored seedlings may result in increased mortality. Planting seedlings lifted late (March), and then stored, results in the highest mortality.

Data in Table 2 indicate that late lifting or storage of seedlings may not affect survival, but gain in fresh weight is certainly reduced when either seedlings lifted after early February or stored seedlings are planted. Increase in fresh weight is lowest for seedlings lifted in March and then stored for 9 weeks. In general, the growth of seedlings in the soil bin paralleled the survival of seedlings planted on the grassy site. The year 1971 was good for seedling establishment because of late spring rains. Less favorable weather would have resulted in higher mortality in both field planting sites, particularly for seedlings lifted late and stored.

If seedlings were lifted early (January) and stored until ready for planting, both late lifting and storing of late-lifted stock could be avoided, and perhaps mortality of stock planted late in the season could be reduced. Present operational goals are to lift only from November through February.

## RECOMMENDATIONS

Based on results obtained to date, the following tentative guidelines are recommended for planting 2-0 Douglas-fir seedlings raised from seed originating at middle elevations and grown at the Dwight L. Phipps State Forest Nursery:

1. Plant early (January) for best survival where other factors, such as frost occurrence or animal damage, permit.
2. If planted in a bare site, expect good survival of stock lifted late and stored, although growth may be less than for stock planted earlier.
3. If late planting is necessary, plant trees lifted in January or early February.
4. When late planting or long storage cannot be avoided, the planting site should be cleared—by cultivation, if in a plantation, for example.

Table 1. Survival of 2-0 Douglas-Fir Seedlings Grown at the Dwight L. Phipps State Forest Nursery, Elkton. Seeds Were from a Middle-Elevation Willamette Valley Source. Planting Was by Hand. Each Average Value Is Based on 200 Seedlings.

Storage period	Survival					
	Bare site <sup>1</sup>			Grassy site <sup>2</sup>		
	Closed box	Open bundle	Avg	Closed box	Open bundle	Avg
Weeks	%	%	%	%	%	%
Lifted 19 Nov 1970						
0	82	82	82	96	96	96
3	88	91	89	84	87	86
6	85	76	80	92	82	87
Lifted 25 Jan 1971						
0	98	98	98	86	86	86
3	93	87	90	76	80	78
6	88	92	90	74	60	67
Lifted 22 Feb 1971						
0	90	90	90	92	92	92
3	93	88	91	81	64	72
6	96	86	92	29	70	50
9	71	93	82	46	41	44
Lifted 15 March 1971						
0	81	81	81	69	69	69
3	95	87	91	49	46	48
6	94	88	91	81	46	64
9	96	94	95	9	70	40

<sup>1</sup>Differences caused by type of storage container, lifting date, or duration of storage are not significant at the 95 percent level of probability.

<sup>2</sup>Differences caused by type of storage container are not significant at the 95 percent level of probability; differences caused by lifting date and duration of storage are significant at the 99 percent level.

Table 2. Increase in Dry Weight of 2-0 Douglas-Fir Seedlings during the First Growing Season. Each Average Value is Based on 80 Seedlings Grown in a Soil Bin.

Storage period <sup>1</sup>	Closed box <sup>2</sup>	Open bundle	Avg
Weeks	%	%	%
Lifted 19 Nov 1970 <sup>1</sup>			
0	206	206	206
3	256	162	209
6	285	142	214
Lifted 25 Jan 1971			
0	224	224	224
3	176	145	163
6	158	140	149
Lifted 22 Feb 1971			
0	113	113	113
3	135	176	155
6	115	155	135
9	136	82	109
Lifted 15 Mar 1971			
0	274	174	174
3	105	153	129
6	109	124	116
9	62	99	81

<sup>1</sup>Differences caused by lifting date and duration of storage are significant at the 99 percent level of probability.

<sup>2</sup>Differences caused by type of storage container are not significant at the 95 percent level of probability.