

Field survival poor for stored and heeled-in ponderosa pine seedlings

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Several thousand 3-0 ponderosa pine seedlings of a Siskiyou National Forest seed source were erroneously lifted from nursery beds in mid-November 1968. Immediately after sorting, bundles of seedlings were wrapped in waterproof paper with moist peat and packed in polyethylene-lined kraft bags. After 5 and 16 weeks of cold storage, some were heeled in for 14 and 3 weeks, respectively, at the nursery. The rest were held in storage for 19 weeks.

In the spring of 1969, field foresters, seeking information concerning the quality of both the heeled-in and stored seedlings, asked reforestation specialists (including the author) to examine them. We recommended that all seedlings stored longer than 5 weeks be discarded and that those heeled-in after 5 weeks' storage be re-sorted before shipment.

A limited study was established to test the validity of this recommendation and to gain more insight into extended storage and heeling in of ponderosa pine seedlings.

The Study

In early April 1969, four batches of 100 seedlings each were prepared for transport to the field:

Batch	Weeks	
	Stored	Heeled-in
1 (control)	0	0
2	5	14
3	16	3
4	19	0

Those taken from the heel-in beds were re-sorted as they were packed. Those taken from storage were neither re-sorted nor repacked. Because undisturbed seedlings of the same lot were no longer available in the nursery, control seedlings (neither stored nor heeled-in) were lifted from

a geographically similar source of the same age.

Test seedlings were transported to the Siskiyou National Forest and planted the day after control seedlings were lifted. Two widely separated square blocks of 200 trees each (50 per treatment) were planted in a single clearcut. Block A was located on a level bench fairly clear of vegetation but covered by a small diameter slash and laced with old roots. Block B was located on a slight north slope entirely clear of slash but having at planting time a very light grass cover. Each block, planted by a single individual, contained 50 identical sets of four seedlings; one from each batch was included in each set. Seedlings were planted 8 feet by 8 feet apart.

Results

One full year later, survival differed significantly; it was best, 57 percent, in the group of trees planted immediately after lifting, and poorest, 18 percent, in the group stored longest:

Weeks		Percent survival		
Stored	Heeled-	Block A	Block B	Average
	in			
0	0	60	54	57
5	14	34	30	32
16	3	24	24	24
19	0	16	20	18

Among heeled-in trees, differences were not significant, but those with the shortest storage survived best. Thirty-two percent of seedlings stored 5 weeks and heeled-in the last week in December survived. Twenty-four percent of those stored 16 weeks and heeled-in the first week of March survived.

Discussion

Under the prevailing nursery and site conditions, neither storage nor storage plus heeling in was satisfactory for long-term holding of seedlings lifted in November. Though survival of seedlings was almost twice as high after storage plus heeling-in as after continuous storage, it was still very low. The recommendation to discard all seedlings lifted prematurely would have been most appropriate.

Another possible recommendation not covered by this study might have been considered. Some of the original seedlings remained heeled-in at the nursery throughout the 1969 growing season. About 90 percent (nurseryman's estimate) survived. A second planting using these

seedlings may have yielded entirely different results.

This limited study suggests that ponderosa pine seedlings should *not* be lifted in late fall for planting the following spring on average or severe sites in south

western Oregon. Low survival of control seedlings indicates how difficult regeneration is on such hot, dry sites even when lifting, transportation, and planting are done promptly and well. Length of storage is important in many

other parts of the West, too, where ponderosa sites are frequently under snow until after seedling growth begins in the nursery.