FREEZING OF NURSERY STOCK

by

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In 1966, the Payette National Forest received some frozen nursery stock to be planted in a seed orchard. Considerable expense was involved so planting proceeded, and because of the seed orchard, complete survival records have been maintained. The first year survival was 95 percent and second year survival was 91 percent. This is good survival under any conditions.

The thought occurred that freezing could possibly be an acceptable storage treatment.

In 1968, approximately twenty Engelmann spruce and twenty Douglas-fir were frozen and a like number placed in refrigeration. All of the trees were handled similarly--packed in moist spagnum moss inside plastic bags. This was April of 1968. The trees to be frozen were placed in a home deep freeze at approximately 0° F. The refrigerated trees were placed in a refrigerator in the office, which later testing showed varied in temperature from 25° to 35° F. Supposedly these trees were to be kept unfrozen.

Through several misconnections, all of these trees were kept in storage until March 1969. All of the trees were removed from storage and placed on top of a melting snowdrift for three days to acclimatize. Some of the packages still had some ice crystals in the moss when planted. Ten to twelve trees from each lot, i.e., Douglas-fir – frozen, Douglas-fir – unfrozen, Engelmann spruce – frozen, and Engelmann spruce – unfrozen were randomly selected and planted in Ogden, using a tile spade. At planting, all trees had the appearance of freshly dug trees.

One of the frozen Engelmann trees was given special treatment. This tree was planted the same as others, but snow was carried in and placed around and over tree. This protection lasted for several days before the snow melted. This treatment was not a planned part of the trial, but a whim of the planter's wife.

Within one week the Douglas-fir, both frozen and unfrozen, had begun to turn brown. This color trend continued and in less than one month all Douglas-fir were definitely dead.

The Engelmann spruce unfrozen maintained fair color with some browning of needles. After three months, three of these plants are alive. There has been tip damage but the plants are definitely alive.

The frozen Engelmann spruce maintained color much longer than the Douglas-fir. After turning brown, they had the feel and texture of living plants, but gradually became brittle and needles fell off. The regular frozen Engelmann spruce all died.

The one frozen Engelmann spruce planted separately and given the snow cover had two of the lower buds break dormancy. Most of the original needles turned brown but the plant is still alive.

It is surprising that any seedlings are still alive after being in storage for an entire year. It is also surprising that any seedlings are alive after complete freezing. It is possible that the snow cover given the one tree may have conditioned the seedling or allowed come pletion of thawing gradually.

It was decided that additional trials should be made.

During the 1969 lifting season (April) additional trees were placed in storage for these trials. On April 25, eight ponderosa pine, fourteen Engelmann spruce, and thirteen Douglas-fir were placed in a refrigerator set to maintain 25 F. The roots were packed in moist spagnum moss and the seedlings packaged separately by species in plastic bags. A like number of seedlings were packaged similarly to be kept refrigerated but at 34 F. as controls.

All tree packages were removed from refrigerators on June 11 and placed in a portable ice chest. On June 12 they were planted on the Cache National Forest. Planting site is on north-facing slope.

A frozen tree and an unfrozen control tree were paired at each stake. Facing the slope and the stake the frozen tree is on right and the unfrozen control tree is on the left of stake.

The buds of ponderosa pine kept at 34° had extended considerably. All other buds had not burst yet.

On July 14, these trees were again observed. suds were just breaking. Trees all looked normal.

On September 22, a survival check was made with the following results:

Ponderosa pine	refrigerated	87% survival
		62% frozen

Douglas-fir	refrigerated	100% survival
	frozen	77%
Engelmann spruce	refrigerated	100% survival
	frozen	86%
Overall total Survival	refrigerated	97% survival
	frozen	77%

We know that at least 4 trees were killed by gopher damage and not because of the freezing.

We believe that trees in storage are not seriously damaged by freezing. We are not recommending freezing at this time, but if trees are frozen do not 'panic. Thaw the trees gradually and proceed with planting as usual.

We do believe that further research or studies should be conducted to determine limits of temperature and time. Colder temperatures may permit mold-free storage. This is one of our problem areas.